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The Future Health Workforce

Integrated Solutions and Models of Care

Edited by
Madhan Balasubramanian and Stephanie Short

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About the Editors

Madhan Balasubramanian is an Australian Government National Health and Medical Research Council (NHMRC) Sidney Sax Research Fellow at the University of Sydney and Kings College London. He is also a Visiting Research Fellow at the University of Adelaide. Madhan is a health services researcher, with core strengths on methodologies, health workforce, ageing, information systems and oral health. He carries specific focus on the future design and sustainable development of core health system components and developing integrated systems to address the sustainable development goals. He brings an excellent track record, relative to opportunity. He has published over 35+ scientific research articles. He has won three nationally competitive Australian Government fellowships. He has received over a million Australian dollars in nationally/internationally competitive fellowships (as CIA), in addition to scholarships and academic prizes. In addition to serving as guest editor in several journals, Madhan also serves as an editorial board member of BMC Health Services Research.

Stephanie Short is an established health sociologist and health policy academic at the University of Sydney. She leads the Global Health Workforce Node at the Menzies Centre for Health Policy and Economics, and convenor of HealthGov, an international research network that brings together researchers, professionals, and regulators to provide ideas and evidence to underpin good regulation, safer practice and improved access to health care. She is a member of the Editorial Committee of Health Sociology Review, the Asia Pacific Journal of Health Management and the International Journal of Health Governance. She has successfully secured approximately A$6 million in competitive grants over the years. Professor Stephanie Short has written nine scholarly books over the last three decades. She is the co-author of the highly successful Health Care and Public Policy: An Australian Analysis, originally published by Macmillan in 1989 with the fifth edition published in 2014. She is the first co-author of the popular text Sociology for Nurses: An Australian Introduction that went into a second edition with Macmillan, and the co-editor of two scholarly collections: Goodbye Normal Gene: Confronting the Genetic Revolution published by Pluto Press, and more recently Health Workforce Governance: Improved Access, Good Regulatory Practice, Safer Patients. These books have attracted over twenty reviews in scholarly journals including Health Policy, Politics and Law, Sociology of Health and Illness, The Journal of Sociology and Health Sociology Review.

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Editorial

The Future Health Workforce: Integrated Solutions and Models of Care

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The health workforce is a vital aspect of health systems, both essential in improving patient and population health outcomes and in addressing contemporary challenges such as universal health coverage (UHC) and sustainable development goals (SDGs). There is an increasing body of research that indicates that if the health workforce were to be re-designed from the ground up—based on population needs—we would see a very different configuration of the health workforce. This makes us wonder how one could design or develop innovative health workforce solution(s) for the future in order to make the health workforce more responsive to population needs.

The 21st century presents several challenges to the health workforce and the health professions that require thoughtful consideration and analysis. Health inequalities continue to exist both within and across countries, especially affecting vulnerable and disadvantaged groups. Disease patterns are changing, with a rise in chronic conditions and non-communicable diseases, the COVID-19 pandemic notwithstanding. Increased life expectancies also present us with the challenge of meeting care provisions for an ageing population. Workforce shortages, geographic maldistribution, and international migration are omnipresent.

Health workforce solutions have been diverse and generally dependent on condition, context, or country-specific scenarios. New health occupations, as well as reforming the scopes of practice of existing occupations, have been widely debated as solutions. Of importance has been how different health personnel groups can work collaboratively as a team, and at different levels of care—primary, secondary, and tertiary. Models of care specific to population groups (e.g., Indigenous peoples, children, or older people) as well as health conditions (e.g., cancer or oral health), and health strategies (e.g., rehabilitation) are emerging, with varied success.

In this special issue of the International Journal of Environmental Research and Public Health, we have brought together research that debates and provides innovative health workforce solutions directed towards meeting population needs, mainly through integrated solutions or models of care. We have also included papers that cover challenges at an education or regulatory level. This special issue, entitled "The Future Health Workforce: Integrated Solutions and Models of Care", features a compelling range of research that spreads across the health professions, including medicine, nursing, dentistry, and allied health. This edition embraces quantitative as well as qualitative research approaches, as well as methodological pluralism and a rapid review. A hallmark of each article is methodological rigor, and we are particularly pleased to have included research conducted with health workforce groups dealing with different conditions in a range of contexts and countries including the USA, the UK, Canada, Australia, Sweden, South Korea, Japan, China, and Brazil. This special issue features 13 papers.

The first research paper, from a multidisciplinary team of researchers based in the Rural Clinical School in the Faculty of Medicine at the University of Queensland in Australia, provides a theory that assists us to understand factors that affect doctors in choosing

a generalist or specialist medical career [1]. Belinda O'Sullivan and colleagues' theory shows us that the decision-making process involves multi-level contextual factors that intersect with triggers that produce a career preference. Both clinical and context-specific exposures, as well as attributes, skills, norms, and the status of generalist and specialist fields affects choice. These factors combine with doctors' interests and expectations, including their professional values, and perceptions about socio-economic and lifestyle rewards. It is interesting to note too, that these factors and considerations intersected with social circumstances, most especially gender and life stage.

The second article reports research conducted with the health services management workforce in China [2]. The starting point for the study by Zhanming Liang and colleagues is the fact that the traditional recruitment approach relied on clinical performance and seniority, which provided little incentive to improve competencies. The study utilised validated management competency assessment tool that was administered to directors and deputy directors of medical services (n = 295) in three categories of hospitals. The survey revealed that the informal and formal education received by medical leaders in these Chinese hospitals has not been effective in developing the required medical and leadership management competencies. This provides a basis for recommendations regarding health system and higher education strategies to improve the management competencies of clinical leaders in China.

We then turn to a thematic analysis of Twitter data and newspapers extracted through a search for new forms of team work in the health and social care of older people in response to the COVID-19 pandemic [3]. The study conducted out of University College, Dublin in Ireland, identified rapid transformations in ways of working, including innovations in telehealth, and in using online platforms to facilitate team meetings. Interestingly, much of the change was attributed to goodwill as a response to the pandemic.

Catherine Cosgrave's study addresses chronic workforce shortages and unmet health care needs in rural and remote communities in Australia [4]. The findings from this qualitative study (semi-structured interviews with 74 executive staff, managers, and allied health professionals) revealed factors influencing the recruitment and retention of allied health professionals in rural public sector health services in Australia. The study emphasises the value of a 'whole-of-community approach' that supports individual allied health professionals and their families to adjust to a new place and develop a sense of belonging in a new community.

The next paper in this special issue reports a national cross-sectional study of faculties supporting general medical practitioners (GPs) [5]. Matthew McGrail and Belinda O'Sullivan report data obtained from an annual national cross-sectional survey of doctors in Australia conducted between 2008 and 2017. The survey revealed that GPs with fellowship of a rural faculty, were more likely to use advanced skills, especially procedural skills, compared with standard GPs. Membership in a rural faculty was also associated with significantly improved geographic distribution. Thus, the rural faculties were found to be critical in building and sustaining a general medical practice workforce that is better able to respond to health needs in smaller, often isolated, communities.

The following paper takes us to research conducted on an innovative model of workers' healthcare assistants by a group of Portuguese researchers in Brazil [6]. This study presented and validated the Workers' Healthcare Assistance Model (WHAM) which includes an interdisciplinary approach to health risk management. The study was conducted between 2011 and 2018 in a workers' occupational health center in the oil industry in Brazil. The study of a sample of workers (n = 965) showed a sustainable return on investment, covering workers with heart disease and diabetes. The study concludes that this model of workers' healthcare assistants is capable of enhancing workers' health in companies, while reducing costs for employers and improving workers' quality of life within the organisation.

Luis Miguel Dos Santos has investigated reasons behind the shortage of public health, social work, and psychological counselling professionals who can provide multilingual

services to minority groups and foreign residents in South Korea [7]. This fascinating study explored why graduates and professionals with multilingual skills in these three professions decided to leave their professional fields for the hospitality and business service sectors, particularly for those who completed their initial training at a university outside Korea. Twelve professionals were interviewed in depth, based on an approach consistent with social cognitive career theory. The results indicated that public health, social work, and psychological counselling services-related positions were not available, and that there was a lack of career development skills amongst these graduates who were working in fields such as tourism (such as a social worker working as a car valet) and marketing.

The next paper in this special issue investigated the future of careers for public-health professionals with training in climate change based on analysis of 16 years' worth of job postings and a survey with prospective employers [8]. Heather Krasna and colleagues from the Mailman School of Public Health at Columbia University in the USA conducted this study in a context where skills and competencies relevant to climate change have been incorporated into the curricula of schools of public health in Europe and Australia. They discovered that current employers value knowledge of fields such as climate mitigation and adaptation, climate-health justice, effects of climate on health, health impact assessment, risk assessment, pollution-health consequences and causes, geographic information system (GIS) mapping, communication, finance and economics, policy analysis, systems thinking, and interdisciplinary understanding. The study found that the current job market for public-health professionals with training in climate change appears small and may grow in the next 5–10 years.

Innovative health workforce solutions were needed for the Swedish mental health workforce due to the recent refugee crisis. Sandra Gupta and colleagues from Uppsala University Sweden explored the experiences of mental health workers towards new training solutions to effectively manage unaccompanied refugee minors [9]. They suggest that dealing with suicidal ideation can be challenging and feelings of helplessness can occur. They suggest that collaboration between agencies and key stakeholders as essential when targeting refugee mental health in a stepped care model to assist the mental health workforce.

The next paper from Sierras-Davo and colleagues based in Spain and Greece discusses how you can transform the future healthcare workforce across Europe through improvement science [10]. They evaluate the experience of European nursing students after an intensive one-week summer programme conducted in 2019 at the University of Alicante in Spain. Based on the findings from the study, values like compassion, respect, or empathy were identified as key elements of care. Furthermore, promoting international students' networking emerged as the key to creating a positive provision for change and the generation of improvement initiatives. They suggest that building a healthcare improvement science culture may provide future healthcare professionals with critical thinking skills and the resources needed to improve their future work settings.

Yuki Ohara and colleagues based in Japan discuss an interesting paper on job attractiveness and job satisfaction of dental hygienists based on the 2019 Japanese dental hygienists survey [11]. Using a nationally representative data set of 7869 working dental hygienists, they analyse seven items of job attractiveness, 14 items of job satisfaction, and 13 items of request to improve the working environment. They implement item response theory and structural equation modelling (SEM) in the analysis. They identify that dental hygienists preferred national qualifications more than income stability. The SEM also showed that job satisfaction consisted of two factors, 'value for work' and 'working environment', as did job attractiveness, with 'contribution' and 'assured income'. Finally, they suggest that improving job satisfaction and work environments could help to improve the employment rate of dental hygienists, which could positively influence patient care.

A very interesting commentary is featured as the penultimate article, titled Broken Promises to the People of Newark. Franklin et al [12] discuss the relationship between organised medicine, state and local leaders, and the people of Newark. The authors

emphasise that among medical schools, Rutgers New Jersey Medical School's commitment to Newark is meaningfully unique. This social contract between the medical school and the people of Newark is identified through the portrayal of historical events which led to the establishment and development of the medical school.

We round out this special issue with a rapid review of contemporary techniques and practices in oral health workforce modelling, conducted by a team of researchers from England and Australia [13]. Workforce modelling is used to inform health workforce planning through examination of the current and future supply of professionals against the need and demands of a population. The rapid review included 23 studies from 15 different countries. The study identifies that dentists were the sole oral-health workforce group modelled in 13 studies; only five studies included skill-mix (allied dental personnel) considerations. Furthermore, the most common application of modelling was a workforce to population ratio or a needs-based demand weighted variant. Nearly all studies presented weaknesses in modelling process due to the limitations in data sources and/or nonavailability of necessary data to inform oral health workforce planning. Skill-mix considerations in planning models were also limited to horizontal integration within the oral health professions. This timely study identifies that planning for the future oral health workforce is heavily reliant on quality data being available for supply, demand, and needs models. Integrated methodologies that expand skill-mix considerations and account for uncertainty are essential for future planning exercises.

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Article

A Realist Evaluation of Theory about Triggers for Doctors Choosing a Generalist or Specialist Medical Career

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Abstract: There is a lack of theory about what drives choice to be a generalist or specialist doctor, an important issue in many countries for increasing primary/preventative care. We did a realist evaluation to develop a theory to inform what works for whom, when and in what contexts, to yield doctors' choice to be a generalist or specialist. We interviewed 32 Australian doctors (graduates of a large university medical school) who had decided on a generalist (GP/public health) or specialist (all other specialties) career. They reflected on their personal responses to experiences at different times to stimulate their choice. Theory was refined and confirmed by testing it with 17 additional doctors of various specialties/career stages and by referring to wider literature. Our final theory showed the decision involved multi-level contextual factors intersecting with eight triggers to produce either a specialist or generalist choice. Both clinical and place-based exposures, as well as attributes, skills, norms and status of different fields affected choice. This occurred relative to the interests and expectations of different doctors, including their values for professional, socio-economic and lifestyle rewards, often intersecting with issues like gender and life stage. Applying this theory, it is possible to tailor selection and ongoing exposures to yield more generalists.

Keywords: career choice; generalist; general practice; specialist; medical training; doctors; realist evaluation; theory; experience; norms; attributes

1. Introduction

Many countries are training more doctors than ever before, but a major goal is achieving enough generalists working in fields like general practice (GP) and public health compared with narrow specialty fields [1]. Achieving a critical mass of generalists is important as they support delivery of integrated, preventative and primary care services across a wide range of community needs, at lower cost, for increased life expectancy [2–5]. Although preventive and primary care services are universally needed, many countries are facing declining general practice numbers [6,7]. Current trends are producing an overabundance of non-GP specialists who focus on targeted populations or body systems, potentially increasing the geographic centralisation (city practitioners), fragmentation and inefficiencies of healthcare. A more generalist workforce could be realised if the levers underpinning the choice to become a generalist or specialist doctor, were better understood.

The existing evidence of specialty choice is limited to countries where there are strong markets for specialist services, including Australia, the United Kingdom (UK), the United States of America (USA), Canada, Germany and Japan. Some is based on medical student intentions [8–14], somewhat unreliable for informing actual choice. Other material explores preferences of junior (pre-registrar) doctors [15–21]

or trainees (registrars/residents enrolled in postgraduate vocational training) along with qualified fellows (generalist/specialist) [22–26]. However, this evidence is largely analysed by influential factors, not specifically about how these factors are activated (including for whom and when various choices might fire), which would better inform the design of interventions to produce generalists, across the long medical training pathway.

The literature highlights that choosing a specialty is a complex process with a number of identified correlates. One national survey of trainees suggested choice of a particular specialty was stimulated by *intrinsic*—appraisal of skills against specialty; intellectual content; interest in helping people; and *extrinsic* factors—work culture; flexible working hours and; hours of work [26]. Compared with other specialties, general practice trainees showed a higher regard for helping people and fitting their work to domestic circumstances [26]. General practice is also attractive because of lifestyle, continuity of care, procedural skills and work opportunities [15,16]. Primary care role models and experiences may facilitate uptake of general practice [15,24,27], although scant studies suggest general practice may have lower professional status compared with focused specialties [15,16,24]. Higher professional status is attributed to specialty fields like surgery that give a clear professional identity and tight network of inherent socio-economic capital [28].

Particular specialties may also be attractive to young and emerging doctors because of their pro-social attributes, like teamwork and caring, which reinforce expected values, norms and cultures [28]. Equally technical attributes may be a drawcard. Cardiology [25], surgery, obstetrics and gynaecology, ophthalmology, anaesthesia and emergency medicine, were attractive because of technical skills and procedural work [26].

Financial reward and medical student debt may also affect the choice to be a generalist or specialist, though the evidence is mixed. A review suggested higher medical student debt may lead to pursuing higher paying specialties in countries like the USA [29], although other USA [29–31] and Australian research [32] contradicts this.

Demographics may equally overlay choice patterns. Females show differentiated considerations of work-life balance and part-time work options when choosing specialties [11,12,25,26,33]. Females are widely demonstrated to be more likely to work in general practice, which has more flexible work options [33]. Males of older age at medical school graduation may also choose general practice to fit with the rest of their lives [32]. Apart from gender, other factors may 'prime the pump' for choosing to be a generalist or specialist, such as ethnic, family and community background as well as personal experiences, but these are under-researched.

There is minimal research specifically dichotomised to generalist or specialist choice, which accounts for the temporal dimensions impacting choice-making. Only one longitudinal study in the UK suggests general practice interest may increase over time following graduation (18% to 33%), 81% noting this related to achieving particular work conditions and 44% to fit domestic circumstances [33]. Otherwise, the decision-making process regardless of specialty is known to be multi-staged [20] and emergent [22].

In summary, complex dynamic patterns are likely to underpin specialty choices but there is minimal theory about how the choice to be a generalist or specialist doctor occurs which accounts for doctor's characteristics and their experiences over time. We aimed to develop theory about what works for whom, when and in what contexts, to yield choice to become a generalist or specialist doctor.

2. Materials and Methods

2.1. Design

We used a realist evaluation method guided by the RAMESES II standards because our question was realist in nature and realist evaluation is applicable for evaluating complex issues [34]. We aimed to explore how context (C) (the backdrop of the doctor's personal characteristics and experiences over time) would trigger mechanisms (M) (the things that enable or the generative force) to yield uptake of

a generalist or other specialist medical career (O) [35]). The terms used in realist methods are outlined in Box 1. Realist evaluation aims to test initially hypothesised theory and develop and refine new theory about how programs achieve results, frequently expressed as C + M = O configurations (CMO). As such, the outcome of a realist evaluation is theory, depicted by one or many CMO configurations. The main author (BOS) had completed formal realist methods training and BOS and MM had previously applied the method to a program evaluation.

This study had ethical approval from The University of Queensland ethics committee 2012001171.

Box 1. Definition of terms used in realist evaluations [35,36].

Context—pertains to the backdrop of conditions connected to triggering generative forces (mechanism) that modify behaviour towards the outcome. These may include conditions that change over time, such as funding, trust, experience, locations.

Mechanisms—are considered the 'triggers' or generative forces that lead to outcomes if they are 'activated' in the right conditions. It may denote cognitive or emotional reasoning of the various actors at work, challenges or successes or may be synonymous with the program's strategies such as responding to an incentive.

Outcomes—are intended or unintended resulting from the interplay of context and mechanisms and can be proximal, intermediate or final.

Context-mechanism-outcome (CMO) configurations—is a heuristic used to generate causative explanations pertaining to the data. This process draws out and reflects on the relationship of context, mechanism and outcome of interest in a particular program being evaluated. A CMO configuration may pertain to either the whole program or only certain aspects. Configuring CMO patterns is the basis for generating and/or refining theory that is the product of a realist evaluation.

2.2. The Environment for our Evaluation

Our study was based in Australia which is experiencing a shortage of generalists and rural doctors related to developing a new National Medical Workforce Strategy which this evaluation can inform [37]. After completing university-based medical training, which is of 4–6 years' duration (noting Australia has a mix of under and postgraduate medical degree options), doctors work independently in hospitals as pre-registrars for a minimum of 2 years. Around this time, they are eligible to start applying/commence vocational training (spanning 3–6 years), which involves entering a competitive process for selection into one of a number of individually governed medical colleges (equivalent to 'residency' in many countries).

2.3. Initial Program Theory

Realist methods require that researchers have an initial program theory, which can be tested during the realist evaluation process. This involves broadly hypothesising the potential causal patterns at play for producing generalist or specialist doctors [35]. We applied reciprocal determinism as part of social cognitive theory to our evaluation question. This theory was set out by psychologist Bandura in 1978 [38]. It notes that a person's behaviours both influence and are influenced by personal factors like cognition and the social environment such as observing other doctors. Further, the impact on behaviour may be conditioned from what is experienced/observed and the consequences of this, such as negative feedback or low financial reward. This theory aligns with the background literature about specialty choice, showing it is complex and dynamic, impacted by intrinsic and extrinsic drivers [26], an interplay of influences and mediating factors [15,28].

Moreover, that choosing a specialty involves a complex cognitive process undertaken within a personal, social and professional context particular to each individual [28,32] and over different stages [20]. The methods for exploring this further, across two phases, were chosen to firstly allow for in-depth analysis of empirical data from contemporary early career doctors about their career decisions (interviews) (phase 1: developing theory). Secondly, and broader perspectives beyond the context of the individual were collected, by checking phase 1's findings with a wider sample of medical experts involved in this field, along with exploring other literature (phase 2: refining theory).

2.3.1. Phase 1: Developing Theory

To develop theory relevant to the research question, in 2019, we drew on a purposeful sample of 82 doctors who graduated from the University of Queensland (one of Australia's largest medical courses) for whom we had Email contact details. We aimed to recruit graduates between their 1st and 17th postgraduate year of work (as this is a broad period of those both entering and recently experiencing specialty training, thus capturing specialty choice decisions across diverse pathways/fields), covering a mix of genders, work locations and generalist/specialist fields to gain a breadth of perspectives of relevance to our research question.

A semi-structured interview schedule was developed and piloted by the research team of mixed qualitative and quantitative experience and explored "*the nature of medical career decision making*" including reflections (current or recent past) about specialty choice (Table 1). Participants were blinded to the research question to encourage free reflection from the perspective of their own experiences.

Table 1. Interview guide used in phase 1.

Question	Specific Prompts	General Prompts
Could we start by you telling me a little about yourself and your career as a doctor?	Things like your current practice location, area of medicine, stage of medical career, and where you did each stage of your medical training?	Could you please expand on that? That is very interesting, could you tell me more? Really, what was that like? Reflecting on that time in X, could you give me a bit more detail about X experience?
What are the major factors that have influenced your medical career journey to date?	Identify factors that influenced participant's career decision, current practice location; area of clinical practice; amount of time devoted to clinical medicine; decision-making in the context of family situations, partner employment, incentives, professional support	
What were the important time points when things happened that determined the current shape of your medical career?		
What made these time points important?		
What happened at those times and how did they affect your career trajectory?		
How much control have you had over how your medical career has turned out?	Things like; going to medical school, internship location, vocational training, geographical location of current clinical practice	
What are the factors that influenced (gave you more or restricted) that control?		
How easy (or realistic) is it to change where you practice (geographically); and also your field of medical practice?	How flexible is a medical career; and does it vary at different times in one's life? Does it vary by area of medical practice? By where you live (city/country)?	
Have you considered changing where you practice or your field of medical practice?		
Have you had to move from where you were living to pursue a training opportunity, or to meet clinical/professional college requirements?		
Did you later return to where you were?		
Have you had breaks in practice?		
Can you tell me the reasons for those breaks?		
What would have made your medical career progression better informed?		
What (else) would have improved the way your medical career has progressed?		
Before I turn off the recording device, is there anything else you would like to comment on?		

Interviews of up to 40 minutes' duration were done using video and phone-meetings, by two qualitative-PhD-trained female interviewers who had no prior relationship with participants (TG and PM). Participants were not paid. Prompts (Table 1) were used to expand and deepen understanding of issues for full description [39]. Post-interviews, the researchers recorded reflective notes and discussed emerging themes with the wider research team for sense-making and informing hidden areas for further exploration [39]. Data collection ceased once saturation was reached. Interviews were recorded, transcribed verbatim and de-identified using a unique identifier.

The full de-identified transcripts were read by the whole research team. For a breadth of interpretation, the research team included academics with experience as clinicians (BOS, PM, both non-medical), policy/program staff (BOS, PM) and mixed methods medical workforce research (all). This allowed analysis to draw on different theoretical interpretations of the data (triangulation) to reduce subjective bias [39] and be self-reflexive with respect to predilections or opinions [40,41].

The researchers highlighted and sorted CMO configurations from transcripts, building on and expanding the original program theory. These configurations were discussed at multiple meetings (iterative process), where reflective notes were recorded and shared with the team to aid depth of analysis. Thereafter, full transcripts and extracted text were re-reviewed by all authors, to check for any deviations and consider consistent CMO configurations underlying an holistic theory [39]. This process enabled internal corroboration or disconfirmation [42,43] until the research team reached consensus about a coherent phase 1 program theory.

To aid interpretation, transcripts and extracted text included notation of participant characteristics and the outcome: generalist or specialist choice (Table 2).

Table 2. Definition of notation used to depict participants in the text of phase 1 interviews [a].

Notation	Definition
J, T or F	junior doctor, trainee or fellow (defined in Table 3)
R or M	working rurally or metropolitan
Male or Fem	male or female
Gen or Spec	Generalist (general practice or public health) or specialist (all others) based on self-reported interest/uptake of a chosen postgraduate field of medicine

[a] All participants interviewed had decided on, commenced or recently completed a specialty field allowing the outcome to be measured. Rural work location was determined using official Modified Monash Model levels 2–7, which is the standard definition used by the Australian government for health policy [44].

Table 3. Summary of phase 1 participants (n = 32) [a].

Characteristics	*n* (%)
Sex	
Females	16 (50)
Males	16 (50)
Training stage	
Junior—yet to start vocational training as registrar (typically PGY 1–5)	8 (25)
Trainee—currently enrolled in specialty training (registrar) (typically PGY 3–10).	10 (31)
Fellow—completed specialty (registrar) training (typically PGY 6–17)	14 (44)

Table 3. *Cont.*

Characteristics	*n* (%)
Working rurally	
Yes	15 (47)
No	17 (53)
Rural background	
Yes	8 (25)
No	24 (75)
Specialty focus	
Generalist	12 (38)
Specialist	20 (63)

[a] Rural work location was determined using official Modified Monash Model levels 2–7, which is the standard definition used by the Australian government for health policy [44]. All participants interviewed had decided on, commenced or recently completed a specialty field allowing the outcome to be measured. 'Generalist' includes doctors interested, training or fellowed in general practice or public health physician. 'Specialist' included doctors interested, training or fellowed in focused fields –interviewees covering anaesthetics, ophthalmology, surgery, physician, radiology, psychiatry, dermatology.

2.3.2. Phase 2: Refining Theory

Inherent to the realist evaluation method, we sought to check the validity of our phase 1 theory and refine it [34]. To do this, a table of CMO configurations from phase 1 (our first stage of program theory) was sent by Email to other medical generalists and specialist experts from Australia, known for leading medical education and/or publishing in the field of medical workforce education/training. They were purposefully selected for a mix of gender, career stages, medical school of origin and Australian states. Those choosing to respond participated in an informal phone conversation about the theory, approximately one week later, (led by BOS), where the theory was explained and participants were asked to use their own experience/observations to reflect on potential refinements and missing elements. Where new or refined CMO configurations were proposed, they were explored for confirmation with further participants and considered with reference to the existing literature. Final patterns were validated or disconfirmed by in-depth discussion with the research team.

3. Results

In phase 1, 32 postgraduate doctors participated, including 50% females and 38% of generalist (11 general practice and 1 public health) and 63% specialist choice (anaesthetics, ophthalmology, surgery, physician, radiology, psychiatry, dermatology) (Table 3).

In phase 2, all 17 contacted doctors responded including graduates of various Australian medical courses, including 30% who were female. Eight were generalists (seven general practice and one public health) and nine specialists (psychiatry, urology, emergency medicine, anaesthetics and three physicians and two from obstetrics and gynaecology).

Phase 1 identified theory consisting of six CMO configurations depicting six mechanisms that stimulated generalist or specialist career choice. These configurations included three mechanisms of an environmental nature: a conversion; ruling things in or out and; validation and support. Two were of a professional nature: suits desired clinical practice and; fits personality and skills. One was of a non-professional nature: work-life balance and personal sustainability. Phase 2 confirmed this theory (each of the six CMO configurations) and identified two additional CMO configurations that should be added. One was of a professional nature: status and reward and; another of a non-professional nature: suits desired economic and social position. The final refined theory consisted of eight CMO configurations, of which the mechanisms are summarised in Figure 1. The full CMO configurations underpinning the consolidated theory are summarised in Table 4 and described below, by mechanism.

Figure 1. Mechanisms to produce a generalist or specialist doctor. For the mechanism ruling in or out.

Table 4. Full theory about exposures (C) for doctors at different stages of training (C) triggering choice (M) to be a generalist or specialist doctor (O) [a].

Outcome	Trigger for Choice (Mechanisms)	Doctor's Characteristics/Timing of Exposure (Context)	Doctor's Exposure (Context)
Specialisation choice (S or G)	ENVIRONMENTAL		
	A conversion	(S/G) Medical school and reinforced over time	(S) A key focused clinical experience or clicking with a Department or specialist clinician (G) Connecting to a community and/or rural areas and exemplary generalist clinicians
	Ruling things in (G) or out (S)	(S/G) Mostly postgraduate	(S) Experiencing a range of areas of clinical medicine (G) Experiencing a range of areas of clinical medicine and seeing how these can be linked into generalist practice, with sufficient training
	Validation and support	(S) Early postgraduate when impressionable (G) Medical school and early postgraduate when impressionable	(S) Getting reinforcing feedback from senior clinician/s, focused clinical skills and endorsement/references for job/training applications (G) Connecting with role models who invest in a personal relationship, demonstrating lifestyle and continuity medicine
	PROFESSIONAL		
	Suits desired clinical practice	(S) Mostly postgraduate if do not have a fixed specialty ideation (S) Medical school if have a fixed specialty ideation (G) Mostly postgraduate, burnt out from hospital work	(S) Being intellectually stimulated, enjoying procedural work and working in acute hospital care and comfortable with working in teams (G) Enjoying skills breadth (including procedural and intellectually challenging work), complexity of the 'whole person' continuity of care, working independently and making an upstream impact to population health

Table 4. *Cont.*

Outcome	Trigger for Choice (Mechanisms)	Doctor's Characteristics/Timing of Exposure (Context)	Doctor's Exposure (Context)
	Fits personality, skills and norms	(S) Before medicine, medical school and postgraduate (G) Mostly postgraduate	(S) Having particular attributes—technical or soft skills and desire to align with social and professional norms (G) Comfortable with uncertainty and enjoy problem-solving, innovation, change and challenging social and professional norms
	Status and reward	(S) Medical school and reinforced over time, desire to optimise professional power and maintain income through market control (G) Medical school and reinforced over time, desire to be useful and maintain income within broader market	(S) Being sensitised that G have inferior skills and observing benefits of being known in tight professional network for doing a key skill well (G) Observing G with excellent skills (recognised by professional title) and remunerated/supported for the range of their skills, working in sustainable models (enough clinical back up), plus benefits of being known in community for doing many things well.
	NON-PROFESSIONAL		
	Work-life balance and personal sustainability	(S–M) Mostly postgraduate, partner and older when completed medical school (S–F) Mostly postgraduate, have partner, planning/have children (G–M) Mostly postgraduate, partner and older when completed medical school (G–F) Mostly postgraduate, partner, planning/have children and/or other personal constraints	(S–M) Observing specialty options with controlled working hours and feasible to complete (length, difficulty) (S–F) Observing specialty options with controlled working hours and less job creep into personal life (G–M) Observing shorter times to access/complete training and flexible and part-time work options (G–F) Observing flexible and part-time work options
	Suits desired economic and social position	(S) Medical school and reinforced over time, desire to gain or uphold social status and financial security relative to familial and social expectations, cost/effort of training and potential remuneration for the working hours involved (G) Medical school and reinforced over time, desire to uphold broader socio-cultural values including important non-professional roles	(S/G) Observe benefits of socio-economic position

[a] Rural work location was determined using official Modified Monash Model levels 2–7 of the Australian government [44]. G refers to 'Generalist' and includes doctors interested, training or fellowed in general practice or as public health physicians. S refers to 'Specialist' and includes doctors interested, training or fellowed in focused fields –interviewees covering anaesthetics, ophthalmology, surgery, physician, radiology, psychiatry, oncology, dermatology.

3.1. Environmental

3.1.1. A Conversion

Key focused clinical experiences during medical school were pivotal for choosing to be a specialist particularly if these were reinforced by further exposures in the area of interest:

> *I was a medical student . . . . I visited a surgeon . . . who ended up doing the most comprehensive face transplant in history . . . after that . . . I did a student elective in [major city]—plastic surgery—that was quite good, and then I got into the nitty gritty of trying to be a Plastic Surgery Service Registrar.* (FM4_Male_Spec)

Some were also converted to specialist fields from a sense of belonging/comradery within a hospital Department:

> *I just clicked with that department. I really enjoyed the people I worked with. I enjoyed the nature of the work, so that's how I chose anaesthetics.*(TR1_Fem_Spec)

For generalist choice, early experiences of connecting to a community and rural area were transformative, if reinforced:

> *I did a rural health placement here [regional centre] as a student … I wasn't really interested in GP probably still at that point … but I was really interested in Aboriginal health … I decided to apply for internship up here … then when I was a Resident … I did a PGPPP [general practice rotation] in [remote area] … in a homeland service … which was just incredible.*(FR5_Fem_Gen)

Phase 2 confirmed this pattern of decision-making was valid and identified that generalist conversions could also be stimulated by contact with exemplary generalist doctors [15,24,43].

3.1.2. Ruling Things in or Out

Choosing a specialist career involved evaluating a range of mostly postgraduate clinical experience for what was enjoyable and ruling things out.

> [as a junior doctor] … *it's just been solidified over time as I've done different rotations. And you rule out certain specialties.*(TM2_Male_Spec)

Comparatively, generalists had a degree of difficulty with choosing one area and progressively ruled things in:

> [as a junior doctor] *I had trouble choosing one specific specialty … I* [hoped I] *could have that opportunity to practice some primary health, some hospital health in emergency on the wards as well as some anaesthetics and giving me that wide breadth.*(TM1_Male_Gen)

Phase 2 confirmed this pattern of decision-making and added that a generalist choice was a way for the things that doctors 'ruled in' to be aggregated under a single role, with sufficient training [44].

3.1.3. Validation and Support

Receiving feedback and endorsement of focused skills, including references from a specialist, was related to choosing to become a specialist. This occurred at a stage when they were impressionable and open to new experiences.

> *I think the primary motivating factor for psychiatry … was driven partly by what I perceive to be reasonable success and good feedback when I worked in a junior stage. I think I was quite impressionable and so, I was quick to jump …* (TR3_Male_Spec)

For generalists, validation and support came from professional role models (often supervisors) who invested in a personal connection, demonstrating lifestyle and continuity medicine as early as medical school:

> [When medical student] … *I was nursed along and shown what the joys of general practice and long-term care in a community was like.*(FR1_Male_Gen)

> [When medical student] … *individuals who were prepared to take me into their personal and family lives, and not just at clinic … as a person, in my early 20s, that had a big impact on my ideas about the world.*(FR6_Fem_Gen)

Phase 2 confirmed this pattern of decision-making.

3.2. Professional

3.2.1. Suits Desired Clinical Practice

Choosing to be a specialist also occurred when doctors evaluated the suitability of the components of clinical practice against professional expectations like achieving intellectual stimulation, doing procedural work and working in acute hospital care. For doctors of fixed specialty ideation at medical school entry (who knew exactly what sort of specialist they wanted to be), experiencing their preferred specialty reinforced their orientation to that particular specialist field.

> *I always loved doing critical care, I was always interested in looking after sick patients. I always wanted to work in a hospital environment. That's just how I felt about it . . . .*(FM1_Fem_Spec)

For doctors with malleable career ideation, postgraduate experiences aided an attraction to a particular specialist area:

> *I became interested in anaesthetics when I was in my intern year . . . I guess I really enjoy the very procedural nature of anaesthetics*(TR1_Fem_Spec)

Choice to be a generalist was fashioned by evaluating clinical practice against professional expectations of using a breadth of skills, being involved in holistic and longitudinal patient care improving population health. This mainly occurred in the postgraduate stage.

> [As a junior doctor] . . . *I can do whole of life care and get in earlier and be the first point of contact rather than just see people when they get to hospital.*(FR6_Fem_Gen)

For some, the desire to work in a generalist role to make an upstream difference emanated from getting burnt out by acute hospital healthcare:

> [As a junior doctor] . . . *I was burnt out from the hospital—you see all the sort of pointy end of things there.*(FR5_Fem_Gen)

Phase 2 confirmed this pattern of decision-making and expanded that choice to be a specialist was also related to desire to work in teams [28] whereas choosing to be a generalist was related to seeking more autonomous decision-making [16,32,43].

3.2.2. Fit Personality, Skills and Norms

Doctors choosing to be a specialist discussed being drawn to a field that they perceived fit their attributes, whether these were technical (knowledge of anatomy) or soft skills (communication).

> [when a junior doctor] *I chose oncology . . . I guess my communication skills are probably my strongest point and oncology is a specialty where it's based around communication.*(FR8_Male_Spec)

Few choosing to be a generalist noted particular personality or skills that drew them to this, except being comfortable with uncertainty. Phase 2 confirmed this pattern of decision-making and added that along with personality and skills, doctors also evaluated the fit of particular fields to desired professional norms. Those choosing to be a specialist were more likely to desire to align with professional norms [28] whereas generalists, to challenge these included integrating traditional siloes of medical care under one practice model (see *Collingrove Agreement*) [45]. Further, extending on their 'comfort with uncertainty', doctors choosing to be a generalist have attributes of enjoying problem-solving, innovation and change [43,46].

3.2.3. Status and Reward

Phase 2 identified a new pattern of decision-making about status and reward, which was validated through further testing and relating to the literature. This occurred in medical school and was reinforced over time. Doctors oriented to specialist choice were sensitised to the inferiority of generalists after hearing from other (hospital) doctors that generalist skills were less, commencing in medical school and reinforced over time [15,24,32]. Those with a desire to be known for doing one thing well (professional status), and to maintain income in a tightly controlled professional network and market, were stimulated to choose to choose to be a specialist [16,28]. People with healthcare power are known to be more likely to act to increase this power including by talking others down, negotiating and using coercion, to maintain this [47,48].

Status and reward influenced choice to be a generalist where doctors observed generalists with excellent skills, recognised by a professional title and well remunerated and supported to use all their skills (capacity to maintain income in a broader market and sustainable rosters and back up supports). This included observing that being able to do many things well achieved status in the community, and made a doctor useful [49]. Recognition methods necessarily have to handle the competing identities of doctors working under the generalist banner (rural and non-rural generalist practitioners is one distinction) and reconcile historical and aspirational conceptualisations of their roles [50].

3.3. Non-Professional

3.3.1. Work-Life Balance and Personal Sustainability

Mainly at the postgraduate stage, female and male doctors chose to be a specialist in a particular field, to fulfil expectations for controlled working hours. Males mentioned this in relation to firstly, lifestyle and secondly, being older when they completed medicine and wanting to set up practice faster.

> [with partner and children] *Oncology . . . was a specialty that appealed to me . . . for a bit of a lifestyle—not a lot of after-hours.*(FR8_Male_Spec)

> [psychiatry] *I was very well supported in paediatrics as a PHO, but I looked at how long the training programme was at my age and what I'd have to learn and I, despite their assistance, I didn't go that way.*(FM5_Male_Spec)

Females did this if they had a partner and were planning children, desiring a sustainable role around personal goals.

> [partner planning children, anaesthetics] *. . . a career that I can spend time with my children when I have them and all that, and spend time with my partner . . . you don't have inpatients, you don't have longitudinal care . . . it doesn't drain you . . . .* (JM1_Fem_Spec)

Females chose to be a generalist for work flexibility and part-time hours:

> *. . . my own health and then also the birth of my son, yeah just helped to cement my desire for a more flexible part-time approach to clinical work.*(TR3_Fem_Gen)

Males chose to be a generalist if they wanted shorter times to access and greater ease to complete training thus commencing independent practice sooner. One participant who was older had considered 'Emergency medicine' but saw 'tough training' and chose to be generalist for flexibility and part-time options.

> [GP] *. . . allowed much more flexibility in the training and taking part-time work, for example, which any of the other specialties didn't allow.*(FR4_Male_Gen)

Phase 2 confirmed these decision-making patterns, including the nuanced differences by gender. Other literature identifies that female doctors favour sustainable careers [49–51] and that male doctors choose careers that allow for lifestyle interests, not restricted to having/raising children [16].

3.3.2. Suits Desired Economic and Social Position

Phase 2 identified a new pattern of decision-making about suiting desired economic and social position, which was validated by further testing and in relation to the literature. Doctors chose to be a specialist based on observing the positive socio-economic benefits of various fields. A perception of improved economic and social position was forged by early experience within medical families, at medical schools and reinforced over time, when doctors socialised and worked together [28]. Those with a desire to improve or uphold their socio-economic position and achieve financial security through a medical career, were attracted to specialist roles which pay more than generalist roles [52]. This desire was potentially reinforced by the level of expected rewards for the cost and effort related to training as a doctor [53] and the working hours involved in the role [54].

For doctors choosing to be a generalist, their desired economic and social position was considered in relation to broader socio-cultural values that were wider than gains to be made within the profession [55]. This could include prioritising and complementing other aspects of their socio-cultural identity formed by the values they held for family and within wider society, beyond a professional identity [24]. Other literature confirmed that generalist doctors are more motivated by benevolence, than money and power [56], suggesting that for generalists, social and cultural interests may be stronger than economic ones.

4. Discussion

This is the first known study to develop theory about choosing a generalist or specialist medical career. The decision-making patterns revolved around eight mechanisms of environmental, professional and non-professional domains. These may contribute in proximal, intermediate and final ways [35], to achieving a generalist or specialist doctor, depending on the doctor's characteristics including their attributes, values and desires and how these intersect with their exposures over time.

The final theory reinforces, with some degree of nuance, elements of the original hypothesis about how choice is made, through the theory of reciprocal determinism. This includes depicting that personal cognitive, social/environmental components and conditioning plays a strong role in generalist or specialist choice [38]. Various CMO configurations have the potential to work in synchrony and nudge towards a tipping point of choice to be a generalist or specialist doctor, particularly where these may intersect and build momentum over time. No one CMO configuration within the theory is considered causal, but together these configurations contribute to the emergence of generalist or specialist choice.

Some triggers were stronger for some doctors than others. But our findings provide an understanding of a full range of ways that choice-making can be affected. This includes the context of the doctor and timing by which choice is triggered, whereby our findings have the potential to holistically inform education, training and workforce strategies for better uptake of generalist doctors and the distribution of rural doctors [7,37,57].

Although we present this theory as driving the outcome (positive direction), it can also produce negative outcomes, if patterns of generalist decision-making are suppressed, or insufficient triggers are mounted. Thus, the theory may have greatest utility if used to design holistic policies and programs that promote multiple pro-generalist decision patterns and dampen many of the pro-specialist ones.

Our initial theory was strengthened by drawing on empirical evidence from recent graduates (all of whom at chosen specialty) across a spread of specialties, genders and locations. By then gaining further input from experts spanning different medical schools, career stages and disciplines, enabled the findings and perspectives of individuals to be refined and expanded, supporting greater generalisability of the final theory. This builds on existing research showing specialty choice is multi-level [26] and multi-staged [20], by uniquely depicting the timing of various program, social-economic and cultural normative influences on driving to a generalist or specialist outcome.

The findings identify that exposures for choosing a generalist career such as connecting '*to a community*' and '*role models*', may require recurrent investment (including in medical program

design) and be strong and frequent enough to override stimuli leading to specialist choice. This includes reducing the potential that some pro-specialist triggers could fire including doctors being converted by '*key focused clinical experiences*' with specialist departments in hospitals. Other research shows the value of community general practice placements for pre-registrar doctors during internship (additional knowledge and skills) [58]. Planned and regular rotations to non-hospital settings, including in rural areas, with exemplary skilled generalists, who showcase innovative practice, '*problem-solving*' and procedural aspects of their work have the potential to stimulate generalist career interest. Students and junior doctors may also be inspired if they observe the status of generalist doctors in the community, respected for their confidence and competence in a range of situations. This needs to be powerful enough to override potential professional derision of generalists by specialists who are seeking to maintain professional power and market control [15,47].

Our findings also depict that choosing to be a generalist also relies on getting '*enough experience*' of different forms of clinical medicine to '*rule things in*'. This differs from the perception that generalist doctors take this path because they aren't sure about what to do (path of least resistance). On the contrary, generalists are likely to choose this deliberately '*ruling in*' a package of skills areas that form a complementary clinical practice model that is remunerated, recognised, sustainable and allows them to focus on upstream health improvement [59]. Conceptualising viable generalist practice models may take longer for junior doctors than understanding work in more homogenous areas like hospital specialist fields that have a clear professional identity. This may underpin the need for a longer pathway and more deliberate exposure to potential models in areas of interest, to stimulate a generalist choice.

Several elements of theory relate to contemporary challenges. In many countries, more doctors are emerging from postgraduate medical degrees, having incurred more time and cost to achieve two degrees to qualify as a doctor than those from undergraduate systems. Our theory might suggest that older graduates may be more likely to drive towards choosing particular specialty fields or generalist practice, based on two factors: interest in a rapid transition to independent practice (shorter training times and relative ease of training) and to manage work-life balance (leisure, children or other constraints like illness). The tipping point for this group to nominate to a specialty field is that some of these fields enable controlled hours (noted from our research, as psychiatry, anaesthetics and oncology). For this reason, a generalist choice cannot rely on controlled working hours and flexible conditions alone to attract doctors. Instead it requires multi-level strategies including emphasising the gains of organised training pathways to rapid independent practice and promoting of the gains for choosing a generalist career, such as community recognition for '*doing many things well*'. This could be strongly promoted as part of messaging within national campaigns.

Although specialists may claim legitimacy based on their lengthy professional training, expert status and certainty in one area, it may be important to counter this with evidence of generalist competence [48], trust and credibility [60] and the reward generalists may experience from contributing to social (not just professional) goals. This may be important for breaking down the assumed professional hierarchies and levels of reward enabled in specialist roles [28]. Further a structural issue to address, is reducing the gap in earnings between specialists and generalists [52].

As hours of medical work are trending down (average fall of 3.4 h per week 1999–2009 in Australia) [61], advertising generalist work through access to shorter training time frames, flexible and part-time work tailored to trainee needs (including gender-specific flexibility and maternity leave) and sustainable practice models (minimising burnout) continues to be relevant. This issue is increasingly pressing as females (wanting to build careers around children) are making up the bulk of emerging medical school graduates in many countries [62–64].

Finally, our findings also suggest that generalists may be achieved by enrolling more students into medicine who have wider values and social interests based on family, culture and community, as the basis of their identity (status), over would-be-doctors motivated by professional identity and socio-economic gain [28]. Given that values and expectations are established within a socio-cultural

context of family, ethnicity, religion and community, it may be relevant to consider these as important covariates that can affect generalist workforce outcomes.

Our study has limitations. Although we used a 2-phase process to build and refine our theory, it is possible that some elements of theory were missed. This is unlikely given that the cross-university cross-career stage experts in phase 2 largely supported the phase 1 theory, expanding only to two new patterns of decision-making that were cross-validated. Relying on phase 1 interviews across a broad single university early career cohort means there is some potential for sample and recall bias. However, participants were working independently of the university when interviewed and easily recalled their career choice process, whether generalist or specialist and, being blinded to the research question, provided genuine reflections.

The theory we propose is based on medicine in Australia and needs to be refined and validated for other disciplines, countries or career stages. This is particularly because in some countries like America and Canada, the timing of generalist or specialist career choice may occur earlier as part of filling particular pre-set generalist or specialist programs in medical schools that articulate with resident programs, which does not occur in Australia.

In our theory socio-cultural and familial influences mostly featured in relation to affecting pre-set personality, norms and skill as well as the desire for social and economic position relative to other values, but their role and timing of socio-cultural and familial influences may vary in different training sub-systems, countries and cultures. As it was based on a dichotomous outcome, out theory may also require further differentiation for choosing specific specialties and sub-specialties of medical work, including exploring whether this theory applies to further differentiating choice to be a more general (e.g., general surgeon, or more focused sub-specialist e.g., paediatric cardiologist.

5. Conclusions

Our study developed new theory about the dynamics of choosing to be a generalist or specialist doctors. Within three domains: environmental, professional and non-professional, we found eight clear mechanisms linked with the patterns of decision-making to yield a generalist or specialist outcome. These represent multi-level triggers which are turned on by various exposures, relative to doctor's characteristics, at different times, to determine generalist or specialist choice. The findings provide an avenue for tailoring medical education and postgraduate work programs, as well as selecting and mentoring students and junior doctors with particular attributes, norms, values and professional orientations, to increase generalist uptake.

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A Call for Leadership and Management Competency Development for Directors of Medical Services—Evidence from the Chinese Public Hospital System

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Abstract: *Background:* A competent medical leadership and management workforce is key to the effectiveness and efficiency of health service provision and to leading and managing the health system reform agenda in China. However, the traditional recruitment and promotion approach of relying on clinical performance and seniority provides limited incentive for competency development and improvement. *Methods:* A three-component survey including the use of a validated management competency assessment tool was conducted with Directors of Medical Services (n = 143) and Deputy Directors of Medical Services (n = 152) from three categories of hospital in Jinan, Shandong Province, China. *Results:* The survey identified the inadequacy of formal and informal management training received by hospital medical leaders before commencing their management positions and confirms that the low self-perceived competency level across two medical management level and three hospitals was beyond acceptable. The study also indicates that the informal and formal education provided to Chinese medical leaders have not been effective in developing the required management competencies. *Conclusions:* The study suggests two system level approaches (health and higher education systems) and one organization level approach to formulate overall medical leadership and management workforce development strategies to encourages continuous management competency development and self-improvement among clinical leaders in China.

Keywords: medical directors; health service management; management workforce development; management competency, Chinese hospitals

1. Introduction

1.1. Development of Clinical Managers—The Pathway

Healthcare systems are unique, complex and politically sensitive, not only because of their size, but because their outputs impact directly and indirectly on the health and wellbeing of the populations that they serve. Healthcare systems require management personnel who not only have the generic management competencies, but also have a good understanding of how such complex systems function, the context in which they operate, and how the large number of organizations and sectors interact. Further limitations include dealing with constant financial constraints and the pressures of the growing healthcare needs of the population. This no doubt leads to why the increasing importance of the role

of clinicians as leaders and managers and the concepts of 'clinical leadership' and 'clinician turned manager' have been well recognized [1,2].

For decades, the utilization of doctors in management roles has been common practice globally [3,4]. In more advanced and well-developed systems, healthcare is generally provided using the 'clinical directorate' concept—healthcare organizations and service provisions are managed by both clinical leaders (such as clinical directors who provide clinical leadership and manage direct service provisions) and by managing directors who may not have clinical backgrounds or qualifications and are responsible for the business and operational aspects. Very often, clinical directors carry the dual roles of heading a clinical specialty, performing management activities and maintaining their own clinical practice [4]. In a medically dominated healthcare system, clinical directors have primary control of medical practices, determine the structure and arrangements of care delivery, and manage the entire system [5]. However, this may not be the case in the less well developed and medically dominated system in China [6].

In the face of global financial downturns, a shrinking resource base and increases in demand, changing a fragmented care provision model into an integrated care model by involving clinicians, especially doctors, to manage and lead such processes, should result in the improvement of service quality, effectiveness and efficiency [2]. This makes the recruitment, selection and preparation of clinicians before and during taking on such challenging clinical management roles more critical than ever. In addition to the traditional approach of in-service training, a much more formal, systematic approach to develop clinical leaders has been recognized for decades [7].

1.2. Overall Health Management Workforce Development

Studies conducted in different industries and healthcare contexts over the past 20 years suggest that management competence can be acquired and improved through targeted training programs and continuous professional development [8–11]. For example, a recent study using the UK Health and Safety Executive Management Competency Framework to train financial managers in Japan demonstrated the effectiveness of training programs in developing management competence and facilitating better work engagement between managers and subordinates [10]. A recent nursing internship program implemented at the Centre for Addiction and Mental Health (CAMH) in Toronto, Canada confirmed the success of professional development and mentoring in developing nursing leaders' competency guided by the Canadian College of Health Leaders Framework (LEADs) (2013) [11]. A randomized control trial which tested the benefits of training programs to develop the competency of public health nurses in program planning also supported the positive linkage between management training and competency development and performance improvement [12]. However, as only a small proportion of managers have the opportunity of formal management training as a mean to advancing their management careers, even in a well-developed health system such as Australia [13], informal training and development become critical. Hence, the development of a health service management workforce requires a combination of formal education such as university degree programs focusing on health service management/administration, informal training and development with more short-term and flexible approaches to management workforce development, and in-service training, mentoring and coaching [6,9]. Participation in networking activities, seminars and conferences is also a widespread approach for professional development and skill enhancement [14]. Evidence also points at the importance of using innovative pedagogy to allow integration of competencies into practice in addition to self-reflection and improvement, such as a combined approach of briefing, discussion facilitation and virtual simulation [15,16].

In Australia, Canada, the U.S., U.K. and other European countries, clinicians can formally develop their management competency via the completion of postgraduate qualifications in health administration or health service management. For example, there are 13 Master of Health Administration Programs (MHA) being offered in Australia which are accredited by the Australasian College of Health Service Management (https://www.achsm.org.au/). In the U.S. and Canada, 88 programs are accredited to the Association of University Programs in Health Administration

(https://www.aupha.org/home). However, the proportion of clinicians trained by the above formal programs remains limited. There are also several specific training programs offered by medical professional institutions to foster development of doctors in leadership and management, such as the Royal Australian College of Medical Administrators (https://racma.edu.au/); the Faculty of Leadership and Medical Management in the U.K. (https://www.fmlm.ac.uk/) and the American Association of Physician Leadership in the U.S. (https://www.physicianleaders.org/).

It is argued that a cultural change in medical education is important, not only for developing medical students' clinical skills, but also introducing some leadership and management topics into the medical curriculum to develop future clinical leaders' understanding of healthcare policy, related issues and funding and financial arrangements [17]. The importance of leadership and management training needs to be recognized as there are core management knowledge and skills that cannot be leant solely based on experience [18].

Despite the increasing recognition of the importance of health service management, the implementation of consistent and large-scale health service management workforce development strategies can be challenging to achieve. For example, unlike other health professions in Australia health service management is not regulated by an accreditation board, resulting in no requirements for management qualifications. In addition, the management competency requirements have not been embedded in regular management performance appraisals resulting in inadequate incentives for continuous informal management training and development which are both time and financially consuming [18]. The lack of understanding of management competency requirements and competency development needs of health service managers in developing countries further limits the capacity of health service management workforce development, in particular leadership amongst clinical managers [19].

The international literature confirms the existence of core competency requirements across management levels and positions allowing learning and borrowing from competencies between different healthcare contexts [19,20]. However, the context sensitive nature of management competencies indicates that the importance of and required level of demonstration for core management competencies may vary between sectors, management positions and management levels [21]. An understanding of the extent of these differences will provide evidence to shape the design of management training and development for health service managers in specific healthcare contexts and positions [22].

1.3. Chinese Public Hospitals at a Glance—The Challenges and Management

The population of China slightly exceeded 1.440 billion in July 2020 equivalent to 18.5% of the total world population and the most populated country in the world [23]. Among the total of 34,000 hospitals in China, 12,000 are public and 22,000 are private. However, 85% of the 6.97 million hospital beds are located in public hospitals responsible for 85% of the 8.52 billion total hospital inpatient and outpatient consultations, [24] making the public hospital system the major medical service provider in China (another 1.89 million beds are in township healthcare centers).

As of 2019, the Chinese healthcare system employs 10.10 million medical technical personnel including 3.82 million licensed doctors and licensed assistant doctors and 4.43 million registered nurses, with majority of them currently working in the public hospital system. Approximately 4.3% of these personnel are also classified as a manager and/or have taken on dual clinician and management roles [25]. The health management workforce consisting of about half million managers is crucial to leading and supervising the transformation of the current Chinese healthcare system. This planned transformation is focused on improving the quality and cost-efficiency of health service provision by shifting from a hospital-centered and fragmentation of health service delivery approach into a more primary care-centered and integrated delivery model [25,26].

The governmental agenda of developing and expanding the healthcare landscape and the rapid development in health service provision requires a health workforce of an appropriate size, skill-mix and competency levels. Recommendations for improving the competencies for hospital managers

were made in the Healthy China 2030 Program Outline and *The Guidelines Opinion of Building Modern Hospital Management Systems* published by the Chinese State Council [27]. These two governmental policy documents highlighted the important role of hospital managers in the area of hospital and medical service capacity development and the expectations of improving their professionalism and managerial skills, and the management methods/tools that they used [27]. However, as argued by Linnander et al. (2017) when comparing the health service management workforce development strategies between the USA and Ethiopia, a national framework and pathway to developing the overall health service management workforce is required [28].

1.4. The Recruitment and Development of Clinical Leadership and Management in the Chinese Hospital System

Similar to many developing countries, the Chinese public hospital system is still medically dominated with the vast majority of the senior hospital management positions being filled by clinicians [29,30]. A study focused on understanding the competency training needs of health executives was recently completed in three hospitals representing three different hospital categories completed in Jinan, the 19th most populated city in China with more than 4.3 million population. The study confirmed that 65% of all hospital executives are clinical directors with a medical degree with a further 28% of hospital executives (mainly Directors of Nursing) with nursing qualifications. Less than 6% of all hospital executives (mainly Directors of Administration) came from neither medical nor nursing backgrounds [6].

The senior executive positions in Chinese public hospitals, typically, Executive Directors and Deputy Directors and the Chair and Deputy Chair of the Communist Party, are appointed directly by the Provincial Health Department. The senior management positions under this executive level such as Director of Administration, Director of Clinical Services and Director of Nursing are usually selected internally based on seniority and clinical performance without specific management skills or systematic training requirements [6,29,30]. The development of managerial competency is based on experience rather than targeted management training and development [30].

Although the National Health Commission requires all health services managers to receive management training, meeting such requirements has proven challenging. Liang et al. (2020a) summed up these challenges as the following: lack of agreed management standards and requirements; irrelevance of postgraduate training in management competency development; the absence of requirement of management qualifications for management positions, and the inability of embedding the assessment of management competence and management outcomes in regular performance appraisal of hospital managers providing limited incentives for continuous management training and development [6].

In this context, a large-scale survey was conducted in three hospitals from three hospital categories in Jinan, the capital city of Shandong Province located in the northern part of China in early 2019. The study aimed to develop an understanding of hospital medical directors in terms of their education background, training received prior to and after taking up their management positions, perceived importance of management competencies to management roles, the difficulties encountered and the perceived level of management competency. The study also examined factors that may impact on the management competency development of Directors and Deputy Medical Directors. Based on the findings, the paper will discuss the proposed direction and implications for developing the health management workforce in particular the senior clinical leadership in Chinese hospitals.

2. Materials and Methods

A cross-sectional, descriptive study was conducted to answer the above research questions.

2.1. Target Population

The target population were Directors of Medical Services (DoMS) and Deputy Directors of Medical Services (DDoMS) working at three hospitals representing the three-tier system of hospital

categorization in Jinan, Shandong, China. They were: (i) a Level 3 hospital, the First Affiliated Hospital of Shandong First Medical University, formally named Qianfoshan Hospital (QFSH), located in Jinan, the capital city of Shandong Province; (2) Lai Wu Hospital (LWH), a Level 2 hospital located in a suburb of Jinan, and (3) Xi Xian Hospital (XXH), a Level 1 hospital, located in a county area in Shandong Province. A Level 1 hospital is the equivalent to a secondary care facility based outside urban areas. Level II hospitals are equivalent to secondary care facilities based in urban areas. Level 3 hospitals are tertiary care facilities usually based in a large metropolitan center [6].

2.2. Questionnaire

The survey was conducted with potential participants in the targeted positions from three hospitals in Jinan City in late 2018 and early 2019. The questionnaire was developed in English and went through translation and back translation processes and pilot tested in another Jinan hospital before the Chinese version (in Mandarin) was finalized. Each questionnaire took approximately 25 min to complete and consisted of four components:

1. An explanation of the purpose of the study, instructions and consent to participate with assurance of identity protection;
2. Demography, educational background *(the lowest education category, 'Technical College' refers to a post school study program, a qualification or degree below that of an undergraduate or bachelor's level.)*, and previous and current work experience;
3. Past and current management related training and management difficulties encountered;
4. Perceived importance and self-assessment of six core management competencies using the validated MCAP management competency tool, [20,31] which were:

    C1. Evidence-informed decision-making (Evidence)—13 behavioral items
    C2. Operations, administration and resource management (Resources)—17 behavioral items
    C3. Demonstrated knowledge of healthcare environment and the organization (Knowledge)—11 behavioral items
    C4. Interpersonal, communication qualities and relationship management (Communications)—19 behavioral items
    C5. Leading people and organizations (Leadership)—13 behavioral items
    C6. Enabling and managing change (Change)—9 behavioral items

The validated MCAP 7-point descriptive scale (Appendix A Table A1) was used for participants to assess their own competency levels [31]. Participants were also asked to self-assess their level of competence for the 82 behavioral items for the six competencies. The results of the self-assessments of the behavioral items associated with the six competencies will be the topic of another paper.

The Qualtrics survey platform (https://www.qualtrics.com/) was used to host the online questionnaire which was distributed by one of the QFSH Deputy Executive Directors directly to the targeted management positions at each of the three hospitals and was open for a two-week period in November and December, 2018. Three reminders were sent from the Deputy Executive Directors to all potential participants during this two-week period. Due to low response rates at QFSH, after discussions a paper-based survey with the same content as the online version was distributed in February 2019 to potential participants to encourage a higher response rate. Completed paper-based surveys were collected within two weeks.

2.3. Data Management and Analysis

The data were downloaded from the Qualtrics website into MS Excel format. In addition, the data from the paper-based questionnaires were entered into MS Excel. The two datasets were merged. Following error checking, the means of the six competencies and the combined competencies were

calculated. All data were then imported into IBM SPSS Statistics version 25.0 (IBM Corp., Armonk, NY, USA) for analysis.

For ease of analysis, three summary scores were calculated. The first was a summary of the number of different topics of management training experienced before participants took up their management roles. The second score summarized the number of management topics taken up by participants during their management positions. The third score enumerated the number of difficulties that the participants experienced in their current position.

Univariate analyses, including tests for normality, were carried out for all variables and separately by hospital and management level. Differences between management levels and/or hospital were tested for statistical significance by crosstabulation comparing column proportions with adjusted p-values (Bonferroni method) and chi square tests (exact tests where indicated) or for other continuous variables by t-tests or univariate analyses of variance.

2.4. Ethical Approval and Consent to Participate

Ethics Approval was granted by the University Human Ethics Committee, La Trobe University (Application ID: HEC18071). All participants consented to participate in the study. This was achieved in the introductory pages of the online survey.

3. Results

A total of 295 DoMS/DDoMS out of a target population of 303 (97%) participated in the survey from the three targeted hospitals. Table 1 provides the characteristics of the participants by hospital. The distribution of management levels was significantly different across hospital levels. DoMS: Level 1 hospital 68.2% versus Level 3 hospital 42.6% (Chi square = 11.009, df = 2, $p = 0.004$).

3.1. Demography and Employment Details

The average male and female gender ratio was 1.78:1 ranging from 1.47:1 to 3.0:1 across hospitals and management levels. Overall, the mean age of participants was 47.2 years. DoMS were significantly older than DDoMS (49.4 years versus 45.1 years, t = 5.883, df = 293, $p < 0.0005$). DoMS had been employed at their current hospital significantly longer than DDoMS (26.5 years versus 20.9 years, t = 5.367, df = 293, $p < 0.0005$). DoMS had been employed as a manager significantly longer than DDoMS (12.7 years versus 7.2 years, t = 6.591, df = 293, $p < 0.0005$). DoMS had been employed in their current management role significantly longer than DDoMS (8.6 years versus 5.0 years, t = 5.893, df = 293, $p < 0.0005$).

3.2. Qualifications and Disciplines

Table 1 also shows the highest levels of education by hospital level. The most frequent highest level was a doctorate ($n = 115$, 39%), followed by a bachelor's degree ($n = 102$, 35%). The next highest level was a master's degree ($n = 54$, 18%). Finally, 8% of participants had only achieved a technical college education. The participants of this last category were usually older DoMS at the Level 1 hospital. Amongst the 169 directors with postgraduate qualifications, five of them were from LCQH (Level 2 hospital), the rest (164, 97%) worked at QFSH (Level 3 hospital). The distributions of education levels were significantly different between hospitals (Fisher's Exact Test = 166.291 $p < 0.0001$).

Table 1. Characteristics of participants by hospital.

Position		Hospital Level			
		Level 1 *	**Level 2 ***	**Level 3 ***	**Total**
Directors of Medical Services	**Count (%)**	30 (68.2) $_{a}$	24 (57.1) $_{a, b}$	89 (42.6) $_{b}$	143 (48.5)
Deputy Directors of Medical Services	Count (%)	14 (31.8) $_{a}$	18 (42.9) $_{a, b}$	120 (57.4) $_{b}$	152 (51.5)
Total	Count	44	42	209	295
Sex		**Level 1**	**Level 2**	**Level 3**	**Total**
Male	Count (%)	33 (75.) $_{a}$	25 (59.5) $_{a}$	131 (62.7) $_{a}$	189 (64.1)
Female	Count (%)	11 (25.0) $_{a}$	17 (40.5) $_{a}$	78 (37.3) $_{a}$	106 (35.9)
Highest education level		**Level 1**	**Level 2**	**Level 3**	**Total**
Technical college	Count (%)	15 (34.1) $_{a}$	4 (9.5) $_{b}$	4 (1.9) $_{c}$	23 (7.8)
Bachelor's degree	Count (%)	29 (65.9) $_{a}$	33 (78.6) $_{a}$	40 (19.2) $_{b}$	102 (34.7)
Master's degree	Count (%)	0 (0.0) $_{a}$	5 (11.9) $_{a, b}$	49 (23.6) $_{b}$	54 (18.4)
Doctorate	Count (%)	0 (0.0) $_{a}$	0 (0.0) $_{a}$	115 (55.3) $_{b}$	115 (39.1)
Age		**Level 1**	**Level 2**	**Level 3**	**Total**
	Count	44	42	209	295
	Median (IRQ)	41.0 (9)	46.0 (4)	48.0 (12)	47.0 (11)
Years at current hospital		**Level 1**	**Level 2**	**Level 3**	**Total**
	Count	44	42	209	295
	Median (IRQ)	17.50 (13)	23.00 (9)	25.00 (13)	24.00 (13)
Years as manager		**Level 1**	**Level 2**	**Level 3**	**Total**
	Count	44	42	209	295
	Median (IRQ)	8.0 (15)	8.0 (12)	9.0 (12)	8.00 (12)
Years in current management position		**Level 1**	**Level 2**	**Level 3**	**Total**
	Count	44	42	209	295
	Median (IRQ)	3.0 (6)	6.0 (9)	4.0 (8)	4.0 (8)

* Level 1—Xi Xian Hospital (XXH); Level 2—Lai Wu Hospital (LWH); Level 3—Qian FoShan Hospital (QFSH). The proportions shown are based on a comparison of columns. The compare column proportions option computes pairwise comparisons of column proportions and indicates which pairs of columns (for a given row) in the crosstabulation table are significantly different. The column proportions test assigns a subscript letter to the categories of the column variable. For each pair of columns, the column proportions (for each row) are compared using a *z test*. If a pair of values is significantly different, the values have different subscript letters assigned to them.

There were also significant differences in the distribution of education levels between management levels (data not shown). Deputy directors had significantly higher levels of education compared to directors (Chi-Square = 21.632, df = 3, $p < 0.0001$). More deputy directors of medical services had completed a doctorate compared to directors (48.0% versus 29.4%). Moreover, directors had a higher proportion of technical college education compared to deputy directors (13.3% versus 2.6%).

Out of the 295 participants, 245 (83.1%) had degrees in medicine. Seven participants (2.4%) held a degree in nursing; 13 (4.4%) held a degree in management and 30 (10.2%) held a degree in another discipline. Only nine of the 169 postgraduate qualifications (≈5%) were management related.

3.3. Informal Training

Hospital managers had opportunities to participate in different types of informal training which may include management or non-management related training organized internally by the hospitals or externally by other organizations. Table 2 indicates that more managers participated in management training organized internally than externally (72% vs. 41%) for more than 10 h annually. There were no significant differences between management levels.

Table 2. Proportion of participants undertaking different types of informal training for more than 10 h annually by management level, and proportion undertaking self-study by management level and hospital.

	Training Type				Self-Study of Management-Related Topics			
					Hospital Level			
Management Level	**Internal Management**	**External Management**	**Internal Non-Management**	**External Non-Management**	**Level 1 ***	**Level 2 ***	**Level 3 ***	**Combined**
Directors of Medical Services	69.0%	40.8%	54.9%	54.2%	28.6%	7.1%	64.3%	65.6%
Deputy Directors of Medical Services	75.0%	40.3%	57.6%	45.1%	4.5%	13.6%	81.8%	34.4%
All Directors	72.0%	40.6%	56.3%	49.7%	20.3%	9.4%	70.3%	100%

* Level 1—Xi Xian Hospital (XXH); Level 2—Lai Wu Hospital (LWH); Level 3—Qian FoShan Hospital (QFSH).

About 22% of participants committed to no less than ten hours in self-study of management related topics annually in the past three years. Table 2 indicates the self-study commitment by DoMS and DDoMS by hospital. Significantly more directors (65.6%) completed self-study compared to deputy directors (34.4%) (Chi square = 8.417, df = 1, $p = 0.004$).

3.4. Informal Management Related Training

Overall, between 37% and 54% of managers from the three hospitals participated in some form of management related training before taking up their current management positions and between 51% and 77% of the managers from the three hospitals participated in some form of management related training after taking up their current management positions. There was an increase in management training participation amongst managers after taking up current management positions across the three hospitals. The participation rate increased between 13% and 29% (Table 3); the increase being greatest amongst managers from XXH.

Table 3. Frequency and proportion (*n* (%)) of participants taking part in management related training before taking up and during their current management positions by hospital, and mean scores of training types completed by hospital.

	Percentage of Participants			Mean Score of Training Types		
	Before	**During**	**Increase**	**Before**	**During**	**Increase**
Level 1 *	20 (48)	33 (77)	29%	2.18	3.45	58%
Level 2 *	15 (37)	21 (51)	14%	3.14	3.52	12%
Level 3 *	108 (54)	136 (67)	13%	3.28	4.44	35%
Total	143 (50)	190 (66)	16%	3.10	4.16	34%

* Level 1—Xi Xian Hospital (XXH); Level 2—Lai Wu Hospital (LWH); Level 3—Qian FoShan Hospital (QFSH).

3.5. Participation in Training Focusing on Different Management Related Topics

Sixteen management related training topics were provided to participants for multiple selection. Table 3 details the mean scores for training types undertaken before and during current management role by hospital. Managers at QFSH attended significantly more management training types both before taking up and during their management positions compared to the other two hospitals but the differences were not statistically significant. Across all hospitals, managers completed more training types after taking up the management roles compared with before. The increases were greater amongst managers at QFSH and XXH than managers at LWH but the differences were not statistically significant.

Of all the management training topics, (1) conflict resolution, (2) employee relationships, (3) safety training, (4) performance management, (5) leadership, (6) human resource management, and (7) communications were the seven areas which attracted the highest participation (26–37%) before taking up the management positions. After taking up their management roles, an additional five topics (time management, decision-making, resource management, quality control and policy and procedure) also attracted higher participation rates (27–35%).

3.6. Difficulties Encountered in the Management Position

A list of 15 difficulties for multiple selection were provided for participants to indicate those that they had encountered while in their current management position. There was considerable variation between hospitals. Participants at QFSH tended to report more difficulties than the other hospitals. Table 4 shows the mean difficulties scores by hospital and management level. The mean scores of QFSH managers were significantly higher than the managers at XXH (3.85 versus 2.74). The mean scores of directors of medical services were higher than those of deputy directors (3.89 versus 3.36). In a univariate model of difficulty scores both hospital and management level were significant predictors (hospital: Type III Sum of Squares = 59.206, df = 2, Mean Square = 29.603, $p = 0.013$); management

level: Type III Sum of Squares = 34., df = 1, Mean Square = 34.391, $p = 0.024$). Figure 1 illustrates these results.

Table 4. Mean difficulty scores and difficulties experienced (percentage of managers) by hospital and management level.

	Level 1 *	Level 2 *	Level 3 *	DoMS #	DDoMS #
Mean Difficulty Scores	2.74	3.43	3.85	3.89	3.36
Difficulties	**Level 1**	**Level 2**	**Level 3**	**DoMS (%)**	**DDoMS (%)**
Peer conflict	23	*25*	*29*	*27*	*28*
Team conflict	19	23	27	28	23
Staff turnover	21	23	5	14	5
Patient conflict	**40**	**48**	**50**	***46***	***50***
Innovative teamwork	14	23	41	***38***	***31***
Staff hiring	5	3	9	7	7
Loss of skilled staff	16	18	10	13	11
Team skill building	14	8	26	23	21
Ethical problems	2	5	11	9	11
Supervisor confrontation	12	3	9	12	5
Employee performance	**28**	**35**	**41**	***40***	***36***
Decision-making & change	*30*	18	*31*	***33***	***25***
New skill acquisition	19	*45*	*33*	***35***	***31***
Expected work quality	14	*43*	*33*	***34***	***29***
Management outcomes expectations	16	*28*	*27*	30	22

* Level 1—Xi Xian Hospital (XXH); Level 2—Lai Wu Hospital (LWH); Level 3—Qian FoShan Hospital (QFSH). # DoMS—Director of Medical Services; DDoMS—Deputy Directors of Medical Services. Bolded percentages identify difficulties experienced by more than 25% of managers from all three hospitals. Italicized percentages indicate difficulties experienced by more than 25% of managers from two hospitals. Those bolded and italicized identify difficulties experienced by more than 25% of both DoMS and DDoMS.

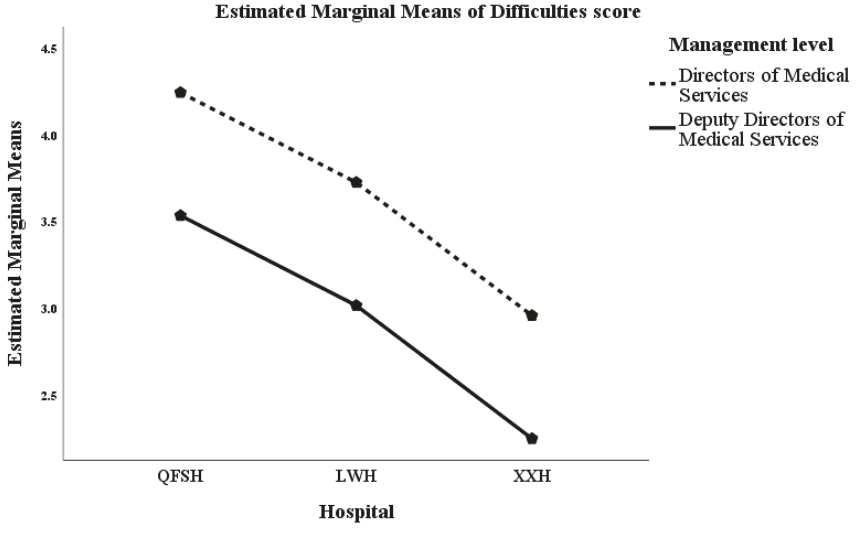

Figure 1. Marginal means of difficulties scores by hospital and management level. Level 1—Xi Xian Hospital (XXH); Level 2—Lai Wu Hospital (LWH); Level 3—Qian FoShan Hospital (QFSH).

Table 4 also shows the percentage of managers selecting specific difficulties by management level and hospital. Patient conflict and employee performance were the difficulties selected by no less than 25% of directors from all three hospitals (bolded). Other difficulties that were selected by no less than 25% of directors from at least two hospitals included peer conflict, decision-making and change, new skill acquisition, expected work quality and management outcomes expectations (italicized). In addition, more than 25% of directors from QFSH also encountered the difficulties of team conflict, innovative teamwork and team skill building. There were few significant differences in the selection of difficulties by management level. Those selected by more than 25% of directors and deputy directors (bolded and italicized) included: peer conflict, patient conflict, innovative teamwork, employee performance, decision making and change, new skill acquisition and expected work quality.

3.7. Perceived Importance and Self-Assessment of Management Competencies

Participants were asked to indicate the importance of each of the six core management competencies to their current management role. Using a 5-point Likert importance scale, the vast majority of the managers (ranging from 88% to 98%) confirmed the six competencies as important or very important.

Participants were also asked to what extent they had acquired these competencies prior to taking up the current management position using another 5-point Likert scale as detailed in Table 5. The 'cumulative percentage' column indicates the percentage of participants (ranging between 14.6% and 38.1%) who had not fully acquired or acquired most of the competency.

Table 5. Proportions of managers acquiring competencies before taking up their current management position.

Competency	Not at All	Acquired to Limited Degree	Unsure	Cumulative Percentage	Acquired Most of It	Fully Acquired
C1 Evidence	2.4%	9.1%	15.4%	26.9%	55.6%	17.5%
C2 Resources	5.9%	8.4%	23.8%	38.1%	49.0%	12.9%
C3 Knowledge	0.0%	5.2%	10.1%	15.3%	61.9%	22.7%
C4 Communications	0.0%	5.2%	9.4%	14.6%	59.1%	26.2%
C5 Leadership	3.8%	8.7%	20.3%	32.8%	50.7%	16.4%
C6 Change	6.3%	10.1%	21.0%	37.4%	46.5%	16.1%

3.8. Overall Competency Level—Self-Assessment

Participants were asked to rate their own competency level of the six 'overall' competencies using the validated MCAP management competency assessment descriptive scale [25]. According to the description of MCAP Likert scale (Appendix A Table A1), a competency score of five (5.0) or greater indicates that participants could demonstrate the competency in their role independently without guidance. Table 6 provides details of the mean scores for the six competencies and the combined competencies by management level and hospital. None of the competencies received a mean score greater than five for both management levels. DoMS (range 4.33 to 4.84) scored themselves higher than DDoMS (range 3.94 to 4.57), the differences being statistically significant for competencies 2 (t = 2.350, n = 279, p = 0.019), 3 (t = 2.089, n = 279, p = 0.038), 6 (t = 2.126, n = 279, p = 0.034) and combined competencies (t = 2.128, n = 279, p = 0.034).

Table 6. Mean scores of self-assessed management competencies by management level and hospital.

Competencies	Management Level		All Directors	Hospital Level		
	DoMS #	DDoMS #		Level 1 *	Level 2 *	Level 3 *
C1. Evidence	4.47	4.19	4.33	3.86	3.75	4.55
C2. Resources	4.44	4.02	4.23	3.74	3.63	4.45
C3. Knowledge	4.78	4.42	4.59	4.07	3.98	4.83
C4. Communications	4.84	4.57	4.70	4.37	4.15	4.89
C5. Leadership	4.56	4.23	4.40	3.86	3.88	4.62
C6. Change	4.33	3.94	4.14	3.84	3.58	4.31
Six competencies	4.57	4.23	4.40	3.96	3.83	4.61

* Level 1—Xi Xian Hospital (XXH); Level 2—Lai Wu Hospital (LWH); Level 3—Qian FoShan Hospital (QFSH).
# DoMS—Director of Medical Services; DDoMS—Deputy Directors of Medical Services.

When analysed by hospital, managers from QFSH consistently scored themselves higher than managers from the other two hospitals. The results of analyses of variance (data not shown) showed these differences were statistically significant.

If the hospital and management level variables were included as predictors in a univariate analysis of variance model, there were significant differences between hospitals (mean square = 19.492; F = 9.649; $p < 0.0001$) and between management levels (mean square = 12.; F = 5.997; $p = 0.015$). Figure 2 is typical of all the competencies. Figure 2 demonstrates with results.

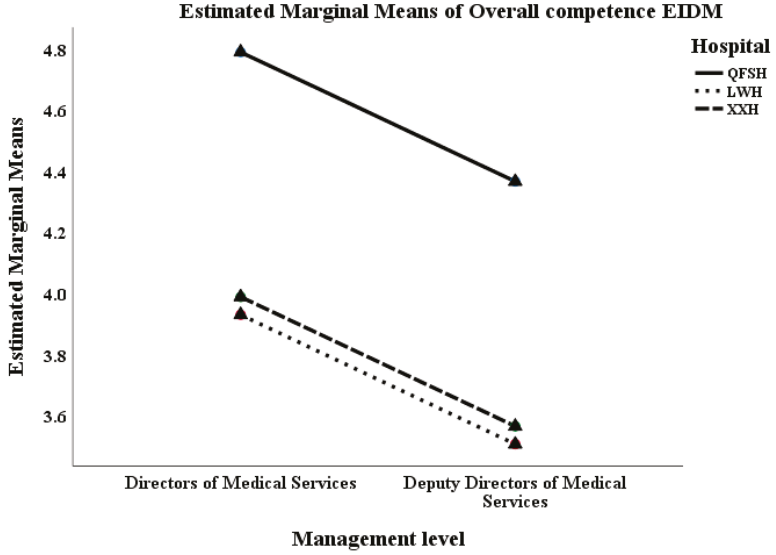

Figure 2. Marginal means for competency 1 (EIDM) by management level and hospital. Level 1—Xi Xian Hospital (XXH); Level 2—Lai Wu Hospital (LWH); Level 3—Qian FoShan Hospital (QFSH).

Other statistically significant predictors of the self-assessed competency levels in a bivariate relationship included age (positive correlation), total number of years as a manager (positive correlation). hospital, management level and qualifications (undergraduate > postgraduate). Including these predictor variables into a univariate model with an interaction term for age/total years as a manager (highly correlated), age was the only consistently significant predictor of the scores of all six competencies

and the combined competencies scores. Total years as a manager was also a significant independent predictor for competencies 4 (communications) and 5 (leadership). None of the interaction terms were significant.

4. Discussion

The survey achieved a 97% response rate demonstrating the support and commitment from the participating hospitals and the perceived importance and relevance of the study. The findings of the survey confirm the importance and timeliness of the study. As discussed earlier, the rapidly changing healthcare landscape and the pressure of transformation of the Chinese hospital system signal the demand for a highly skilled and resilient health service management workforce [6]. As Chinese public hospitals provide more than 80% of medical services across the country and have been medically dominated since their establishment, the development of clinical leaders in particularly medical directors is essential [25]. Current medical curricula are focused primarily on the development of clinical skills and medial expertise with no coverage of leadership and management competencies. The tradition of 'clinician turned manager' continues to be determined by seniority and clinical performance. Consequently, the development of a competent management workforce in Chinese public hospitals is challenging and requires a framework of guidance with a more holistic and systematic approach.

This study suggests that a review of the requirements for qualifications and participation in informal training among clinical leaders (DoMS and DDoMS) is indicated, particularly in the better resourced and more competitive Level 3 hospital. This maybe a reflection of the recognition of the importance of a competent health service management workforce and its development needs at the central government level, clearly emphasized by the 'Healthy China 2030 Program Outline' and *The Guidelines Opinion of Building Modern Hospital Management Systems* [32]. The study found that about half of the deputy directors of medical services in QFSH (Level 3 hospital) possessed doctorate level qualifications which was significantly higher than the directors in the same hospital and among colleagues at the same management level at the other two hospitals. Explanations would include the commitment of Level 3 hospitals to a greater research responsibility and the more competitive nature of a younger generation of medical directors.

Although higher qualifications (master's and doctorates) were possessed by a much larger proportion of the younger generation of directors (deputy directors were on average four years younger than directors), less than six percent of these degrees were management related which may explain the findings of the study—possession of higher qualification was not positively associated with an increase self-assessed confidence in management competency. On the other hand, given significantly higher proportion of directors of medical services had committed to self-study in management related topics than deputy directors and had gained average six to eight years of additional management experience, the positive correlation between age and self-assessed management competency levels is not surprising.

Whilst formal higher education was not focused on improving management competency, informal training in management related topics, self-study and wisdom gained from actual management experience become important. However, this cannot relegate the importance of formal education and training in health service management as the finding of self-assessed management competency scores of less than five amongst both management levels across three different levels of hospital is of concern (a score of five is the distinction between competent requiring guidance and competent without guidance).

4.1. Lack of Self-Assessed Management Competence

Despite the recognition of the importance of the six core management competencies for management roles, not all medical directors felt that they had fully acquired or acquired most of the competencies before taking up medical directorship, with a higher proportion (more than 30%)

for competency 2 (Resources), competency 5 (Leadership) and competency 6 (Change). This may explain why they gave themselves an overall score less than five for each of the six management competencies ranging between 4.31 and 4.89 with a combined six competencies score of 4.61. Consistently, although not statistically significant, C6 (Change) received the lowest score among all six competencies across management levels and hospitals, followed by C2 (Resources). More alarming, deputy directors of medical services and medical directors from LWH and XXH scored less than four for C6 (Change) indicating a self-perception of not being fully competent in demonstrating the competency in their management role. Such low levels of self-assessed competence was not identified in similar studies in Australia targeting senior and middle level managers [13,20].

This further confirms that the possession of postgraduate qualifications (more than 57% of all medical directors possessed postgraduate qualifications with vast majority of these possessed by deputy directors' medical directors from QFSH) and a higher level of participation in management related training before and after taking up the management positions (50–66%) are not linked to satisfactory scores of self-assessed management competence. A possible conclusion is that the management related training undertaken was less than effective.

Medical directors are the highest level of clinical leaders in Chinese Public hospitals who hold the responsibility for clinical service provision and resource allocation and influence the quality and safety of patient care and are also central to the complex patient–doctor relationship and disputes [6,33]. Medical directors should also play a key role in providing leadership, mentoring and coaching to junior level managers as future clinical leaders. Their low level of commitment to self-study (only 22% all medical directors committed to more than 10 h annually) and informal training, accompanied by their low self-assessed competency scores raises questions of how to develop and sustain a competent health service management workforce in China to meet the increasing healthcare demands in public hospitals and manage and lead a successful health system reform agenda [25,26].

Chinese public hospitals urgently require not only effective clinical leadership with improved management competence, but also a vision for appropriate strategies that can lead to the development of a sustainable management workforce that plays an essential leading role in managing the challenges facing the Chinese public health system.

4.2. Training, Difficulties, Competencies and Implications

As mentioned earlier, in the medically dominated public hospital system, the recruitment of medical directors is primarily based on seniority and clinical performance providing inadequate incentives for taking up management related training [6,29,30]. Clinicians face heavy workloads and are encumbered by the financially driven public hospital funding model and more complex patient–doctor relationships [33–36]. Empirical evidence indicates that the erosion of trust in the medical profession, poor communications and attitudes including de-valuing patients' views by medical professionals are two of major reasons behind the medical disputes in Chinese hospitals [29,30]. Highlighting that good communications and interpersonal skills are tools that help improving patient satisfaction and quality of patient care [37].

However, performance of the medical leaders is likely to be assessed by clinical performance and the ability to meet financial targets and profit benchmarks, rather than overall management outcomes such as efficiency in resource allocation and work processes, and further assessed by immediate clinical outcomes rather than long term improvement of patients' health and wellbeing [33]. In this context, relying on self-motivation to develop and improve management competency, and the ability to use tested management tools and methods without specific formal and informal management training is a major challenge [38].

The study confirms that all medical directors across hospitals and management levels have encountered difficulties in their management positions, in particular those at the most senior level—directors of medical services and those who are working at the Level 3 hospital. These difficulties relate to:

- Dealing with conflicts with patients, staff members and their peers;
- Improving and managing performance: staff performance, service quality and management outcomes;
- Developing new skills; and
- Making decisions and managing change.

Examining the main difficulties in reference to the detailed behaviors associated with the six core management competencies, it is clear that all of the competencies are important to successfully overcome the main difficulties encountered. However, the low level of self-assessed competency is likely to be an obstacle in itself, suggesting that further formal and informal management training will be essential for not only overcoming difficulties but also for maintaining the expected clinical and management performance outcomes, confirming the importance of overall management competency development for medical directors.

Furthermore, the fact that the difficulties encountered are common across management levels and hospitals, such difficulties may not be a result of a specific local hospital context or patient cohorts, but factors that impact on the overall public hospital system and hospital management workforce. Therefore, system-wide policy development and strategies are required.

In addition, reviews of organization-based policies and strategies and of medical curricula should occur in conjunction with the policy reviews at the system level. There is also empirical evidence that has not only championed the importance of self-improvement and life-long learning in enabling work efficiency and career advancement, but also its ability to instill a sense of purpose, self-worth and self-assessed confidence [39].

To summarize the above discussion (see Table 7), the authors suggest that strategies to develop the overall leadership and management competency of clinical directors for Chinese public hospitals beyond individual levels should at least focus on three levels: (1) two system levels: health system and higher education system [6,13,14,17,18,27,28]; and (2) healthcare organization level [6,8,9,13,14,31].

Table 7. Three levels of strategic development for clinical leaders and managers.

Level	Strategies
Health system [6,18,27,28]	■ Establish national level standards for clinical leaders/managers by defining management qualifications and competency requirements. ■ Develop a national policy that recognizes the importance of health service management positions and identify indicators to measure successful management outcomes. ■ Incorporate continuous professional development as requirement for managers to maintain standards.
Higher education system [6,14,17]	■ Work closely with public hospitals to identify strategies to bridge the knowledge gaps that are fundamental to further develop clinical leadership and management. ■ Review and revise undergraduate medical curricula to introduce leadership and management related concepts that will provide an understanding of the roles of clinical leaders/managers. In addition, incorporate some leadership and management knowledge and skills into clinically based master's degrees to prepare medical doctors to take up medical leadership and management roles. ■ Further development of non-research-based postgraduate courses in health service management
Healthcare organisation [6,8,9,13,14,31]	■ Develop management position job descriptions and a hierarchy for clinical leadership development. ■ Formulate succession planning and recruitment strategies for senior management positions with clear qualification and competency requirements. ■ Embed management competency assessment as part of the performance review process to identify competency gaps. ■ Developing an organization-wide support and training framework, using a mixed approach including the provision of targeted training, support, mentoring and on the job coaching.

The successful implementation of the above strategies would ultimately develop a culture that encourages continuous management competency development and self-improvement among clinical leaders who can lead and manage the health system reform agenda and maintain and improve the quality of health service provision which is important to a sustainable healthcare system that can meet the increasing healthcare needs the population.

4.3. Strengths and Weaknesses

The major strength of the study is the sample size and high response rates across hospitals. One weakness of the study was the reliance on self-reported information which may challenge its objectivity. However, any error introduced is likely to randomly distributed, although a degree of common method bias cannot be excluded. In addition, the results are based on a study in three hospitals from one province, so its external validity may be limited nationally.

5. Conclusions

The study confirms that core management competencies identified in a non-Chinese context are also core to medical directors in the Chinese public hospitals. Despite the recognition of their importance, medical directors across three Chinese public hospital levels have not sufficiently acquired such competencies prior to taking up their senior medical leadership roles. The lack of effective formal and informal training in management related areas may have attributed to the low self-assessed management competency levels. The study strongly argues the importance of informal management training, coaching and mentoring for developing the medical leadership and management without downgrading the importance of formal management training.

To develop and sustain an effective medical leadership and management workforce in China, the paper champions two-system level (health system and higher education system) and one healthcare organization level approaches to formulate overall workforce development strategies. The successful implementation of such strategies would lead to the development of a culture that encourages continuous management competency development and self-improvement among clinical leaders. Investment in the capability development and competency improvement of the medical leaders in China is critical and could lead to improved quality of service provision with greater economic sustainability and improved public health outcomes.

Author Contributions: Z.L. and J.W. were responsible for the overall design and conceptualization of the research; Z.L., J.W. and M.X. were responsible for the finalization of the survey questionnaire; Z.L. was also responsible for the overall design of the current publication and majority of the writing of the introduction, discussion and conclusion; P.H. was responsible for data analysis, the development of the methods section and editing of the whole paper; J.W. and M.X. provided useful background information for the formulation of introduction and discussion. All authors have read and approved the manuscript.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. MCAP Competency Likert Scale for self-assessment.

Scale *	Level	Competency Level
1	Not competent	Do not understand the requirements and am not capable of applying it to my role
2	Basic or novice	May be capable of demonstrating minor aspects in my role
3	Advanced beginner	May be capable of demonstrating in my role, but not in all required aspects
4	Competent with occasional guidance	Can generally demonstrate in my role, but guidance is needed occasionally
5	Competent, no guidance	Can demonstrate in my role independently without guidance, but have not had extensive experience
6	Proficient	Always apply appropriately in my role with extensive experience
7	Superior expertise	Always apply appropriately in my role with extensive experience gained from diverse management roles at executive level and can teach this competency to others

* Scores less than five are considered less than fully competent. Scores five or greater are considered fully competent.

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Article

New Ways of Working? A Rapid Exploration of Emerging Evidence Regarding the Care of Older People during COVID19

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Abstract: Health and social care staff have had to quickly adapt, respond and improve teamwork, as a response to the COVID-19 pandemic. Our objective was to rapidly summarize the emerging evidence of new ways of working in the care of older people during this period. We conducted an exploration of the emerging evidence within the timeframe of 1 March 2020 to 11 May 2020. To capture a broad perspective, we undertook thematic analysis of Twitter data which was extracted through a broad search for new ways of working in health and social care. For a more in-depth focus on the health and social care of older people, we undertook a systematic scoping of newspapers using the Nexis UK database. We undertook a validation workshop with members of the interprofessional working group of the Irish National Integrated Care Programme for Older People, and with researchers. A total of 317 tweets were extracted related to six new ways of working. There was evidence of using telehealth to provide ongoing care to patients; interprofessional work; team meetings using online platforms; trust and collaboration within teams; as well as teams feeling empowered to change at a local level. 34 newspaper articles were extracted related to new ways of working in the care of older people, originating in England (n = 17), Wales (n = 6), Scotland (n = 6), Ireland (n = 4) and Germany (n = 1). Four main themes were captured that focused on role expansion, innovations in communication, environmental restructuring and enablement. The results of this exploration of emerging evidence show that health and social care teams can transform very rapidly. Much of the change was based on goodwill as a response to the pandemic. Further analysis of empirical evidence of changing practices should include the perspectives of older people and should capture the resources needed to sustain innovations, as well as evaluate gaps in service provision.

Keywords: integrated care; older people; Covid-19; new ways of working; health and social care; teamwork; social media

1. Introduction

On the 11 March 2020, the World Health Organisation declared that severe acute respiratory syndrome secondary to the novel coronavirus disease (SARS-COV-2) was a worldwide pandemic [1]. Currently (19 August 2020) 1,962,958 cases of COVID-19 have been reported in the European Union and the United Kingdom, including 179,963 deaths [2]. Research into a potential treatment and vaccine development is ongoing but caution has been urged that this will take time [3]. As a response to the pandemic, sweeping changes have occurred in health and social care systems to mitigate the virus [4–6]. The emerging research has found that Covid-19 disproportionately affects older people. Older people are more likely to require hospital admission and they are most likely to die from

COVID-19 infection [7–12]. As a response to COVID-19, Ireland's National Public Health Emergency Team (NPHET) followed the guidance of the European Centre for Disease Prevention and Control who recommended several measures. These included the closure of non-essential services and travel on the 27 March 2020 to limit human to human transmission [13]. As of the 19 August 2020, Ireland has had 27,499 confirmed cases including 1738 deaths [14]. Following trends in other countries, people over the age of 70 were deemed as particularly vulnerable to COVID-19. A specific recommendation was made that people over 70 should 'cocoon' at home to reduce face-to-face interaction with other people [11].

Across the globe, frontline health and social care staff experienced exceptional demands such as dealing with high mortality, rationing of personal protective equipment and ethical dilemmas involving rationing access to ventilators and other essential supplies [15]. Since the restrictions were introduced in Ireland in March 2020, health and social care staff have had to adapt and respond to the COVID-19 pandemic. The literature notes that teamwork during the pandemic has become both essential and challenging [16,17]. Capturing evidence of changes that have occurred within teamwork during this critical responsive period is important in developing an understanding of these new ways of working. This critical understanding will contribute knowledge of team dynamics in healthcare settings and may identify new ways of working which are beneficial for inter-professional collaboration and have the potential to be sustained [18,19]. To commence the capture of this evidence, we decided to undertake a scoping review of the available emerging evidence during COVID-19 [20]. Scoping reviews are particularly useful to capture emerging evidence, when it is unclear which more specific questions can be posed, for evidence synthesis [21].

2. Methods

Two complementarity approaches were undertaken to enable us to characterize and map the current evidence of new ways of working in the care of older people during COVID-19. An explorative descriptive study design was implemented using a modified version of Arksey and O'Malley's framework [22] that included identifying the research focus, identifying databases to search, generating inclusion/exclusion criteria, study screening and extraction, and external validation.

2.1. Identifying the Research Focus

In April 2020 we held three video consultations with our college librarian (DS) during which we reviewed potential questions and scope before agreement on refinement. For this exploration of new ways of working in the health and social care of older people during COVID-19, we wanted to capture some of the emerging evidence from two sources: Twitter and newspapers. For breadth and without any geographical restrictions we decided to search Twitter for data which described new ways of working in health and social care generally, without limiting this to the care of older people. For a more in-depth focus on the care of older people we decided to capture newspaper coverage from Europe, where many countries were experiencing a peak of COVID19.

2.2. Identifying Databases

The study was undertaken in May 2020. We followed two parallel approaches to identify relevant emerging evidence pertaining to a broad understanding of new ways of working (breadth) as well as a more in-depth view of the context of older people's health and social care (depth).

2.2.1. Breadth

An analysis of posts on Twitter was conducted to collect information about new ways of working within health and social care during the period of the COVID-19 pandemic. Twitter is a social media microblogging platform that provides the user with 280 character 'tweets' that may consist of images, text, and links [23]. Approximately 500 million tweets are sent per day and Twitter has 316 million active users [24]. When a person registers to a Twitter account other users can follow them and see their tweets. Previous work has found that analysis of the content on social media has become a

valuable source of information for health researchers [25–27] The information provides researchers with publicly available data that would not be accessible using more traditional methods for data collection [28]. Previous work has highlighted that peer interaction on social networks such as Twitter can contribute to policy development in health and social care [28,29].

We used the Twitter advanced search function to inform our scoping review [https://twitter.com/search-advanced?lang=en]. As there was no generic hashtag, we decided to search broadly using new ways of working (Table 1).

Table 1. Twitter Advanced Search.

All of these Words	New Ways of Working
Language	English
Any of these Words	Health and Social Care OR Health or Social OR Care
Dates	1 March 2020 and the 11 May 2020

2.2.2. Depth

Following some testing of keywords by the college librarian in April 2020 using several academic journal databases, it became clear that depth would not be achieved from searching relevant academic articles. It was agreed to undertake a systematic approach to retrieve newspaper articles which described new ways of working in the health and social care of older people as a result of the COVID 19 pandemic. Previous scoping reviews have included newspapers to capture emerging evidence [21,30]. The search was conducted in the Nexis UK database which is a curated archive of the UK and Ireland's national and regional newspapers as well as international newspapers and newswires. The timeframe for the search was limited to articles published between 1 March 2020 and 11 May 2020.

The search terms used, either singularly or in combinations were: ("Older People" OR Elder* OR Senior* OR Pensioner* OR "Over 65's" OR Cocooner* OR Geriatric* OR Resident* OR OAP OR Aged OR Grandparent OR Centenarian* OR Retiree* OR "Retired person") AND (HCP* OR "Healthcare Professional*" OR Doctor* OR Consultant* OR Intern* OR "Senior House Officer*" OR Registrar* OR Attending OR Physician* OR "General practitioner*" OR medic OR Nurse* OR PHN OR RGN OR "Allied Health" OR "Occupational Therapist*" OR OTs OR "Speech and language therapist*" OR SLTs OR Dietitian* OR Physiotherapist* OR PTs OR "Social worker*" OR HSCPs OR "Health and Social Care Professional*" OR Paramedic* OR "Health care assistant*" OR HCAs OR Carers OR "home help" OR "Home visit*" OR care) AND (Covid-19 OR Coronavirus OR MERS-CoV OR "2019 nCoV" OR 2019nCoV OR "COVID 19" OR COVID-19 OR "SARS CoV-2" OR "SARS-CoV" OR "2019-nCoV" OR "SARS-CoV-2") AND (Inter-disciplinary OR interdisciplinary OR Inter-professional* OR Interprofessional* OR Team* OR Collaboration* OR "Collective leadership").

2.3. Inclusion and Exclusion Criteria

The authors participated in multiple video meetings to determine the criteria for inclusion of articles or tweets. For the Twitter search, it was agreed to include all tweets in English mentioning 'COVID-19' and "new ways of working' within 'health' and 'social care'." No geographic exclusion was placed on the search. We did not focus on any specific health and social care discipline. Our focus was to capture the breadth of tweets related to any new ways of working occurring at the time of the search. Excluded tweets would include those not specifically mentioning or relevant to health and social care. The criteria for inclusion of newspapers in the review were 'English language' (or translations). We searched for newspaper articles published in Europe under the subject category of 'medicine and health' and focusing on the healthcare industry. We excluded articles that did not focus on the care of older people or where the primary focus of the article was not the care of the older person. Articles were also excluded if they did not describe changes in the work practices and teamwork of health and social care professionals as a response to the COVID 19 pandemic.

2.4. Screening and Extraction

Relevant health and social care tweets were collected by one reviewer (É.N.S.) using the NCapture tool for NVivo. NCapture is a Chrome web browser extension for NVivo12 (QSR International, Doncaster, Australia) that can be used to create a chronological dataset or 'batch' of tweets, working backwards from the time of the 'capture' [28]. We used descriptive statistics to describe the sample and thematic analysis for the resulting qualitative data set using NVivo nodes. Thematic analysis is a process of identifying patterns or themes within qualitative data [31]. Using the Twitter advanced search option thousands of tweets were retrieved which mentioned 'news ways of working', covering areas such as education, health, work, family and personal tweets (supplementary file 1-Table S1). The initial codes for the extracted tweets were based on the specified research question and identified tweets which were most relevant to health and social care and COVID-19. Following a review and discussion by team members (É.N.S., M.O. and D.O.), a final set of codes were agreed. The extracted tweets were divided between the two members and codes were developed and discussed by the team over video discussion. Following best practice guidance, the usernames are not presented in the results section [28,32].

The newspaper search was conducted on 12 May 2020 yielding a total of 5562 articles for full-text screening. Two reviewers (É.N.S., M.O.) screened the full-text articles based on eligibility criteria with a third reviewer acting as moderator (D.O.). A total of 51 articles were identified in the initial review. A further full-text screening conducted by all three reviewers yielded a final 34 articles identified as eligible for extraction (see Figure 1).

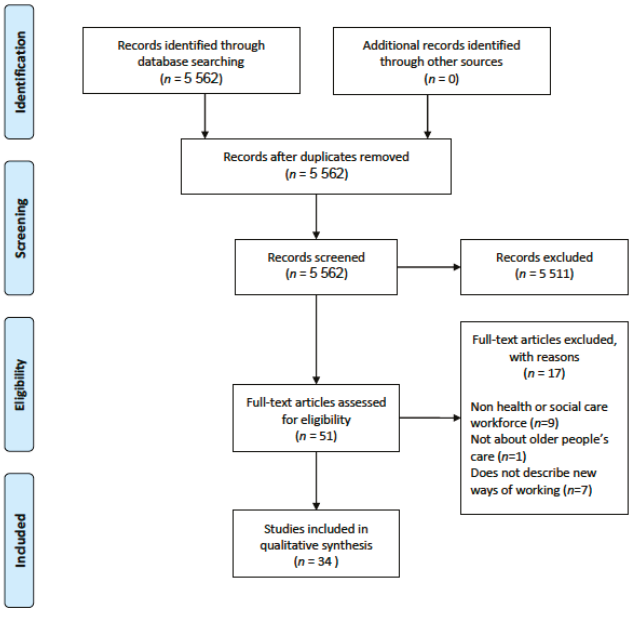

Figure 1. PRISMA Flow Diagram.

An extraction template was created (supplementary file 2, Table S2–S10). Three researchers extracted the articles noting the country of origin, the healthcare setting described, and the specific health and social care professionals involved. The extraction criteria included two types of innovations: changes in the roles and behaviours of individuals and teams as well as innovations in the organisation of how healthcare resources, structures and contexts are governed and managed in the care of older people. The social processes underlying the innovation were also noted with reference to the human

and social resources, competencies, motivations, reasoning and interrelationships being described. Finally, the extraction of information from the articles identified 'new ways of working' in providing health and social care to older people during the pandemic (context).

2.5. Validation

After our data extraction, we extended an invitation to attend a validation workshop to members of the interprofessional working group of the Irish National Integrated Care Programme for Older People and with researchers in the University College Dublin Centre for Interdisciplinary Research Education and Innovation in Health Systems. Validation and feedback were undertaken via videoconference on the 2 July 2020 with 11 participants. Research team members É.N.S., D.O. and M.O. provided a summary of the key findings. Feedback on the findings was sought. Specifically, we asked if our findings were consistent with their own experiences of working in the care of older people during COVID-19. Further analyses suggested by the experts were incorporated into our final manuscript, specifically in the discussion section.

3. Results

3.1. Twitter: New Ways of Working in Health and Social Care during COVID-19

A total of 317 tweets were extracted relating to six new ways of working in health and social care during COVID-19 between 1 March 2020 and 11 May 2020. These were:

1. Using telehealth and or phone consultations to provide ongoing care to patients
2. Interprofessional work
3. Team meetings using online platforms
4. Trust and collaboration within teams
5. Sharing information and a clear feedback loop between teams
6. Teams felt empowered to change at a local level

The tweet themes are shown in Table 2 with supporting examples.

Table 2. Main Themes Supported by Tweets.

Theme	Tweets	Tweets Supporting the Theme
Using telehealth and/or phone consultations to provide ongoing care to patients	71	We will definitely keep this moving forward and continue to embrace the new ways of working. Primary care is now a blend of face to face and digital medicine. Safety first as always. Many of my patients happy to share video consultations but important to remember not everyone has tech still. 9 May 2020
		The Nurse Service is here to support any families caring for someone with dementia during this difficult and worrying time (new ways of working- telephone clinics, consultations, practical help, advice and support) supporting our community. 21 April 2020
		First #telehealth call with my youngest child today. In 20 mins he went from hiding and running from camera to smiling and waving. So grateful to parents for their flexibility and patience as we find new ways of working. #mySLTday. 20 March 2020
		Learning new ways of working during #COVID-19. Did ward round in psychiatry with registrar, nurse and OT in room with patient and consultant on Webex due to having to isolate. Patients coped quite well. 19 March 2020

Table 2. *Cont.*

Theme	Tweets	Tweets Supporting the Theme
Interprofessional Work	79	"It's changed beyond recognition"—Many of our staff have had to find new ways of working, or take on new roles entirely, and the response has been brilliant. 1 April 2020 I'm so impressed with the speed that our staff have implemented and adapted to new ways of working to provide therapeutic interventions during the barriers that face us in this challenging time. #Covid_19 #NHSheroes 20 March 2020
		Community spirit, Covid-19 shows the true strength of interdisciplinary cooperation and cross boundary working, no time for "me" or professional boundaries that are barriers to common good. New ways of working and long may they last! 14 March 2020
		Doctors and HCW are working together at all levels to prepare for an outbreak of #COVID-19 in the coming weeks. Whatever is required we will be there, delivering care. This may require redeployment and new ways of working, and we will do our best and our duty. 10 March 2020
Team meetings using online platforms	22	Working in new ways in our perinatal mental health team: Teams enables us to huddle with a virtual huddle board, & team drop-in at end of day: chance to think, connect and be ready for next day. + less emails and more conversations mean faster progress. Adapting positively. 6 April 2020
		It's a strange time but look we did a virtual handover yesterday. Community nurses are used to mobile working and problem solving. 22 March 2020
		Teams testing out #Webex today. Checking in with our staff across primary care team, keeping ourselves up to date with new norms and new ways of working. 21 March 2020
		ED ACPs ENPs and Team SDEC evening get together in this new world, comes new ways of working, connecting and learning. 19 March 2020
Trust and collaboration within teams	18	Local relationships, trust & new ways of working at the heart of health & social care integration/wider service reform have been the bedrock of our ability to respond to C-19. They have to continue be the foundation of what we do next. 10 May 2020
		The last few weeks have brought challenges, gripes and niggles to say the least. However, they have also brought new and innovative ways of working with all different staff groups! Diversity and Inclusion have produced teamwork for a shared goal #CriticalCare 29 April 2020
		My colleagues (SHOs, SpRs, consultants) have all been amazing. We have changed to completely different ways of working - more weekends, nightshifts, new clinical challenges. Everyone has come on board and we've retained a really high morale despite the stress everyone is under. 18 April 2020
		We look for the positives at work. Things we have noticed are how quickly we can adapt to new ways of working. Clear channels for communication Even more #kindness from local community and between colleagues. 3 April 2020

Table 2. *Cont.*

Theme	Tweets	Tweets Supporting the Theme
Sharing information and a clear feedback loop between teams	16	Thank you from the leadership team to all our Older Adult Services teams in #Location- you've continued to work tirelessly to provide the best care possible & embrace new ways of working. Feedback has been really positive. Well done! #OurNHSPeople 29 April 2020
		We know that a lot of our teams are adjusting to new ways of working, so we've set up a Clinical Support line to provide mentoring and reassurance. 21 April 2020
		Due to #COVID-19 you may find yourself working in different ways, different settings or with new teams. Our guidance for support workers in health & social care include team working in rapidly changing environments, keeping a record of care & communication. 17 April 2020
		Social distancing means people are getting used to new ways of working. Today colleagues joined us to learn how they can work together & collaborate virtually: we look forward to seeing how you put your learning into action. 19 March 2020
Team felt empowered to change at a local level	111	We now have to look through a new lens as to how we deliver health services in Ireland. We need to retain some of our responses for #Covid-19 as they have proven good for the public. Working closer with GPs and unlocking the huge passion of staff are just two. 26 April 2020
		There have been countless innovations & new ways of working. Changes that might have taken years have been achieved in days in hospitals, mental health, GP & community services. As one leader said, we're not going back to normal, we must embrace a new & very different future. 18 April 2020
		So many examples of great teamwork and leadership. Over the past few weeks - discharge pathways completely rewritten, different ways of working implemented and new teams formed. Very proud of everyone's effort and resolve. 7 April 2020
		I have never known so much change happen so quickly. Honestly the NHS in a crisis is amazing, people working together all over the place and achieving so much and developing new ways of working. All with care and compassion for each other and the patients. 26 March 2020

A majority of the tweets extracted (n = 111) were themed under teams being empowered at the local level to change. There was clear evidence of teams being able to implement changes quickly at a local level. Evidence of pride expressed by health and social care workers in what they had achieved, was clear, with a desire that the changes should be sustained following the peak of the pandemic. Interprofessional work (n = 79) was the second most frequent theme in the twitter data that described 'new ways of working' in health and social care. The tweets relayed how team members had taken on new roles and that there had been a removal of siloed and hierarchical structures during COVID-19. There was clear evidence of new ways of working in the delivery of care with the introduction of telehealth and phone consultations (n = 71). The tweets cited that this initiative was something health and social care teams wanted to retain after the peak of the pandemic. How teams were engaging with each other also appeared under new ways of working (n = 22). Various online platforms were highlighted that had assisted team engagement, team huddles and debriefs across various sites. There was evidence of trust and collaboration amongst teams, enabled by the COVID-19 pandemic (n = 18). Finally, tweets (n = 16) showcased how teams were sharing information amongst and between teams

and there was also evidence of feedback loops being created right across the health system with additional information provided.

3.2. Newspaper Articles: A Focus on New Ways of Working in the Care of Older People during COVID-19

A total of 34 articles were identified for extraction originating in England (n = 17), Wales (n = 6), Scotland (n = 6), Ireland (n = 4) and Germany (n = 1). (Figure 2).

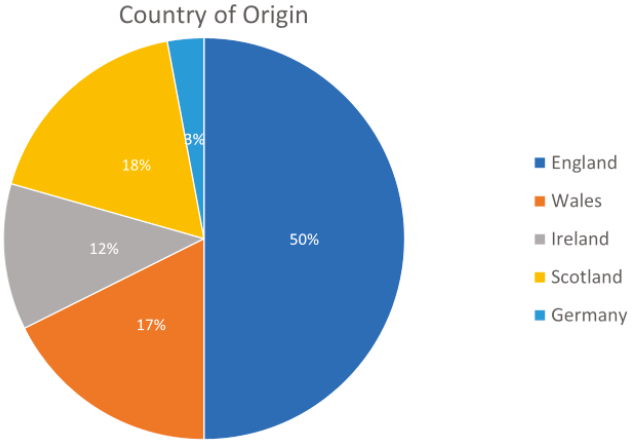

Figure 2. Pie chart showing the distribution of extracted articles by country of origin (n = 34).

The articles focused on healthcare settings across the care continuum for older people including community care, acute hospital care, and residential care and rehabilitation settings. Figure 3 provides a summary of the key themes described in the 34 newspaper articles.

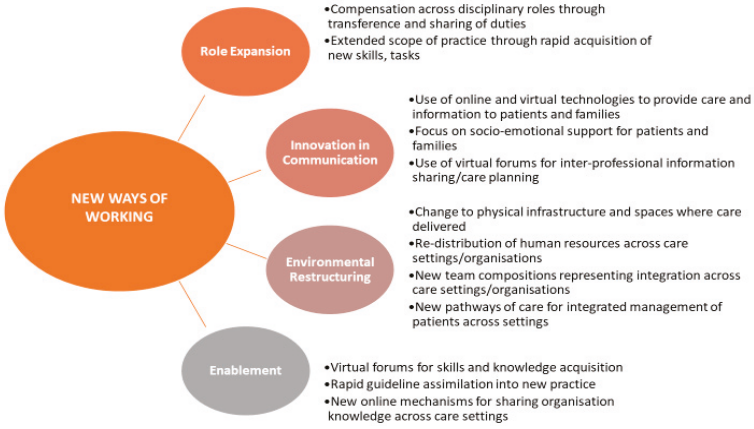

Figure 3. Summary of Key Themes for New Ways of Working Described in Newspaper Articles (n = 34).

The 34 newspapers articles focused on new ways of working in the care of older people and provided evidence for an in-depth understanding of changing practices.

Role expansion was captured in two ways from newspaper coverage. There was evidence of staff transferring and expanding from their normal duties [33–38]. One example saw cleaning staff stepping in as carers in a hospital ward in Wales with another example of council workers in England

being redeployed as home carers to support older people in the community [39–44]. Other examples noted an expansion in the scope of the roles of health and social care staff [45,46]. One such initiative involved General Practitioners (GPs) and hospital physicians in Wales distributing iPads to care home residents to enable telehealth consultations [47]. Another story from Wales saw hospital physicians collaborating with GPs and community teams to deliver care directly in the home setting [48].

A story from Ireland mapped the rapid transformations that occurred between general practitioners and community pharmacists [49]. By working together they reorganised services to provide care to older patients. This reorganisation included arranging deliveries of prescriptions for older people who were cocooning and pharmacists changing their protocols to allow for electronic prescriptions from GP's [49].

The retrieved newspaper articles described significant innovation in communication [49–56]. This included the use of on-line tools to support service provision to older people as well as facilitating communication with family members [57–59]. Coverage also highlighted significant uptake by healthcare staff of virtual forums and websites to support training, interprofessional care-planning and information sharing [50,56].

Healthcare professionals were described in the newspaper articles as demonstrating strong communication skills in providing emotional support to older people to compensate for the physical distancing. One story from a nursing home in Scotland, for example, outlined how staff provided ongoing verbal emotional support to residents in the absence of physical contact [51]. Changes to the social and physical infrastructure where care was delivered were captured in the retrieved articles [42,46,60–62]. One story from Germany outlined how a nursing home created three separate zones for residents based on their triage status [61]. Newspapers also captured the redistribution of staff across care settings and the establishment of new integrated care teams [40,42,63,64]. There was also evidence of new pathways of care being developed to protect older people transitioning between services [49,52,65,66]. A story from England for, example, mapped how a front line social care team from a local council worked within hospitals to expedite the discharge of older people to appropriate community settings [67].

There was evidence within the articles of rapid acquisition of knowledge and training regarding the clinical management of Covid-19. One exemplar from England found care home staff working across different settings meeting virtually to collaborate, share knowledge and support each other [57]. The rapid development and adoption of clinical guidelines were also highlighted. An Irish exemplar noted how staff in a particular setting had to rapidly respond to guidelines around personal protective equipment [50]. The use of online resources was the mechanism used by teams to receive education and training and to acquire information rapidly [58,67].

3.3. Validation Workshop

During the validation workshop much of what was captured in the review corresponded with the experiences of the health and social care workers who participated. Attendees outlined how barriers were removed quickly for them and they provided examples of work they had done to reconfigure services and embed telemedicine into practice with older patients. One attendee noted how a local government sports partnership had worked with her team to develop exercise classes for older people who were at home. Exercise classes were loaded onto a tablet and they developed simple user instructions where internet access was not required. Other participants noted how health and social care professionals developed webinars and video conferences to share learning with nursing home staff across public and private providers at the height of the COVID-19 crisis. Workshop attendees noted how hierarchies and seniority in roles disappeared as people worked together on a common goal. Concern was raised on service provision gaps that had occurred due to redeployment and new ways of working. Examples outlined how one redeployment had left a team without a social worker whilst community occupational therapists had been redeployed to do testing/contact tracing. The participants noted that further research and exploration of these gaps in service provision was required particularly

where there was potential for deconditioning, increasing the risk of frailty and/or hospital admission. Other concerns expressed related to the psychological impact on staff and, significantly, burnout and staff retention.

4. Discussion

This exploratory study searched for evidence of new ways of working during the peak of the COVID-19 pandemic in Europe and in particular in Ireland and the United Kingdom. The Twitter exercise provided a broad overview of emerging evidence of new ways of working within health and social care teams. There was evidence of teams expressing excitement at being empowered at a local level to bring about changes. Tweets noted that much of the changes that have been introduced would normally have taken years to implement, such as the introduction of telehealth. Central to the success of the changes was teamwork and this aligns to the literature [16,17]. Added to this was evidence of interprofessional work, described as cooperative and boundary spanning and noted by one tweeter as having changed 'beyond recognition'. Evidence of increased trust and collaboration was also seen locally. Tweets noted the pressures experienced by all, but strong relationships were key enablers to overcome these. There were many examples tweeted of health and social care teams using various online platforms to continue to meet and communicate with each other and include teams outside of their settings. The sharing of information across sites and within teams was done quickly and it was clear from the tweets that staff were able to feedback their perspectives.

The scoping of newspapers provided an opportunity to capture a more in-depth focus on health and social care teams working in the care of older people. The COVID-19 pandemic disproportionately affects older people [7–9]. The scoping review of newspapers found evidence of remarkable efforts by health and social care teams to ensure that older people remained COVID-19 free. Coverage noted how staff had moved into residential settings and many had expanded their roles. Examples highlighted how care homes and older person wards went to great efforts to ensure emotional support for older people to try to compensate for a lack of physical contact with the family. Examples included music on the wards, singing, and social initiatives. There was evidence of innovation in communication within teams, ensuring information was shared quickly across boundaries. This corresponds with the descriptions emerging from the synthesis of Twitter data. Healthcare teams worked together to understand new guidelines and collaborated to implement them. Significant coverage captured the environmental restructuring that occurred, both physical and social. One example described hospital teams stepping into new roles by undertaking home visits to support older people.

This exploratory study demonstrated that the health and social care system can transform very rapidly when presented with a single focus or threat. The context in which these changes have occurred is unprecedented. The level of risk for a potential second wave of COVID-19 is still unclear [1,2]. It is important to capture the changes that have occurred in this current wave of the pandemic to support the identification of new ways of working. Previous work has noted that social media sites such as Twitter can be used for real-time content analysis and knowledge translation research especially during a pandemic [68]. More recently, academic literature has noted the benefits of undertaking analysis of social media posts to understand the interprofessional experiences of clinicians during COVID-19 [69]. This was a clear finding in our review, in which tweets clearly expressed evidence of new ways of working and a desire to sustain these changes.

It is necessary to reflect upon both benefits as well as negative effects of practice changes and consider the potential to sustain innovations [18,19]. It should be stressed that the new ways of working occurred within a context of health and social care teams working way beyond their current roles. This was done with a significant degree of staff goodwill and commitment to their patients and colleagues in the face of an unprecedented threat to public health. Further research should capture the resources that are needed to support the sustaining of innovations that have occurred. Emerging academic literature focusing on the impact of COVID19 on health systems is capturing how healthcare staff are adapting and expanding their practices, thereby enabling the health system to respond to

this public health emergency [70,71]. Sustaining positive changes, particularly those pertaining to inter-professional collaboration, communication and sharing of information, will require ongoing support and resourcing [72,73]. Diverse communication was a key enabler for health system preparation and responsiveness, identified in our exploratory study. The need for innovative communication, including tele-health, expedited referral pathways and information sharing within multidisciplinary health and social care teams and by senior leaders has also been identified in the emerging literature [74].

Limitations

Our study does have some limitations. For this review, we searched Twitter and one newspaper database. Nexis UK database archives regional newspapers from the UK only, along with national papers more globally. A further limitation is our focus only on English language Twitter and newspaper publications. Future work should capture and synthesise the anticipated outputs from ongoing and emerging robust academic research describing and evaluating practice innovations and health systems responses to the pandemic. In particular, attention should focus on learning in other territories where the impact of Covid19 has increased such as Canada, the United States of America, Brazil and Australia. We are mindful that our Twitter and newspaper search looked for the positives of 'new ways of working' but was a useful exercise to capture real-time insight [69]. Through consultation with the inter-professional sub-group of the National Clinical Programme in Ireland, we were able to validate our review findings. This enables us to draw some conclusions from our work within the parameters of an initial exploratory study. Our validation identified the concerns of those directly working in the health system. These concerns should be explored in detail in further work. Notably missing from Twitter and the newspaper articles were the direct insights into these changes from older people themselves. Their exclusion is aligned to a broader decrease in patient and public participation in research and policy that has occurred during the pandemic [11,75]. Recognising this gap, organisations such as the British Geriatrics Society have called for the inclusion of older people in COVID-19 research [76]. Further work should prioritise older peoples' perspectives. Following our validation workshop, further work should capture the impact of potential gaps which the response to COVID-19 has left in service provision and the composition of inter-professional teams.

5. Conclusions

To the best of our knowledge, this is the first exploratory study to collate new ways of working in the delivery of care for older people during the COVID-19 pandemic. The emerging evidence shows that it is older people who are disproportionately impacted. This exploration describes how health and social care teams transformed very rapidly. Much of the change was based on goodwill as a response to the CODID-19 pandemic. Further work should capture the resources and support needed to expand these new ways of working. Central to this is the involvement of older people themselves.

Supplementary Materials: The following are available online at http://www.mdpi.com/1660-4601/17/18/6442/s1. Supplementary file 1: The Twitter Advance Search Results. Supplementary file 2: Table S1: Newspaper Extraction Template, Supplementary file 3: Table S2–S10: Extraction for Retrieved Newspaper Articles (N = 34).

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Context Matters: Findings from a Qualitative Study Exploring Service and Place Factors Influencing the Recruitment and Retention of Allied Health Professionals in Rural Australian Public Health Services

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Abstract: Chronic health workforce shortages significantly contribute to unmet health care needs in rural and remote communities. Of particular and growing concern are shortages of allied health professionals (AHPs). This study explored the contextual factors impacting the recruitment and retention of AHPs in rural Australia. A qualitative approach using a constructivist-interpretivist methodology was taken. Semi-structured interviews (n = 74) with executive staff, allied health (AH) managers and newly recruited AHPs working in two rural public health services in Victoria, Australia were conducted. Data was coded and categorised inductively and analysed thematically. The findings suggest that to support a stable and sustainable AH workforce, rural public sector health services need to be more efficient, strategic and visionary. This means ensuring that policies and procedures are equitable and accessible, processes are effective, and action is taken to develop local programs, opportunities and supports that allow AH staff to thrive and grow in place at all grade levels and life stages. This study reinforces the need for a whole-of-community approach to effectively support individual AH workers and their family members in adjusting to a new place and developing a sense of belonging in place. The recommendations arising from this study are likely to have utility for other high-income countries, particularly in guiding AH recruitment and retention strategies in rural public sector health services. Recommendations relating to community/place will likely benefit broader rural health workforce initiatives.

Keywords: rural health workforce; allied health; local context; recruitment; retention; turnover; Australia

1. Introduction

Many rural communities around the world struggle to attract, recruit and retain a full spectrum of health workers to service the often-complex health needs of diverse populations living in rural places. In Australia, these chronic rural health workforce shortages have been identified as significantly contributing to the substantial unaddressed health care needs found in rural and remote communities [1]. Of particular and growing concern are shortages of allied health professionals (AHPs), particularly given the greater reliance on collaborative, team-based care in rural places and the lead role that AHPs play in providing rehabilitation and chronic disease management services [2,3]. Shortages of AHPs are also likely to be a contributing factor in the lower hospitalisation rates for rehabilitation care among Australians living in rural areas, with 6.9 hospitalisations per 1000 population for outer regional areas and 6.2 for remote areas compared to 19 in major cities [1]. Allied health (AH) rural

workforce shortages also persist despite substantial investment by the Australian Government over the last 20 years in funding university places to increase the number of trained AHPs [4,5].

The rural AH workforce issue is primarily one of maldistribution, with an oversupply of AHPs in metropolitan areas and an undersupply in rural areas, especially of experienced AHPs, with AH workforce shortages intensifying with remoteness [1,6,7]. In 2017, 81% of physiotherapists, 75.5% of podiatrists, 77.1% of occupational therapists, 77.4% of pharmacists and 79.1% of medical radiation practitioners worked in major cities, while only 72% of the Australian population of approximately 25 million lives in major cities [1,5]. In rural and remote Australia, there is also greater reliance on the public health sector given there is more limited access to private health services [8]. Related to this, studies indicate that approximately half to two-thirds of rural AHPs work in public sector services [9,10]. In an Australian study in western Victoria that measured rural AH workforce turnover and retention, career grade was found to influence retention, with AHPs at Grade 2 or higher having a significantly reduced risk of leaving their rural position compared to those who commenced at Grade 1 [6]. The grade level classification system for AHPs working in the public sector is outlined in the relevant Australian state or territory's Enterprise Bargaining Agreement (EBA) for AHPs. An EBA is an agreement, made at an enterprise level between employers and employees and their union, about terms and conditions of employment. Grading of AHPs starts at Grade 1 for new graduates, rising to Grade 3–4 for managers. The classification level relates to the degree of responsibility, skills and experience for the position, not an employee's performance in the position. The western Victoria study also found that being under 35 years of age at commencement of employment had an important and statistically significant association with turnover risk [6]. The authors attributed this higher risk of turnover among younger, entry-level AHPs to the limited opportunities for grade level advancement, given the small size of AH workforces found in rural and remote health services [6]. Thus, to improve the stability of the AH rural workforce, recruitment and retention strategies need to address the particular factors underlying the different turnover risks between early career and more experienced AHPs.

While the AH rural workforce problem is well recognised [11], the development of effective recruitment and retention strategies to support the achievement of a stable and sustainable AH workforce in rural places remains elusive. In part, this can be attributed to the complexity of the issue, with the reasons why health professionals' come, stay or leave a rural position being multifaceted, involving personal, organisational, social and spatial aspects that change over the life course [12]. In addition, for recruitment and retention strategies to be effective in rural settings, as well as being evidence based, they must be context specific and founded on a sound understanding of the unique factors at play in each service and place [13]. In response to this complexity and the need for a person-centred, evidence-based and context-informed approach, the author developed a rural health workforce conceptual framework—the Whole-of-Person Retention Improvement Framework (WoP-RIF)—to support Australia's rural health service executives and line managers, rural communities, and governing bodies to develop effective strategic actions to improve rural health workforce retention [14]. While the WoP-RIP's focus is on retention, it does not ignore recruitment or attraction. Rather, retention is conceptualised as starting with recruitment and the importance of 'person-environment-fit' selection is emphasised with attraction as a key component of recruitment [14].

Guiding Theoretical Framework

In this paper, the WoP-RIF is drawn on to help guide an exploration of the service and place factors influencing recruitment and retention of AH staff working in rural public sector services. For this study, the WoP-RIF was used to inform the development of the participant interview schedule, thematic analysis of the interview data, and the development of the retention improvement recommendations for each service. The WoP-RIF resulted from the author's grounded theory study investigating the full range of 'life' factors influencing the turnover intention of AHPs and nurses working in rural public health services in New South Wales, Australia. It was developed from a substantive theory

explaining turnover intention, which was then cross-referenced with the extensive body of rural health retention literature [14]. The WoP-RIF has three domains—workplace/organisational, role/career and community/place—and the necessary preconditions for improving retention through strengthening job and personal satisfaction are set out under each domain. These preconditions are: working in a friendly supportive, inclusive workplace (workplace/organisational); having opportunities to build skills and access career pathways (role/career); and feeling settled in, being socially connected, and having a sense of belonging (community/place) (see Figure 1).

Figure 1. The Whole-of-Person Retention Improvement Framework.

The major known influences regarding the job and personal satisfaction of rural-based health staff under each domain were explained in a paper detailing the WoP-RIF [14] (see Table 1).

Table 1. Influences on health staff's job/personal satisfaction in the Whole-of-Person Retention Improvement Framework.

WoP-RIF Domains	Major Influence on Job/Personal Satisfaction
Workplace	High-quality workplace relationships with line manager and in team
Organisational	Organisation managed efficiently and strategically
Role	Opportunities to engage with other discipline-specific health professionals and governing bodies
Career	Opportunities for career development/advancement
Place	Experience a sense of belonging in place
Community	Community involved in the planning and implementation of recruitment and retention strategies

2. Materials and Methods

2.1. Aims

The aim of this study was to explore the contextual factors perceived and experienced as impacting the recruitment and retention of AHPs amongst executive staff, AH managers and newly recruited AHPs working in rural public health services. This research was the first stage in a larger project seeking to produce new knowledge about how rural-based public health services can better attract

and improve the retention of AHPs through the implementation of a set of evidence-informed and contextually-specific recommendations. This research was guided by the following research questions:

- How do AH staff working in rural public health services perceive their current work and personal experience as influencing job retention?
- What are the service and place-specific challenges and opportunities facing rural public health services in achieving a sustainable AH workforce?

This study takes a broad definition of AH and AHPs, drawing on the Allied Health Professions Australia's description on its website: AHPs are qualified health practitioners with specialist skills in preventing, diagnosing and treating a range of conditions and illnesses. This study also draws on the Victorian Government, Department of Health and Human Services' (DHHS) categorisation of AH, which includes health professionals from the therapies (including AH assistants working under the supervision AH professionals) and the sciences. In regard to the geographic setting, given the strength of existing evidence that retention challenges increase with remoteness, all areas outside major cities were of interest [1]. Herein, the use of the term 'rural' includes regional and rural places unless otherwise specified. Ethical approval for this study was applied for and granted by The University of Melbourne's Department of Rural Health Human Ethics Advisory Group (1749205).

2.2. Design

This study was undertaken in Victoria, the smallest state on Australia's mainland, the second most populous and the least geographically remote state or territory in the country. This study was conducted with AH staff from two rural public health services. Victorian public health services are state funded through the DHHS. Under the DHHS's health service classification system, the two health services selected were a regional service and a medium-sized rural service, hereafter referred to as the regional health service (ReHS) and the rural health service (RuHS). These two service types were selected to support a full exploration of AH staffing challenges in rural services, which are known to differ not only due to remoteness but also in relation to service size [15].

The two health services selected were identified by drawing on the University of Melbourne, Department of Rural Health (UoM-DRH) research team's knowledge of rural Victorian public health services, an assessment of the services' AH workforce challenges, and the perceived level of likely interest by the services' executive and senior AH management in partnering with UoM-DRH to undertake this research project. The UoM-DRH is one of 16 DRHs funded by the Australian Government to undertake multidisciplinary rural health education and research with local communities in a specified geographical footprint to address unmet health care needs. The UoM-DRH footprint is within rural Victoria.

A legally binding project partnership agreement was drawn up between UoM-DRH and each of the two participating health services. Each agreement outlined partners' cash and in-kind contributions, project inputs and governance arrangements. The main financial input was the employment of a project worker in each service. For this stage of the study, the project worker assisted the author in recruiting staff participants and developing retention improvement recommendations. The governance arrangements included the operation of two groups for the duration of the full study: the Project Working Group (PWG) and the Project Reference Group (PRG). The PWG members included the author, an assigned senior AH manager and the project worker at each site. The PRG members included PWG members, the UoM-DRH Director, senior AH staff and executives of the particular service. In the regional service, a community representative from the local council was also a member of the PRG.

To identify the contextual factors impacting the recruitment and retention of AHPs, a qualitative approach using a constructivist-interpretivist methodology was taken in this study [16].

2.3. Participants

This study used a purposive sampling method to recruit participants for semi-structured interviews who were either 1) AHPs in 'early career', 2) 'experienced' AHPs who had relocated for work within the last 12 months, or 3) key informant staff members on the AH workforce. From this point in this paper, 1) and 2) will be described as 'target AH staff' and 3) as 'key informants'. In this study, 'early career' was defined as having worked less than three years in an AH health role since graduating and 'experienced' as working for three years or more. In the ReHS, the target AH staff participants included both the therapies and sciences. These staff worked at various sites in a broad range of teams and settings including inpatient and community. In the RuHS, the target AH staff participants were mostly from the therapies, working from one site and treating both in- and out-patients and community. The AH workforce is generally considered to exclude medical, nursing and dentistry. However, the RuHS requested that dentistry professionals be included for this study given that a dentistry service was co-located with AH and considered to be part of community services.

2.4. Recruitment

To recruit participants, the two project workers made presentations at AH team meetings and management meetings and/or discussed the project with individual potential participants. Staff members interested in participating gave the project worker permission to share their work email with the author who then made contact, inviting the individual to participate in a face-to-face interview and attaching a copy of the plain language statements (PLS) and consent form (CF). The author liaised with each participant to identify a suitable time to schedule a face-to-face interview. All interviews were conducted at the health services in a pre-booked room selected, whenever possible, at a distance from 'usual' AH work areas to reduce the risk of participant identifiability.

2.5. Interview Data Collection

The author brought hard copies of the PLS and CF and, before each interview, any questions were answered, and consent was given by the participant signing the CF. The interviews were scheduled for one hour and most interviews were between 45 and 60 minutes in length. A flexible interview guide was used to focus the conversation. For the target AH staff group, this included questions on reasons for taking the position, onboarding experience, quality of relationships with line manager and team, extent of job satisfaction with role, access to professional development and career development opportunities, perceived social connection in the workplace and in-community, and personal satisfaction with the local community and place. For those target AH staff participants who had relocated to take up their position, additional questions were asked to explore their experience of relocating and the perceived level of organisational and community support received. The key informant participants were asked questions regarding their experience of attracting, recruiting and retaining AH staff and their perception of the organisational, team, community and place challenges and opportunities for achieving a sustainable AH team/workforce. The interviews were audio-recorded and handwritten notes were taken during the interview to assist the author with participant recall and identifying important aspects of the discussion during analysis.

2.6. Interview Data Analysis

The audio-recordings were transcribed verbatim into separate Word documents and then checked by the author for accuracy against the original recording. The author assigned a unique identifier to each transcript denoting the service type: regional (ReHS) or rural (RuHS); the participant type: target AH staff (TAHS) or key informants (KI); and the interview number for that service and group type (e.g., ReHS-KI-6). The author then conducted a thematic analysis of the data using NVivo v12 software (QSR International) [17]. The WoP-RIF's three domains—workplace/organisational, role/career and community/place—provided structure for the first level of analysis—coding and

categorisation. Identification of emergent themes drew on the key influences on staff job and personal satisfaction under each WoP-RIF domain (see Table 1). These identified themes underpinned the development of a set of recommendations for each service to support a sustainable allied health workforce. Fourteen recommendations were made for the ReHS and 13 for the RuHS; 10 of these recommendations were common to both services. This paper focuses on the data underpinning these 10 shared recommendations because these are most likely to resonate with, and have utility for, other rural health services.

2.7. Rigour

Within NVivo data coding, listing explaining preliminary codes, categories and themes was developed to support consistency in the coding. The thematic coding was checked for consistency by another experienced qualitative researcher and minor adjustments were made. Given that no conflicts or uncertainties arose, a third reviewer, who would have been consulted if there were discrepancies, was not sought. To safeguard participant confidentiality, the transcripts were not shared with any other PWG or PRG members. The author only ever presented the findings thematically with deidentified supporting quotes. To check the rigour of the author's analysis, a presentation of the findings was made to senior executive staff and/or PWG members in each service and these members expressed that the themes identified were relatable. A set of draft recommendations were then developed, initially by the author, and then worked on by all members of the PWG. These recommendations were then presented to the respective PRG for approval. Formal approval to implement the recommendations was given by the PRG in the regional service in late May 2018 and the rural service in June 2018.

3. Results

3.1. Overview of Participants

Interviews were conducted by the author from November 2017 to May 2018. A total of n = 74 participants were interviewed—n = 53 from the regional health service (n = 37 target AH staff and n = 16 KI); and n = 21 from the rural health service (n = 14 TAHS and n = 7 KI). See Table 2 for an overview of participants.

Table 2. Overview of participants by AH profession or position type.

AH Profession/Position Type	Regional Health Service	Rural Health Service	Total
No. Target AH Staff Participants			
Allied health assistance	4	-	4
Dentistry	NA	2	2
Dietetics	2	2	4
Exercise physiology	2	1	3
Medical laboratory science	2	-	2
Diagnostic imaging medical physics	9	1	10
Occupational therapy	3	3	6
Podiatry		2	2
Pharmacy	2	-	2
Physiotherapy	9	2	11
Psychology	1	-	1
Social work	1	1	2
Speech pathology	2	-	2
	37	14	51
Key Informant Participants			
Executive	1	3	4
AH managers	10	3	13
Other health managers	1	1	2
AH locums	4	-	4
	16	7	23
All participants	53	21	74

The key contextual factors perceived and experienced as impacting the recruitment and retention of AHPs identified in thematic analysis are presented under each of the WoP-RIF domains: workplace/organisational, role/career and community/place. A summary is provided in Table 3. In the last domain, 'place' is discussed before 'community' as finding suitable accommodation was found to be the initial primary need that participants relocating for work needed to address before social connection was prioritised.

Table 3. The key identified themes and elements perceived and experienced as impacting the recruitment and retention of allied health professionals (AHPs).

WoP-RiF Domains	Key Identified Themes	Key Elements
Workplace	Degree of challenge attracting, recruiting, and retaining AHPs varies depending on profession, experience level and life stage	1. Differing levels of recruiting challenge between AH disciplines. 2. AHPs from over-supplied professions commonly experience more job insecurity. 3. For entry-level AHPs, retention NOT recruitment is the main challenge as a result of limited professional development and career building prospects and wanting new experiences and more social opportunities. 4. For experienced AHPs, recruitment NOT retention is the primary challenge and is attributable to life stage and social disincentives. 5. Offering financial incentives for relocation to reduce/eliminate out-of-pocket expenses and accommodation uncertainty is important for attracting candidates and for successful recruitment. 6. In rural services, turnover of AH staff is fairly constant and has a high level of direct and indirect costs, particularly regarding the workloads of team members.
	AH managers usually recruited from existing workforce and poorly prepared for leadership	1. In rural services AH managers are commonly promoted from the existing pool of AH staff. 2. The leadership skill level of AH managers, especially those recently promoted, is often very poor. This was explained by university training being focused on developing clinical skills and managers receiving limited on the job support or training.
Organisational	Overly complex human resources systems negatively impact successful AH recruitment and burdensome for AH managers	1. Human resources recruitment systems are very compliance focused and commonly result in onboarding delays of new staff. 2. Slow onboarding has been experienced by managers (e.g., losing the preferred candidate). 3. High AH turnover, combined with poor human resources processes, negatively impacts managers in terms of additional workload and stress.
Role	Most entry-level AH staff experience a challenging adjustment	1. Entry-level AHPs have a very challenging initial adjustment to their first AH job in terms of managing the size and demands of the job and their confidence as clinicians. 2. Experiencing one's line manager and other team members as being supportive is critical for the successful adjustment of entry-level AHPs. 3. The types of adjustment challenges, benefits and opportunities facing entry-level AHPs differ depending on the size of the health service's AH workforce.
	Professional development opportunities are a high priority for AHPs and the level and type of support offered is not always well understood by AH staff or consistently implemented by AH managers	1. Access to, and organisational support for undertaking, professional development is important for all AHPs but especially those in early career. 2. Among AH staff, it was often unclear what external PD was being/could be supported by the service and it was frequently differently applied by AH line managers. 3. The level of organisational support for PD and financial support offered to AH staff significantly differed between the two services, with rural service offering support well above the regional service.
Career	Limited career development/advancement opportunities for AHPs working in rural services	1. AH staff observed that those in senior clinical roles and/or managers tended to stay in their roles for the medium to long term and so there were few opportunities for clinical career advancement in the service. 2. The lack of AH career advancement opportunities was considered a major obstacle for improving AH staff retention.
Place	Securing suitable housing is a priority issue for all AHPs relocating for work	1. AHPs relocating for work to the health services commonly experienced housing challenges in the respective towns. 2. The level of organisational support for transitional accommodation and securing private housing offered to AH staff significantly differed between the two services, with the rural service offering support well above the regional service. 3. The workplace and suggestions/support offered by other staff and managers were the most important source of information for potential housing and housemates.
Community	Establishing social connections, particularly in the workplace, is a priority issue for nearly all AHPs relocating for work	1. Work colleagues are often relied on for initial social connection. 2. Social support in the workplace tends to be team based and occurs differently depending on the size of the health service and the number of teams and the physical location of the teams. 3. Many AH staff commute to work and/or spend most weekends away, and so their social connection opportunities are limited to the workplace and work hours. 4. Almost all staff relocating for work, even those who were returning home, were keen to expand their social connections but those in early adulthood and/or unpartnered were by far the most enthusiastic.
	Linking into local activities is of importance for many AHPs relocating for work	1. Reliance on work colleagues for initial social connection often provided an entrée into the town and the range of activities on offer, which otherwise were hard to find. 2. The types of social activities on offer in both towns were considered to be fairly limited (e.g., sporting pubs/entertainment venues) and tended to suit young adults, extroverts and those from Anglo-Celtic cultural backgrounds. 3. Sporting clubs offered the most opportunities for social connection but were not always welcoming of newcomers.

3.2. Workplace

3.2.1. Degree of Challenge: Attracting, Recruiting, and Retaining Allied Health Professionals (AHPs) Varies Depending on Profession, Experience Level and Life Stage

The managers interviewed in both services were all familiar with the challenges of recruiting and retaining AH staff. Most executives and AH managers demonstrated a nuanced understanding of the different factors impacting the recruitment and retention of AHPs. Managers discussed the differences between AH professions in terms of the degree of challenge for recruiting. Dietetics and exercise physiology positions were commonly discussed as being fairly easy to recruit to, given an oversupply of graduates, while physiotherapy and occupational therapy, the latter especially since the commencement of the Australian Government's National Disability Insurance Scheme, were described as being challenging to recruit to: 'They're in oversupply, there's no physios and no podiatrists, but there's too many dietetics.' [RuHS–KI-4]

This observation was supported by new staff participants, with those in over-supplied professions often attributing their motivation for taking the position as primarily being just wanting to get some work experience: 'I was looking in Melbourne as well but there weren't a lot of openings' [ReHS-TAHS-25]. In the regional service, this group of staff were often on fractional short-term contracts and many were commuting, sometimes long distances, or staying over on workdays. The cost of this travel and/or accommodation was borne by the individual staff member:

> *So, I commute every day [it's] one hour and 20 [drive] to here. Yeah, I do 240kms a day when I work here. I only work here three days a week now.*
>
> *ReHS-TAHS-6*

Managers commonly observed differences in recruitment and retention challenges between early career AHPs compared to more experienced AHPs. Recruiting to entry-level positions was described as being achievable, 'It is far easier to attract a Grade 1' (ReHS-KI-3), but retaining them beyond 12 months was considered challenging.

> *I know I can keep my staff for 12 months. I can do that. I've got systems in place that they're that busy and they're that well-nourished and they're that supported that 12 months is easy. 12–24 months, it's gets a bit more tenuous.*
>
> *ReHS-KI-4*

This high turnover among early career AHPs was explained by one participant as being the result of skills development plateauing after the first year or so of rural practice:

> *The benefit of them being here in terms of skills development are huge in the first year, probably pretty solid in the second year, I don't know what they would gain in clinical advantage being here after two years, so . . . that third year would really be more for the community's benefit than for them . . . they'd need social reasons to stick around.*
>
> *RuHS-KI-6*

Most managers considered the high turnover among early career AHP staff as unavoidable and it was commonly attributed to social determinants, especially relationships, as well as the common desire among young adults to seek new experiences:

> *The single thing that will bring it all down, is the social side.*
>
> *ReHS-KI-4*
>
> *It's ongoing. There seems to always be a constant flow of vacancies but not for the wrong reasons, it's . . . that younger group heading off overseas . . . heading off to the next opportunity.*
>
> *ReHS-KI-10*

Managers generally described attracting 'experienced' AHPs to relocate for a rural position as being difficult:

I think one of our big recruitment areas is the Grade 2s in our community teams—getting someone who's mid-career to come here for that next step in their career.

ReHS-KI-8

One manager attributed these difficulties to the barriers posed by life stage and social factors by older, more senior AHPs:

When you are mid-career, when you've hit a Grade 2 level, you usually have been working for a little while, you've sort of set your group somewhere. You're not necessarily going to up and shift . . . you might shift for a partner, but you won't necessarily shift for a job.

ReHS-KI-3

Both health services were situated in towns that were considered by many managers as being difficult to encourage longer-term stays by early career AH staff, particularly those who were partnered:

The partners aren't interested in coming up to X [town's name], it's not geographically a big enough drawcard that they could envisage themselves living up here.

ReHS-KI-4

In the regional service, high AHP turnover was also connected to staff being on short-term contracts and/or part-time/fractional appointments and leaving to take up more secure employment in another health service, either a permanent and/or full-time position. This particularly involved AHP staff who were on maternity leave contracts:

I'm Grade 2, so if you want to retain that next level of workers—kind of the middle seniority—you have to give them permanent hours . . . because it's just too difficult to be going from contract to contract.

ReHS-KI-5

In the rural service, to make health positions more attractive, most AH positions were offered as permanent, full-time roles, and if relocation was required, eight weeks of minimum transitional accommodation and reimbursement of relocation costs up to $1,000 was provided. In addition, recognising that a six-month probationary period made it difficult for new staff to secure private accommodation in the town, the service had recently shortened the probation period from six months to eight weeks. These employment incentives were appreciated by new staff and described by some as influencing their decision to take the position:

On the contract, on the letter, they already say they are going to supply eight weeks of free accommodations. . . . [The offer of accommodation was] very important, probably the most important fact, because like for me, because I'm living in Melbourne . . . it is actually impossible for me to get any accommodation because I don't want to get accommodation I haven't seen before I rent it. So, it's very important for that . . . accommodation.

RuHS-TAHS-13

The hospital provided it [accommodation]. They've got quite a few houses around that they lease off landlords or whatever and then they charge people to come in. But they provided accommodation for X weeks free, no bills, no nothing. I thought that was magnificent, that was a really attractive thing coming down here . . . free accommodation and really good accommodation too.

RuHS-TAHS-7

Constant AHP staff turnover was discussed by most managers from both health services as having both direct and indirect costs, the latter particularly relating to the burden placed on other AH team members in terms of the time taken to orientate new staff and the extra workload carried while positions were vacant and new staff members were getting up to speed:

[We are] turning over positions every six months. By the time they're orientated and can start being useful, they're actually leaving. So, it's not a good result for the community and it's not a good result for us financially either, having to run and educate and it's demoralising for other staff to have to orientate and onboard, and at some stage you get fatigued with that.

RuHS-KI-4

3.2.2. Allied Health (AH) Managers Usually Recruited from Existing Workforce and Poorly Prepared for Leadership

In both services, the skill level of AH managers was described as variable, with some managers considered exemplars and others having a poor level of understanding and skills:

I've been told by a few others that I have a softer style that helps to try and nurture and bring people along—not as direct as some might be. So, having that open-door policy and so forth to make sure that they're comfortable, they can come and talk at any time. So, it's about being open, being honest with them, answering their questions, helping to guide and support them.

ReHS-KI-10

My manager creates the environment and I feel like … she's the very key reason the staff that I work with are here and a very key reason for why I love to work here.

ReHS-TAHS-6

Some managers discussed feeling that they did not have the requisite skills or experience to be good managers:

Everything [staff member's name] says she wants, I never got at her stage, so I don't know what it looks like. I've never had a mentor. I've never been supervised.

RuHS-TAHS-3

Given challenges attracting Grade 2 and higher-level staff, AH managers were often recruited from the existing pool of clinical staff who had stayed on and eventually been promoted to managers. The level of management skill by these new managers was commonly considered to be poor:

From workforce perspective that was a concern … I had people that were being remunerated as seniors that weren't necessarily acting or taking responsibility of seniors, not all of them.

ReHS-KI-2

This low skill level was explained by one manager as relating to the focus of AH university training:

You don't go to uni to learn to be a manager, you go to uni to learn to be a clinician, the rest is on the job.

ReHS-KI-10

In both services, some staff and KI mentioned that AH managers needed more training and support, especially new managers:

I think for early leaders it's a real challenge … that's hard and that's where I think [name of service] is off track it needs to support those new emerging leaders as they come into those roles.

ReHS-KI-10

3.3. Organisational

Overly Complex Human Resources Systems Negatively Impact Successful AHP Recruitment and are Burdensome for AH Managers

In both services, human resources recruitment processes were mentioned by many AH managers and some new staff as compliance focused and overly complex, resulting in onboarding delays being commonplace:

> *Our HR department seems under resourced. The responsiveness to getting our staff on board, they're off accepting another opportunity before [HR have] managed to complete an onboarding or even to get to onboarding. It's a challenge, 2–3 weeks to get back to someone to say 'Yeah, you've been through all those processes and you are now successful'. That's a long time.*
>
> *ReHS-KI-10*

A few managers attributed slow onboarding to their having lost their preferred candidate:

> *We have major issues with HR . . . It's killing us . . . So, the guy that was due to start today . . . he still didn't have a contract 10 days beforehand and I recruited him six weeks ago. And [so] you lose them. I just wonder if he had had a contract and signed it whether he would have felt committed?*
>
> *ReHS-KI-15*

Many new staff, particularly in the regional service, also mentioned experiencing longer than expected delays during the onboarding processes resulting in their becoming concerned about the soundness of the employment offer:

> *I understand there was a bit of a HR block here. So the HR process took a long time to come through . . . Maybe I interviewed in early Feb then, because I remember starting on the [late date in] March . . . as that was as soon as HR could onboard me . . . So I remember like it made me doubt myself . . . and I thought how could I have not gotten this job?*
>
> *ReHS-TAHS-10*

Given the high turnover of allied health workforce, most AH managers fairly continuously discussed having to recruit staff, particularly in the regional service, and the delays in human resources processes increasing their workloads:

> *My recruitment efforts have been enormous but for every recruitment, the amount of time I have spent riding HR to get things through has meant there's 10 other things I'm not getting done.*
>
> *ReHS-KI-15*

In both services, managers often mentioned feeling stressed or were described by their staff or other managers as being stressed. This was discussed as negatively impacting team morale and individual staff members, particularly new graduates:

> *I think reducing the stress and burnout on the senior clinicians. There's some teams at the moment where I think the stress levels of the senior clinicians is not a great environment for the new grads to be in at all.*
>
> *ReHS-KI-8*

3.4. Role

3.4.1. Most Entry-Level AH Staff Experience a Challenging Adjustment

Almost all entry-level AH staff discussed experiencing a challenging initial adjustment to work, feeling both overwhelmed by the size and demands of the job and lacking confidence in their clinical skills and decision making:

So, the X [name of the clinical team] area is incredibly fast paced and busy and there isn't a lot of time to think, prepare, discuss. It's bang, bang, bang, and bang. . . . Absolutely [it's a] 'do' job, [there's] very little time. The culture is reflected in that, that everybody's very efficient and busy and quick and there's not a lot of sort of chatting.

ReHS-TAHS-7

Some entry-level AH staff attributed their initially low level of job satisfaction from the pressure they had put on themselves to quickly get up to speed so they could share the workload:

I got to the point after three months where I was booking in, probably overbooking a little bit, because I'm like, 'Oh, the wait list is huge, I'm going to try and get through, try and get through it'. And then things would pop up on the IPU (inpatient unit) that were urgent, and I was getting quite stressed because I couldn't fit everything into the day.

RuHS-TAHS-4

The benefit of having a supportive manager and team to help navigate the adjustment to the workplace and the workload and in building clinical confidence was mentioned by several entry-level AH staff:

Anything I need, anything I have to run by them, they make the time for me and X [name of manager] really gives me a lot of confidence in my abilities. She's like, 'Why are you worrying about this? It's exactly what I would have done.' 'Of course, you're on the right track.' 'If you forgot to ask a question [to a patient], you can go back and see them, tomorrow, can't you?' or 'It's just no fuss.' I'm stressing about these things that I was made to stress about on placement which I don't ever stress about here, it's completely different.

RuHS-TAHS-9

On the other hand, the perceived absence of a supportive manager was sharply felt and described as having negative impacts on job satisfaction:

[Early career is] not really easy. I personally don't advise new grads to work in rural anymore. I think they need support and no matter how much promise they get, I got a lot of promises but I didn't get a lot of support.

RuHS-TAHS-1

While the extent of work challenges for entry-level AH staff were similar in both services, the different sizes of the two services posed distinct challenges, benefits and opportunities. The community health team in the rural service mostly comprised small AH discipline-specific teams (of 2–3 staff) and some solo practitioners. The small AH team sizes meant that entry-level staff in a team were highly dependent on their discipline-specific line manager's skill level and interest in supervising and mentoring. It was well understood by the executive and AH managers in the service that new graduates working as solo practitioners had a heightened turnover risk and as a result, the service had implemented a number of strategies to try to reduce the risk. These strategies included increasing one of the AH teams full time-equivalent staffing to two, organising, during the recruitment phase, external supervision with a discipline-specific AHP from a nearby regional service; the community health service manager taking line management responsibility for the solo practitioners and organising weekly or twice-weekly catch-up meetings; and placing solo practitioners in shared offices. The service also encouraged entry-level AH staff to participate in a 10-month program for early career AHPs that was being run annually by another health care service in the region and within a one-hour driving distance.

The much larger AH team sizes in the regional health service, at least in theory, afforded entry-level staff access to both a discipline-specific line manager and team members. Some new entry-level AHPs spoke highly of the level of support that other team members gave them in the adjustment period:

[It's] the best team. . . . so approachable [and] non-judgemental, because I come up with some stupid questions sometimes. But [they're] just very, very supportive. Willing to go the extra mile, to kind of make you feel comfy or address any issues or whatever. If you're like, 'Oh, could I talk to you about this?' They'll go, 'No, no sit down, what's happening?' . . . My manager creates the environment and I feel like . . . she sets the culture.

ReHS-TAHS-6

On the other hand, some entry-level AH staff experienced their team as unsupportive and described this as adding to their adjustment challenges:

Well, there's a bit, maybe bullying might be the wrong word, like it's not as strong. But I just feel like the people who have been here a lot longer, when there's new people who come, the expectations they have of them are very high . . . When they're . . . doing that same shift, they . . . expect that newer persons to have done all those things . . . [that] they themselves they don't usually do.

ReHS-TAHS-24

The AH management in the regional service recognised that entry-level staff have particular adjustment needs and, in response, the incumbent in the Allied Health Educator position [this position did not exist in the rural service] had established a support group for early career AH staff which, at the time of interviewing, had been operating for a couple of years. This support group involved monthly face-to-face sessions on specified topics that had been selected based on the expressed needs and interests of the attendees. However, awareness of this group's existence was fairly low among many AH managers and AH staff, especially in the sciences. Many entry-level staff discussed that even if they had been were aware of the group, it would be difficult for them to attend given their team's heavy workloads and staffing shortages, and so they did not think their managers would support their attendance.

3.4.2. Professional Development Opportunities Are a High Priority for AHPs and the Level and Type of Support Offered Is not Always Well Understood by AH Staff or Consistently Implemented by AH Managers

Access to, and organisational support for undertaking professional development (PD) was important to all new AH staff, and especially among those in early career. In both services, what PD was available and what external PD would/could be supported by the organisation was often unclear and applied differently by AH line managers. In the rural service, new AH staff were generally satisfied with the amount of external PD they had access to, and they described their PD requests as nearly always being accepted, and the service covering their salaries as well as paying for the training course and any accommodation and travel expenses.

I had a little bit of interest in learning [a particular discipline-specific approach] . . . and it's something you [the service] might offer in the future, but probably not anytime soon. But I wanted to do it for my own sort of learning and interest. And work was supportive of me taking the time off for leave and paid for the course as well, which I really didn't expect. Which was really nice, and the course was run over a Friday and then a Saturday morning and they offered either time in lieu or to be paid for the Saturday morning as well, which I didn't expect. Because I was happy just to, so yeah, they were very, very, very supportive.

RuHS-TAHS-4

One of the things that I thought was really important for me when I wanted to come and work here was about the opportunity for professional development and ongoing learning . . . That's really important to me. I don't know, we're all learning people, that's why we go into this lifestyle and X [health service's name] have been really good.

RuHS-TAHS-8

Senior management viewed the service's current PD system as a free for all and urgently in need of a more strategic and systematic approach:

> *I came from X [another rural service's name] and you got $250 a year [for external CPD], that was it. And here we're paying thousands and they're going off to all sorts of things and even for locums. [In my head] I'm going, 'Oh my god', but I haven't [changed anything yet]. I'd like a framework so that I can be transparent in decision making and equitable [regarding funding for external courses]. So, if you can produce one of those that would be fantastic.*
>
> *RuHS-KI-2*

In the regional service, AH staff had a range of experiences regarding PD support and these seemed to vary depending on their expectations, how PD support was presented during recruitment, and then later supported by their line manager:

> *There's no [financial support for PD], you just get the leave … And it wasn't made clear [during recruitment]. I only found out from someone here who said, '[It's] in the EBA that there's no money'.*
>
> *ReHS-TAHS-36*

> *Yeah, good training opportunities, quick training opportunities, you're able to get training quickly here as in compared to bigger metropolitan cities [where] it takes a while.*
>
> *ReHS-TAHS-35*

The regional service's PD support was in line with the EBA for Victorian public sector AHPs, where full-time staff are entitled to five full days paid leave (pro rata for part-time staff) excluding any mandatory training, and all staff, both full and part-time, are entitled to two days' paid study/conference/seminar leave. One manager felt that AH staff access to PD was 'pretty good' and 'probably more so than if they were [in] metro services':

> *We have a budget. My budget's $500 for the year for the whole team … What I do is, I say to them, 'I'm very supportive of professional development, you tell me what you want to go to, and if you will be prepared to pay for it [up front, then] we'll apply for a scholarship through RWAV [Rural Workforce Agency Victoria], and that's usually not knocked back and the organisation pays for the days.*
>
> *ReHS-KI-3*

However, other managers felt that the pre-EBA-RWAV system, when the service had its own budget for PD support and was able to directly fund staff to attend courses, had been important for attracting candidates:

> *Many years ago, the hospital funded lots of stuff and it was fantastic, and it was a great drawcard and it was really good. It was like, 'Yeah, we'll fund you for a course a year maybe'. They've pulled all that back.*
>
> *ReHS-KI-4*

Having some budget for PD support and flexibility in managing was considered by one manager as being especially important for attracting Grade 2 and above AH staff:

> *I think, recruitment wise, focusing on how we market that [PD support] and what incentives we offer to people at that stage of their life to be taking that next career step here.*
>
> *ReHS-KI-8*

3.5. Career

Limited Career Development/Advancement Opportunities for AHPs Working in Rural Services

It was generally thought, by both staff and managers in both services, that there were few opportunities for upwards career development. In the rural service, this was related, in part, to the EBA establishing a maximum grade level of Grade 2 for medium and small rural services. AH staff participants also mentioned low turnover of senior roles and little growth in the service:

> *There's two opportunities [at the moment] but then if they . . . get two people and they are [then] here for 30 years, you're going to be stuck as a Grade 1 for 30 years.*
>
> *ReHS-TAHS-24*

> *There's not much movement within organisations as well, particularly when it's a smaller organisation. It makes it harder because there's not as much growth usually.*
>
> *ReHS-TAHS-1*

> *If there were the opportunities to step up, yeah absolutely [I'd stay]. If there's not, then I'll leave.*
>
> *RuHS-TAHS-5*

Managers also recognised the importance of there being career opportunities for retaining staff:

> *When it comes to retaining them, well I think we have touched on it, in regard to the opportunities that they have to grow and develop.*
>
> *ReHS-KI-10*

3.6. Place

Securing Suitable Housing is a Priority Issue for all AHPs Relocating for Work

Almost all AHPs in both services who relocated to take up a position in the health service described having similar establishment needs. Primarily, these related to finding suitable housing, making friends and finding activities of interest, with housing being the primary initial concern.

Both the towns experienced chronic rental housing shortages:

> *I didn't realise how hard it was going to be for them to get housing and, in hindsight, I probably should have.*
>
> *MN ReHS-KI-4*

However, housing shortages impacted differently in the two services. As discussed above, the rural service routinely provided a minimum of eight weeks paid transitional accommodation and newcomers generally described management as being highly supportive in regard to assistance with housing. Given the relatively small AH workforce, AH managers and executive staff were usually aware of where new staff were up to with finding suitable housing and would step in to support staff if obstacles were encountered. New staff who were having difficulties finding private suitable housing discussed being allowed to stay longer in the services' transitional housing while paying a significantly under-market rent, the lease on a transitional house being handed over to staff member(s), a departing manager organising the transfer of their lease to two new staff members, and being assisted, from the outset, by management to find housing suitable for pets.

> *Everyone was very supportive, and you know [saying], 'I've got spare room'. They were [saying], 'You're not going to be homeless, so don't worry'.*
>
> *RuHS-TAHS-4*

In the case of the regional service, with the exception of one group of AHPs, transitional accommodation had not historically been offered to AH staff relocating to take up a position. These staff discussed that it was challenging to find suitable housing and this was made more difficult by house viewings usually being held during work hours.

> *I just couldn't find anything. I just thought, 'I can't find anything that fits the bill', and it didn't matter how many properties people threw under my nose . . . then it was around Christmas time and Christmas was impossible to find anything. No one will take you on inspections. And trying to find inspections that were on after hours was really difficult. All the real estate agents shut, they open at 8.30, they shut at 5pm. My working hours are anywhere between 7 and 5, so it's just, it was impossible to even to get to a real estate office to say, 'I'm looking for a property, I want some support' . . . I'd have friends going to inspections for me.*
>
> *ReHS-TAHS-10*

New staff interested in shared housing discussed commonly finding housemates through the workplace, either by word of mouth among staff or through the support of their manager.

> *I had [housing] options in place before I moved . . . She [her manager] sent an email around, you know, around and then just said, 'these are all the potentials'. I think there were about six different contact numbers of people to [share with]. That made things so much easier . . . a lot easier not having to come and try and then find things on my own.*
>
> *ReHS-TAHS-1*

3.7. Community

3.7.1. Establishing Social Connections, Particularly in the Workplace, is a Priority Issue for Almost all AHPs Relocating for Work

Newcomers without pre-existing social links to the town discussed, in the first instance, relying on their work colleagues for social connection. This tended be team based in the workplace. For the rural health service, this involved the whole community health team. This team had a high proportion of early career newcomers in early adulthood who were mostly single, and these staff members were described as social and inclusive of newcomers:

> *Pretty much from the first day, for the first week, I felt included like that. Everyone in, particularly in this area, is incredibly welcoming, really amazingly so.*
>
> *RuHS-TAHS-6*

In the regional service, social connection tended to be situated in teams/services and/or specific professions. For most teams, the social activities were limited to the workplace and involved shared morning teas or lunches. A couple of teams organised regular out-of-hours social events, but again these teams tended to comprise a large cohort of staff in early adulthood who were mostly single:

> *[In the] X [profession name] team I felt really welcomed. As soon as I got here, they made sure I was okay, got to know me, had a welcome dinner. Y [staff member's name] organises all of the social events for X and that was a good opportunity to get to know them outside of work, you talk about different things.*
>
> *ReHS-TAHS-9*

In both services, a significant number of AH staff commuted to work and/or spent most weekends in their hometown or travelling to where their partners resided. For these staff, social connection opportunities tended to be limited to activities that were offered in the workplace during work hours.

I would love to be closer and I have close bonds with people [here] but there is still the [distance] barrier that separates you from developing … things further. And a lot of other people are not from here, so they're most likely to go back home [straight after work] anyway. But everyone's from different directions and some people have kids and it just gets really messy [trying to catch-up out of work].

ReHS-TAHS-6

There was a couple of people there who just weren't interested in any of the regional stuff, unless it was open after hours on a Monday to Thursday because 'we'll only be here for one year and we'll be going to Melbourne every Friday night and coming back on Monday morning'.

ReHS-KI-8

Most new AH staff who relocated for work, especially those who were single and/or in young adulthood, expressed that they were keen to broaden their social connections both in the workplace and in the local community:

I don't have friends here and I've sort of grown distant from my friends from uni. So that's, like it does impact a lot that I don't have friends, I don't have, like, a social life … I do wish there were more opportunities to make friends and more sort of social events, which there's definitely a lack of in X [town's name].

ReHS-TAHS-24

Even new AH staff returning to live in their hometown expressed interest in making new friends as they found their previous social network had diminished:

Moving back to a small town I thought that I'd know everyone. I don't know anyone there either … they've all moved away.

ReHS-TAHS-22

3.7.2. Linking into Local Activities is of Importance for Many AHPs Relocating for Work

Social connection with work colleagues often provided an entrée into the town and the range of activities on offer. This social entrée was described as important for new staff as they commonly found it difficult to find out what events or activities were on or available:

The social activities are quite underground in [town's name] and so there's a whole lot of things going on but there's never any communication about it or even being sort of asked.

ReHS-KI-2

Social activities on offer in both towns mostly involved a hospital-based social club, sporting groups, pub trivia nights, music and winery events and a young professionals' network.

I think my main, I guess, outlook for finding friends has been through work and then through the tennis club and then if you know someone and they bring someone new along then.

ReHS-TAHS-9

Such activities were described as being better suited to young adults, extroverts and those from Anglo-Celtic cultural backgrounds.

To be honest, no [not interested in participating in social activities in town], because I'm sort of moving from that social young stage into the settling down, sort of maybe getting married stage. But to be honest, and I'm not a super social person, I'm pretty slack, I'm a bit of homebody as well.

ReHS-TAHS-8

They're fine, they're nice [other team members], I just, I don't go out . . . Yeah see [if] I go out, I don't drink, I'm Muslim, most of the food they have I can't have, as [it's not] halal. It's not that I don't make friends here, I've got friends here, but I just don't socialise. Out of hours I don't socialise that much.

ReHS-TAHS-35

In both towns, the opportunities for making new friends in the community were described by many new staff as mostly being sporting groups:

I think in the country towns is if you're not sort of in the football, netball, then it's harder I suppose to make those connections outside of work and get to know the people.

ReHS-TAHS-19

However, some newcomers who had approached local sporting groups experienced them as unwelcoming and/or cliquey:

I was made aware of a local running group . . . I eventually made contact with one of the people and he said, 'Yeah. Come along, get involved.' I thought it would be good to get involved in that . . . I'll give it go . . . I quite enjoyed it, but . . . they didn't tend to come up to me and say: 'I'm such and such, how you going? What you been doing etc., etc.?' There wasn't a lot of that. I haven't been back.

RuHS-TAHS-7

4. Discussion

4.1. Review of Findings

The emergent themes depict contextual challenges within all of the WoP-RIF domains, most of which negatively impact the attraction, recruitment and retention of AH staff. In both rural public sector health services, AH turnover and workforce shortages were a significant and chronic problem. The AH managers and executive commonly demonstrated a nuanced understanding of the recruitment and retention challenges in terms of the differences between AH disciplines, experience levels, life stage and social factors. However, despite the extent of the problem and a sound understanding the workforce challenges, there were few specific attraction, recruitment and retention strategies in place for the AH workforce. Notable exceptions are the financial and accommodation incentives offered by the rural health service to new health staff needing to relocate in response to the local housing shortage and the identified disincentive of costs associated with relocation.

This study also identified many examples in both services of poor processes, inefficiencies and inconsistencies in the application of policies and procedures which negatively impacted on the job satisfaction of AH staff. The importance of skilled AH leaders/managers was strongly supported and found to be commonly lacking in the two services. Managers in both services generally had a sound understanding of the significant challenges facing entry-level AH staff and the importance of PD for AH staff. Programs specifically targeting entry-level AH staff and supports for undertaking external PD for all AH staff were in place. However, because of organisational inefficiencies, these were not always accessible to all AH staff. The need for local AH career development opportunities was widely accepted as being essential for medium–long-term retention but very little activity was being undertaken to address this issue. This study highlighted how place-based social processes are an important influencing factor on job retention and this was generally well understood by AH management and executive, but again, very little activity was being undertaken to address the issue and none at all involving the broader community.

Overall, this study highlighted that public sector rural health services were not adequately addressing AH workforce challenges in an efficient, systematic or strategic manner and there was an urgent need for this occur to stabilise the existing workforce and support the development of a sustainable AH workforce. While this finding was not surprising to either the author or the

two partnering health services, what was unexpected was the extent to which the challenges were so similar and that the bulk of the recommendations would be the same for both services.

The findings resonate strongly with other Australian AH rural workforce studies exploring the enablers and barriers to rural recruitment and/or retention [7,14,18]. Of particular interest are the many similarities this study has with the findings in a recent qualitative study investigating AHPs' transition to practice in rural regions of South Australia involving AHPs (n = 16) and managers/employers in the public sector (n = 2) and the private sector (n = 4) [19]. Kumar et al.'s study categorised transition into 'before', 'during' and 'after' stages. In the 'before' stage, comparable findings relate to 'job availability', with AHPs discussing the need to 'get experience' and the difficulties in getting a job as a new graduate, and managers/employers discussing lengthy recruiting processes outside their locus of control (related to higher organisational departments) negatively impacting recruitment [19]. In the 'during' stage, an analogous finding was the nature of rural practice (e.g., staffing shortages, small AH teams, lack of experienced staff) and the related challenges of providing mentoring/clinical supervision and accessing PD given the workplace environment. The challenges of rural practice environment were identified by both AHPs and managers/employers as contributing to almost all the AHPs feeling a lack of support in transitioning to the job. This was also found in the present study and has generally been well identified in the extant rural health workforce research [10,20–22]. In Kumar et al.'s study, working in a supportive team was found to be an important aspect of supporting transition and deciding to stay and again this was well supported in this study and other AHP rural retention literature [19,23–25]. The Kumar et al. study, as well as others, identified that incentives such as accommodation support may help attract AHPs to 'go rural' but these are not as important as access to PD and do not influence retention [18,19,26]. In the Kumar et al. study, 'social/lifestyle' was a critical factor identified by employers/managers for successful transition and retention of AHPs. This involved different factors in the stages of transition including 'before' (recruiting)—the need to assess AHPs personality types and the likelihood of 'fitting in'; 'during'—the significance that social networks in the workplace play in social inclusion; and 'after'(retention)—the need for AHPs to be embedded within the community with established connections with local people and groups [19].

The critical role social/lifestyle factors play in successful transition and in supporting retention of AHPs in rural positions is increasingly being recognised in the extant literature (including by this author) and understanding is rapidly developing as to what processes are at play and which are modifiable [7,26–31]. Kumar's findings relating to social/lifestyle dimensions to retention are equivalent to the WoP-RIF community/place domain. This domain was recently explored in Cuesta-Briand et al.'s Western Australian study of factors influencing junior doctors' (n = 21) career decision making [32]. In their study, two key themes were identified: the importance of place and people, and broader context factors. Place and people factors resonate strongly with the present study's findings involving the community/place domain. In regard to 'place', junior doctors with a strong rural intention discussed lifestyle factors associated with a particular place, and the importance of this place providing a sense of community. Respondents in this study also considered place to include the workplace and the need for colleagues to be friendly and supportive [32]. In regard to 'people', the physical settings (both town and workplace) were identified as being intrinsically linked to the people inhabiting them and connectedness was important [32]. Accommodating life partners' careers was perceived as a main barrier to attracting and retaining doctors in rural places [32]. This was upheld in the present study. While the place and people processes were congruent with this study's findings, the broader context factors were dissimilar. Concerning the junior doctors' thoughts regarding career opportunities, a commonly held viewpoint was that they were limited to primary care and general practice in rural places and that other medical specialisations would require them to train in an urban setting [32].

Humphreys, Wakerman and Wells argue that a sustainable rural health system requires a sustainable 'fit-for-purpose' health workforce [33]. To achieve this, policies that support an integrated training pipeline for all the health professions as well as an 'effective, flexible, bundled retention strategy' [34] are needed. The author argues that the latter is always contextual and a redistribution

of Australia's health funding is needed at both national and state levels to allow health services and communities to implement strategies that can respond to the particular local challenges and opportunities affecting the recruitment and retention of health staff. Rigorous evaluation of these local endeavours may assist in identifying successful initiatives that have potential to be scaled up and contribute to the evidence-base for other health services and communities to use, as well as generally strengthen Australia's rural health system [34]. The next part of this research study is an evaluation involving analyses of the recommendations' utility for improving AH retention by two Victorian rural public health services. The outcomes and conclusions drawn from this stage of the research are forthcoming.

4.2. Analysis of Recommendations

To analyse the 10 recommendations (listed in Table 4), this study draws on two key studies presenting evidence-based recommendations to improve attraction, recruitment and retention of rural and remote workers: the World Health Organisation (WHO) [35] and Buykx et al. (2010) [36]. The analysis also draws on other rural health workforce literature where relevant.

Table 4. Ten common recommendations to improve retention of AH workforce in two rural public sector health services and their correspondence to recommendations made by the WHO and/or Buykx et al.

WoP-RiF Domains	Key Themes Identified	Study Recommendations	WHO Recommendations [35]	Buykx et al. Recommendations [36]
Organisational	Degree of challenge attracting, recruiting, and retaining AHPs varies depending on profession, experience level and life stage	1. Ensure new staff needing to relocate for work are routinely offered paid transitional accommodation and reimbursement of relocation costs. 2. Identify the main attractors/detractors impacting the successful recruitment and retention of AH staff and develop marketing materials that promote the benefits and opportunities for use in recruiting.	Make it worthwhile to move to a remote or rural area Pay attention to living conditions	Maintaining realistic and competitive remuneration—packaging benefits Providing appropriate and adequate infrastructure—adequate housing Maintaining adequate and stable staffing
	Overly complex human resources systems negatively impact successful AH recruitment and burdensome for AH managers	3. Streamline HR systems and recruiting processes to support faster recruitment/onboarding of new AH staff.	Ensure the workplace is up to an acceptable standard	Fostering an effective and sustainable workplace organisation
Workplace	AH managers usually recruited from existing workforce and poorly prepared for leadership	4. Ensure AH managers have an evidence-based understanding of the factors influencing recruitment and retention of AHPs in rural health services and, in particular, the importance of their being skillful leaders and supportive managers.		Maintaining adequate and stable staffing
Role	Most entry-level AH staff experience a challenging adjustment	5. Establish a two-year early career AH support program to assist entry-level staff manage the size and demands of the job, develop their clinical skills, provide support for professional development and career development and support social connection in the workplace.	Facilitate professional development	Shaping the professional environment that recognises and rewards individuals making a significant contribution to patient care
	Professional development (PD) opportunities are a high priority for AHPs and the level and type of support offered is not always well understood by AH staff or consistently implemented by AH managers	6. Review the AH PD policy and develop a system that is consistent and equitable for all AH staff.		
Career	Limited career development/advancement opportunities for AHPs working in rural services	7. Build AH managers' understanding of the range of AH career pathways (both clinical and non-clinical) to assist them in better supporting the career development of their staff.	Design career ladders for rural health workers	
Place	Securing suitable housing is a priority issue for all AHPs relocating for work	8. Work with community organisations to establish a strategy for professionals relocating to the town/region to feel welcomed and to assist with addressing initial adjustment needs (e.g., housing, local doctor, vet, hairdresser, dentist).	Pay attention to living conditions	Ensuring social, family and community support
Community	Establishing social connections, particularly in the workplace, is a priority issue for almost all AHPs relocating for work	9. Ensure there are AH workforce-wide policies and systems in place in to welcome and support the social connection of new AH staff.	NA	
	Linking into local activities is of importance for many AHPs relocating for work	10. Work with community organisations to establish a strategy for professionals relocating to the town/region to welcome and encourage social connection and belonging in place.	NA	

4.2.1. Organisational/Workplace Domain

A key challenge identified as impacting the attraction of AHPs related to housing concerns and financial costs of relocating. In line with various WHO and Buykx et al. recommendations, the author recommended that transitional accommodation and reimbursement of relocation costs be routinely offered to AHP candidates needing to relocate for work (Recommendation 1).

Other Australian rural workforce studies have argued that 'work systems' need to suit the particular work environment and that local managers need to be able to develop employment policies that are responsive to the local context [3,4]. To improve the attraction for AHPs who are the 'right person' for the work and place context, this study identified the need to strengthen existing recruitment materials by better promoting the work benefits and local lifestyle and living features, which is in line with Buykx et al.'s recommendation to maintain adequate and stable staffing (Recommendation 2).

The WHO identified that workplaces needed to meet an 'acceptable standard' and Buykx et al. recognised the importance of health services being perceived as 'efficient' organisations and that health workers' initial entrée to the service can influence their perception about the suitability of the job and retention. Thus, streamlining the HR processes was recommended (Recommendation 3).

In a study of Australian remote health services, line managers were seen by health staff as representing the 'organisation' and their level of support was equated with what the organisation provides [22]. Therefore, the need to support strategic and effective AH leadership was recommended (Recommendation 4).

4.2.2. Role/Career Domain

Entry-level AHPs were found to experience a difficult transition to work and those in early adulthood (early–mid 20s) who had relocated for work were found to be the most vulnerable to experiencing social disconnection and loneliness [17]. Therefore, a support program to assist entry-level AHPs to adjust to work, build their clinical confidence, support their professional and career development, and foster social connection was recommended (Recommendation 5).

The importance of health workers' professional identity for their job satisfaction and thus retention is widely recognised and both the WHO and Buykx et al. recommend professional development. For those AHPs working in rural and remote health services, given their more limited staff numbers, having regular access to profession-specific PD is particularly important for reducing professional isolation. Therefore, the author recommended reviewing the service's AH PD policy to ensure equity of access for staff (Recommendation 6).

Both the WHO and Buykx et al. identified the importance of career advancement for retention. Development of an AH career pathways program was recommended (Recommendation 7).

4.2.3. Place/Community Domain

The importance of place and community were identified and addressed in recommendations 8 and 9. Buykx et al. identified the need for social and community support for new staff and their family members, while the WHO identified that living conditions had a significant influence on both rural attraction and retention and this included housing, employment opportunities for partners, adequate schools, road access and internet connectivity. Other AH rural workforce studies have identified the need for rural health staff to have meaningful social connections in place for medium–long-term retention [18,37]. In WoP-RIF, these social and community factors were included under the community and place domain. Key elements included 1) having strategies in the workplace and in-community to welcome and support the initial adjustment of new staff and any family members, 2) local town residents being welcoming and accepting of newcomers, and 3) the active involvement of local community organisations to run activities/events that support the social integration of newcomers [14].

4.3. Broader Relevance of the Recommendations

This study's recommendations relating to the community/place domain will likely have generalisability for the broad health workforce in other high-income countries, especially those that have similar Westernised health, education, social and training systems, such as Canada, United Kingdom and United States. This is supported by research conducted in high-income countries across different rural contexts and health professions where matters relating to people and place (including supportive work environments) are often identified as being of high importance in attracting and retaining health professionals [30,32,38–40]. Further exploration is needed as to whether these community/place recommendations could have relevance for rural-based health professionals from low-income countries given the differences in cultures and health and education systems [41,42]. On the other hand, the recommendations made relating to organisational/workplace and role/career domains are likely highly contextual and relate specifically to Australia's AHPs working in public sector services. In this circumstance, salaries and work conditions are collectively set under an EBA and did not feature as impacting either recruitment or retention. In the case of rural medical professionals (i.e., general practitioners) in high-income countries, most work in private practice and their earning potential is variable. For this group, income and work conditions are major factors for attraction and retention [38,39]. In addition, recruitment of rural doctors may be influenced by financial enticements such as bonded placements, loan repayment schemes or other financial incentives, and these types of financial benefits are less commonly on offer to AHPs and nurses [41,42].

The author supports the WHO's position that a sustainable rural health workforce requires incentives and interventions that are attractive to individual health professionals [43]. This requires that health professionals' 'reality' is well understood, including the education and health systems and workplaces in which they are trained and/or work [43,44]. Thus, in the case of organisation/workplace and role/career domains, these 'realities' will likely markedly differ between health professional groups (allied health, medicine, nursing). In addition to needing to address the differing realities between the health professions, effective incentives and interventions must also be able to flexibly respond to the fact that the three domains are interlinked and career aspirations and quality of life needs will change over the life course.

4.4. Limitations

This study was conducted in one geographical location (Victoria) in Australia's least geographically remote state and limited to two public health services, which may limit the transferability of the findings. While this study provides rich data on the issues and concerns experienced in the first 12 months of working in a rural position, the AHP interviews were undertaken at just one point in time, while it is known that influences on retention change over time. To better understand retention and the impact of individual factors, longitudinal studies of rural-based AHPs applying quantitative measures and in-depth qualitative research at particular time points are needed.

5. Conclusions

The findings from this study highlight that there are many shared organisational and workplace challenges that contribute to poor recruitment and 'avoidable' AH staff turnover. To support a sustainable AH workforce, rural public sector health services must be efficient and demonstrate strategic leadership and vision. In this context, efficiency means such things as improving recruitment processes and ensuring that PD programs are accessible to all staff, while strategic leadership and vision mean going beyond just understanding AH workforce challenges and taking action to develop local programs, opportunities and supports that allow AH staff to thrive and grow in place. This includes understanding the critical importance of PD and career advancement and working to address challenges and create local opportunities for AH staff at all grade levels. It also requires a systematic approach to addressing the social needs of AH workers who have relocated for work and addressing the differing

social support needs individuals have depending on their life stage, relationship status and culture. Strategic leadership and vision include taking a whole-of-community approach to effectively support individual health workers and their family members to successfully adjust to a new place and develop a sense of belonging in place.

Given the strength of the findings that underpin the 10 shared recommendations developed for the two rural health services, the author contends that these approaches will likely have utility for other rural public sector health services in high-income countries. These recommendations provide guidance for the development of recruitment and retention strategies aimed at achieving a more stable and sustainable AH workforce. Furthermore, the recommendations relating to the community/place domain will likely benefit the broader rural health workforce in other high-income countries.

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Article

Faculties to Support General Practitioners Working Rurally at Broader Scope: A National Cross-Sectional Study of Their Value

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Abstract: Strategies are urgently needed to foster rural general practitioners (GPs) with the skills and professional support required to adequately address healthcare needs in smaller, often isolated communities. Australia has uniquely developed two national-scale faculties that target rural practice: the Fellowship in Advanced Rural General Practice (FARGP) and the Fellowship of the Australian College of Rural and Remote Medicine (FACRRM). This study evaluates the benefit of rural faculties for supporting GPs practicing rurally and at a broader scope. Data came from an annual national survey of Australian doctors from 2008 and 2017, providing a cross-sectional design. Work location (rurality) and scope of practice were compared between FACRRM and FARGP members, as well as standard non-members. FACRRMs mostly worked rurally (75–84%, odds ratio (OR) 8.7, 5.8–13.1), including in smaller rural communities (<15,000 population) (41–54%, OR 3.5, 2.3–5.3). FARGPs also mostly worked in rural communities (56–67%, OR 4.2, 2.2–7.8), but fewer in smaller communities (25–41%, OR 1.1, 0.5–2.5). Both FACRRMs and FARGPs were more likely to use advanced skills, especially procedural skills. GPs with fellowship of a rural faculty were associated with significantly improved geographic distribution and expanded scope, compared with standard GPs. Given their strong outcomes, expanding rural faculties is likely to be a critical strategy to building and sustaining a general practice workforce that meets the needs of rural communities.

Keywords: general practitioners; postgraduate medical training; rural workforce; medical faculty; advanced skills; scope of practice; vocational education; primary health care; rural population; family physicians

1. Introduction

Rural communities worldwide need a sustainable, skilled medical workforce, especially general practitioners (GPs) and family physicians because they cover a wide range of primary and preventative healthcare needs for people in rural and isolated communities [1,2]. Universally, countries have sought to grow the rural GP workforce including in smaller rural communities because it provides essential services that mitigate the need for people to travel long distances for healthcare [3,4]. In response, many medical schools are aiming to enroll more rural background students and provide rural immersion experiences, which has shown positive results for rural work outcomes [5,6]. However, there is little evidence about national-scale interventions related to postgraduate education that supports targeting rural GP capacity, despite global recommendations identifying that tailored professional development improves the supply and retention of rural doctors [3].

Rural GPs are largely supported by mainstream faculties, but on their own these may provide limited attention to the skills and professional support needed by rural GPs. In response, many countries are developing specific postgraduate training and professional support pathways aimed to grow and

support the skills that doctors need in rural practice, especially in primary care [7]. Australia is a unique case study of a country that developed two national faculties for rural GPs in the late 1990s: the Fellowship in Advanced Rural General Practice (FARGP) and the Fellowship of the Australian College of Rural and Remote Medicine (FACRRM), both of which promote more targeted education and continuous learning (Table 2) [8]. Australia's rural faculties are the most developed internationally, but to date there is limited objective research evaluating their outcomes [9]. This includes whether they relate to practicing as GPs in rural communities (particularly smaller and isolated populations) and across a broader 'rural generalist' scope of services (doctors providing both comprehensive primary care and additional specialist services such as emergency medicine) [9,10]. Such evidence has the potential to inform the value of rural faculties and advise other countries seeking to implement similar strategies, including large-scale rural-centric vocational training (or residencies) and related professional development programs. Thus, our study aimed to evaluate the benefit of rural faculties for supporting a more geographically distributed rural GP workforce, practicing at broader scope.

The unique demands of working in rural communities and sometimes in isolated practice underpin the philosophy that rural GPs require tailored skills training, as well as ongoing professional development and networking opportunities. Rural faculties aim to create a community of practice that reduces professional isolation and increases doctors' professional confidence and capabilities for providing a safe and high-quality breadth of care for rural communities [10–13]. The ongoing professional development accounts for the fact that the range of skills needed is not static, but evolves as the community profile changes, doctor's interests develop, or specific healthcare needs change as doctors move between communities [14]. Maintaining both general and specialized skills relative to the specific needs of any one rural community underpins access to safe, life-saving medical interventions.

Rural faculties that target the education and ongoing support for rural doctors may serve a particular role [15–17]. They can both generate a specifically skilled general practice workforce, while also addressing the need for GPs to access regular, rural-tailored medical education, professional networking, and support options [18]. Over mainstream faculties, they also enable learning that is based and contextualized in rural places, thereby minimizing travel and assisting real-world application. As such, rural faculties may be an important intervention for achieving a sustainable and high-quality medical services for rural communities [9,19–21].

Australia's two national-scale rural faculties were developed at slightly different times (Table 2). Moreover, they involve somewhat different training elements, but each target relevant education to working in rural contexts, across a wider practice scope (Table 1) [22–25]. Firstly, embedded within the existing standard general practice training and fellowship of the Royal Australian College of General Practice (FRACGP) is the FARGP, which is associated with education and support of advanced skills in areas like emergency, obstetrics, anesthetics, and basic surgery. Secondly is a standalone and independent rural faculty of the Australian College of Rural and Remote Medicine (ACRRM), which enables a fellowship (FACRRM) with a core mission of developing and supporting rural doctors through education mainly based in rural areas, and is associated with a wider range of emergency skills, additional advanced skills, and experience in smaller and isolated communities. Table 2 summarizes the reasoning for each faculty's emergence, both of which are equivalent for Australian Medical Council accreditation purposes. However, despite their potential value, evidence about rural faculties remains largely descriptive with limited evaluation of their workforce outcomes against mainstream approaches [7,26–28], including limited evidence from small scale rural residencies in other countries and other more localized postgraduate workforce interventions [29–31].

Table 1. Training pathway to attaining either FARGP or FACCRM qualifications.

Pathway Component	FARGP (First 3 Years Are FRACGP) (All Rural or Part Rural/Metro)	FACRRM (All Rural)
Selection into general practice training [#]	1350 places (RACGP) under the Australian General Practice Training (AGPT) program, enrolled with Regional Training Organization (RTO)	150 places (ACRRM), 3 pathways: AGPT—enrolled with Regional Training Organization Remote Vocational Training Scheme—typically remain in existing rural job, enroll with Regional Training Organization, remote supervision Independent pathway—enrolled with ACRRM only
Hospital training (core/foundation terms)	12 months, 'rotations' for: Adequate exposure to the discipline of medicine, surgery, emergency medicine and pediatrics	12 months, 'rotations' for: General surgery; general internal medicine; obstetrics and gynecology; pediatrics; anesthetics; emergency medicine.
General practice training terms	18 months: Accredited general practice training posts (rural or metropolitan)Guidance of RACGP-accredited supervisor	18 months: 6 months in a community primary care role 12 months living and working in small rural and remote practice (<15,000 communities), without ready access to specialist support
Hospital term (emergency/inpatient care)	Nil	6 months: Hospital care for admitted patients Emergency medicine in hospital emergency department
Extended skills term	6 months: Singular post or a combination of posts, develop an area of interest or address area of weakness (not necessarily an advanced skill)	N/A
Advanced skills training (AST)	FARGP enrollees only Minimum 12 months (some components can be concurrently completed during their FRACGP): 12 months in rural general practice (<50,000 communities) 6 months rural general practice community project (population health, with needs assessment) 12 months advanced skills training, one of Procedural: Anesthetics; obstetrics; emergency medicine; surgery Non-procedural: child health; mental health; aboriginal and Torres Strait Islander health; palliative care; adult internal medicine	Minimum 12 months (surgery requires 24 months), AST may be undertaken in one of the following disciplines: Procedural: Anesthetics; emergency medicine; obstetrics and gynecology; surgery Non-procedural: Aboriginal and Torres Strait Islander health; Academic Practice; adult internal medicine; mental health; pediatrics; population health; remote medicine
Supervision	Mix of FARGP, ACRRM fellows and other specialists	Mix of ACRRM fellows and other specialists
Professional development (PD, post fellowship)	Small rural-focused program (e.g., rural webinar series) overseen by the RACGP rural faculty Large range of PD events and courses available for all members, but mostly not rural specific	Large range of PD events, targeted at maintaining skills for *rural* general practice National annual conference for rural medicine Key voice for advocacy and policy reform at the national (and international) level in rural medicine

[#] Control of general practice training has recently begun a transition phase from the Australian government's AGPT, to ACRRM and RACGP from 2022 [38]. FACRRM: Fellowship of the Australian College of Rural and Remote Medicine; FARGP: Fellowship in Advanced Rural General Practice; RACGP: Royal Australian College of General Practitioners; ACRRM: Australian College of Rural and Remote Medicine.

Table 2. Timeline of the development of Australia's two rural general practice faculties (the Fellowship in Advanced Rural General Practice (FARGP) and the Fellowship of the Australian College of Rural and Remote Medicine (FACRRM).

Year	Faculty Development Outcome	Related Information
1973	RACGP's education program began (three years duration, end point FRACGP), but was not compulsory until 1996 [32].	
1989–1995	Existing GPs could take up a 'grandfathering' option (recognizing prior learning, RPL) for FRACGP [25].	Other existing doctors chose to have a formal 'fellowship', with no major implications to their practice.
1992	RACGP established a Faculty of Rural Medicine (FRM), recognizing the specific skills related to working in rural primary care.	This was the first acknowledgement that additional skills were required by GPs working in rural areas.
>1992	An optional Graduate Diploma of Rural General Practice (GradDip RurGP) was initiated, involving an additional year of training, with early results finding 70% retention in rural areas [33].	However, debate continued within the FRM and Rural Doctors Association of Australia (RDAA) if a full fellowship better recognized the standard of rural-specific learning.
1995–1996	A formal plebiscite led by the RDAA, asked rural doctors whether to continue in their academic association with FRM, whereby the majority voted to split from RACGP [22].	
1997	An independent rural-focused GP training college was initiated called the ACRRM, with a specific mission to deliver rural general practice training to the level of a fellowship.	This split of general practice training through two specialty college pathways remains to this day.
1998–1999	Approximately 700 rural-based GPs were 'grandfathered' (full RPL) ACRRM's fellowship, as part of growing the rural supervisory faculty.	
2000	ACRRM commenced intake of new trainees, with training structured very similar to the modern 4-year qualification as per Table 1.	ACRRM also developed a rural-specific professional development and support program for existing members [22,24,33].
2006	RACGP's FRM continued with its GradDip RurGP, transferring to a fellowship (FARGP), as per Table 1.	
	Other key parallel interventions	
1999–now	National policy (Rural Clinical Schools) supporting delivery of partial and full rural medical education programs [34,35].	
2000–now	National policy: 50% of general practice training occurs in rural areas.	
2007–now	Additionally, separate formal rural generalist (RG) pathways begun in various forms.	Queensland's program (articulating with FACRRM and FARGP qualifications) linked to specific state-based awards recognizing and remunerating RG doctors [36,37].
2017–now	An inaugural Office of the National Rural Health Commissioner designed a scaled-up national RG pathway, with both FACRRM and FARGP agreed as the recognized RG doctor qualification [36].	

FACRRM: Fellowship of the Australian College of Rural and Remote Medicine; FARGP: Fellowship in Advanced Rural General Practice; RACGP: Royal Australian College of General Practitioners; ACRRM: Australian College of Rural and Remote Medicine.

2. Materials and Methods

This study used 2008–2017 data (waves 1–10) from the "Medicine in Australia: Balancing Employment and Life (MABEL)" study. MABEL collected annual cross-sectional survey data from a national panel of doctors across all career stages. It commenced in 2008, with 10,498 doctors (19% of the sampling frame, minimal participation bias) completing the initial survey (wave 1) [39]. There has subsequently been an annual 70–80% study retention rate, with new doctors topping up the sampling frame. MABEL was approved by the University of Melbourne Faculty of Business and Economics Human Ethics Advisory Group (Ref. 0709559) and the Monash University Standing Committee on Ethics in Research Involving Humans (Ref. CF07/1102-2007000291).

This study only included data from clinically active GPs and excluded those currently enrolled in vocational training (equivalent to 'residency') programs. Qualification data were self-reported across all 10 waves, responding to "What GP and other specialist postgraduate qualifications have you obtained in Australia? (e.g., FRACGP, FRACP, FACRRM, diploma)" and "Please list any GP and other medical qualifications you have obtained in Australia since the last time you completed the MABEL Survey". Doctors were categorized into qualification categories, as described in the analysis below.

Geographic distribution of the main work location was the primary outcome. Rurality was defined using the Department of Health's Modified Monash Model (MMM) classification as metropolitan (MMM-1) rural (MMM 2–7) [40]. Some analyses further collapsed the rural category into MMM 2–3 (large rural/regional, >15,000 population) or MMM 4–7 (smaller rural <15,000 population or remote/frontier areas). Distribution was additionally explored by the state, due to the potential for state-based variation from both geography and state-based rural generalist support. Other key demographic factors were gender, age (<50, 50+), childhood background (at least 6 childhood years in a rural area), and place of basic medical training (Australian or New Zealand medical graduate (AMG), or overseas trained doctor (OTD)).

Measures of scope of practice were firstly defined by advanced skills area, whereby all doctors reported doing "specialized training of at least 6 months which is outside the normal scope of practice for GPs". Four groups were defined (see skills listed in Table 1): (i) practicing at least one additional skill; (ii) practicing one of the four procedural skills; (iii) having trained in an additional skill area, but not currently practicing it; and (iv) having trained in a procedural skill, but not currently practicing it. The latter two categories aimed to identify skill maintenance. These scope data were only available in Wave 10 (2017) of the MABEL survey. Secondly, scope was defined by a series of other indicators: work in a hospital, work on-call, total hours worked, direct patient hours, hours worked in community settings, and two self-nominated measures of practice complexity.

Analysis

Descriptive statistics were used to analyze longitudinal outcomes of geographic distributional and scope of practice for (i) wave 1 (2008), (ii) wave 6 (2013), and (iii) wave 10 (2017). Due to multiple fellowships, some doctors were counted in more than one category. Notably, all FARGPs also had a FRACGP qualification (a pre-set requirement), 5–10% of FACRRMs also had a FRACGP, while 25–35% of FARGPs also had a FACRRM. Secondary analyses limited respondents to only those who graduated from medical school after 1995, as a proxy for the cohort doing general practice training in the period of both the ACRRM and GradDip RurGP programs emerging, thus largely removing those awarded via full RPL. The discrete qualification categories were those (i) having a FACRRM; (ii) having a FARGP or GradDip RurGP (henceforth merged as 'FARGP'); (iii) having a FRACGP and not having (i) or (ii); (iv) GPs not reporting any related qualification. Multiple logistic regression models were used to measure associations between these fellowships, other key characteristics, and the main geographic distribution outcomes. Sampling weights were used to adjust for survey non-response bias of key demographics. All analyses used Stata SE 15.1 for Windows (Stata Corp, College Station, TX, USA) and statistical significance was $p < 0.05$.

3. Results

In waves 1, 6, and 10 there were respectively 3930, 2936, and 3185 clinically active GPs who completed the MABEL survey. On average, in each wave there were 274 (8%) and 63 (2%) who, respectively, indicated they had either the FACRRM and/or FARGP qualifications.

FACRRMs were 75–83% male, compared with 50–65% for all other qualification groups (Table 3). Both FACRRMS and FARGPs were more likely to have a rural background (32–38%) than the other qualification groups (18–21%), but less likely to have been trained overseas (8–15%, compared with 22–31%). Reflective of their large RPL process, most FACRRMs were aged 50+. In contrast, most FARGPs were aged <50.

FACRRMs were mostly working in rural areas (75–84%) and approximately half were in the smaller communities (41–54%) (Table 4). Those with FARGPs were also mostly working in rural communities (56–67%), though proportionally fewer were in the smaller rural communities (25–41%). Around 50–60% of both FACRRMs and FARGPs were working in either Queensland or New South Wales, reflecting the largest rural populations. Amongst recent graduates, FACRRMs were moderately biased to working in Queensland (48%).

Both FACRRMs (26–31%) and FARGPs (29–34%) were more likely to be using advanced skills in their job, compared with those without these qualifications (14–26%) (Table 5). This was more pronounced for the four main procedural skills. However, FACRRMs and FARGPs were also more likely to have an advanced skill but not use it (13–26% vs 9–16%). Recent graduate FACRRMs (>1995) were more strongly related to maintaining their advanced skills than recent FARGP graduates. FACRRMs were most likely to work in a hospital setting and do on-call. FARGPs worked the longest hours per week, though both FARGPs and FACRRMs worked longer per week in other community settings. FACRRMs and FARGPs reported using less consultation support for complex patients, which is possibly reflective of their geographic distribution. FACRRMs reported mostly seeing patients with complex problems.

After adjusting for covariates (Table 6), FACRRMs were substantially more likely to be working in a rural area compared with those with standard qualifications (OR 8.7, 5.8–13.1), including when limited to graduates > 1995 (OR 9.6, 3.4–27.0). FACRRMs working rurally were significantly more likely to be working in smaller rural communities (OR 3.5, 2.3–5.3). FARGPs were also significantly more likely to work rurally (OR 4.2, 2.2–7.8). However, rural FARGPs were not more likely than those with standard qualifications to work in smaller rural communities (OR 1.1, 0.5–2.5).

Table 3. Demographics of GP participants by fellowship group.

Characteristic	Wave 1 (2008), n = 3930				Wave 6 (2013), n = 2936				Wave 10 (2017), n = 3185			
	FACRRM	FARGP	FRACGP	None	FACRRM	FARGP	FRACGP	None	FACRRM	FARGP	FRACGP	None
Count ^	346	50	1718	1881	247	73	1513	1200	233	72	1667	1301
Male	83%	59%	55%	64%	75%	54%	54%	60%	81%	57%	50%	58%
Female	17%	41%	45%	36%	25%	46%	46%	40%	19%	43%	50%	42%
Metropolitan background	68%	63%	80%	82%	65%	68%	80%	80%	62%	67%	80%	79%
Rural background	32%	37%	20%	18%	35%	32%	20%	20%	38%	33%	20%	21%
AMG	85%	92%	78%	78%	87%	86%	70%	69%	90%	92%	76%	73%
OTD	15%	8%	22%	22%	13%	14%	30%	31%	10%	8%	24%	27%
<50 years	37%	94%	65%	34%	32%	78%	55%	44%	33%	74%	54%	47%
50+ years	63%	6%	35%	66%	68%	22%	45%	56%	67%	26%	46%	53%

^ Counted in two categories (FACRRM and FRACGP, or FACRRM and FARGP): Wave 1 = 65; Wave 6 = 97; Wave 10 = 88; AMG: Australian (or New Zealand) Medical Graduate; OTD: Overseas Trained Doctor; FACRRM: Fellowship of the Australian College of Rural and Remote Medicine; FARGP: Fellowship in Advanced Rural General Practice; FRACGP: Fellowship of the Royal Australian College of General Practitioners.

Table 4. Geographic distribution of the Medicine in Australia: Balancing Employment and Life (MABEL) study. GP participants by fellowship group.

Geographic Region		Wave 1 (2008), n = 3930				Wave 6 (2013), n = 2936				Wave 10 (2017), n = 3185				Wave 10 (2017), Only Medical School Graduates > 1995, n = 1510			
Australia's Population (2016)		FACRRM	FARGP	FRACGP	None	FACRRM	FARGP	FRACGP	None	FACRRM	FARGP	FRACGP	None	FACRRM	FARGP	FRACGP	None
Metropolitan (MMM 1)	71%	25%	35%	76%	77%	24%	33%	74%	69%	25%	38%	73%	71%	16%	44%	70%	60%
Large rural/regional (MMM 2–3)	16%	25%	33%	15%	15%	35%	26%	17%	18%	28%	33%	17%	18%	31%	31%	19%	24%
Small rural or isolated (MMM 4–7)	13%	50%	32%	9%	9%	41%	41%	9%	13%	48%	29%	10%	11%	53%	25%	11%	16%
State Population—Rural Only (2016)																	
Queensland	26%	18%	32%	22%	18%	26%	35%	24%	19%	29%	26%	21%	20%	48%	29%	21%	25%
New South Wales	28%	41%	28%	31%	37%	40%	21%	29%	37%	31%	30%	32%	34%	16%	24%	34%	33%
Victoria	20%	18%	19%	26%	24%	17%	21%	25%	23%	19%	21%	26%	25%	9%	12%	22%	22%
Other state	26%	22%	22%	20%	21%	18%	23%	22%	22%	21%	23%	21%	21%	27%	35%	23%	20%

Those with multiple fellowships were counted in each respective category; MMM: Modified Monash Model rurality classification; FACRRM: Fellowship of the Australian College of Rural and Remote Medicine; FARGP: Fellowship in Advanced Rural General Practice; FRACGP: Fellowship of the Royal Australian College of General Practitioners.

Table 5. Scope of practice of MABEL GP participants by fellowship group.

Scope Measure	Wave 10 (2017), n = 3185				Wave 10 (2017), Only Medical School Graduates > 1995, n = 1510			
	FACRRM	FARGP	FRACGP	None	FACRRM	FARGP	FRACGP	None
Use any advanced skill	31%	34%	26%	21%	26%	29%	23%	14%
Use any procedural skill	20%	16%	7%	5%	24%	10%	6%	4%
Not use any advanced skill	26%	23%	16%	16%	13%	26%	11%	9%
Not use any procedural skill	23%	19%	11%	11%	12%	25%	8%	6%
Work in hospital	63%	50%	20%	16%	81%	48%	20%	17%
On call	64%	57%	28%	28%	70%	41%	25%	26%
Total work hours (mean)	44	41	37	36	47	43	36	37
Direct patient hours (mean)	33	30	30	30	35	34	30	31
Work community hours [#] (mean)	3.6	4.0	2.5	2.3	4.7	3.1	2.1	2.2
Consult with others [1]	60%	66%	71%	74%	69%	63%	76%	83%
Complexity of patients [2]	91%	78%	80%	79%	91%	70%	73%	74%

Those with multiple fellowships were counted in each respective category; [#] Aggregate of Community health center, Residential/aged care facility, Aboriginal health service; [1] "I normally consult with others in the practice about the management of patients with complex health and social problems"—% agree or strongly agree; [2] "The majority of my patients have complex health and social problems"—% agree or strongly agree; FACRRM: Fellowship of the Australian College of Rural and Remote Medicine; FARGP: Fellowship in Advanced Rural General Practice; FRACGP: Fellowship of the Royal Australian College of General Practitioners.

Table 6. Multivariate logistic regression models of geographic distribution by fellowship group and other characteristics (Wave 10—2017, MABEL).

		All GPs		Rural GPs Only	
		Working Any Rural v Metropolitan, n = 2833	Working Any Rural v Metropolitan, Only Medical School Graduates > 1995, n = 1309	Working Small Rural (MMM4–7) v Large Rural (MMM 2–3), n = 1094	Working Small Rural (MMM4–7) v Large Rural (MMM 2–3), Only Medical School Graduates > 1995, n = 564
Reference Category	Characteristic	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
FRACGP	FACRRM	8.7 (5.8–13.1) **	9.6 (3.4–27.0) **	3.5 (2.3–5.3) **	3.6 (1.7–7.7) **
FRACGP	FARGP	4.2 (2.2–7.8) **	3.1 (1.4–6.8) **	1.1 (0.5–2.5)	1.2 (0.4–3.3)
FRACGP	None	1.2 (1.0–1.5) *	1.8 (1.4–2.4) **	1.2 (0.9–1.6)	1.2 (0.8–1.8)
Age <50	50+	0.6 (0.5–0.8) **	N/A	1.0 (0.7–1.3)	N/A
Male	Female	0.8 (0.7–1.0) *	0.8 (0.6–1.0)	0.8 (0.6–1.1)	0.9 (0.6–1.3)
AMG	OTD	1.4 (1.1–1.7) **	1.1 (0.8–1.5)	1.1 (0.8–1.5)	1.3 (0.8–2.0)
Metro background	Rural background	2.3 (1.9–2.8) **	2.6 (1.9–3.4) **	0.9 (0.7–1.2)	0.9 (0.6–1.4)

* $p < 0.05$; ** $p < 0.01$; Those with multiple fellowships were only counted in their first category (allocation order = FACRRM, FARGP, FRACGP, none); State was adjusted for in the model (coefficients are not shown as they largely reflect the population dispersion across Australia's states); AMG: Australian (or New Zealand) Medical Graduate; OTD: Overseas Trained Doctor who gained basic medical qualifications an another country; FACRRM: Fellowship of the Australian College of Rural and Remote Medicine; FARGP: Fellowship in Advanced Rural General Practice; FRACGP: Fellowship of the Royal Australian College of General Practitioners.

4. Discussion

This paper presents the first empirical evidence about the characteristics and geographic distribution of doctors related to rural general practice faculties compared with GPs who are not members of these faculties. It identifies GPs associated with both FACRRM and FARGP compared with GPs of standard qualifications. None significantly improved rural distribution and expanded the scope of practice. Though the faculties are structured in different ways and function relatively independently of each other, each faculty relates to members who work in rural communities at a broader scope of practice, with improved geographic distribution than those GPs who are not such faculty members.

A key finding is that the stand-alone faculty that has a specific rural mission and delivers wholly rural training (FACRRM), relates to doctors of better distribution into smaller rural and isolated communities, as well as doctors who sustain practice of their advanced skills (working in areas like obstetrics atop of general practice, as rural generalists). These findings demonstrate the value of rural faculties as a professional hub for rural doctors, enabling rural-tailored training and professional support, as a critical strategy for growing and sustaining a skilled and geographically distributed primary care workforce.

These data additionally provide a strong reminder that GPs associated with rural faculties remain a small minority of the trained general practice workforce, around 10% relative to 29% of Australians living rurally, and the 13% of Australians living in smaller rural and isolated communities (where rural generalist doctors are most indicated to be required). GPs working and living in large regional centers may not require specific professional training for their practice, and often have similar professional and personal experiences to colleagues in metropolitan areas [41]. However, strong growth of rural faculties might assist to address growing the skilled rural generalist workforce that is sorely needed in smaller rural towns. Further, most of the ACRRM fellows are older than 50 and will require replacement within 15–20 years. Currently, of around 1500 new general practice vocational training enrolments each year across Australia, there are approximately 150 FACRRM (10%) enrolments annually and around 85 FARGPs (6%). A February 2020 government announcement stated that ACRRM's training intake will increase from 150 to 250 in future years, which is likely to be a welcome expansion.

Another potential source of faculty expansion to consider is to draw on the large proportion of international doctors, both those graduating domestically as international students or those migrating as graduates to Australia from their home country (OTDs). Each of these groups face Australian regulations that require up to 10 years of rural practice if they wish to access Medicare billing opportunities in Australia. Other research identifies that FGAMS have higher odds of working as a GP than local graduates, but decreased odds of working rurally [42]. Additionally, OTDs constitute a high and increasing proportion of GPs and other specialists in large and smaller rural communities [43]. Despite this, OTDs were seen to have considerably lower rural faculty membership, and there may be ways for current faculties to attract uptake of memberships by this group (and FGAMS), in order to encourage their experience of collegial and skills-supported rural practice.

The FACRRM group are predominantly male (75–83%, or 60% for graduates >1995), despite the majority of Australia's recent medical graduates being female (around 55–60%). This may relate to ACRRM's relatively large initial recognition of prior learning process to grow the faculty at its initiation, but it may also reflect that female GPs are less likely to practice procedural skills and often desire more control of their working hours [44,45]. Flexible training options, supportive team practices with sufficient staff relief, salaried employment options, female-tailored continuing professional development topics, and robust social and professional network opportunities may be important strategies to attracting more females to this workforce [44,46,47]. Previous research has demonstrated the linkage between female GPs having children and relocations to more urban settings, with the same effect on males only occurring when the children are of secondary school age [48]. There appears to be a strong scope for rural faculties to play a role in accommodating the tailored employment and family needs of doctors.

Potentially related to their work locations, a higher proportion of rural faculty had a broader scope of work than standard qualified GPs. Notably, a higher proportion of FACRRMs who recently graduated (>1995) were using their advanced skills, whereas GPs mostly used four procedural types. This is likely capturing the strong association between the recent graduates working in Queensland where there is a specific state-based award, recognition, and remuneration for procedural rural generalist doctors [37]. This may also relate to FACRRMs, unlike FARGPs, compulsorily required to complete at least 12 months of training in smaller rural communities and 6 months of emergency medicine. Thus, their members may have greater confidence in working in more isolated communities requiring advanced skills. Maintaining advanced skills in procedural practice areas is likely to depend on matching training options to community need and ongoing job opportunities, availability of hospital departments with service gaps from other specialists, as well as employing adequate professional rewards and continuing learning support for advanced skill use [49].

A limitation of our study is that it likely has undercounted specific qualifications and advanced skills, as we relied on self-reported data. It is not possible to distinguish between incomplete (missing) data and genuine not applicable (missing) data. A further limitation of this study is that qualifications via RPL mostly cannot be distinguished from those related to completing training requirements. RPL was a major feature of ACRRM's establishment and thus results of only more recent graduates are shown. This study presents a series of cross-sectional results, thus only associations rather than causality can be identified. A strength of this study is its use of national data, without focus on a single program; however, not all characteristics of the two rural faculty programs will readily match those of other countries.

5. Conclusions

This study demonstrates the value of different rural faculty models for building a skilled and qualified rural generalist GP workforce, over standard GP training. It highlights that rural faculties, whether as a standalone rural college (FACRRM) or embedded within an existing faculty (FARGP), reflect a common professional practice model. Both groups of rural faculty members related to a majority geographically distributed workforce (>50% in rural communities), practicing at a broader scope. FACRRM members, however, were more likely to work in smaller rural communities and retain use of their procedural skills. Our evidence suggests that rural faculties may better cater for a rural-ready primary care workforce with common professional practice models, providing potential gains for developing rural-specific networks, continuing professional development activities, and promoting recognition of rural practice. A key factor for future planning is maintaining objective data to evaluate further the critical design, progress, and outcomes of rural faculties against their specific missions to ensure that they remain fit for purpose. Expanding the utilization of rural faculties to sufficient capacity is likely to be a critical strategy for building and sustaining a primary care doctor workforce that meets the needs of rural communities.

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Article

Workers' Healthcare Assistance Model (WHAM): Development, Validation, and Assessment of Sustainable Return on Investment (S-ROI)

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Abstract: The present study aimed to present and validate the Worker´s Healthcare Assistance Model (WHAM), which includes an interdisciplinary approach to health risk management in search of integral and integrated health, considering economic sustainability. Through the integration of distinct methodological strategies, WHAM was developed in the period from 2011 to 2018, in a workers' occupational health centre in the oil industry in Bahia, Brazil. The study included a sample of 965 workers, 91.7% of which were men, with a mean age of 44.9 years (age ranged from 23 to 73 years). The Kendall rank correlation coefficient and hierarchical multiple regression analysis were used for the validation of WHAM. The assessment of sustainable return on investment (S-ROI) was made using the WELLCAST ROI™ decision support tool, covering workers with heart disease and diabetes. WHAM can be considered an innovative healthcare model, as there is no available comparative model. WHAM is considered robust, with 86% health risk explanatory capacity and with an 85.5% S-ROI. It can be concluded that WHAM is a model capable of enhancing the level of workers' health in companies, reducing costs for employers and improving the quality of life within the organization.

Keywords: Workers' Healthcare Assistance Model (WHAM); patient-centred care; integrated care; interdisciplinary; sustainable return on investment (S-ROI); economic sustainability; WELLCAST ROI™

1. Introduction

More than ever, life, as we know, will never be the same. The world is currently experiencing the coronavirus pandemic (COVID-19) [1], an unforeseeable health development that is affecting the entire global population, and consequently healthcare assistance models across the globe. There is now an urgent need to look at human health through the "one health" lens [2], to design and implement programs, policies, legislation, and research in a cooperative manner among all sectors of society to achieve better public health outcomes.

In addition to the recognition of the success of the current healthcare models in the relief of pain and the treatment of multiple pathologies, several criticisms are gaining support, pointing out the limitations relating to the attention to patient health. These issues include approaches that take an undifferentiated view of the individual, which is focused exclusively on the part of the body that is sick; the focus on the curative actions of diseases, injuries, and damages; the advancement of medicalization; and the generalization of hospital care using technology. In the past, if a medical doctor was seen as a figure possessing the knowledge necessary to cure the patient, nowadays that figure is seen as one part of a team, with the patient being the final decision-maker in their health outcomes.

The World Health Organization has chosen to strengthen people-centred care and integrated health services as priority strategies to transform health services to meet the health challenges of the 21st century [3]. This favours the emergence of integrated care models, which are seen as possible solutions to the growing demand for improvement in the patient experience, especially in patients with chronic conditions.

Considering economic sustainability in the search for integral and integrated health, this study aims to present and validate a model of workers' healthcare, the Workers´ Healthcare Assistance Model (WHAM), which embraces an interdisciplinary approach towards health risk management.

In light of the literature review, the following three research hypotheses were formulated:

Hypotheses (H1). *WHAM promotes integral and integrated care;*

Hypotheses (H2). *WHAM is robust and has greater explanatory capacity for workers' health risks;*

Hypotheses (H3). *WHAM is economically sustainable and provides a significant return on investment.*

2. Literature Review

A review of the literature in the field of occupational health highlights discussions relating to "assistance models", a term that varies based on the conceptualization, which can include "assistance modalities or technological models" [4,5]; "ways to promote health" [6]; "assistance models" [4,6,7]; "technical, techno-assistance, and technical assistance models" [4,8]; "modes of intervention" [7]; "attention models" [9–11]; and "care models". The result of this diversity of terms is the already identified difficulty in conceptualizing assistance models. Healthcare assistance models are understood as technological combinations with different purposes, which are used to solve problems and meet needs within a given context and population and in a given territory (individuals, groups, or communities), to organize health services or to intervene in situations, depending on the epidemiological profile and investigation of health problems and risks [12]. These logical systems organize the functioning of care networks, articulating the relationships between network components and health interventions. In turn, these are defined according to the prevailing view of health, demographic and epidemiological situations, and social determinants of health at a given time and in a given society and place [13].

According to Campos [5,6], the conceptualization of an assistance model, technological model, or assistance modality must go beyond mere organizational and technical design, showing a new way of producing assistance actions anchored in the organization of the state.

According to Silva [14], biomedicine has become the hegemonic model in the provision of health services in Brazil and other countries around the world, influenced by accumulated knowledge and the paradigm of science. In this process, the daily requirements in the health sector stand out, such as the relationships between people; the involvement and co-responsibility of managers, health professionals, and patients in healthcare; as well as the bond, reception, and humanization of healthcare assistance practices [15]. From a technological point of view, there is a predominance of the use of the so-called "hard technologies" (equipment), to the detriment of light technologies (professional-patient relationships) [8,16]. Thus, diagnostic tests are a priority, but patients are not necessarily considered in terms of their suffering. This approach has been the target of criticism at the international level, starting from the 1970s and gaining greater importance in the second half of the 1980s [11,17]. In terms of the biomedical model, there is a certain neglect of the importance of the determinants of the health–disease process; that is, the focus on the disease and not on the elements that contribute to health promotion, underestimating that cultural, ethical, and social aspects condition lifestyles and that these are also determinants in the same process [13,14,18].

Merhy [8] contributes to the debate about the need to change the hegemonic assistance model, arguing that it is necessary to impact the core of care. In this sense, it is necessary to invest in relational-type light technologies, focusing on the needs of users and reversing the investment in hard or light-hard technologies, which can be translated into standards, equipment, and materials. Thus,

light technologies are used and combined with people and resources to achieve certain objectives, which are gathered in an organized manner and consolidated as essential elements of health services [19].

Regardless of the scope, health services are always complex. The processes are standardized by regulatory bodies, service providers, and class representatives, among others. They have highly specialized and qualified workers who, belonging to different class councils, have interests that do not always converge [20]. Team composition characteristics in health services must be highlighted, recognizing these team members as the main actors responsible for the implementation of technologies aligned to a healthcare assistance model. Faria [21] draws attention to the fact that actions performed in a given place to deal with a certain problem may not apply to other situations, considering the historical-political context that influences a situation. Therefore, the use of healthcare assistance models invariably requires the selection of certain constructs that support them. Thus, they can be used in an alternative or adapted way, as long as they enable the achievement of similar results. To incorporate new health needs, healthcare assistance models can be considered to have influenced the organization of care models, being more focused on specific populations, such as the chronically ill. A comprehensive care model defines how health services are offered, providing the best care and service practices for a person or population group as they evolve through a condition, injury, or event, aiming for people to receive the right care, at the right time, by the right team, and in the right place [22].

The field of occupational health is a fertile environment for the development of interdisciplinary practices [23–26], as it encompasses knowledge from different disciplines, requiring constant and complex interactions between professionals in the fields of epidemiology, the environment, engineering, and healthcare, among others. The framing of occupational health in a biomedical healthcare assistance model favours the development of disjointed and ineffective interventions regarding the needs presented by workers, while the biopsychosocial model is often used in their work environments. According to Annadale [27], the biomedical healthcare assistance model only focuses on the physical processes, i.e., the pathology, biochemistry, and physiology of a disease, neglecting the roles of social factors or individual subjectivity.

In this context, it is necessary to discuss a model of assistance in occupational health that is capable of reviewing the central characteristics of the biomedical healthcare assistance model, including: (i) organization of practices focused on the identification of signs and symptoms and the treatment of diseases, with health promotion not being a priority; (ii) assistance is organized based on individual spontaneous demand, with an emphasis on specialization and the use of hard technologies; (iii) the work is developed in a fragmented, hierarchical manner and with inequality across different professional categories; (iv) difficulty in implementing the integrated care due to the lack of understanding of the individual as a multidimensional human being, as well as the lack of communication and integration between the services involved; (v) health planning is seldom used as a management tool; (vi) the training of health professionals is specialized, based on the hegemony of scientific knowledge; and (vii) themes such as interdisciplinary, people-centered care, attachment, and welcoming are not prioritized. Another aspect of great relevance in the current global context of scarcity of resources, particularly in the current context of COVID-19, is the prioritization of investments ineffective, integral, and integrated interventions, which can be achieved through a model that contemplates the management of occupational health risks, considering the social health determinants [28,29], global disease burden [30], environmental aspects [31,32], sustainable development goals [33,34] and in particular, working conditions that affect an individual's health [35].

In the current context, the effectiveness of a healthcare assistance model must include economic sustainability in addition to health gains, to know how much the company has earned due to investments made in a certain area, with the sustainable return on investment (S-ROI) being a very important metric for this assessment. Measuring the S-ROI [36–38] of preventive programs is not an easy task, due to the large number of variables that influence this calculation. The main variable is patient health, which can improve or worsen unpredictably. Analyzing the S-ROI in preventive programs identifies the financial impact a program generates concerning the amount invested, which must be

considered in the long term. Disease prevention actions bring future returns, mainly to the reduction of healthcare assistance costs. If the individual participates in preventive programs, the probability of developing diseases or discovering them in advanced stages decreases. Over the past 20 years, several studies [39–47] have addressed this issue and there is growing evidence that workplace programs can generate acceptable financial returns for employers investing in them. A study of Johnson and Johnson employees [39] showed a difference in the increase in the average annual costs of internment between workers involved and not involved in lifestyle improvement programs and changes in the workplace, representing $43 and $76, respectively, thus representing a considerable increase in percentage terms. The study by Munir et al. [45] aimed to conduct a cost-benefit analysis of the stand more at work (SMArT) workplace intervention, designed to reduce sitting time. A net saving of $2.18813 (95% CI; $−4.3804; $4.8143) per employee was found as a result of productivity increase. Peik and others [46] applied the Research and Development (RAND) Europe model, a program designed to expand access to up to 40 evidence-based clinical preventive services for all employees and eligible family members, as part of a unique global health initiative at the country level to estimate the return on investment over a five-year timeframe. The study concluded that this program generates a global return of $4.28–$11.88 (after investment cost). Gao and co-workers [47] assessed the economic performance of a workplace-delivered intervention to reduce sitting time among desk-based workers. The incremental cost-efficacy ratios ranged from $6.28/minute reduction in workplace sitting time to $8.45/minute reduction in overall sitting time. The intervention was cost-effective over the lifetime of the cohort when scaled up to the national workforce, and provides important evidence for policy-makers and workplaces regarding the allocation of resources to reduce workplace sitting.

3. Materials and Methods

3.1. Study Design

The present study was carried out from 2011 to 2018, in a workers' occupational healthcare centre in the oil industry in Bahia, Brazil. It involved the integration of distinct methodological strategies for the development of WHAM, such as the development of a conceptual model, action research, statistical validation, and S-ROI analysis. The study involved two experts who had been working in the field of occupational health for fifteen years, with an emphasis on ergonomics and health management, an interdisciplinary approach, and a database composed of a population group and sample of workers, numbering 1275 and 965 individuals, respectively (Table 1).

Table 1. Population and sample characterization.

	Population *n* (%)	Sample *n* (%)	Difference (%)	*p*
Sex				
Male	1117 (87.6)	884 (91.6)	4.0	
Female	158 (12.4)	81 (8.4)	−4.0	
Age Group			0.7	
≤29	50 (3.9)	44 (4.6)	−0.5	
30 a 39	350 (27.5)	261 (27.0)	2.5	>0.05
40 a 49	245 (19.2)	209 (21.7)	−1.1	
50 a 59	556 (43.6)	410 (42.5)	−1.6	
≥60	74 (5.8)	41 (4.2)	4.0	
Total	1275	965		

3.2. Data Analyses

Data analyses were carried out using SPSS version 25 for Windows (IBM Corporation, New York, NY, USA). Diagnostics and intervention prevalence were presented as absolute and relative frequencies. Correlations among modifiable health risk factors and health outcomes were performed through the Kendall rank correlation coefficient. Correlations among health indicators and the interdisciplinary risk coefficients were also performed using the Kendall rank correlation coefficient. Hierarchical

multiple regression analysis was used to calculate the independent contributions of occupational medicine interdisciplinary, dentistry interdisciplinary, physical education interdisciplinary, nursing interdisciplinary, and nutrition interdisciplinary risk coefficients, to provide an estimate of incremental variance accounting for the Workers' Health Risk Index (*WHRI*) [48]. This index had already been published, resulting from the classification of workers into three risk ranges—"low", "moderate", and "high". The Durbin–Watson test was applied to detect the presence of autocorrelation at lag 1 in the residuals (prediction errors), through which the hierarchical multiple regression analysis multicollinearity was verified. To lead the application of the WHAM, the "Guidelines for Implementing the Workers' Healthcare Assistance Model (WHAM)" were developed, which are presented in the Supplementary Materials (Word S1).

3.3. Model Development

The "Workers' Healthcare Assistance Model" is understood as the organization of the conditions necessary to carry out a person-centred care process, about the method, staff, and instruments. The term "process" used in the context of healthcare makes it possible to identify, understand, describe, explain, and predict the needs of a person, family, or community at a given moment in the health and disease process, demanding professional care by health specialists. Therefore, WHAM presupposes a set of actions, through certain means of action, regulated by a course of thinking; that is, through a conception of workers' health, WHAM's origin and its potential to transform itself or to be transformed.

To compose the WHAM, the Interdisciplinary Workers' Health Approach Instrument (IWHAI) [49], a tool that had already been published, was used as a data collection instrument, aiming to collect data from 43 health indicators. To map the diagnoses, the health taxonomies were used, while the *WHRI* [48] was used to prioritize the health risks of the workers. Figure 1 shows the main stages of integrating the WHAM.

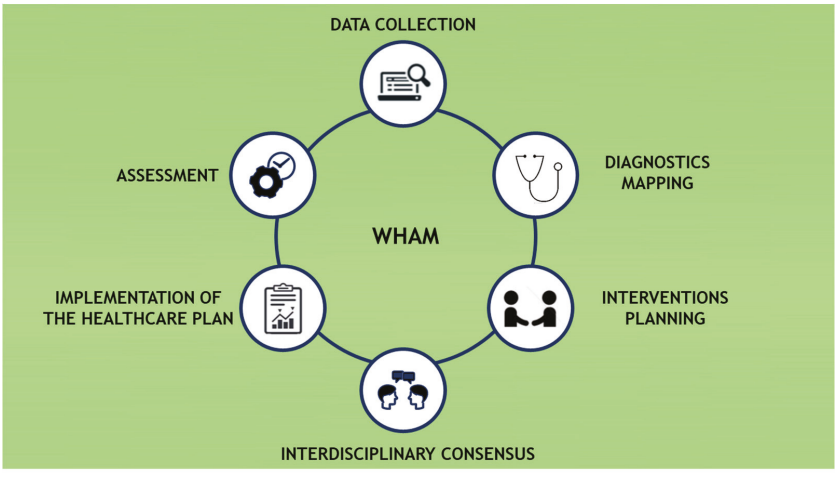

Figure 1. Phases in the Workers' Healthcare Assistance Model (WHAM).

3.3.1. Data Collection

The data collection stage aimed to identify health problems, as well as the efficient and targeted recording of the workers' needs in its broadest sense. For this, the IWHAI [49] was chosen. It allows structured data collection, covering the disciplines of medicine, dentistry, nursing, nutrition, and physical education, as well as environmental, occupational, behavioural, personal, and metabolic factors. It is composed of in 5 dimensions with 43 indicators, totalling 215 sub-indexes with closed response coding, where zero represents non-existent or inadequate control of risk and four represents

optimal control of risk, arranged in the following scale: 0 = non-existent or inadequate; 1 = tolerable; 2 = reasonable; 3 = good; 4 = excellent.

3.3.2. Diagnostics Mapping

For the diagnostics mapping stage, it was necessary to define taxonomies that encompass the complexity of the workers' health field, especially those related to the health, environment, and work triad. The following codes were used for medical, dental, nursing, nutritional, and physical education factors: (i) International Classification of Diseases (ICD 11) [50]; International Classification of Nursing Practice (CIPE®) [51,52]; International Dietetics and Nutritional Terminology (IDNT) [53]; and the International Classification of Functioning, Disability, and Health (ICF) [54].

3.3.3. Intervention Planning

For the intervention design stage, it was necessary to define classifications that encompass proposals for interventions, which include ecological and occupational care. For each mapped diagnosis, an intervention must be associated. During the attendance of the worker, priority is given to diagnoses for health indicators that are classified as control or health conditions: 0 = non-existent or inadequate; 1 = poor; 2 = reasonable.

3.3.4. Interdisciplinary Consensus

This consists of a discussion amongst the interdisciplinary health team to validate the perceptions [55] raised by professionals in each area during the attendance of workers, sharing the diagnoses and interventions proposed by each discipline. The IWHAI [49] was used as a guiding instrument for data collection. For support of the team decisions regarding the hierarchy of priority interventions, the *WHRI* [48] was used, allowing multidisciplinary (by dimension) and interdisciplinary (association of all dimensions) risk classifications. The classifications comprise three ranges: "low", "moderate", and "high". Since 64% of the sample age is above 40 years and the gender proportion of male to female is very high, the effects of these factors were controlled in this step by the *WHRI* [48] assessment. As the workers' ages increase, the risk indicator also increases; the same happens for male and female workers for some sex-related diseases, such as the higher susceptibility by men to develop cardiovascular diseases and alcohol abuse. For this reason, when *WHRI* [48] is applied, each worker will have two risk indicators influencing the indicators of health behaviours and outcomes: a risk indicator related to the workers' age, whereby the older the worker, the higher their risk indicator; and another risk related to their sex, whereby female or male gender will have different impacts on health behaviours and outcomes. The final *WHRI* [48] score is mediated by the workers' age and sex.

The *WHRI* [48] dimension that has the greatest weight in the interdisciplinary context is designated as the worker case manager (WCM) and will assume technical responsibility concerning care management.

3.3.5. Implementation of the Healthcare Plan

The care plan (CP) is an interdisciplinary document, composed of relevant IWHAI indicators with their respective diagnoses and associated interventions, in addition to the definitions of the implementation and deadline. For the implementation of the CP, the WCM must bring together the interdisciplinary intervention team (IIT), ratify the CP, and proceed with the treatment of the proposed actions through interdisciplinary assistance, group work, and collective and environmental interventions. After validation of the CP by the IIT, the workers are involved in discussing the CP and implementing it at the individual level.

3.3.6. Assessment

The assessment stage deals with the follow-up and monitoring of the workers to the effectiveness of the implemented health interventions. For this, it is necessary to systematically reassess the *WHRI* [48]. The attendance took place in a single period (shift) by each member of the interdisciplinary team, with an average time of 40 min for each consultation and a total time of 3.5 h for each worker in the health service.

3.4. WHAM Validation

To validate the WHAM, the data collected in 2018 were used in a representative sample of the population of 965 workers, where attendance by the interdisciplinary team occurred at the same time. Through statistical tests, the intention was to identify the prevalent diagnoses and interventions, how the modifiable factors are related to health outcomes in this sample, and the impact each dimension has on the *WHRI* [48], i.e., if the joint use of these dimensions contributes to greater robustness and explanatory capacity of the WHAM.

3.5. Assessment of Sustainable Return on Investment (S-ROI)

To assess the cost-benefit (*CB*) relationship of implementing WHAM, interventions directed at workers with coronary heart disease (CHD) and diabetes in the period ranging from 2011 to 2018 were analyzed. The effectiveness of the intervention was based on the results of epidemiological studies over this period. Brazilian national data were used to estimate the average annual benefits of preventing direct medical costs for diseases.

The analytical tool WELLCAST ROI™ [56], developed to justify the approval of disease prevention and management programs, was used to calculate the S-ROI. For this, the following steps were taken: (i) determine the incidence of the pre-program disease; (ii) determine all costs associated with the disease, either medical costs (for CHD patients, the Framingham model [57] was used to calculate incidence pre and post-program for a period of 10 years, assuming changes in Low-density lipoprotein (LDL) cholesterol, and systolic and diastolic pressure risk factors; for patients with diabetes mellitus, the reduction in the progression of diabetes comorbidities over 10 years was calculated, based on the reduction of glycemia, considering the retinopathy, kidney disease, neuropathy, and microangiopathy comorbidities) or economic costs (monthly salary data, loss of daily productivity, medical inflation rate, among other rates estimated by WELLCAST ROI™); (iii) define the program and its cost; (iv) determine the effectiveness of the program in reducing costs; (v) subtract post-program costs from pre-program costs to determine reductions; and (vi) apply the concepts of net present value (*NPV*), internal rate of return (*IRR*), and *CB* to determine the S-ROI.

3.6. Ethical Approval

In all stages of the study, the recommendations and guidelines of Resolution 466/2012 [58] of the Brazilian Ministry of Health on ethical aspects regulating research with human beings, approved by the Research Ethics Committee of the Bahia School of Medicine and Public Health and Certificate of Presentation for Ethical Consideration (CAAE) 84318218.2.0000.5544, were followed. All subjects gave their informed consent for inclusion before participating in the study.

4. Results

The prevalent diagnoses and their respective interventions by dimension are presented in detail in Table 2.

Table 2. Diagnosis and intervention prevalence by dimension.

Dimension	Indicator (Assessment Number)	Prevalent Diagnostics	*n* (%)	Prevalent Intervention	*n* (%)
Physical Education	Physical Activity Level (527)	General Physical Resistance—Sedentary	140 (26.6)	Guide and Clarify the Frequency and Duration of Activities Performed to Increase the Level of Physical Activity	290 (55.1)
	Contemplation Stage for Physical Activity Practice (322)	Serious Difficulty in Making Decisions—Contemplation	96 (29.8)	Encourage Thinking about Starting a Physical Activity Program, Warning about the Harm of Physical Inactivity	273 (84.8)
	Feeling of Pain (71)	Moderate Pain	34 (47.9)	Guide to Work Physiotherapy	35 (49.3)
	Cardiorespiratory Fitness (135)	Regular Aerobic Capacity	103 (76.3)	Recommend Specific Physical Activity	89 (66.4)
	Abdominal Strength Level (222)	General Physical Resistance—Regularly Active	58 (26.1)	Stimulate and Guide for Resistance Exercise	134 (60.4)
	Flexibility Level (386)	Mobility of Several Joints—Weak Moderate Disability	85 (22.0)	Encourage and Guide for Flexibility Exercise	273 (70.7)
	Manual Gripping Force (121)	General Physical Resistance—Regularly Active	32 (26.4)	Stimulate and Guide for Resistance Exercise	93 (77.5)
Nursing	Ergonomic Risks—Physical Aspects (193)	Impaired Ergonomic Condition	148 (76.7)	Promote Ergonomic Comfort	191 (99.0)
	Ergonomic Risks—Organizational Aspects (46)	Stress due to Change or Transfer of Environment	16 (34.8)	Obtain Data on Ability to Manage Stress	19 (42.2)
	Work Environment Health Conditions (140)	Impaired Health Surveillance	133 (95.0)	Inspect the Workplace	100 (71.4)
	Family Relationships (25)	Impaired Family Process	9 (36.0)	Support Family Coping Process	12 (48.0)
	Social Aspects—Leisure (14)	Impaired Ability to Perform Leisure Activities	14 (100.0)	Implement Leisure and Fun Activities for Workers and Family Members	7 (50.0)
	Self-Care Level (585)	Health-Seeking Behavior	165 (28.2)	Reinforce Positive Behavior	106 (18.1)
Medicine	Tobacco Use (22)	Tobacco Use	16 (72.7)	Encourage Health-Seeking Behavior	21 (95.5)
	Stress Level and Symptoms (64)	Symptoms and Signs Related to Emotional State	13 (20.3)	Encourage Health-Seeking Behavior	38 (59.4)
	Dyslipidemia (515)	Pure hypercholesterolemia	179 (34.8)	Encourage Health-Seeking Behavior	362 (70.4)
	Diabetes Mellitus (68)	Non-insulin-dependent	53 (77.9)	Guide to Specialist	42 (61.8)
	Systemic Arterial Hypertension (94)	Primary Essential Hypertension	82 (87.2)	Encourage Health-Seeking Behavior	51 (54.3)
	Musculoskeletal Pathology (111)	Low Back Pain	21 (18.9)	Encourage Health-Seeking Behavior	69 (62.2)
	Psychiatric Pathology (10)	Generalized Anxiety	2 (20.0)	Encourage Health-Seeking Behavior	7 (77.8)
	Altered Glycemia (93)	Increased Blood Glucose	62 (66.7)	Guide to Specialist	50 (53.8)
	Altered Blood Pressure (220)	Primary Essential Hypertension	111 (50.5)	Guide to Specialist	96 (43.6)

Table 2. *Cont.*

Dimension	Indicator (Assessment Number)	Prevalent Diagnostics	*n* (%)	Prevalent Intervention	*n* (%)
Nutrition	Energy Balance Intake (339)	Excessive Estimated Energy Intake	239 (70.5)	Adequate Macronutrients	296 (87.6)
	Simple Carbohydrate Intake (148)	Excessive Carbohydrate Intake	74 (50.0)	Adequate Macronutrients	83 (56.5)
	Saturated Lipids Intake (47)	Lipid Type Intake in Disagreement with Needs	30 (63.8)	Adequate Macronutrients	17 (36.2)
	Sodium Mineral Intake (3)	Excessive Oral Intake	2 (66.7)	Instruct Knowledge Related to Nutrition	2 (66.7)
	Fibre Intake (240)	Inadequate Fiber Intake	224 (93.3)	Adequate Macronutrients	92 (38.8)
	Alcohol Consumption (196)	Excessive Alcohol Intake	194 (99.0)	Guide on Alcohol Consumption	147 (75.4)
	Level of Food Knowledge (289)	Limited Adherence to Nutrition Recommendations	48 (16.6)	Promote Continued Food and Nutrition Education	245 (84.8)
	Body Weight Condition (596)	Overweight—Obesity	312 (52.3)	Modify the Distribution, Type, or Amount of Food Nutrients Within Meals or over Time	469 (78.8)
	Altered Triglycerides (268)	Change in Laboratory Values Related to Nutrition	189 (70.5)	Modify the Distribution, Type, or Amount of Food Nutrients Within Meals or over Time	227 (85.0)
Dentistry	Oral Hygiene Quality (803)	Adequate Oral Hygiene	438 (54.5)	Prophylaxis, Topical Application of Fluoride, and Guidance on Correct Oral Hygiene	420 (52.0)
	Periodontal Condition (378)	Supragingival Tartar	223 (59.0)	Supragingival Tartarectomy, Prophylaxis, Topical Application of Fluoride, and Guidance on Brushing Technique and Wire Use	260 (67.0)
	Bruxism (34)	Other Somatoform Disorders Related to Stressful Events—Bruxism	33 (97.1)	Guide to Specialist	13 (35.1)
	Periodontal Disease (27)	Chronic Periodontitis	18 (66.7)	Guide to Periodontist Treatment	17 (60.7)
	Caries (84)	Dentin Caries	50 (59.5)	Guide to Restorative Treatment with External Dentist	62 (72.9)
	Oral Lesion on Soft or Hard Tissue (3)	Leukoplakia and Other Disorders of the Oral Epithelium, Including the Tongue	1 (33.3)	Guide to Specialist	2 (66.7)

In the physical education dimension, the most prevalent diagnosis is "regular aerobic capacity" (76.3 %), with the most prevalent intervention being "encourage thinking about starting a physical activity program, warning about the harm of physical inactivity" (84.8 %). In the field of nursing, the "impaired ability to perform leisure activities" (100.0 %) stands out as the most prevalent diagnosis, followed by the need to "promote ergonomic comfort" (99.0 %) as the most necessary intervention. In the field of medicine, "primary essential hypertension" emerges as the diagnosis with the highest prevalence among workers (87.2 %), preceded by "encourage health-seeking behaviour" (95.5 %) as the intervention with the greatest application within this sample. At the nutritional level, "excessive

alcohol intake" is the most prevalent (99.0 %), with the intervention with the greatest application focusing on the need for "adequate macronutrients" (87.6 %). Finally, in the field of dentistry, the most prevalent diagnosis is identified as "other somatoform disorders related to stressful events—bruxism" (97.1 %), with the predominant intervention being "guide to restorative treatment with external dentist" (72.9 %).

Table 3 shows the statistically significant correlations between modifiable health behaviours and health outcomes.

Table 3. Significant ($p < 0.05$) correlations among modifiable health behaviours and health outcomes.

	Health Outcomes							
Modifiable Health Behaviors	1	2	3	4	5	6	7	8
Altered Blood Glucose	0.65		0.25			0.14		0.45
Stress Level and Symptoms								
Altered Blood Pressure	0.21					0.21	0.18	
Alcohol Consumption		0.09				0.13		
Social Aspects - Leisure								
Self-Care Level		0.08				0.25		
Family Relationships								
Body Weight Conditions		0.06	0.15			0.23		
Energy Balance Intake	0.48	0.07	0.21		0.36	0.32	0.17	0.44
Simple Carbohydrate Intake			0.16			0.25		0.33
Saturated Lipids Intake		0.11						
Sodium Mineral Intake						0.07		
Fibre Intake						0.06		
Tobacco Use								
Level of Food Knowledge	0.46	0.11	0.25			0.28	0.18	0.31
Oral Hygiene Quality			0.14			0.12	0.30	0.58
Cardiorespiratory Fitness						0.08		
Contemplation Stage for Physical Activity			0.31			0.09		
Handgrip Strength			0.15					
Physical Activity Level			0.29			0.10		
Abdominal Strength Level			0.18			0.12		
Feeling of Pain				0.40				
Flexibility Level			0.19			0.12		
Bruxism					1.00	0.27		
Periodontal Condition						0.10	0.26	0.76

Note: 1—Diabetes mellitus; 2—Dyslipidemia; 3—Arterial hypertension; 4—Musculoskeletal pathology; 5—Triglycerides; 6—Caries; 7—Periodontal disease.

Moderate correlations in Table 3 ($\tau b \geq 0.30$) are identified as follows: between diabetes mellitus and altered blood glucose ($\tau b = 0.65$), energy balance intake ($\tau b = 0.48$), and the level of food knowledge ($\tau b = 0.46$); between arterial hypertension and the contemplation stage for physical activity ($\tau b = 0.31$); between the musculoskeletal pathology and the feeling of pain ($\tau b = 0.40$); between psychiatric pathology and energy balance intake ($\tau b = 0.36$); between triglycerides and energy balance intake ($\tau b = 0.32$); between caries and oral hygiene quality ($\tau b = 0.30$); between periodontal disease and periodontal condition ($\tau b = 0.76$), oral hygiene quality ($\tau b = 0.58$), level of food knowledge ($\tau b = 0.31$), altered blood glucose ($\tau b = 0.45$), energy balance intake ($\tau b = 0.44$), and simple carbohydrate intake ($\tau b = 0.33$).

The results are shown in Table 4 show which indicators are most correlated with each coefficient of each dimension of interdisciplinary risk.

Table 4. Correlations among health indicators and the interdisciplinary risk coefficients.

Indicators	Multidisciplinary Risk Coefficient				
	Physical Education	Nursing	Medicine	Nutrition	Dentistry
Physical Activity Level	−0.57 *				
Contemplation Stage for Physical Activity Practice	−0.59 *				
Feeling of Pain	−0.31 *				
Cardiorespiratory Fitness	−0.32 *				
Abdominal Strength Level	−0.47 *				
Flexibility Level	−0.41 *				
Manual Gripping Force	−0.22*				
Ergonomic Risks—Physical Aspects		−0.44 *			
Ergonomic Risks—Organizational Aspects		−0.13 *			
Work Environment Health Conditions		−0.26 *			
Family Relationships		−0.16 *			
Social Aspects—Leisure		−0.03			
Self-Care Level		−0.07 *			
Tobacco Use			−0.52 *		
Stress Level and Symptoms			−0.22 *		
Dyslipidemia			−0.39 *		
Diabetes Mellitus			−0.60 *		
Systemic Arterial Hypertension			−0.49 *		
Musculoskeletal Pathology			−0.37 *		
Psychiatric Pathology			−0.28		
Altered Glycemia			−0.25 *		
Altered Blood Pressure			−0.42 *		
Energy Balance Intake				−0.37 *	
Simple Carbohydrate Intake				−0.11 *	
Saturated Lipids Intake				−0.13 *	
Sodium Mineral Intake				−0.04	
Fibre Intake				−0.25 *	
Alcohol Consumption				−0.45 *	
Level of Food Knowledge				−0.18 *	
Body Weight Condition				−0.47 *	
Altered Triglycerides				−0.43 *	
Oral Hygiene Quality					−0.55 *
Periodontal Condition					−0.66 *
Bruxism					−0.34 *
Periodontal Disease					−0.54 *
Caries					−0.37 *
Oral Lesion on Soft or Hard Tissues					−0.82 *

Notes: * significant correlations ($p < 0.05$).

The values presented in Table 4 make it clear which indicators are most correlated with multidisciplinary risk; the worse an indicator is, the more the risk increases. Thus, in the field of physical education, it appears that the indicator of the contemplation stage for physical activity is the one that is most strongly correlated ($\tau b = 0.59$). In nursing, the physical aspects of ergonomic risks have the most significant correlation ($\tau b = 0.44$). In the field of medicine, diabetes mellitus is the most disturbing indicator ($\tau b = 0.60$). In nutrition, alcohol consumption presents the strongest correlation ($\tau b = 0.45$). Finally, the highest correlation of all is for oral lesion on soft or hard tissue, which is the most significant indicator in the field of dentistry ($\tau b = 0.82$).

Hierarchical regression analysis was applied to understand whether the variables or dimensions under analysis explain a statistically significant amount of the variance of the dependent variable to be tested—in this case, the *WHRI* [48] *(*Table 5). A comparison of stages is made by gradually adding each independent variable in each stage, to understand if the combination of the dimensions explains more than considering them separately.

Table 5. Hierarchical multiple regression analysis scheme.

Predictor Dimensions	Step 1		Step 2		Step 3		Step 4		Step 5	
	B	*t*	*B*	*t*	*B*	*t*	*B*	*t*	*B*	*t*
Medicine	0.272	22.28	0.285	24.57	0.234	26.61	0.216	30.91	0.205	35.03
Dentistry			0.223	18.66	0.209	21.01	0.195	24.66	0.166	29.35
Physical Education					0.179	20.81	0.169	24.93	0.179	29.82
Nutrition							0.174	24.06	0.194	29.45
Nursing									0.168	20.76
R		0.58		0.72		0.82		0.89		0.93
R^2		0.34		0.52		0.67		0.79		0.86
$R^2{}_a$		0.34		0.51		0.66		0.79		0.86

Notes: *B* = unstandardized beta; *t* = *t*-test statistic; *R* = multiple correlation coefficient; R^2 = R Square; $R^2{}_a$ = Adjusted R Square; R =Step 1: Constant = 0.370, F = 496.6, $p < 0.001$; Step 2: Constant = 0.300, F = 511.7 $p < 0.001$; Step 3: Constant = 0.231, F = 638.5 $p < 0.001$; Step 4: Constant = 0.101, F = 911.1, $p < 0.001$; Step 5: Constant = 0.035, F = 1141.3 $p < 0.001$. Durbin–Watson = 1.506. All predictors are significant at 0.05 level. No multicollinearity was identified.

It can be observed that as the dimensions under analysis are added, the model becomes more robust and has greater explanatory capacity for the dependent *WHRI* [48] variable. Thus, when comparing the first stage (step 1) with the last stage (step 5), an increase of 52% in the explained variance of the *WHRI* is observed with the 5 analyzed dimensions, showing values of 34% ($R^2 = 0.34$) and 86% ($R^2 = 0.86$), respectively. Medicine is the dimension with the most significant impact on the model ($B = 0.205$; $t = 35.03$; $p < 0.05$) and nursing has the least impact on the model ($B = 0.168$; $t = 20.76$; $p < 0.05$). The model's final expression is as follows:

$$\begin{aligned} WHRI \;=\; & 0.035 + (0.205 \times Medicine) + (0.194 \times Nutrition) \\ & + (0.179 \times Physical\ Education) + (0.168 \times Nursing) + (0.166 \\ & \times Dentistry) \end{aligned} \quad (1)$$

After analyzing the robustness of WHAM, its economic sustainability was assessed using the WELLCAST ROI™ tool. For the analyzed time period and based on the *NPV* of USD 23,363.29/per worker, the *IRR* of 85.5%, and the *CB* of 1.85:1, the S-ROI was determined, suggesting that WHAM is economically sustainable.

5. Discussion

Given its complexity, the field of healthcare requires the mobilization of specialists from different areas, with the aim of promoting comprehensive and integrated care for workers. Based on an approach aimed at changing behaviors and adopting healthier lifestyles, going beyond the mere medicalization or treatment of diseases, the interdisciplinary care on which the WHAM model is based resulted in the data presented in Table 2. In view of the most prevalent diagnoses identified for each of the integrated dimensions, an intervention was generated that promotes worker autonomy and the maintenance of healthy lifestyles and behaviors, such as physical activity, healthy eating, non-consumption of alcohol and tobacco, good oral hygiene, balanced social and environmental relations, and decent work habits [55]. At this level, hypertension or diabetes mellitus diagnosis is highlighted, suggesting healthy behaviors or healthier eating habits interventions. As Eng and collaborators [59] state, the workplace is a key space for guidance around healthy behaviors and the reduction of non-communicable diseases (NCDs), such as diabetes mellitus and arterial hypertension. Viterbo and co-authors [23] report that long-term interdisciplinary practice has had very positive and significant effects on reducing NCDs. Hochart and Lang [60] also mention in their study that the implementation of a comprehensive care program in the workplace with the aim of modifying health risk behaviors resulted in a decrease in workers in the high and medium risk ranges and in the maintenance of health for those that were in the low risk range. The same is true for the issue of oral health, a problem that is related to other serious

diseases [61,62], and which is solved through the implementation of regular programs for the adoption of oral hygiene behavior among workers, as reported by Viterbo and collaborators [63]. Supporting these results, and in order to reinforce the importance of an integral look at workers' health, Table 3 presents the results between the behaviors (modifiable factors) and the results for workers' health. An overview of these results makes the connections between behaviors and health outcomes even more evident, as well as between the results themselves. In this case, an individual look at a worker would not allow one to understand them as a whole, contributing to fragmentation. Certain associations exemplify this idea, namely between the level of food knowledge and the type of food, identified by the energy balance intake, altered blood glucose, and diabetes mellitus. A similar relationship was identified in a review by Sami and co-authors [64], in which guidance towards healthier eating practices reduced the level of diabetes and prevented associated complications. The study by Holynska and colleagues [65] showed that the level of food knowledge is effectively related to nutrient intake, as this study also demonstrated. In line with this, Breen et al. [66] argued that the level of food knowledge enhances the choice of food, thus optimizing the quality of life of people with diabetes.

Table 4 shows the results of the indicators that are most correlated with the risk of each analyzed dimension, making it possible to identify those that contribute most to the increased risk in that dimension. The strongest correlation belongs to the field of dentistry, more specifically for oral lesions increasing the health risk of these workers. According to Warnakulasuriya et al. [67], conducting screening programs using valid visual inspection method to detect potentially malignant oral disorders within a workplace is not only feasible, but also effective. In terms of physical activity, the indicator that has the strongest correlation is that of the contemplation stage for physical activity; that is, the predisposition to start a physical activity. In the review by Jirathananuwat and Pongpirul [68], the 48 studies analyzed demonstrated that the workplace can play an important role in promoting regular physical activity among workers. Ergonomic risks in the workplace are, in this context, assumed to be the most correlated with risk in the field of nursing. This has been documented in several studies, namely by Skovlund et al. [69] and Welch et al. [70]. Since workers spend long hours of their day at the workplace, an additional concern regarding workplace ergonomics must be considered, as correct adaptation will result not only in promoting the well-being of workers, but also in reducing medical costs for employers, as reported by Munir et al. [45], Gao et al. [47], and Welch et al. [70]. In terms of pathologies, diabetes mellitus is the indicator that most contributes to risk in the dimension of medicine. In the reviews by Hafez [71] and Gan [72], the workplace is an important space for effective reduction of diabetes mellitus.

Implications for Workplace

Some of the results in this study will have a direct implication in the workplace context, thus a more detailed specific analysis is necessary. The results regarding the WHAM robustness (Table 5) make it clear that the combination of technical and scientific knowledge in the work context results in a better understanding of the workers' global health. This result makes it possible to effectively verify that the interdisciplinary approach translates into gains in health, and that it must be adopted as a matrix in all work contexts, particularly those referring to a higher exposure risk and greater number of employees, as already identified in the studies by Viterbo et al. [23], Clark et al. [73], and Costa et al. [74].

Considering that health promotion and prevention actions can influence the health habits and behaviors of workers, they can also reduce health costs. The literature review [38,75–77] suggests that programs based on behavior change theory and using personalized communication and individualized counselling for high-risk individuals are likely to produce a positive return on the amount invested in these programs. The assessment of S-ROI in the specific model under investigation (WHAM) corroborates other studies carried out in the workplace [41,44,45,47], showing positive financial results and reinforcing the advantages of applying WHAM, which in addition to directing investment in health strategies that are proven to be a priority, enables the optimization of financial resources, resulting in

an S-ROI of 85.5% for interdisciplinary, integral, and integrated interventions for the community of workers with a high risk level.

6. Conclusions

The search for a healthcare model for workers that is oriented towards integrated care, expanded health needs, economic sustainability, and which overcomes the problems arising from the hegemony of the biomedicine paradigm, such as the excessive use of technologies and focus on curative actions of diseases, is one of the great challenges of the Brazilian health system today. This scenario is strongly present in Brazilian scientific production and is reflected in national and international policies through legislation and public initiative.

The results obtained with the practical application of WHAM in the oil industry in Bahia, Brazil, demonstrated the potential of the model, where the articulated and hierarchical management of the various indicators of workers' health makes it possible to direct practices aimed at the cause and not at the effect or symptom. At the individual level, the model presented an interdisciplinary diagnosis of the health conditions of each worker, correlating the modifiable health factors and their respective impacts. The presentation of information to individuals promoted autonomy and empowered workers to change behaviors that negatively interfere with health conditions. At the collective level, the application of the model demonstrated the correlation between health indicators and interdisciplinary risk in the studied context, encouraging the creation of strategies aimed at the most critical conditions, as well as the design of preventive interventions. The robustness of the model highlights this same potential, in addition to the related optimization of financial resources of 85.5% for interdisciplinary interventions.

The absence of a similar model in occupational health is a limitation of this study since comparative analyses in the context of this work are not possible. The application of WHAM in different healthcare contexts is suggested in future studies, as well as carrying out analyses of the model's effectiveness by comparing the population's epidemiological results and studying the S-ROI.

The different theoretical contributions to the theme of this study, as well as the results found, lead to the understanding that WHAM can be considered as a model capable of encompassing the complexity of the field of occupational health, considering the interdisciplinary approach, risk management, and comprehensive and integrated care, in addition to accounting for economic sustainability for companies investing in healthcare.

Supplementary Materials: The following are available online at http://www.mdpi.com/1660-4601/17/9/3143/s1, Word S1: Guidelines for Implementing the Workers' Healthcare Assistance Model (WHAM).

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The Challenges of Public Health, Social Work, and Psychological Counselling Services in South Korea: The Issues of Limited Support and Resource

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Abstract: Public health, social work, and psychological counselling professions in South Korea are facing challenges of human resource shortage and shortage of professionals who can provide multilingual services. The purpose of this study was to explore and understand why public health, social work, and psychological counselling services degree graduates and professionals with multilingual skills in South Korea decide to leave their professional field to the hospitality and business industries, particularly for those who completed their initial training at one of the international universities. Based on the approach of the Social Cognitive Career Theory, individuals' self-efficacy, outcome expectations, interests, and goals were examined and considered. The data were collected from 12 participants with the methodology of interpretative phenomenological analysis. The general inductive approach was employed to categorize the themes for reporting. The results indicated that public health, social work, and psychological counselling services-related positions are not available, modelling from peers, and lack of career development skills are the primary difficulties of public health, social work, and psychological counselling services graduates. The completion of this study provides clear recommendations to educators, policymakers, school leaders, human resource planners, and university administrators to improve their curricula and school counselling for public health, social work, and psychological counselling services graduates and the next generation.

Keywords: human resource shortage; mental counselling; psychological counselling; public health; shortage; social cognitive; social work; workforce management

1. Introduction

1.1. Background of the Study: The Current Public Health, Social Work, and Psychological Counselling Services in South Korea

The shortage of health and social caring professionals is significant in many regions and cities, including those in South Korea. Public health, social work, and psychological counselling services are some of the foundational services [1] that can help social minorities, the elderly, refugees, vulnerable people, female residents, and even sexual minorities [2] to overcome some social, cultural, and financial difficulties in society [3]. Although the South Korean government has established some governmental agencies and foreign resident support centers with multilingual services, such centers cannot offer long-term, gradual, and follow-up services to some minority groups in the community [4]. Nowadays, nearly a million foreign residents are living in South Korea for various reasons, such as education, family reunion, work, and even giving political support [5]. However, there are only a few organizations that can provide public health, social work, and psychological counselling services to these minority groups.

As a result, after completing their secondary school qualifications, many students decide to pursue undergraduate degrees, graduate degrees, and initial licenses in the fields of public health, social work,

and psychological counselling services [6] at colleges and universities outside of South Korea with multilingual and inter-cultural training. Besides joining government agencies, large non-governmental organizations (NGOs), and non-profit organizations (NPOs), establishing their start-up NPOs may provide targeted services to particular groups of people in their specialization (e.g., refugee service, girls' rights in rural communities, orphanage for abandoned girls, etc.) [7]. However, such NGOs and NPOs are rarely found in the current South Korean environment.

Moreover, although South Korea is an international region with multi-disciplinary services, industries, and business options, the South Korean government tends to invest resources in the hospitality, tourism, and service management sectors [8]. Hotels, restaurants, entertainment, and similar industries employ many local and international residents. Although there are no official statistics regarding human resource management and occupational background, many local people and residents work in these industries. Based on the current employment trends of the region, many graduates with majors other than business and hospitality may not be able to work in the industries of their backgrounds, particularly for South Korean graduates who completed their education at an international university. Such unhealthy environments may limit the diversification potential of South Korea.

1.2. Purpose of the Study

The purpose of this study was to explore and understand the factors contributing to the career decisions and decision-making processes of recent public health, social work, and psychological counselling services graduates in South Korea, particularly for those with degrees from overseas universities who are working in industries other than public health, social work, and psychological counselling services. Based on the approach of Social Cognitive Career Theory (SCCT) [9], individuals' self-efficacy [10–12], outcome expectations, interests, and goals [13,14] were considered and examined.

First, studies [15] indicate that recent graduates tend to enter industries corresponding to their academic majors and personal interests. Although financial consideration is a critical element in career development, public health, social work, and psychological counselling services professionals tend to consider personal interests and outcomes developments as their priorities [16–18]. One report [19] indicates that public health, social work, and psychological counselling services graduates in western societies usually start their centers or join NPOs after graduation. However, recent public health, social work, and psychological counselling services graduates in South Korea are not interested in starting businesses or NPOs. Therefore, the researcher aimed to understand the reasons for the career decisions and decision-making processes of recent public health, social work, and psychological counselling services graduates [20].

Second, although the South Korean government has financially and administratively supported many types of start-up NPOs and NGOs, unlike other professionals, individuals in the fields of public health, social work, and psychological counselling services have no interest in establishing businesses or NPOs of any kind in the public health, social work, and psychological counselling services industries. It is essential to understand the underlying reasons for this [21].

Third, one study [19] indicates that public health, social work, and psychological counselling services professionals tend to start their centers or NPOs after graduation, particularly with support from government agencies. Although the South Korean government has established planning for supporting such endeavors, public health, social work, and psychological counselling services professionals tend to give up and leave the public health, social work, and psychological counselling services industries to further develop their careers in other areas. The study aimed to explore this unique behaviour [22].

Fourth, career development theories have been based in large part on studies with university students, career changers, and working adults. Underrepresented populations have different career desires and face difficulties concerning their social status, academic majors, networking, and career development [14,16]. However, there are only a few research articles concerning the career pathways

and development of public health, social work, and psychological counselling services graduates, particularly in South Korea. Most research articles in public health, social work, and psychological counselling services examine how to incorporate public health, social work, and psychological counselling services into the curriculum, and how to enhance practices for patients. This is because public health, social work, and psychological counselling services educators tend not to feel strongly about the further development of graduates. Therefore, a large gap in career counselling and development is found for public health, social work, and psychological counselling services graduates. An emerging area of research focusing on career development has concentrated primarily on hospitality workers' perspectives and human resources shortages [23]. Graduates with academic majors other than business-related subjects represent a significant proportion of the region's human resources, particularly graduates with public health, social work, and psychological counselling services degrees from overseas. Yet, questions remain about the career perspectives and career planning of these groups of residents [1].

1.3. Theoretical Framework

This study employed SCCT [9,13,14] to explore the career decisions and decision-making processes of recent public health, social work, and psychological counselling services graduates, particularly those working in industries other than public health, social work, and psychological counselling services. SCCT [24–26] is a famous theoretical framework for vocational and academic predictors of interests, career choice options, and performance. However, only a few studies explore the career and vocational perspectives of residents in South Korea.

More importantly, research on the views and behaviors of public health, social work, and psychological counselling services professionals are absent. Therefore, the result of this study may increase the social attention paid to public health, social work, and psychological counselling services professionals. The outcome of this study may lead to recommendations for policymakers, human resource professionals, secondary school staff, parents, career counsellors, and university administrators in planning career developmental plans for the next generation.

SCCT [9,14] was developed to understand and explore career perspectives and intentions. It aims to explain, describe, and explore academic and vocational decisions and performance, and the persistence of educational and vocational goals. This framework examines how people apply personal factors in the occupational and career development procedures and how personal elements increase, decrease, or otherwise impact personal agency. SCCT also indicates the significance of Social Cognitive Theory and triadic reciprocal causality [23]. Triadic reciprocal causality is an inter-influential point which impacts the connections, interactions, and significances among people, behaviors, and environmental factors. Activities, thinking, and behaviors of people are not the results of inter-connected events between people and environmental and social elements; instead, behaviors act as inter-connected elements by impacting and influencing results, thereby impacting the personal, emotional, intrapersonal, and further movements, activities, decisions, and behaviors of people [9,14,17,27,28].

Given SCCT's notions about how people, behaviors, and environmental elements could impact and influence the career decisions and decision-making processes of people, in this case, recent public health, social work, and psychological counselling services graduates, this study explored the factors that may be related to their career decisions and decision-making processes. The SCCT works as an effective framework when seeking to address the gaps in the current debate relevant to making the career decision to work in an industry other than that relevant to one's educational goals and interests.

2. Materials and Methods

Based on the structure of the SCCT [9,14] and the significances, one research question guided the direction, which was: Why do recent South Korean public health, social work, and psychological counselling services degree graduates with overseas degrees decide to work in the fields other than public health, social work, and psychological counselling services? The purpose of this chapter was to

outline the research methods, including research design, participants, instrumentation, data collection procedures, and data analysis procedures.

The researcher decided to employ the Interpretative Phenomenological Analysis (IPA) in understanding how lived stories and in-depth personal understanding associated with social, education, financial, and personal goals influenced the career decision and decision-making process of recent public health, social work, and psychological counselling services graduates who are working in the industries other than public health, social work, and psychological counselling services [29,30]. Previous Interpretative Phenomenological Analysis studies have shown how individuals and participants make sense of their personal and social world and experience. As the aims of this study tended to collect in-depth understanding and rich lived stories from the participants, the Interpretative Phenomenological Analysis was appropriate as the methodology. The researcher employed the qualitative research method with purposive sampling for recruitment.

2.1. Participation

The sample involved 12 participants. First, the Interpretative Phenomenological Analysis seeks to understand the in-depth understanding and lived stories. Each represents a lived story that may be extremely meaningful. The data collection and analysis may highly satisfy. Second, the general phenomenological analysis may recruit at least ten participants and up to 200 participants. Large sample size may eliminate and cover up the rich lived stories from each participant. Also, as this study primarily focuses on the in-depth understanding of career development for South Korean residents who completed their public health, social work, and psychological counselling services degree overseas, a small sample size was more reasonable [31].

A purposive sampling strategy [31] was employed to invite 12 students who graduated overseas. Participants' demographic information, such as name, age, gender, year of experience, educational background, etc. was collected. However, the identifications of participants were pseudonym to protect the privacy.

The participants of this study satisfied the following requirements,

- Currently working in a field other than public health, social work, and psychological counselling services;
- Graduated no more than three years;
- Completed their academic degree in the field of public health, social work, and psychological counselling services from an international university outside South Korea;
- At least 18 years old;
- Non-vulnerable person;

The researcher contacted each potential participant by email invitation. The invitation letter provided the information including the nature, objective, aim, and methodology, requirement of participants, and purpose of the study with a declaration about their voluntary participation or non-participation. If the participant agreed with the research, the participant responded to the email for further actions. For detail about the participants' information, please refer to Table 1.

2.2. Data Collection

The researcher was the primary tool for data collection and analysis. Participants usually shared personal background, lived stories, and career decision with people who they can believe. To establish a solid relationship, the researcher designed two rounds of a semi-structured and one-on-one interviews. The member checking interviews were conducted after the completion of data analysis. Therefore, both met each other for at least three interview sessions in total. Each semi-structured interview was between 60–90 min. The member checking interview was hosted for about 30 min. Pseudonyms were assigned to shadow their privacy [32].

Table 1. Biography of the participants.

Name	Gender	Age	Major	Current Position
Participant#1	F	24	Public Health	Administrative Assistant
Participant#2	F	23	Social Work	Administrative Assistant
Participant#3	M	23	Health Promotion	Ticket Seller
Participant#4	M	25	Social Work	Reservation Attendant
Participant#5	M	26	Social Work and Mental Counselling	Hotel Front Office Attendant
Participant#6	F	23	Mental Counselling	Hotel Concierge Attendant
Participant#7	M	24	Social Work	Valet Parking Attendant
Participant#8	F	27	Public Health and Social Work	Receptionist
Participant#9	F	28	Psychological Counselling	Restaurant Servant
Participant#10	M	29	Psychological Counselling	Advertisement Assistant
Participant#11	F	24	Psychological Counselling	Marketing Assistant
Participant#12	M	25	Psychological Counselling	Security Supervisor

2.3. Data Analysis

Themes, patterns, and groups that were categorized during the interview sessions were individually mapped. The general inductive approach was employed to analyze. The general inductive approach allowed researchers to explore the interview transcripts. First, the researcher followed the general inductive approach to reduce the large-size interview transcripts into the first-level themes by employing the open-coding strategy based on the direction of the grounded theory approach. Due to the detailed and in-depth interview sessions, the researcher captured 700 pages of interview transcripts. After the open-coding strategy, the researcher categorized 19 themes and 28 subthemes for the first-level reporting [33].

Second, based on the first-level themes and subthemes, the researcher reduced the interview transcripts into the second-level themes and subthemes with the axial-coding strategy. Several qualitative researchers [31,33,34] have indicated that the axial-coding strategy allows the researcher to narrow down the first-level themes and subthemes based on the research question. Therefore, three themes and four subthemes were categorized.

2.4. Human Protection and Ethical Consideration

The study involved 12 participants in South Korea. The protection of human subjects was important to this study, particularly given the study's focus. Therefore, the researcher made every effort to protect the identities of all those involved, allowing them to remain anonymous to any parties in society. In the report, each person was identified solely by their role.

All subjects gave their informed consent for inclusion before they participated in the study. The study was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by the Ethics Committee of Social Caring Center (Summer/2019).

3. Results

During the interview, the participants answered the same general open-ended questions about their educational background, ideas regarding public health, social work, and psychological counselling services in the current South Korean environment, expectations to do with their degrees, personal goals, the social expectations of the public health, social work, and psychological counselling services professions, governmental policy toward the public health, social work, and psychological counselling services industries, and so on. Although all had similar interests in the fields of public health, social work, and psychological counselling services, some of their shared experiences, lived stories, and financial considerations were not the same. The situation in South Korea is unique. As a small region with a large population, people's lifestyles, family structures, conceptions, and understandings may have many common grounds while also having many differences due to geographic elements. To answer the research question in a structured order, this section is categorized into three themes

and four subthemes based on the interview transcripts and information from the participants. Table 2 outlines the themes and subthemes of this study.

Table 2. The themes and subthemes.

Themes and Subthemes
3.1. Public Health, Social Work, and Psychological Counselling Services: Positions are Reserved
3.2. Modelling Peers
3.2.1. Modelling and Referral from Classmates
3.2.2. Modelling and Referral from Cousins
3.3. Lack of Career Development Skills
3.1. Afraid to Start Own Centers and Non-Profit Organizations
3.2. Lack of Interdisciplinary and Practical Skills

3.1. Public Health, Social Work, and Psychological Counselling Services-Related Positions are not Available

The high percentage of hospitality employment reflects that most available positions are in a single industry. Professionals from other fields are less likely to expand their expertise in their own fields. In the current study, all participants were in the field of public health, social work, and psychological counselling services, where employment is less likely to be found in the business and non-profit sectors.

All participants had public health, social work, or psychological counselling services degrees from overseas institutions, but none of them were able to work in public health, social work, and psychological counselling services-related positions due to the shortage of opportunities. All except Participant#8 and Participant#9 believed the government did not emphasize the public health, social work, and psychological counselling services industry enough. They referred to the current public health, social work, and psychological counselling services environment as a "desert" to reflect the lack of support. Participant#9, who had a psychological counselling degree, but was working as a restaurant servant, asserted the dead-end nature of the counselling services environment, saying, "the hotels kill all other professionals. The tourism industries are the big dragon. No one in the city even supports psychological services." Participant#2 echoed this negativity, saying, "I tried to ask the Government Department for support for the support of sexual minorities' services for foreign residents in Seoul … not a hard request, but only negative news." Participant#10 also expressed that there were no opportunities for recent graduates, saying,

> *… for those who want to join the field, there are only two ways, either start your own non-profit or enter the government. Public health, social work, and psychological counselling are not easy jobs … in South Korea, even if I graduated from a top-tier university, there are no positions … it depends on internships and networking … at least I don't have savings to start my own [organization]. Even if I do have millions, I cannot recruit all graduates …*

Participant#12's academic background was similar to Participant#10's (e.g., psychological counselling), but Participant#12 worked in the surveillance office due to his video-related skills (i.e., academic minor). Although Participant#12's working position was related to video, the job specifications and responsibilities were not the same as for public health, social work, and psychological counselling services, as Participant#12 explained, saying, "Looking at the camera for potential cheating is not the same as making meaningful and enjoyable videos for the minorities in my country. I cannot say I entered into the public health, social work, and psychological counselling services, this is hospitality … " Participant#3 asserted that many orphanages and religious churches are operating in South Korea. Although a few places recruit people without networking and connections, as Participant#3 said, "South Korea is an international region … but the governmental agencies and large-size non-profit organizational heads recruit their own team members … for us … there are no openings." Participant#5 and Participant#6 were hotel front line attendants at the same company. Both used the statement "no future, no dream for our public health, social work, and psychological counselling services career" as

an ironic pun on the hotel's slogan. Participant#7 somehow used his professional skill to make fun of his current position saying,

> *I wish I could leave this meaningless position in valet parking. But I am glad that I can laugh in front of all customers all the time. At least I learnt social work skills. Even if I don't want to work, I must work for basic living.*

Participant#4 continued to seek openings as a professional in the fields of public health, social work, and psychological counselling services in the near future, but his expectation of potential opportunities in public health, social work, and psychological counselling services was weak, as he explained, saying,

> *The government said there are rooms to open our center. But it has been four years. I want to go back to public health, social work, and psychological counselling services. But can I come back? I am afraid six years later I will not have the courage to leave my position in this hotel.*

Participant#8 did not express much negative thinking about her position, but believed professionals in the field of public health, social work, and psychological counselling services should able to take hardship, saying,

> *I understood there were no opportunities once I graduated. This was my own choice . . . I cannot work as a professional in the field of public health, social work, and psychological counselling services now. But I can enjoy chatting with my customers in the hotel. I can help my customers and other co-workers at my workplace . . . But this is very stupid . . . I have my professional skills in the field of public health, social work, and psychological counselling services . . . But I cannot use my multilingual skills and professional skills to help the correct minorities and people who are suffering from pain . . .*

Participant#11 worked in the marketing department. The department relied on Participant#11's photographic and art therapy skills to put pictures in emails. She said, "my responsibilities are 20% related to my public health, social work, and psychological counselling services profession, particularly art therapy. All footnote pictures at the bottom of emails in my department were my art. But I am only responsible for typing and responding to emails between my company and customers." Participant#1 was the only participant who was not working in the hospitality and hotel industry. Her viewpoint was slightly different from the others', who were working in the hospitality industry, saying,

> *. . . I enjoy working as an administrative assistant. I can coordinate some printing workshops with the center users and members. I don't think I can open my center because I don't understand how to operate a counselling center. I would rather use the money for my down payment . . . for my apartment and unit . . . perhaps my children in the future?*

All participants were working in industries other than public health, social work, and psychological counselling services. Recent graduates with public health, social work, and psychological counselling services degrees may apply their professional skills and abilities to other professional environments. For example, Participant#11 applied her photographic and art therapy skills in her marketing department and email designs. However, most of the participants worked in fields that were totally removed from public health, social work, and psychological counselling services. Many expressed negative comments due to the mismatching of career expectations and personal development. For example, Participant#3 worked as a ticket seller in a hotel's box office. This mismatching may further create a high level of turnover due to dissatisfaction.

3.2. Modelling Peers

Starting a career pathway is not an easy step for recent public health, social work, and psychological counselling services graduates without much working experience or connections. First, unlike their

counterparts in business schools or vocational training institutions, students in public health, social work, and psychological counselling services programs may not need to complete a business-oriented, practical internship for their professional year. Second, all participants completed their academic degree at a university overseas. Most were therefore unable to work in organizations outside the university setting without visa sponsorship. The visa requirement limited their opportunities to seek appropriate working experience during their academic career. Third, South Korean students do not have the right of abode overseas. Most had to leave their host countries within a certain period after graduation. Even if they had built up strong connections and good networking, they had to leave after graduation. Therefore, the absence of social and vocational connections within the professional field in South Korea was disadvantageous for this group of public health, social work, and psychological counselling services graduates.

3.2.1. Modelling and Referral from Classmates

All participants worked in the hospitality industry except for Participant#1. One of the strongest reasons why graduates with public health, social work, and psychological counselling services degrees joined the hospitality industry was peer influence. All participants were originally from South Korea, where they completed their secondary education. Therefore, most of their peer connections and career recommendations were in South Korea. Participant#2, Participant#5, Participant#6, and Participant#8 said that they entered the hospitality industry due to suggestions from their secondary classmates. Participant#2 said,

> *Several of my classmates studied hospitality and tourism management. They were able to seek their first full-time position right after their internships. Therefore, they referred me to their department supervisor and recruited me. I am so fortunate to have a full-time job after I came back.*

Participant#5 echoed a similar expression about referral from classmates, saying,

> *In South Korean culture, references from others are key to finding opportunities. My classmates in the business administration program told their bosses to recruit me. I applied for many positions . . . but no responses . . . most of my friends were doing well in the hotel, so I wanted to join and try too.*

Participant#6 elaborated on peer influence and her first position in the hospitality industry, saying, "my secondary classmates are successful in the hotel. I seriously don't think the government is going to support my center. To survive, I follow my classmates' footsteps and make some money for living."

3.2.2. Modelling and Referral from Cousins

Participant#4, Participant#7, and Participant#9 were influenced by their same-age cousins who were in the hospitality industry. Participant#4 entered the reservation department due to the peer influence from his female cousin in a similar position, saying, "my cousin is a reservation assistant supervisor and says the workload is okay. I keep writing poems and storybooks during the days off." Participant#7's cousin was promoted to a supervisor position about two years ago. Participant#7 was able to secure his position due to the referral of his cousin, saying,

> *I sent out my applications and CV [curriculum vitae] at the beginning of my last year of university. No responses or interviews. I knew my cousin was working in the parking department, so I sought him out for help. I cannot say I like it, but I know I must survive.*

Participant#9 also sought her first position in a different field based on the referral from a cousin, saying,

> *Public health, social work, and psychological counselling services are not a trend . . . the biggest companies are in France, the United Kingdom, Italy, the United States and other western countries.*

I understand the direction has been switched. I cannot wait for a lottery . . . after 15 months of unemployment, my cousin helped me to send out my CV to her department head in a hotel restaurant . . .

It is important to note that modelling peers and classmates reflects the central element of Social Cognitive Career Theory. Scholars [9] have further advocated that modelling other people's success stories may highly influence individuals' career choices and behaviors. More than half of the participants switched their career direction from public health, social work, and psychological counselling services to hospitality due to the strong influence of their peers. These participants may be going against their own principles. However, peer influence changed their points of view about long-term and short-term career pathways.

3.3. Lack of Career Development Skills

Most public health, social work, and psychological counselling services programs do not provide vocational and career-oriented training and preparation for seeking opportunities in the business environment [21]. In fact, many organizations want to recruit business professionals to increase the image of their departments, particularly for marketing advertisements. However, public health, social work, and psychological counselling services graduates usually do not understand how to apply their professional and counselling skills in a business environment. Therefore, most public health, social work, and psychological counselling services graduates are unable to apply their professional skills in appropriate directions.

3.3.1. Afraid to Start Own Centers and Non-Profit Organizations

Three participants expressed that they had planned to start their own centers or NPOs during university. However, these participants stated that they did not understand how to begin, maintain, promote, operate, and continue such endeavors. Therefore, after consideration, they terminated their plans. Participant#3 shared his experience of establishing a center, saying,

During university, the only public health, social work, and psychological counselling services professionals that I could encounter were my lecturers. They were very successful social workers, counsellors, and health professionals. But I could not learn ideas from them about establishing my own center. Most of them never started their own centers, so how could they have taught me?

Participant#1 expressed another idea about the absence of career development, saying,

I don't know how to attract residents and tourists to my center . . . if I start in a small community. The program curriculum does not have such courses . . . they only trained us as a professional service provider. But professional service providers also need money to survive.

Participant#6 further emphasized the feelings from Participant#1 saying,

I know how to promote sexual health, elderly service, youth service, and women's issues . . . During the last year of university, we had to learn how to serve multi-cultural and social disabled people from countries with political unrest . . . but I wanted to start my center. But I somehow didn't know how to start the center. One or two counselling professionals may operate many of the centers in the market. But these centers don't hire outsiders. We have to start our own. But I didn't have the business sense . . .

3.3.2. Lack of Interdisciplinary and Practical Skills

Based on the interviews, the researcher noted that almost all the participants did not understand how to apply their valuable skills in the practical and professional environment outside of the public health, social work, and psychological counselling services professions. In other words, most of the

participants only had skills in their own public health, social work, and psychological counselling services subjects, and no other professional skills. Due to the absence of interdisciplinary and practical skills required from potential employers, they were unable to expand their horizons to the next stage. For example, Participant#2 expressed her hardship in seeking employment, saying,

> *Many international hotels are using technology to design their art products. But I am still in the 70s. I know how to draw and paint in watercolors with art therapy. But how to use a computer to print and how to use the computer to assist . . . I don't know.*

Participant#9 also applied for the wardrobe and linen department at a hotel. Participant#9 should have applicable skills in clothing, so such a position should have been appropriate. However, Participant#9 expressed that her skill was not transferable, saying,

> *My skill is in counselling and visual counselling. I know how to use a different color. My interests are all about color, cutting, and fitting. But in the wardrobe and linen department, they mainly focus on washing the clothes. I never learned that at university. I wish I understood, but I don't want to lie to the manager.*

Participant#4 should be a good writer and even speaker for documents and advertisements, but did not know how to apply this skill to a business environment, saying,

> *. . . I applied for a newspaper journalist position. I wanted to write some articles for the forums. But they only recruited from the traditional section. I never studied, so I was refused an offer. For now, I apply for other contract writer and advertisement writer positions. Their requirements and expectations are not in my expertise . . .*

Participant#5 and Participant#7 both expressed the same sentiment, saying, "how can I apply my professional skills into a business environment . . . a good smile is okay."

All public health, social work, and psychological counselling services graduates should be experts in critical thinking and problem-solving. However, most were close-minded in other professional areas, particularly business. Public health, social work, and psychological counselling services elements are not hard to find in luxury hotels and shopping centers. Most expressed that their public health, social work, and psychological counselling services skills should apply in their particular direction. While some participants may have taken jobs in different industries due to money issues, resistance to applying their professional skills was also obvious.

4. Discussion

The purpose of this section is to discuss the themes shared by participants and implications for the career decisions and development of public health, social work, and psychological counselling services university graduates, using SCCT as a theoretical lens. Based on the idea of SCCT, personal factors (i.e., personal beliefs, biological elements), human behaviors, and external environmental elements (i.e., social movement, society) are the central elements influencing the career choices and selections of individuals [9,17,35]. However, based on the findings of this study, external environmental elements strongly impact career selection.

First, the researcher sought to understand better why public health, social work, and psychological counselling services graduates with overseas degrees plan to work in an industry other than their academic major. Individuals usually do not select and enter careers in which their self-efficacy is lower than average [9]. However, the study discovered that all participants needed to enter an industry in which they had no experience. All sought public health, social work, and psychological counselling services-related employment opportunities but none of them were successful. Environmental elements strongly impacted their career decisions, more than human behaviors and personal factors. External environmental and ecological barriers in society can influence the career decision making of

individuals [16]. One of the most significant contextual barriers to career decisions was the limited public health, social work, and psychological counselling services-related positions in the region. The researcher was interested in understanding whether the outcome expectations of participants would also influence their career decisions, as in another study [14]. Although outcome expectations were considered a lower priority in the current study, several of the participants applied part of their public health, social work, and psychological counselling services skills in their workplace.

Second, it was surprising that almost all were working in the hospitality and service management industry, particularly the field of hotel management. Although there are also other industries, such as small business, government, transportation, and even finance, most decided to enter the hospitality and service management industry. Based on sharing from the participants, most were influenced by their social peers, classmates, family members, and the social situation. In line with SCCT [9,14], it was clear that modelling was one of the most important elements impacting individuals' career decisions and development out of the external and environmental factors. For example, Participant#2 said that most of her friends and classmates were able to achieve promotion to a reasonable position after their graduation due to the growing hospitality and service management industry, saying "regardless of my major, as long as I am willing to work in service management, I can work and potentially … career promotion and advancement … " In the current situation, external and environmental factors highly influenced how individuals selected their careers and their career development, regardless of their university major and background [22].

Third, other evidence to supporting the importance of external and environmental factors came from the influence of families and cousins. Families' and cousins' recommendations are the strongest factors influencing individuals' career decisions and development, particularly for individuals with a South Korean background. SCCT [9,14] asserts that individuals are influenced by external and environmental factors differently. In this case, individuals tended to be significantly influenced by external and environmental factors. For example, Participant#7 indicated that his cousin transferred his CV. Also, Participant#9 indicated that as there were no openings in her profession, she used her cousin's connections to get her first full-time employment. SCCT argues that individuals' social background, social consideration, and the current social environment always influence individuals' career decisions and development [9,13,14]. In this case, although the participants gained essential skills and abilities from their university education and training, they tended to enter and start their career and its development based on external and environmental factors [21].

Fourth, some claimed that they did not have the practical skills and understanding to establish a center with limited resources [21]. Unlike in other countries and cities, recent graduates usually do not have enough resources. Therefore, graduates with limited resources usually cannot afford the operating costs. Furthermore, some explained that the university curriculum did not offer any training in establishing a center. Therefore, self-efficacy [36] and personal intention [24] were low. As a result, most were influenced by external and environmental factors as their surrounding society and environment always encouraged them to follow social expectations and trends [9,13,14].

In short, individuals' career decisions and career development may be explored and described using SCCT [9,13,14] with personal factors (i.e., personal beliefs, biological elements), human behaviors, and external environmental elements (i.e., social movement, and society) as the key elements. In the case of public health, social work, and psychological counselling services university graduates, most were highly influenced by external and environmental factors due to South Korean cultural expectations and limited career opportunities. Unlike other countries and cities with reasonable rental fees, space, and career opportunities, South Korea does not provide additional support and opportunities for graduates to exercise their skills and practices with limited resources, regardless of their majors and skills, particularly for overseas graduates. Therefore, regardless of university majors and skills, most of the participants in this case expressed that their only employment opportunities after university graduation were in the hospitality and service management industry [1].

5. Limitations, Future Research Directions, and Conclusion

5.1. Limitations and Future Research Directions

Some may argue that the number of participants was too small. However, the in-depth and two-round interview sessions were used to overcome this limitation. First, this study employed the Interpretative Phenomenological Analysis methodology to capture in-depth understanding, lived stories, and sharing from the participants. The research study tended to capture how individuals made sense of and understood their social world. Thus, the results of this research study allowed a rich and detailed understanding of the background of the social problem.

Second, some may argue that the background of the participants was limited to the fields of public health, social work, and psychological counselling services. Each research study needs to focus on a group with a focused direction. Therefore, future research studies and projects may expand the current research to additional groups of people, such as medical professionals. As social problems, limited career opportunities, and human resource shortages may influence all industries and businesses as a general problem in South Korea, larger and wider studies and projects would be beneficial to all residents and government leaders.

Third, this research provides a blueprint to government leaders, human resource managers, school administrators, policymakers, university curriculum heads, and general residents for a background understanding of the shortages in the fields of public health, social work, and psychological counselling services in South Korea. This research study gathered feedback and sharing from a group of public health, social work, and psychological counselling services graduates who needed to enter other industries due to the limited career opportunities in the region. Such feedback and sharing should be an indicator to all government leaders to reconsider the region's social policy and management for the coming fiscal years. Therefore, interested researchers and government leaders should take this research study as a starting point for redesigning the social policy regarding the public health, social work, and psychological counselling services industries and related small organizations and companies in the region.

Fourth, countries, cities, and regions with similar situations may use this research to polish their current social policies and activities [1]. The situation in South Korea is extreme and hard to solve due to the chaotic management of the last few decades. Government leaders, policymakers, and human resource managers should have acted to improve the situation before this point.

5.2. Conclusions

This study discovered three critical social situations in South Korea. First, South Korean society is unique to other similar countries and cities internationally. Unlike in other larger countries and cities, limited career opportunities, lands, and industries always prohibit skilled professionals from excelling in their areas of interest and skill based on their university majors and training. A large number of residents in South Korea are employees in the hospitality and service management industry. Although the government has established plans and agendas for additional industries and small businesses, most of the residents do not intend to start their businesses due to limited knowledge and environmental factors [1].

Second, the participants in this study tended to be influenced by external and environmental factors, in accordance with SCCT [9]. The results indicated that all had low levels of self-efficacy and confidence about starting their centers due to the social environment and expectations. Therefore, although most of the participants had the passion to start their own businesses in the fields of public health, social work, and psychological counselling services, most tended to enter the hospitality and service management industry based on social influences either from society or their peers.

Third, South Korea should spend additional resources on and give more consideration to industries and small businesses other than the hospitality and service management industry. Although the revenue and tax incomes of South Korea highly rely on the hospitality industry, the government should

not neglect the development and promotion of other industries, such as public health, social work, and psychological counselling services, and even medical tourism [8].

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Article

The Future of Careers at the Intersection of Climate Change and Public Health: What Can Job Postings and an Employer Survey Tell Us?

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Abstract: Climate change is acknowledged to be a major risk to public health. Skills and competencies related to climate change are becoming a part of the curriculum at schools of public health and are now a competency required by schools in Europe and Australia. However, it is unclear whether graduates of public health programs focusing on climate change are in demand in the current job market. The authors analyzed current job postings, 16 years worth of job postings on a public health job board, and survey responses from prospective employers. The current job market appears small but there is evidence from job postings that it may be growing, and 91.7% of survey respondents believe the need for public health professionals with training in climate change may grow in the next 5–10 years. Current employers value skills/competencies such as the knowledge of climate mitigation/adaptation, climate-health justice, direct/indirect and downstream effects of climate on health, health impact assessment, risk assessment, pollution-health consequences and causes, Geographic Information System (GIS) mapping, communication/writing, finance/economics, policy analysis, systems thinking, and interdisciplinary understanding. Ensuring that competencies align with current and future needs is a key aspect of curriculum development. At the same time, we recognize that while we attempt to predict future workforce needs with historical data or surveys, the disruptive reality created by climate change cannot be modeled from prior trends, and we must therefore adopt new paradigms of education for the emerging future.

Keywords: climate change; health workforce; workforce planning; competencies; public health education

1. Introduction

Climate change is acknowledged to be a major threat to public health [1,2]. Just as public health practice must constantly adapt to emerging viral outbreaks, non-communicable diseases, or other health threats, it must also be prepared for the diverse threats to human health posed by climate change. Several reports and large-scale commissions [3–10] point to the need for training for the health workforce, including the public health workforce, in skills and content to help lead efforts to mitigate and manage the impacts of climate change on health.

A 2008 report by the Association of Schools and Programs of Public Health (ASPPH) mentioned climate change as a key, new area of public health education [11]. The 2016 Council on Education

in Public Health (CEPH) competencies for public health education include areas of focus, which allow public health professionals to protect human health from climate change impacts, such as analyzing data, discussing structural bias, assessing "population needs, assets and capacities that affect communities' health" and "applying systems thinking" [12].

Many competencies required for environmental health science students, such as "approaches for assessing, preventing and controlling environmental hazards that pose risks to human health and safety" [13] are applicable to climate change. However, knowledge of climate change specifically is not yet a core competency of public health degrees in the United States. New initiatives exist, such as the Global Consortium on Climate and Health Education, which now has 193 members [14] and recently proposed a set of Core Climate and Health Competencies for Health Professionals [15]. Additionally, the Association of Schools of Public Health in the European Region (ASPHER)'s 2018 Competencies does list climate change as a competency within "Population Health and Its Material-Physical, Radiological, Chemical and Biological-Environmental Determinants" [16] and the Council of Academic Public Health Institutions Australia (CAPHIA)'s Foundation Competencies for Public Health Graduates in Australia include "identify and describe the impacts of climate change and implications for ecologically sustainable development" and "climate change theory" [17].

To further identify existing research on the skills, competencies, and job market for individuals with training in both public health and climate change, we conducted a brief narrative review of the literature, primarily focusing on a keyword search of Google Scholar of "climate change" AND "public health" AND "workforce", which yielded 28,100 results, and "climate change" AND "public health" AND "jobs", which yielded 86,000 results; we also conducted a search of Pubmed.com for "public health education" AND ("climate change" OR "global warming"). Inclusion criteria included a focus on expected hiring needs for professionals with training in both climate change and public health. Articles that did not include information related to issues with workforce or training needs were excluded.

To identify competencies needed in a future workforce, and to ensure training aligns with labor market demand, it is accepted practice to rely on input from public health employers and organizations. Many ASPPH competencies are based on "blue ribbon panels" of employers [18], as are the Core Competencies for Public Health Professionals developed by the Council on Linkages Between Academia and Public Health Practice [19]. Similar employer input is needed to understand which skills current employers expect of public health graduates with respect to climate change. While employer surveys have been conducted in several public health workforce research articles [20–25], analysis of job postings-a potential key indicator of current employer requirements-has only rarely been used in the public health field [26–28]; this, combined with a survey of employers, can provide a fuller labor market analysis than has been conducted in the past.

Through our analyses, we can attempt to estimate current and future hiring trends for public health professionals with training in climate change-related competencies, as well as continue to identify the training needed to help address the threat of climate change. For those institutions creating new training programs focusing on both climate change and public health, it will be important to assess whether their graduates will be in demand in the labor market, and if so, which sectors are most interested in hiring candidates with these skills. We attempt to address the questions: Which employers currently seek graduates with training in both climate change and public health; and is the demand for such graduates likely to grow?

2. Materials and Methods

In order to best discern whether there is a growing need for professionals with a combination of training in both public health and climate change, the researchers conducted an analysis of current job postings; and to create projections into the future, we conducted an analysis of 16 years worth of job postings in a public health job board. Finally, we conducted a survey of potential employers of public

health graduates focusing on climate change to ask for their projections of the skills needed for this future workforce.

2.1. Data Sources

2.1.1. Analysis of Current Job Postings on Indeed.com (Job Board Aggregator)

In order to determine what types of organizations are currently hiring candidates in the USA with a combination of skills or experience in both public health and climate change, on 14 December 2019, the authors conducted a search of Indeed.com, a job board aggregator, which "crawls" multiple job posting websites to gather millions of job postings into one, searchable database [29]. The rationale for searching Indeed.com is that job postings on the site are pulled from a broad range of thousands of job posting sites (including organizations' job sites as well as job boards), providing a snapshot of any jobs—not only within traditional public health organizations—that include a combination of relevant keywords, allowing an assessment of the scope of the existing job market and whether current jobs fit the training of public health graduates. Indeed.com allows for Boolean search operators. The authors searched for jobs with the following keywords: ("climate change" OR "global warming") AND ("public health" OR "environmental health" OR epidemiology OR "health policy"). A total of 172 jobs were found on Indeed.com; duplicates were removed, for a total of 159 positions. We then conducted a "scrape" (download) of the results using a commercially available web scraping tool called Scrapestorm [30], to identify the industries/sectors of the jobs with this combination of phrases. The Indeed.com main site primarily identifies jobs in the United States.

The resulting Excel file of organizations, job titles and descriptions, were then analyzed using the National Cancer Institute's SOCcer (Standardized Occupation Coding for Computer-assisted Epidemiological Research) system [31], "a publicly available application that was developed to assist epidemiological researchers incorporate occupational risk into their studies", to create Standard Occupational Classification [32] codes for the downloaded search results; those results with a lower degree of certainty in the automated coding system were hand-coded by the authors.

The industries/sectors of the employer organizations were also hand-coded, using a taxonomy in alignment with the new ASPPH employment outcomes data collection [33]. For context, an Indeed.com search of only the keywords "climate change" OR "global warming" conducted on December 19, 2019, found 2423 results. Thus, approximately 6.6% of the search results on Indeed.com related to climate change have an overlap with public health (159 of 2423). An Indeed.com search for ("public health" OR "environmental health" OR epidemiology OR "health policy") on 27 December 2019, found 37,490 jobs, so approximately 0.4% of public health-related jobs also mentioned climate change or global warming.

2.1.2. Analysis of 16 Years Worth of Job Postings on Publichealthjobs.org

The authors were provided access to 32,093 job postings posted into the free job board managed by ASPPH, publichealthjobs.org (previously publichealthjobs.net) dating from 17 July 2003–23 April 2019 [34]. This job board is frequently used by public health employers; it receives approximately 8.16% of all Internet traffic for the search terms "public health jobs" [35] and has been used for other analysis [26]. Of the 30,991 job postings for which the geographic location was known, 11.2% were from countries outside the United States. Unlike Indeed.com, which searches for job postings across numerous job posting websites throughout the Internet, the Publichealthjobs.org website requires employers to manually post their positions into the site, creating a self-selecting group of job postings that are specific to public health. The job description and requirements sections of the job postings were searched for the keywords "climate change" OR "global warming". Duplicates were removed. An analysis of the proportion of all postings that included either of the target phrases was conducted on a year over year basis from 2003 to 2019, using R coding [36].

2.2. Survey of Relevant Employers

In order to assess the views of current employers who are likely to need candidates with training in both public health and climate change, the authors created an online survey using Qualtrics [37]. The survey questions were created through consultation with experts in both climate change and public health education, and included both closed-ended and open-ended questions (see Supplementary Material S1 for survey questions). Questions regarding specific competencies were based on the current curriculum of Columbia University's Climate and Health Certificate program. The survey and outreach methods were approved by the Columbia Human Subjects Review Board. Respondents were identified by the Columbia University Mailman School of Public Health Office of Career Services, which utilized its existing job posting database, a directory of approximately 5900 contactable employers who had posted a job or internship with Columbia University School of Public Health, or otherwise engaged with the career center, since 2012. These records are maintained using a secure vendor software hosted by the GradLeaders [38] company, and are accrued in a variety of ways: career services staff members conduct ongoing, targeted outreach by attending conferences and events such as the American Public Health Association conference, career fairs (including those focused on environment and sustainability), professional association memberships, online directories, leveraging faculty connections, and connecting to recruiters and alumni via LinkedIn.com and other social media platforms. Staff focused employer outreach efforts using input from ongoing surveys of students and engagement with academic departments and student organizations. A subset of 450 employer contacts from the jobs database was identified based on past job postings with keywords such as "climate change", as well as by targeting employers in industries and sectors related to environmental health.

Additional, new contacts were identified by using specific keyword searches on LinkedIn such as: Job Title search for (sustainability OR resilience OR mitigation OR adaptation OR carbon) and the general keywords of "Climate Change" AND "health"; and attempts were made to diversify industries of respondents. This allowed the authors to identify 100 new contacts; of these contacts, 12 were directly contacted via LinkedIn "InMail" messages and 51 by using publicly available information; 37 could not be contacted directly. Twenty-one alumni of the Columbia School of Public Health's Climate Change and Health Certificate program were also surveyed. Three contacts were referred by faculty at Columbia. A total of 537 active contacts were identified from all sources; contacts were primarily based in the USA.

The survey was distributed in January, 2019, with two reminders sent, once in January and once in March, 2019, and the survey was closed on 9 April 2019. Survey respondents were offered an opportunity to win a $50 gift card as an incentive for responding to the survey, and they were also encouraged to forward the survey to others in their network. Ninety seven individuals responded. Ten respondents were excluded because they were current graduate students or postdoctoral researchers, as opposed to professionals employed in the field. In addition, the survey was forwarded to other contacts in many cases, and a link to the survey was also posted on several online discussion boards including the Planetary Health Online Community and Planetary Health Education Subgroup on Hylo [39]. Contrasting the survey recipients with responders, we found that 75 respondents came from our survey outreach and 12 were not on the survey distribution list. Of the 87 respondents, five were US-based international non-governmental organizations, one was a multilateral government organization, one was an international consulting firm, one was a US government agency focusing on global health, and seven were NGOs and corporations based in other countries including China, Mexico, the UK, Kenya, Haiti, and Ecuador. Thus 15 of 87, or 17% of the respondents were international.

A statistical analysis of the responses was conducted. To evaluate the perceived usefulness of skills among employers in the public health field, we designed a mixed version of questions in which the responses are ordinal consisting of seven levels or text. The survey questionnaire comprises fourteen Likert-scale items to assess the usefulness of specific skills; in the later analysis stage we removed the "other" category, so only thirteen were left for the factor construct. We used qualitative methods to analyze the information from the open-ended responses. For the ordinal Likert-scale data,

we first measured the internal consistency of the questionnaire, which was performed using the whole sample with Cronbach's α values reported to be ≥0.60. Then we conducted a frequency description to identify if there was any ceiling effect or floor effect in the data. Finally, we used exploratory factor analysis and confirmatory factor analysis to identify the internal structure of the inventory. The factor analysis [40] is made up of two fundamental stages: (1) estimating the number of factors that should be extracted to represent the variability of the skillsets efficiently and (2) interpreting the meaning of the extracted factors and representing them in terms of theoretical structures that reflect the skillsets dimensions/sub-domains. In the analysis, factor loadings above ±0.40 were retained and listed in Table 4. We also assessed the trend of the annual number of public health job postings mentioning climate change or global warming as a function of year using Poisson regression. The total annual number of jobs was specified as an offset, and cross validation using continuous subsets of the total record was performed to determine if the results are unduly sensitive to a specific year or years. The descriptive and inferential statistical analyses were conducted using SPSS 24.0 [41] and R [36].

3. Results

3.1. Literature Review

Overall, there are many articles on the intersection between "climate change" and "public health," but relatively little on labor market projections. Several articles directly mentioned how public health nurses or health professionals can become involved in climate change response, prevention, adaptation, and mitigation, policy [42], risk management, disaster preparedness, vector-borne diseases, heat-related diseases, the evidence base for climate change adaptation, etc. [8,9,43,44]. One article focused on elements of workforce development including "undergraduate through postgraduate training" in health, professional development of existing workforce, and training of policy-makers [44]. There were three articles on the Australian response to climate change events such as bushfires, extreme heat, and poor air quality, as well as rural health services [5,7,45]. Other articles mention the training needs of governmental public health workers relating to climate change [46], or specific sub-areas of training such as nutrition [47], or the importance of communication [48], or focus generally on why climate change training is needed in public health education [49].

Several articles provided action plans related to climate change and public health, which would require workforce training [50,51]. These examples include diagnosing and investigating health problems and hazards; monitoring health status to identify and solve community health problems; focusing on disaster preparedness [4]; dealing with emerging infectious diseases influenced by climate change [4]; informing, educating, and empowering the public on these issues; evaluating the intervention effectiveness of population-based health services; and monitoring workforce strain due to climate change [52]. Overall, it is difficult to find quantitative public health employment data, but many of the articles mention the importance of training, workforce development, and education to prepare and integrate climate change into public health efforts.

3.1.1. Analysis of Current Job Postings on Indeed.com

The search of job postings from Indeed.com yielded the following distribution by industry:

corporation 32 (20%); nonprofit 76 (47.8%); government 17 (10.7%); and university/academia 34 (21.4%). In terms of occupational codes, the occupations with the largest numbers represented in the data set are listed in Table 1.

It is worth noting that the Standard Occupational Classifications do not include "community organizer", "grassroots activist", or "campaign organizer" as categories, so positions with these titles—the largest single group of positions in the data set—were coded as "Community and Social Service Specialists, All Other". There were a total of 17 faculty positions, 12 within schools of public health, and 5 in environmental or biological sciences. Environmental and occupational health roles—those most likely to be a fit for graduates with a Master's degree in public or environmental health—totaled 14

positions out of 159. Other common occupations included attorneys (primarily at government agencies related to environmental protection as well as legal advocacy nonprofits), public relations and fundraising, sales, and engineering roles. These data suggest that pursuing doctoral-level education, or combining a public health degree with either law or engineering, might best qualify candidates with an interest in both public health and climate change in today's job market, at least in the USA.

Table 1. Most common occupations in Indeed.com postings by the Standard Occupational Classification (SOC) code.

SOC Code	Occupation Title	Number
21-1099	Community and Social Service Specialists, All Other	36
25-1071	Health Specialties Teachers, Postsecondary	12
23-1011	Lawyers	11
19-2041	Environmental Scientists and Specialists, Including Health	9
27-3031	Public Relations Specialists	7
29-9012/29-9011	Occupational Health and Safety Technicians/Specialists	5
41-3099	Sales Representatives, Services, All Other	5
25-1053	Environmental Science Teachers, Postsecondary	5
19-3041	Sociologists	4
17-3029	Engineering Technicians, Except Drafters, All Other	4
11-1021	General and Operations Managers	4

3.1.2. Analysis of 16 Years Worth of Job Postings on Publichealthjobs.org

The proportion of the 32,093 jobs from publichealthjobs.org from July 2003–April 2019, which mention either "climate change" or "global warming" consistently was a very small percentage of the total, but the percentage increased over this time period ($p < 0.0001$, Poisson regression). Cross validation found this trend to be positive and statistically significant for all 12-year or longer continuous subset time periods. The data can be seen in Table 2 and is illustrated in Figure 1.

We can observe that a salient change occurred over time on jobs related to climate change from Table 2. Overall, the total number of jobs increased since 2006, and the variability remained stable since then.

Table 2. Analysis of Data from Publichealthjobs.org/.net from 2003–2019.

Year	Total N Job Postings	Number of Jobs Mentioning "Climate Change"	Percentage
2003	116	0	0%
2004	899	0	0%
2005	998	0	0%
2006	1307	0	0%
2007	2006	1	0.05%
2008	2080	7	0.34%
2009	2044	5	0.24%
2010	2323	4	0.17%
2011	2095	1	0.05%
2012	2236	6	0.27%
2013	2236	4	0.18%
2014	2780	11	0.40%
2015	3213	12	0.37%
2016	2232	10	0.45%
2017	2041	6	0.29%
2018	2903	12	0.41%
2019	584	8	1.37%

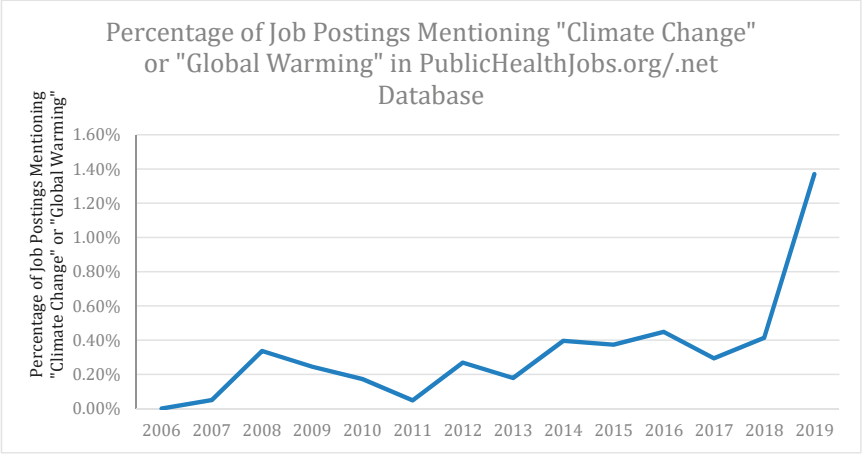

Figure 1. Percent of job postings mentioning "Climate Change" or "Global Warming" in the PublicHealthJobs.org database.

3.1.3. Survey of Relevant Employers

As is often the case with surveys, the survey responders did not fully reflect the recipient population. In particular, government agencies and universities responded at a higher rate than the survey recipient population, while corporations, hospitals, and nonprofits responded at a lower rate (see Table 3). Comparing the survey recipients and respondents with those organizations that were actively posting positions in Indeed.com related to both climate change and public health, we can see that the populations were not quite the same; the Indeed.com search found a comparable percentage of corporations, a higher percentage of universities and nonprofits, and a lower percentage of government agency positions in comparison with the survey recipients and responses. Therefore, it is difficult to determine whether the survey is an accurate representation of the organizations currently hiring public health graduates.

Table 3. Survey recipients vs. responders vs. Indeed.com postings.

	Survey Recipients		Survey Responders		Indeed.Com Job Postings	
	Number	Percent	Number	Percent	Number	Percent
Corporation	194	36.13%	21	24.14%	32	20%
University	43	8.01%	9	10.34%	34	21.40%
Government	113	21.04%	32	36.78%	17	10.70%
Hospital	10	1.86%	1	1.15%	0	0
Nonprofit	172	32.03%	23	26.44%	76	47.80%
Unknown	5	0.93%	1	1.15%	0	0.00%

With this limitation in mind, we might still gather some conclusions. Fifty of Seventy three (68.5%) of the responders who answered the question, "Has your organization hired people with a Master of Public Health or PhD in Public Health in the past" responded "yes". Eighty six individuals responded to the question, "Do you expect the need to hire people with a background in climate and public health to grow in your organization in the next 5–10 years?" and of these, 33 indicated "yes", 34 "maybe", 6 "no", and 13 "don't know". Excluding the "don't know" responders, we could determine that 91.7% of respondents believed that there might be a need for public health and climate change-trained individuals in their organizations in the future.

In addition, an analysis of the thirteen-item Likert scale questions regarding skills, which would be useful to the employer organization, was conducted. See the frequency of responses in Figure 2.

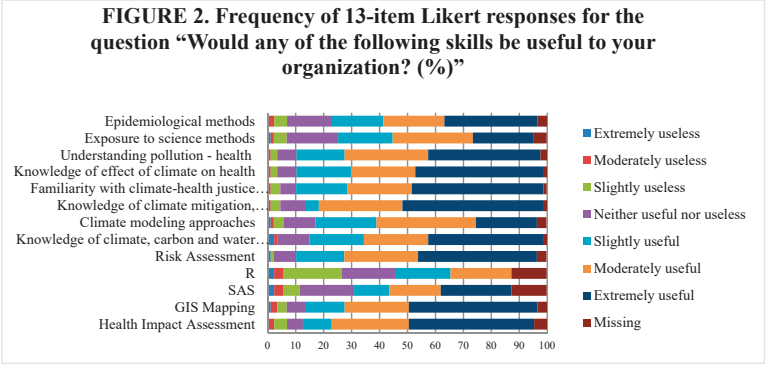

Figure 2. Frequency of 13-item Likert responses for the question "Would any of the following skills be useful to your organization?" (%). R and SAS refer to statistical analysis software.

To standardize the questionnaire data, we considered the numeric data and text data separately. For numeric data, we found that the 13-item Likert scale response shows a high internal consistency of 0.879, which is described by Cronbach's alpha. From Figure 2, it is shown that no ceiling effect or significant floor effect was detected, suggesting it should be well-qualified as a valid measure of skill outcomes for public health employers.

A three-factor solution (all loadings ≥0.40) showed the best model fit to the survey data set. The Scree plot of the final exploratory factor analysis (EFA) solution is shown in Figure 3; we can observe that the eigenvalues of the model dropped below 1.0 when the component number reached 4, which is acknowledged as the rule of thumb cut-off point in deciding the internal structure. Thus, we set our final internal structure as a 3-factor EFA solution; this solution explained 70.16% variance by these three extracted factors and represents 13 items selected from the scale (only Likert Scale questions were included; text question and the "other" category question were filtered). In Table 4, all factor loadings were within the range of 0.456–0.928.

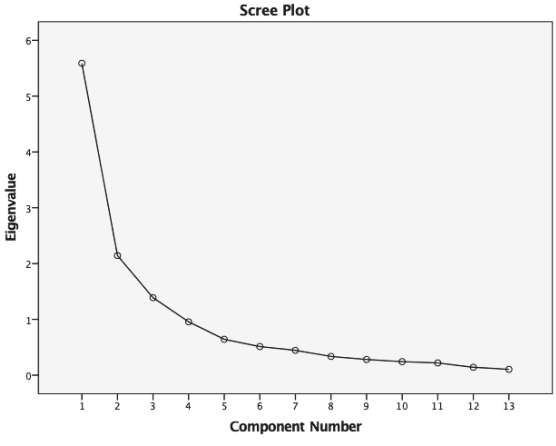

Figure 3. Scree plot of the final exploratory factor analysis (EFA) solution (three factors on 13 items).

Table 4. Pattern matrix of the EFA solution (three factors, 13 items).

	Item	Factor		
		1	2	3
1	Health Impact Assessment	0.820		
2	GIS Mapping	0.607		
3	SAS			0.810
4	R			0.890
5	Risk Assessment	0.456		
6	Knowledge of climate, carbon and water cycles		0.928	
7	Familiarity with climate modeling approaches		0.885	
8	Knowledge of climate mitigation, adaptation and climate-health co-benefits		0.850	
9	Familiarity with climate-health justice issues	0.507	0.686	
10	Knowledge of direct, indirect and downstream effects of climate on health	0.655	0.501	
11	Understanding pollution-health consequences, causes and sources	0.791		
12	Exposure to science methods	0.772		
13	Epidemiological methods	0.645		
	Rotation converged in 6 iterations.			
	Extraction Method: Principal Component Analysis.			
	Rotation Method: Varimax with Kaiser Normalization.			

Only two items had a cross-loading on more than one item with loadings >0.50 (Item 9 and Item 10), and we followed guidelines and discarded them in the final model. As shown in Table 4, the proposed model structure includes three dimensions and 13 items.

After the psychometric validation, we finalized the model with a 3-factor structure, with 11 items, and labeled them according to the theoretical context of each question. The first category was labeled as Population Health Exposure, included six items covering a range from population health analytical skills to general understanding of research methods, and also had a strong consistency of 0.83 (Table 5). The second category, in particular, targeted at the Climate-Related Knowledge and its intercorrelation with health status, showed a high consistency of around 0.9. The final category separates two Statistical Programming Language skills from other concrete skills, and included the two most popular statistical programming tools, R and SAS, which also retained a Cronbach's alpha value of 0.76.

Table 5. Pattern matrix of the EFA solution (three factors, 13 items).

		Factor		
	Item Would Any of the Following Skills be Useful to Your Organization? (%)	**Population Health Exposure**	**Climate-Related Knowledge**	**Statistical Programming Language**
1	Health Impact Assessment	0.820		
2	GIS Mapping	0.684		
3	SAS			0.829
4	R			0.914
5	Risk Assessment	0.534		
6	Knowledge of climate, carbon and water cycles		0.941	
7	Familiarity with climate modeling approaches		0.900	
8	Knowledge of climate mitigation, adaptation and climate-health co-benefits		0.838	
9	Understanding pollution-health consequences, causes and sources	0.776		
10	Exposure to science methods	0.799		
11	Epidemiological methods	0.666		
	Cronbach's α	0.832	0.897	0.761
	Rotation converged in 5 iterations.			
	Extraction Method: Principal Component Analysis.			

The weighted sum score is calculated by using the weighted variance percentage, ranges from −1.34 to 0.63.

Open-ended comments in response to the question "What expertise or skills do you think will be needed to address the issue of climate change and human health in the next 10–20 years?" were coded using qualitative analysis methods, using categories identified by two of the authors (one with a background in higher education career services and the other with training in environmental health), and were independently coded by two research assistants to improve inter-rater reliability. Themes that emerged are listed in Table 6. Example quotes are included in Supplementary Material S2.

Table 6. Open-ended survey responses.

Skill	Number of Respondents Mentioning This Item
Communication/writing skills	19
Climate change knowledge	17
Public health expertise/training	17
Financing/Budgeting/Economic evaluation	13
Policy expertise/thinking	12
Critical thinking/Logical thinking/Systems thinking	12
Ecological/Agricultural/Geological/Environmental knowledge	11
Resilience and adaptation: Cross disciplinary understanding	9
Analytical skills	7
Marketing/Promoting/Advocacy	6

Survey question: "What expertise or skills do you think will be needed to address the issue of climate change and human health in the next 10–20 years?" (open-ended responses, coded).

4. Discussion

The current state of the job market for public health graduates with training in climate change can be described as "emerging". From the Indeed.com job description data analysis, we can see there are relatively few roles—even in search results from a broad-based job board with keywords focusing on public health and climate change—currently available for a graduate with a master's level public health degree and a focus in climate change. Notwithstanding, it is likely that graduates would benefit from training in climate change-related competencies, even if the overt focus of their job is not directly related to climate change. Additionally, resonating with Wals, Corocoran, and others who frame educational institutions as change leaders, graduates with training in both climate change and public health can influence their institutions from within, to create systemic change in grappling with global warming.

The analysis of publichealthjobs.org data seemed to show that while jobs within public health that mention climate change or global warming were a very small proportion of the total, the fraction of such job postings had shown a statistically significant ($p < 0.0001$) increase over the last 16 years. This trend should be monitored by those involved in public health education and career placement of public health graduates, bearing in mind that while prior trends are often used to predict the future, they are not always the best indicator of future trends in a quickly changing world.

While "approaches for assessing, preventing and controlling environmental hazards that pose risks to human health and safety" [13] is not yet a core competency of public health degrees in the United States, the employer survey indicates that a large majority of respondents believe that there may be a growing need for graduates with training in climate change and health. The survey indicates that key skills include knowledge of climate mitigation, health equity and climate justice, an understanding of "downstream" effects of climate change, risk assessment, and technical skills in statistics, GIS mapping, and the carbon cycle. Comments from the responders indicate key themes focusing on these areas as well as communication (especially persuasive communication), finance/budgeting, cross-disciplinary collaboration and systems thinking, analytical skills, and an understanding of climate impacts on mental health, which resonate with Frankson et al.'s [53]. One Health Competency Domains including management, communication and informatics, values and ethics, leadership, team and collaboration, roles and responsibilities, and systems thinking. These skills also appear to be in alignment with

the competencies proposed by ASPHER, CAPHIA, and the Global Consortium on Climate and Health Education.

Importantly, the scope and framing of this study focused primarily on the role of educational institutions in preparing graduates to solve the problems of today, and to meet the demands of today's employers. Universities, however, not only provide education, produce research, and perform service to their communities; in addition, "higher education can play a pivotal role in turning society toward sustainability" [54]. This is an especially essential role in the face of massive and unpredictable global issues such as climate change. Universities create innovation, and can use their often privileged place in society to advocate for a sustainable future and to equip all of their graduates with understanding of their own environmental impact, both in the personal lives and in their careers. The challenges of climate change are profound enough to require an epistemological change; "sustainability is not just another issue to be added to an overcrowded curriculum, but a gateway to a different view of curriculum, of pedagogy, of organizational change, of policy and particularly of ethos" [54]. Additionally, following Scharmer's Theory U, we note that knowledge itself is not in short supply; instead, there is a "knowing-doing gap: a disconnect between our collective consciousness and our collective action" and our entire "mental and social operating system" must be upgraded from "ego-awareness to eco-awareness" [55]. Therefore, while this article focused on historical trends and current and near-term workforce needs to attempt to predict, shape, and model the need for public health students with training in climate change, the disruptive reality created by climate change likely cannot be modeled through such methods. Education should therefore help graduates develop new capacities, allowing them to deal with disruptions and lead a transformational change. The issues of sustainability are so far-reaching that it can be argued that educational institutions must reframe their full mission, using sustainability as their foundation.

Limtations

There are several limitations to the analysis. Indeed.com may not capture all jobs; some jobs are never posted; and the US-focused part of the site was the only section of the site analyzed. A re-examination of these findings over a longer period of time would be helpful. The publichealthjobs.org database has a self-selection bias towards employers specifically recruiting for public health, though this is part of the reason this database was selected for analysis; and the number of job postings mentioning climate change or global warming was sparse, but is useful in indicating trends over time. The employer survey was distributed to a convenience sample of employers, with certain industries/sectors overrepresented and with a likely bias towards those in the United States (especially those based near New York City). While the response rate of 14% appears to be low, it is comparable with other employer surveys in the public health field, where studies have included rates as low as 13.4% [20] and 19.5% [23]. It is important to note, as those in public health have observed from responses to crises such as Ebola and Zika outbreaks [56], funding—and thus the need to use this funding to quickly hire highly trained public health professionals—can change quickly, if and when current events or policy priorities shift. Thus, prior trends (such as a 16 year retrospective analysis of job postings) cannot be assumed to be an accurate indicator of future job market growth. Finally, there is a need for further research in this area; competencies required for tackling climate change also require students and employers to identify and adapt to uncertainty and change, and universities have a special role to play in creating transformative change and disruption using their own critical analyses.

5. Conclusions

Climate change is a growing threat to human health. While the current job market for candidates with training in both climate change and public health is relatively small, it appears to be growing; and it is likely that training in climate change competencies will increasingly benefit a range of public health organizations as climate change impacts continue to grow. Schools of public health can incorporate the skills and competencies related to climate change into their curricula and consider making them an

integral/foundational part of the curriculum, if such training is not yet currently required. Employers, too, may benefit by taking note of the special intersection of skills and competencies offered by public health graduates with training in climate change-related issues. Graduates with such training can bring their paradigm-shifting lens to the work they do within any public health-related organization. Future research, including analyzing job postings, graduate employment outcomes, labor market projections, and employer surveys, could benefit curriculum development for educational institutions in countries around the world, and educational institutions could also remain at the forefront of the paradigm-shifting change that impacts the future public health workforce. By listening to the voices of current employers and assessing labor market trends, while also taking a wider view regarding the role of educational institutions in creating a sustainable world, these institutions can develop the skills and mindset needed to protect the public's health from emerging challenges such as climate change.

Supplementary Materials: The following are available online at http://www.mdpi.com/1660-4601/17/4/1310/s1, Supplementary Material S1: Survey Questions: Climate and Health Jobs of the Future Survey; Supplementary Material S2: Example Quotes from Employer Survey.

Author Contributions: H.K.—conceptualization; conceived of the article, co-designed the survey, identified survey recipients, distributed the survey, contributed to qualitative analysis, gathered job postings data, coded the data, gathered labor market projections, and wrote and edited the article. J.S.—co-designed the survey, contributed to research design, edited the article. K.C.—contributed to article editing, research framing. S.K.—conducted literature review, coded/validated qualitative data. S.J.—coded/validated qualitative data, analyzed job postings data in R, conducted statistical analysis in SPSS and R. H.M.-assisted with coding/analyzing the survey responses, managed IRB process. J.K.—contributed to research design and editing. All authors have read and agreed to the published version of the manuscript.

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Article

Readiness of Allied Professionals to Join the Mental Health Workforce: A Qualitative Evaluation of Trained Lay Trauma Counsellors' Experiences When Refugee Youth Disclose Suicidal Ideation

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Abstract: The recent refugee crisis presented a huge challenge for the Swedish mental health workforce. Hence, innovative mental health workforce solutions were needed. Unaccompanied refugee minors (URM) are a particularly vulnerable refugee group. Teaching Recovery Techniques (TRT) was introduced as a community-based intervention utilising trained lay counsellors in a stepped model of care for refugee youth experiencing trauma symptoms. Professionals (e.g., teachers, social workers) can deliver the Cognitive Behavioural Therapy-based intervention after a brief training. A point of debate in this workforce solution is the readiness of trained lay counsellors to deal with potentially demanding situations like disclosure of suicidal ideation. This study aimed to explore the TRT trained lay counsellors' experiences of procedures upon URM's disclosure of suicidal ideation. Individual semi-structured interviews with TRT trained lay counsellors were conducted, then analysed using systemic text condensation. The analysis revealed four themes: "Importance of safety structures", "Collaboration is key", "Let sleeping dogs lie" and "Going the extra mile". Dealing with suicidal ideation is challenging and feelings of helplessness occur. Adding adequate supervision and specific training on suicidal ideation using role play is recommended. Collaboration between agencies and key stakeholders is essential when targeting refugee mental health in a stepped care model.

Keywords: workforce solution; mental health workforce; trained lay counsellors; unaccompanied refugee minors; teaching recovery techniques; cognitive behaviour therapy; group intervention; stepped care model

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1. Introduction

In 2016, Europe faced the largest single influx of refugees since World War II. This put a high demand on European countries to re-examine and find new sustainable solutions in various aspects of society, including the health care system. In Sweden, the country in the European Union with the highest number of asylum seekers per capita [1], the mental health service gap for this vulnerable group became evident. A substantial group of refugees were unaccompanied refugee minors (URM) [2], who still remain in Sweden. They have been described as the most vulnerable refugee group [3]. It has been formally acknowledged by the Swedish Social Services that existing psychiatric services do not meet the needs of this population, and an innovative mental health workforce solution is required to bridge the service gap [4].

1.1. Population Need

Numerous refugee children have been exposed to traumatic events like violence, threat, and separation in their country of origin and during migration [5]. URM, however, have a higher prevalence of traumatic events, such as torture, sexual abuse and kidnapping, compared to children fleeing with caregivers [6]. URM face the uncertainties of a complex asylum-seeking process and the stress of resettlement and acculturation hassles without the support of their caregivers [5,7]. Subsequently, trauma-related mental health problems, such as post-traumatic stress disorder (PTSD), depression, and anxiety, are particularly common among URM [8]. A recent study from Sweden [9] showed that 76% screened positive for PTSD, and a Norwegian study concluded that 43% met the criteria for a psychiatric diagnosis shortly after arriving at the host country [10]. Longitudinal studies confirm that these mental health problems are long-lasting [11,12]. PTSD diagnosis is associated with suicidality and this association is even stronger when there is comorbid depression. In Sweden, the rate of completed suicides among URM is almost 10 times higher compared to Swedish residents the same age [13]. A majority of URM live at residential homes, in absence of parents in the country, and are appointed a legal guardian. Immigration statistics indicate that the majority of URM who sought asylum in Sweden in 2015 were boys (86%) mainly from Afghanistan, Syria, Somalia and Eritrea between the ages of 13–17 [14].

1.2. Introducing a Stepped Care Model

A potential solution to bridge the mental health service gap is to bring allied professionals, such as teachers, nurses or social workers, into the mental health workforce, acting as a "first line of defence" in a stepped care model. Stepped care is a system of delivering and monitoring treatments. Patients start with an evidence-based treatment of low intensity as a first step and those who do not respond adequately "step up" to a subsequent treatment of higher intensity [15].

In 2016, Teaching Recovery Techniques (TRT) was introduced to Sweden. TRT is a Trauma-Focused Cognitive Behavioural Therapy (TF-CBT) manualised group intervention aimed towards children and adolescents with symptoms of PTSD [16]. It was designed to meet the needs of low-resource and community settings. TRT comprises two sessions for caregivers and five sessions for youth and includes the following components: psychoeducation, affective modulation skills, cognitive coping and processing, in vivo mastery of trauma reminders, guided exposure and exploring plans and hopes for the future. The first two sessions focus on intrusion, the third on arousal and the final two sessions deal with exposure. Among others, techniques like positive self-talk, dual attention and relaxation are used. The focus is on symptoms and tools rather than trauma narrative and processing. In addition, normalisation of trauma symptoms in the group environment is assumed to relieve youth from shame and fear, whereas the safe environment provided by caring adults is geared to rebuild youth's trust in the adult world and provide social support. TRT in Sweden is delivered once a week during a seven-week period and two TRT facilitators co-host each session [17]. In Sweden, an introductory "getting to know each other session" prior to the core TRT sessions and a consolidating session at the end have been added. The purpose of the intervention and a brief overview of the content is discussed in the introductory session to help set expectations for the intervention. It is during this session that the TRT facilitators introduce themselves but there is no specific guidance upon how to do this. However, the importance of creating a safe environment in the group is stressed. When URM in Sweden were asked to describe their experience with the TRT intervention in a qualitative study the following six categories were revealed: social support, normalisation, valuable tools, comprehensibility, manageability and meaningfulness [9].

In order to become a TRT facilitator a three-day training workshop, run by the Swedish non-governmental organisation Children's Rights in Society, is mandatory. Another requirement is that the facilitator meets refugee youth in their professional capacity. Facilitators may be psychologists or counsellors, but also staff with no previous therapeutic experience

or specialist training in psychiatry are eligible to deliver the intervention after the workshop. Hence, some TRT facilitators could be referred to as "TRT trained lay counsellors" as they indeed have training in TRT but lack training in mental health or counselling albeit they might have professional training in other domains, such as teaching, nursing or social work.

Given its brevity (seven weekly sessions), group format and delivery by community professionals, TRT offers several potential economies over individual therapy. Therefore, if a strong evidence base for TRT effectiveness can be presented, it is logical that the intervention would form a valuable component in a stepped care model (see Figure 1). International studies have reported high acceptability and large effect sizes for decrease in symptoms of both depression and PTSD [18,19]. An exploratory trial of TRT with 46 URM in Sweden (mainly male, ages 13–18) showed a significant decrease in reported symptoms of depression and PTSD [9]. There is an ongoing nationwide randomised control trial targeting URM in Sweden to further strengthen the evidence-base; as well as investigating the overall effectiveness, this trail aims to assess effectiveness at the subgroup level [17]. The URM are screened in schools, support groups and at residential homes using the Children's Revised Impact of Events Scale (CRIES-8), where a score of 17 or above indicates high symptom burden and risk of PTSD [20,21] which makes them eligible for TRT.

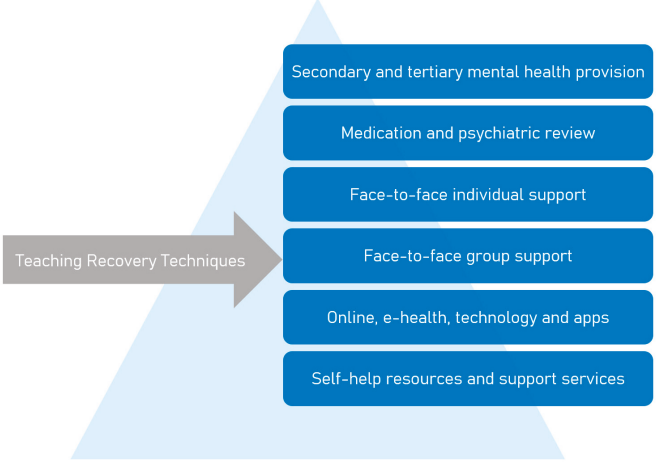

Figure 1. Placement of teaching recovery techniques in a stepped care model for mental health provision.

Yet, a point of debate is the readiness and capability of allied professionals, such as teachers, nurses or social workers, to take on potentially demanding aspects of mental health intervention such as safety processes relating to suicidal ideation. Although a growing number of studies concerning CBT-based PTSD treatments delivered by lay counsellors [22–24] indicate feasibility and short-term effectiveness, there has been little exploration of trained lay counsellors' experiences of safety procedures.

1.3. Safety Aspects and the Potential Vulnerability of TRT Trained Lay Counsellors

Although TRT is not developed for a specialist health care setting, a substantial number of URM within the TRT program report severe, high-risk psychiatric symptoms. A pilot study (N = 55) showed that in addition to posttraumatic stress symptoms, 83% of URM receiving TRT suffered from moderate to severe depression and 48% displayed suicidal ideation or plans [9]. A safety protocol is recommended when dealing with people at risk. Safety protocols may vary depending on location, resources and infrastructure; however, it should clearly state how to assess risk, identify warning signs, implement safety planning techniques and when and how to refer the person at risk [25]. The questionnaires used in

the TRT safety protocol have changed over time, with the Montgomery–Asberg Depression Scale MADRS [26] later replaced with the Patient Health Questionnaire PHQ-9 [27] and the Columbia Suicide Severity Rating Scale Screener, C-SSRS screener [28] introduced as a structured way to discuss suicidal thoughts, yet the overall process has remained the same (see Figure 2).

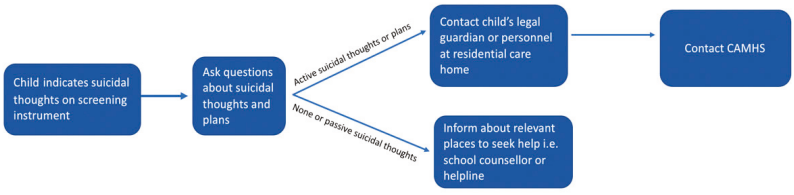

Figure 2. Teaching recovery techniques safety procedure.

Although the TRT facilitators are not expected to do a full suicide risk assessment or to have knowledge about risk factors for suicide, as this responsibility lays within the Child and Adolescent Mental Health Service (CAMHS), they still need to ask potentially difficult questions about suicide and help decide whether the legal guardian should contact CAMHS or not. This may leave the trained lay counsellors, with no formal training in mental health or training on how to address suicidal thoughts, in a vulnerable and potentially risky situation. Although it is important to find new health care solutions to address a need in the community, in this case by task shifting from mental health professionals to allied professionals, it is essential that the personnel are adequately prepared for the task. Previous studies regarding lay counsellors delivering trauma-focused therapy have shown that training and practicing as a lay counsellor can enhance self-esteem and lead to empowerment, whereas others highlighted the particular stress, risk of overinvolvement and even risk of indirect traumatisation lay counsellors face [29–32]. However, these studies are conducted in low-income settings and in some cases the lay counsellors are recruited within the target community of the intervention and were not sufficiently trained. The importance of regular supervision has been raised by lay counsellors working with mental health interventions in previous qualitative studies [23,33].

Dealing with suicidal ideation and conducting suicide risk assessments is a complex and challenging task that even trained mental health personnel struggle with and feel anxious about [34,35]. It is of great importance to learn about the experiences and potential struggles of lay counsellors when they are exposed to someone with suicidal thoughts or plans. This knowledge is crucial to give adequate support and training to the lay counsellors and, ultimately, to ensure the persons signalling suicidal communication are given adequate care.

Hence, the aim of this study was to examine how TRT facilitators, without formal training in mental health or counselling i.e., TRT trained lay counsellors, experience the safety procedure when participating unaccompanied refugee youth disclose suicidal ideation.

2. Methods

2.1. Data Collection

National recruitment of TRT facilitators was conducted through email within the Children's Rights in Society network of operating TRT facilitators (N = 50). The study invitation email explained the purpose of the study and the inclusion criteria: TRT facilitators without therapeutic training or formal education in psychiatry (TRT trained lay counsellors) and who had experienced URM disclosing suicidal ideation during the TRT group session.

Recruitment continued until saturation was reached and no new information was observed in the data. Ten interviews, using an interview guide (Table 1), were conducted using different forms of communication; face to face, via Skype and by phone and varied in length between 35–45 min. Of these ten interviews, two were excluded from analysis.

The first was a pilot interview and the other was excluded since the TRT facilitator had formal training in psychotherapy, contrary to inclusion criteria of no formal mental health training. All interviews were conducted by the first author who is a trained TRT facilitator and a child- and adolescent psychiatrist.

Table 1. Interview guide.

S/N	Questions
1	What motivated you to become a TRT facilitator? Tell me what you remember about your feelings and thoughts during the TRT training.
2	a. What were you enthusiastic about? b. Was there something that intimidated or worried you? c. Anything else?
3	Describe your previous experience of working with depressed or suicidal youth? a. Do you have any experience of suicidal youth outside your work, NGO? b. What about working with refugees?
4	Describe your experience of being a facilitator in TRT working with suicidal youth? a. How did you discover that they had suicidal thoughts? b. What did you do? c. What was helpful for you in your assessment?
5	How did you perceive the safety protocol?
6	How would you describe your experience of collaborating with the legal guardians concerning suicidal youth?
7	How would you describe the collaboration with mental health specialist services regarding suicidal youth? Please exemplify.
8	Do you feel that you had enough knowledge or experience to handle suicidal youth?
9	In your opinion, is there anything that can change within TRT training or program in order to facilitate for group leaders working with suicidal youth?

The included respondents (N = 8; 7 females and 1 male) were from all over Sweden, both rural and urban areas. They included two nurses, five social workers and a child welfare-officer. They had facilitated between 1–10 TRT groups each, with an average of three groups.

2.2. Ethical Considerations

After a pilot interview, it became evident that, although the respondents were interviewed in their professional capacity, which would not normally need ethical clearance according to Swedish legislation, the respondents' disclosure was of such sensitive character that we reconsidered and obtained ethical approval (dnr 2019-01427), excluding the pilot interview from further analyses.

2.3. Data Analysis

All interviews were transcribed verbatim and analysed using Systematic Text Condensation (STC) as described by Malterud [36] (see Figure 3 for a description of the analytic process of STC). STC was chosen for analysis for its descriptive and inductive approach that presents the experiences as described by the participants, rather than searching for underlying meaning. First, all the transcripts were read and re-read by all authors to obtain a full comprehension of each case. This was followed by the process of decontextualisation, in which, recurrent themes regarding the respondents' different experience of dealing with URM who disclosed suicidal thoughts were recognized. Meaning units were then identified and grouped, these were subsequently sorted into categories describing different aspects of the themes. The content of each category was summarized and expressed as a single statement. The analytical text was formulated and quotes illustrating the different

categories were selected. Finally, the results were validated by rereading all eight original transcripts to see whether the themes and code groups had goodness-of-fit.

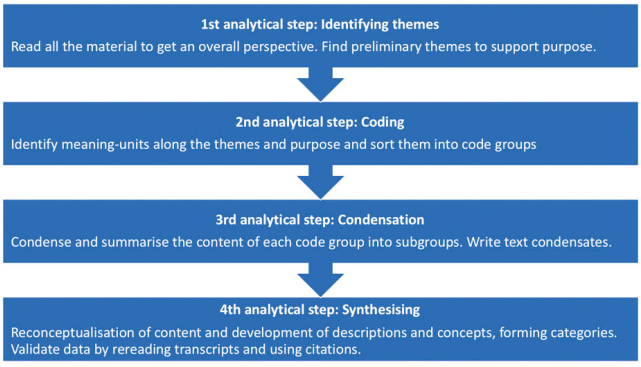

Figure 3. Analytical process of systematic text condensation (STC).

3. Results

Four themes emerged during the analysis. The themes and their corresponding categories are presented in Table 2.

Table 2. Overview of themes and categories.

Themes	Categories
Importance of safety structures	Established safety structures at the workplace Comfort in colleagues Working with the safety protocol
Collaboration is key	Closed doors to child and adolescent mental health services Realising a shared understanding among key persons Navigating the boundaries of responsibility
Let sleeping dogs lie	Readiness to talk about suicide Notion of doing harm
Going the extra mile	Motivated by a structured way of addressing a need Fitting into the chaos

3.1. Theme 1: Importance of Safety Structures

The TRT lay counsellors recognized the significance of having pre-existing routines at the workplace but they also emphasized the importance of finding comfort in a colleague, someone at the workplace in whom they could confide when meeting URM who disclosed suicidal thoughts. Moreover, having established a safety protocol, a step by step guide on what actions to take when a URM discloses suicidal thoughts, was also considered helpful.

3.1.1. Established Safety Routines at the Workplace

TRT lay counsellors working in a medical setting valued the well-defined safety structures and routines that were already established at the workplace. They stated that having a doctor available at the workplace, who was able to do a suicide assessment and refer to mental health services when needed, was very valuable. Although the doctor might not be available the same day as the URM made the disclosure, the mere knowledge that an assessment would be made by someone else was described as a relief. In some workplaces an experienced counsellor was available to assess and have regular individual follow ups with the URM in need. However, the social workers often did not have established safety structures in place as they did not have access to anyone with formal mental health training at their workplace nor did they have established pathways for referral when suicidal ideation was disclosed.

> "I don't feel that we overlook anything. Since we are at a healthcare centre. I feel that we already have a safety informed way of thinking . . . we are prepared to deal with this kind of (pause) [suicidal communication]. We haven't felt scared that something will happen."
>
> (Interview 3)

3.1.2. Comfort in Colleagues

The TRT lay counsellors also emphasised the importance of having a close and trustful relationship with a colleague, either the co-TRT facilitator or someone else at the workplace. When reflecting on features of this colleague the TRT lay counsellor did not attribute formal training in suicide assessments as a prominent feature. Rather, that the colleague was someone the TRT lay counsellor could confide in or someone who expresses confidence in situations dealing with suicidal disclosure.

> "I have learnt so much by facilitating these groups. I don't think I would have wanted to run a group with someone I did not feel secure with. The most important thing is that we know each other and that we can get through this together."
>
> (Interview 3)

The opposite was also highlighted, that not knowing the co-facilitator beforehand and the lack of trust and co-operation between the TRT facilitators was considered particularly stressful when meeting URM who had disclosed suicidal thoughts.

3.1.3. Working with the Safety Protocol

Having a safety protocol was viewed as beneficial when dealing with URM who had disclosed suicidal ideation. TRT lay counsellors explained the safety protocol gave them structure and confidence. However, they also stated the safety protocol did not take into account the complexities involved in asking questions about suicide. They recall that even though they asked the suggested questions regarding suicidal thoughts/plans the answers were not clear, one URM even refused to answer the questions.

> "It felt really good to have a safety protocol, it felt good to have something to lean against. It felt like a backbone. It was something we facilitators talked about beforehand. But in reality, it wasn't as straightforward. There were many factors we couldn't control . . . "
>
> (Interview 4)

The more experienced TRT lay counsellors, who had seen different versions of the safety protocol, implied the earlier versions were too sensitive to suicidal ideation. In fact, one TRT lay counsellor reported that she consciously did not follow the initial protocol as she knew the URM and was not worried about him harming himself although he scored high on the screening.

3.2. Theme 2: Collaboration Is Key

Collaborating with CAMHS and sharing the same understanding about TRT as key persons in the URM's network such as legal guardians and personnel at residential care homes was considered essential when dealing with URM who had disclosed suicidal ideation.

3.2.1. Closed Doors to CAMHS

The TRT lay counsellors' expectations and experiences of collaborating with CAMHS varied. Some reported their previous negative experiences led them to be concerned about this collaboration even before the TRT group started.

> "That was something I thought about even during the training, you know, if we find someone with suicidal thoughts, will CAMHS agree to see them? Or will it just be nothing, limbo? And will I have time to handle it, if it ends in limbo?"
>
> (Interview 1)

A number of TRT lay counsellors reported actual experiences of not receiving the help and care they had needed from CAMHS. There was a sense that CAMHS normalised the URMs' symptoms and suicidal thoughts or did not offer an assessment as urgently as the TRT lay counsellor expected. This left the TRT lay counsellor with a sense of being alone and vulnerable.

> "I felt that we did not get an adequate response [from CAMHS]. They did not take it seriously, like 'this kid has gone through so many horrible things that he is expected to have suicidal thoughts'. They just normalised it and that was not good . . . it just ended there . . . and we were left to take care of it somehow."
>
> (Interview 4)

Although some TRT lay counsellor did not report any specific encounter with CAMHS it was clear they had low expectations of what specialist mental health services could offer. One TRT lay counsellor even recommended the legal guardian to seek help within primary healthcare instead of CAMHS due to prior problems within CAMHS.

> "There have been huge problems with CAMHS in my city . . . it was chaos actually. Enormous waiting lists and on top of that it's my experience that they don't deal with things. So, yes, I have very low expectations."
>
> (Interview 2)

On the other hand, there were also TRT lay counsellors who shared a good experience of collaborating with CAMHS and felt adequately helped by CAMHS.

> "I actually felt like they did a good job, it might take some time . . . But if someone is really unwell it might go faster . . . We had two or three who were in a really bad state and CAMHS agreed to see them."
>
> (Interview 5)

3.2.2. Realising a Shared Understanding among Key Persons

The experiences of collaboration with legal guardians and personnel at residential care homes varied. Some facilitators experienced difficulties in this collaboration, for instance, practical difficulties to get in contact with the legal guardian when the URM had disclosed suicidal intention, which left the TRT lay counsellor with a huge responsibility.

> "Some legal guardians were really good but it did not always work out well. They were difficult to get hold of. Maybe they did not fully understand their role? But some were really engaged. One legal guardian asked if some other teenagers that she knew could join the group. I think they appreciated that we actually did something."
>
> (Interview 6)

Some legal guardians and personnel for residential homes were openly opposed to and critical of TRT, since they felt TRT could potentially be harmful. One TRT lay counsellor mentioned that differences in educational level between the TRT lay counsellors and the personnel for resident care home led to misunderstanding, which was considered an obstacle.

> "Some of the legal guardians had a negative reaction to what we did. Like, okay, now you have had this thing and you are just dumping it all on us. What are we supposed to do with this? We met the same reaction from the ones working at the residential care home. They felt that we stirred up too much among the teenagers and maybe we did? That we caused more harm than good."

(Interview 8)

On the other hand, there are also examples of excellent collaboration where the key persons have been fully onboard, supportive and played a crucial role in for instance helping URM to practice TRT skills outside the sessions.

3.3. Theme 3: Let Sleeping Dogs Lie

Despite the safety protocol, some TRT lay counsellors felt insecure and personally responsible for discovering suicidal thoughts. Several TRT lay counsellors did not feel equipped to meet URM with mental ill health and suicidal ideation and there were TRT lay counsellors who wondered whether the intervention actually might have a negative effect on the URMs' wellbeing.

3.3.1. Navigating the Boundaries of Responsibility

The safety protocol clearly stated the TRT lay counsellors role when participating URM disclosed suicidal ideation. Yet, some TRT lay counsellors described that they felt personally responsible for being the one who discovered the suicidal thoughts and it was unsatisfactory for them to refer the URM to someone else. They expressed a need to go beyond the safety protocol.

> "Of course, I sometimes felt like I should have been the one to be there for them. You know, instead of just leaving it to someone else. Do you see what I mean? That I wanted to see it through all the way. And we couldn't do that . . . We left these people when we should have been the ones who made sure everything turned out okay."
>
> (Interview 5)

3.3.2. Readiness to Talk About Suicide

Some TRT lay counsellors worried that they might lack the competence to assess the URM mental health and that they might disregard something important that the URM was signalling non-verbally. There were times when they were worried a participant actually might harm themselves or even commit suicide and they reflected on their personal responsibility, if something like that would happen.

> "I can't really pinpoint what I felt I needed, maybe more experience . . . I don't know if I needed more experience of working with suicidal youth or just more life experience."
>
> (Interview 4)
>
> "But it became easier with time, with more experience . . . you learn from your mistakes. But of course, sometimes I was really worried, what if they were to jump in front of a train? I would have needed someone to talk to there and then, and that was difficult."
>
> (Interview 6)

Others did not feel any discomfort or threat by the idea that asking questions about suicide might evoke strong negative emotions. Although they had not had any formal training in suicide assessments they felt prepared and safe to ask questions about suicide.

> "I believe that many adults are afraid of asking questions about suicide because they think that it is better to let sleeping dogs lie. I thought that it was liberating to realize that it wasn't the case. On the contrary, when you dare to address it the teenager actually reveals their thoughts. That is something every grown up who encounters teenagers needs to hear."
>
> (Interview 7)

3.3.3. Notion of Doing Harm

Some TRT lay counsellors expressed worry and apprehension about the negative emotions that might be triggered by talking about traumatic memories. Sometimes they were challenged by a particular URM's resistance to talk about trauma. One TRT lay counsellor reflected over that, even though she knew the importance of the exposure session, she felt inhibited to fully implement since she was not sure she could manage the emotions the exposure might trigger in the URM. However, the feeling of doing potential harm seemed to be greatest when conducting their first TRT group, as TRT lay counsellor describe this feeling decreased with time.

> "I remember thinking many times, this is too much for me. What have I gotten myself into? . . . So, I thought, oh my God what kind of processes are we starting? Are we saying things no one else has said? We are talking about stuff and reviving their memories. What am I supposed to do with that? I don't know exactly what I felt, maybe powerless?"
>
> (Interview 4)

Others did not feel any discomfort or threat by the fact that the TRT session might evoke strong negative emotions. On the contrary, they normalised it and viewed it as a part of the process.

> "Personally, I have never been afraid of meeting people with mental ill health on the contrary I find it quite interesting to see whom they choose to tell their story to."
>
> (Interview 5)
>
> "I really believe that it is crucial to label things for what they are. I do not hesitate to say the difficult words."
>
> (Interview 1)

3.4. Theme 4: Going the Extra Mile

TRT lay counsellors described the need for a manual-based intervention for URM whom they had identified as a particularly vulnerable group in society. They also related to their own desire (and struggle) to find meaning and to be creative and flexible in an unstable and chaotic situation in order to deliver TRT.

3.4.1. Motivated by a Structured Way of Addressing a Need

The TRT lay counsellors had identified URM to be a vulnerable group in need of coping strategies and knowledge about trauma and post-traumatic stress. They expressed frustration that URM did not access proper treatment elsewhere and craved an intervention that was hands-on and manual based. This was emphasized as an important motivational factor for joining the TRT training.

> "I really felt that I needed to do something for this group because, you know, people said that there is nothing we can do as long as they are asylum seekers . . . it is better to do something than nothing."
>
> (Interview 6)

At the same time, a few TRT lay counsellor explained that facilitating TRT groups simply was a part of their job description and they had been asked to do the training by their supervisors and managers, rather than by their own identified need or conviction.

3.4.2. Fitting into the Chaos

Meeting URM in a situation of crisis, where a number of basic needs such as shelter and food are not being met, placed high demands on the TRT lay counsellor and was sometimes challenging for them. Yet, the TRT lay counsellor have shown signs of both creativity and flexibility as they described various ways and strategies in which they sought

to increase motivation, session attendance and to facilitate the URMs' ability to fully engage in the sessions. This could entail seemingly small gestures like offering food during the sessions or to make wake-up phone calls to URM with sleeping difficulties. However, TRT lay counsellors reflected this "extra care", outside the manual, felt important not only for the URMs' wellbeing, but also for the lay counsellors themselves as it gave them a sense of accomplishment and meaning in a situation of chaos.

> "Sometimes you need to go beyond the manual. You need to make sure that they come despite the fact that they are homeless. You need to offer fellowship, food and laughter. You need to try. It was difficult but you need to find meaning because, you know, we could offer them something."
>
> (Interview 1)

TRT lay counsellors also expressed great empathy and distress over the URMs' vulnerable and often uncertain life situation relating to the stress of being in the asylum-seeking process. A few TRT lay counsellors questioned whether TRT and addressing trauma actually was suitable in this situation of uncertainty.

> "They were mostly guys from Afghanistan ... And they didn't know if they were going to be granted asylum in Sweden. So, they were in the middle of the asylum-seeking process. This was a major thing for them, if they were going to be able to stay or not. So, this was the dominant thing for them—not thinking about trauma ... I feel that the timing of this intervention was wrong."
>
> (Interview 8)

4. Discussion

This study explored how TRT trained lay counsellors, without formal training in mental health or counselling, experienced dealing with URM disclosing suicidal ideation.

Although some TRT lay counsellors felt anxious and overwhelmed by the disclosure of suicidal ideation, others were surprisingly confident. Dealing with suicidal disclosures seems to be a challenging task regardless of professional training. A recent qualitative study among psychiatrists in Sweden describes feelings of fear, anxiety, uncertainty and even physical reactions in relation to suicide risk assessment [34]. Although the TRT lay counsellors' role regarding suicidal disclosure is not comparable with the role of a psychiatrist conducting a full suicide risk assessment, the experience of uncertainty, fear of making the wrong decision and sense of responsibility unites them. However, an interesting difference is while the TRT lay counsellors reflect over the boundaries of their moral responsibility, the psychiatrists also reveal being burdened by formal responsibility and the fear of malpractice litigation when assessing suicide [34] from which the TRT lay counsellor are spared. One may speculate that formally trained personnel with a legislative duty to, for instance, keep health records, might experience suicidal disclosure with regard to their professional responsibility differently than the lay counsellors.

While the TRT lay counsellors acknowledged the importance of safety structures and there was a general appreciation of the safety protocol and procedures, asking questions about suicide was not always straightforward. The TRT lay counsellors experienced that, despite having followed the instructions in the safety protocol, the URM refused to answer questions about suicide or that the URM was emotionally blunted which made therapeutic alliance difficult. There are several reasons for not disclosing suicidal thoughts, such as lack of trust, fear of hospitalisation, judgment or causing distress for the person asking the questions or even lack of empathy in the person asking the questions [37,38]. Context and proper training in giving rationale for asking questions about suicidal thoughts are important.

Furthermore, establishing interpersonal trust and setting aside screening questionnaires to strengthen therapeutic alliance has been positively correlated to greater overall disclosure [37]. Struggles to obtain suicidal disclosure is not unique to utilisation of lay counsellors or the community setting, it is also found in a therapeutic setting with formally

trained and experienced therapists [39]. Similar challenges of issues related to lack of emotional contact and credibility has been reported by trained psychiatrists and adding additional training on understanding non-verbal signs that may signal increased suicide risk has been suggested [34].

The readiness to talk about suicide varied among the TRT lay counsellors. Some reported feelings of insecurity when dealing with suicidal disclosure and suggested lack of experience (referring to both work and life experience) as a possible explanation. This is in line with a Swedish study among trained personnel working within mental health, concluding that job clarity and confidence regarding their role with suicidal patients as well as attitude towards suicidal prevention was connected to work experience as well as perception of having received sufficient suicidal prevention education [40]. Adding roleplay to training e.g., has shown both reported and observed improvement in communication with youth in distress and directly asking questions about suicide [41] in the context of a community-based suicide prevention intervention. Enhancing the present TRT training with rationale for asking questions about suicidality, training on non-verbal signs and roleplay on asking questions about suicidality could be beneficial and evaluated in future research.

The URMs' situation, their trauma narrative and helplessness in the asylum-seeking process were demanding for some TRT lay counsellors who felt great empathy but also overwhelmed and sometimes helpless themselves. However, they were also motivated by this challenging situation and experienced meaning in helping the specific URM reduce trauma symptoms and by being a part of influencing social injustice as well as addressing need. Even among experienced trauma counsellors, "providing assistance to others" both at a personal and societal level has been described as rewarding and as important factors to thrive as a trauma therapist [42]. Experienced trauma therapists also reflect over the need to modulate their own empathy and by setting boundaries and accepting the counselling intervention and their own limitation [42]. Supervision is important to support lay counsellors [23,43]; however, adequate supervision should include both management of clients and specifically inquiring about counsellors' own emotions to address the particular risk of indirect traumatization [44]. A future research direction could be to design and evaluate a dedicated supervision program for TRT facilitators.

The TRT trained lay counsellors also revealed concerns regarding the tolerability and safety of exposure and the strong negative emotions exposure evoked. This fear of doing potential harm is not limited to lay counsellors. A study among 600 mental health workers disclosed similar concerns regarding exposure although some of them used exposure in their practice [45]. Despite the strong evidence of the efficacy of exposure, even trauma experts are afraid of exposure causing symptom exacerbation and drop outs, leading exposure techniques to be under used [46,47]. Though the TRT lay counsellors received brief training in the rationale for exposure and how to conduct exposure, adding enhanced emotion-based training targeting attitude change by identifying concerns about exposure and adding video-based client testimonies may reduce concerns and enhance delivery of exposure [48]. Given the strength of opinion coming through regarding exposure, more thorough investigation of this particular topic could be warranted.

The need for a shared understanding with key stakeholders was identified by the TRT lay counsellors, as some legal guardians and personnel from residential care homes questioned the need and purpose of the intervention as they feared the URM might experience more trauma symptoms due to the intervention. However, the TRT lay counsellors who reported most apprehension and resistance from other stakeholders also reported that they themselves became TRT facilitators due to the will of their managers rather than their own conviction of a need for an intervention. One might speculate that this group of lay counsellors were more sceptic to the intervention and therefore not as well equipped to explain the benefits or reduce misbeliefs regarding the intervention to the stakeholders. Despite efforts made to reduce the knowledge gap and stigma regarding psychiatric treatment in Sweden, a study on change in public attitudes regarding mental health concluded that appreciation

of treatment of mental illness and psychiatric care remains low [49]. Hence, facing negative beliefs about mental health care is common and not unique to lay counsellors.

The TRT lay counsellors were also concerned about URM not being assessed or admitted to CAMHS. This perceived "closed door" to CAMHS could in part be due to a debated belief that trauma treatment should not commence in an unstable setting, traditionally excluding asylum seekers from accessing trauma treatment in specialist care [50]. Although CAMHS are obliged to conduct suicide risk assessments on asylum seekers, the way the profile of the population interacts with the existing service model of care is a potential source of friction in collaboration. This lack of well-functioning collaboration and accessibility to CAMHS left the lay counsellors with a sense of loneliness and vulnerability. This structural problem is in-line with a previous study emphasising "building relationships between agencies" and increasing accessibility to mental health services for refugee children are crucial for increased service utility [51] and needs to be addressed at a health governance level. There needs to be more time dedicated to identifying ways in which collaboration could be enhanced. One could look to the interdisciplinary collaboration literature [52] to look for attributes to target for instance, effective communication channels between CAMHS and TRT facilitators, shared accountability and building trust. The effectiveness of these working models in improving collaboration would need to be evaluated.

Methodological Considerations

The first author is a child and adolescent psychiatrist with long experience of meeting URM and conducting suicide assessments at CAMHS. She is also a trained TRT facilitator and had, at the time of the interviews, conducted one TRT group. Although this background gave her great knowledge and experience in the field of psychiatry and suicide assessments, throughout the study there, has been an awareness of how this might impact the interviewed TRT lay counsellors, i.e., researcher reflexivity. There was an initial concern the TRT lay counsellors might feel intimidated or judged, less likely to reveal own limitations or less likely to speak freely about negative experiences of collaborating with CAMHS. In order to reduce her potential role as an "expert", or as a spokesperson for CAMHS, this issue was addressed before the interviews and by making extra efforts to create an interview environment that promoted trust and openness. In addition, the purpose of the study was stressed repeatedly and participants encouraged to speak freely and honestly.

To further strengthen credibility, a semi-structured interview guide was used. To promote transferability, interview data were collected from TRT lay counsellors with different occupations, working in different geographical areas in Sweden and a difference in number of conducted TRT groups. Furthermore, transferability was also promoted by describing both typical and atypical views expressed by the TRT lay counsellors within each theme, i.e., negative case analysis. Although the number of interviews could seem low, saturation was assessed, and all authors were in agreement that it had been reached. Dependability and confirmability were enhanced by having a clear research trail during the entire process of analysis and involving all authors in the analysis. Reflecting on possible preconceptions was an essential part in this process.

Limitations: This study adopted a qualitative methodology that intended to investigate experiences in the particular context of Sweden, hence generalizability of the findings to other international contexts was not an expected attribute; the structure of health and social care in the local context would need to be considered. The study also specifically addressed the target group of URM and not refugee adolescents in general. It is possible that knowing there is a parent available to contact and discuss with might alter the experiences of the lay counsellors. Finally, questions about suicidal ideation followed initial screening and were part of a safety protocol. Thus, the study does not cover situations where disclosure is spontaneous, not backed up with a plan. It is likely that those situations cause more apprehension, anxiety, and insecurity in lay counsellors. Future studies could therefore expand the scope of target groups to refugee or otherwise vulnerable adoles-

cents and counselling types, to investigate how lay counsellors deal with disclosures of suicidal ideation.

5. Conclusions

Dealing with suicidal disclosure is a complex and challenging task regardless of training. Both lay counsellors and experienced mental health workers struggle with feelings of uncertainty, helplessness and boundaries of responsibility; however, lay counsellors seem to be exempt from fear of professional repercussions. The motivations for becoming a TRT facilitator might also be interacting with their perceived experiences. Adding specific training on how to address suicidal throughs and talk about suicidal ideation using roleplay is recommended. Adding "attitude change" based training specifically challenging the concerns regarding exposure could be valuable, as well as adequate supervision advising on management but also targeting the lay counsellors' own emotions is recommended. Finally, collaboration with key stakeholders and building relationships between agencies is essential to facilitate working with refugee mental health in a stepped care model and new working models based on interdisciplinary collaboration is recommended. Another potential obstacle for collaboration regarding this particular population could be conflicting views about the timing of trauma treatment, which needs to be addressed. Overall, although there is room for improvement in training and collaborative working, incorporation of allied professionals in the mental health workforce appears to be a workable solution to the mental health needs of URM in Sweden.

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Transforming the Future Healthcare Workforce across Europe through Improvement Science Training: A Qualitative Approach

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Abstract: Healthcare improvement science (HIS) is the generation of knowledge to cultivate change towards improving health systems performance. Our purpose was to evaluate the experience of European nursing students after an intensive one-week summer program conducted in 2019 at the University of Alicante in Spain. The educational intervention combined theoretical and practical HIS contents, with students from different countries, educational programs, and health systems. The intervention was evaluated under a qualitative approach through the open discussion group technique based on the method of participatory action research (PAR), with a total of 25 students who reflected about their experiences and perceptions during the intervention. The responses were used to improve the program's contents, its didactics, and organization. Nursing empowerment, professional recognition, and healthcare research were some of the seven main categories identified through the systematic content analysis method triangulated by three experienced researchers. According to the students' replies, values like compassion, respect, or empathy were identified as key elements of care. Promoting international students' networking emerged as the key to creating a positive provision for change and the generation of improvement initiatives. Building a HIS culture may potentially provide future healthcare professionals with critical thinking skills and the resources needed to improve their future work settings.

Keywords: Europe; thinking; improvement science; nursing students; qualitative research

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1. Introduction

Over the period 1999–2010 the Bologna Reform in the European Union highlighted the importance of value-centered education across Europe in the field of health studies. In line with this, patient safety should be of upmost importance for healthcare professionals, while fundamental values like compassion, integrity, or human dignity, among others, are key to delivering the highest level of quality of care. However, those values are still not widely included in the training process of healthcare professionals in Europe and are not observed as part of improvement initiatives in the educational and healthcare fields [1–6].

From 2013 to 2015 the Improvement Science Training for European Healthcare Workers (ISTEW) project funded by the European Commission evidenced the gap in the provision of accredited health improvement science (HIS) education across Europe and outlined the need to improve quality of care services and related education. The most representative ISTEW outcomes were (a) the European HIS consensus definition, known as the Bled definition, (b) four HIS training modules, and (c) the Healthcare Improvement Science Evaluation Framework (HISEF) [7–9]. The Bled definition defines HIS in the European context as "the generation of knowledge to cultivate change and deliver person-centered care that is safe, effective, efficient, equitable and timely. It improves patient outcomes, health system performance, and population health" [9]. However, HIS status and understanding in other

non-European countries such as the United States (U.S.) remain different. Since the 1980s improvement science has been developed extensively, focusing on health outcomes from an economic and efficiency perspective. In the U.S., the Institute of Health Improvement (IHI) has been focused for decades on the creation of specific improvement education, its implementation in healthcare contexts, and dissemination in their healthcare system [8]. Across the European countries, differences among HIS understanding and practice have been evidenced. In fact, a higher level of development is observed in the English-speaking countries such as the United Kingdom and Ireland. In the European educational field specifically, the differences are even more evident. For instance, in Slovenia only 4% of the European Quality Assurance Register for Higher Education (EQUAR) courses include HIS contents, a figure similar to that of Italy (7%), followed by Poland (10%), and far behind England (27%) and Romania (25%) [8].

As stated before, based on the previous gap analysis of nursing studies in Europe conducted during the ISTEW Project there is a lack of specific training for nurses focused on the following items: development of improvement-based and critical thinking, quality improvement measurements, systems thinking, and safety practices [8]. Therefore, those items were the ones upon which the ISTEW modules and the contents of the Alicante Summer Program were based. The University of Alicante in Spain, as a partner team, promoted HIS culture and prospectively used the ISTEW outcomes by organizing an Annual International Summer Program. The "Immersion in HIS" course started in July 2016 and was repeated yearly until 2019 [7,8]. Participants were nursing students from different European universities (Scotland, Ireland, Finland, and Spain), and were therefore from different cultures, with distinct types of health system organization and professional competencies. Such international education led to a discussion on how value-centered healthcare education focusing on HIS should be considered, while analyzing the differences and similarities amongst cultures. Students had the chance during the training to propose improvement initiatives in their own real contexts and discuss what other colleagues from other cultures were doing [1]. Along the four Summer Programs, the HIS Evaluation Framework (HISEF) created throughout the ISTEW project was used as the evaluation tool which included participants' qualitative and quantitative data through different questionnaires based on Kirkpatrick's Learning Evaluation Model [10–12]. To support the data collected through the evaluation framework, new dynamics were introduced in 2019. The research presented focuses on this new section where qualitative data were collected after exploring the experience and perception of European nursing students regarding HIS after an intensive one-week summer program.

2. Materials and Methods

2.1. Educational Intervention, Qualitative Method, and Techniques

A practical and theoretical educational intervention regarding HIS was conducted consecutively from 2016 to 2019, focusing on the four main HIS modules developed by the ISTEW project: (a) the development of improvement-based and critical thinking, (b) quality improvement measurements, (c) systems thinking, and (d) safety practices. For our research purpose we concentrated on the qualitative data collected in the 2019 course. The educational intervention was evaluated under the scope of participatory action research (PAR), which was selected as the qualitative method. Within PAR, the subject becomes the protagonist and participates in the change itself. Citing Cassell and Symon [13], PAR enables participants to confront their experiences and existing conflicts with others, particularly in healthcare provision to the patients. The transition from object of study to subject protagonist is carried out by cyclic processes of reflection–action–reflection where the researcher continuously evaluates each intervention, interacting constantly with the target study population [14]. We understood that the inclusion of all the course users and all the educators participating in this intervention would determine the success of the implementation of HIS knowledge in the future healthcare workforce [15].

Although we used the HISEF as the evaluation tool of the HIS learning, which included open-ended and closed questions together with Likert scales, we considered this insufficient for our qualitative goal. For that reason, further qualitative research to capture students' personal perspectives and experiences was needed. In order to fill this gap, a plenary discussion and brainstorming session was conducted at the end of the intervention in 2019, providing an approach to the participants' perceptions and experiences. The session had four main topics: (a) take-home ideas, (b) values learnt, (c) previous HIS experience, and (d) initiatives that students would implement to improve their local settings and also the recently visited ones during the Summer Program.

2.2. Setting and Procedures

The educational intervention for healthcare future professionals and its evaluation was conducted in July 2019 at the University of Alicante. Since the ISTEW project ended, this course has been the only implementation initiative with regard to the specific educational modules created in the project. It consisted of a one-week 50-h program divided into theory and practice. Students had the chance to visit Spanish public and private hospitals as well as primary health care centers, observing, detecting, and discussing similarities and differences with regard to their healthcare contexts and contrasting such practical experience with the knowledge achieved in the theoretical sessions. The purpose of this intervention was to develop their theoretical and practical knowledge about HIS contents and values, promoting critical thinking, developing improvement-based thinking and behavior, creating awareness, and consequently generating a HIS culture. During the course, students created their own projects designing HIS interventions in practice by using scientific HIS evidence and sources (e.g., indicators, questionnaires, interviews etc.) and presented their ideas in a dynamic environment where all students could make their input and interact to one another. For our research purpose we conducted the discussion session in the main classroom used for the course at the University of Alicante on the last day once the program had been fully completed.

2.3. Participants

Twenty-five nursing students from other European Higher Education Institutions such as the University of The West of Scotland in the United Kingdom, the Waterford Institute of Technology in Ireland, the Laurea University of Applied Sciences in Finland, and the University of Alicante itself participated. All of them agreed to be part of the plenary discussion and participated in the cyclic process of reflection–action–reflection based on PAR principles in which the researchers evaluated continuously each intervention, interacting constantly with them [16].

2.4. Data Collection and Analysis

Students' experiences through the course were collected from the discussion session conducted. Notes were taken manually by one researcher. Another experienced researcher moderated the session in which students and educators participated, and the other researcher was the observer. The full transcribed notes are in the Supplementary Material (Document S1). The data content analysis was the method of analysis chosen and was carried out throughout a triangulation process in which three experienced qualitative researchers participated. Content analysis is a systematic analysis method that makes inferences in this case from the participants' experiences expressed in the open session and observed by the researchers. The results were classified firstly following the four main topics that guided the discussion: Take-home ideas, values learnt, previous HIS experience, and initiatives that students would implement to improve their local settings and also the recently visited ones during the Summer Program. The three researchers participating in the analysis decided to classify the answers to the first three topics into categories according to the number of times repeated, while the results of the fourth topic were gathered by

country, since the analysis of the data showed that the content of the students' answers was associated with their place of origin.

3. Results

About the first topic, researchers explored the main idea that students referred as having learnt. After the analysis of this topic, eight categories came up corresponding to the most-repeated ideas (Table 1).

Table 1. Categories regarding the students' main ideas on healthcare improvement science (HIS).

Categories	(Times Repeated) Percentage
Nursing empowerment	(10) 11.36%
Healthcare flat system/organization	(26) 29.54%
Healthcare professionals' motivation	(6) 6.81%
Nursing research	(7) 7.95%
Job appreciation and recognition	(18) 20.45%
Values in healthcare	(12) 13.63%
Communication between team members	(5) 5.68%
Professional development	(4) 4.54%

Continuing with topic 1, in Table 2 eight categories have been gathered according to whom is responsible for them: "Internal" indicates that it is the student/future professional who is responsible for the action and "External" refers to when the responsibility lies with another person/organization.

Table 2. Category classification per responsible agent.

Internal	External
Empowerment	Flat system
Motivation	Communication
Recognition (of oneself)	Recognition (of others)
Values (of oneself as a person)	Values (of the company/system)
Research	Professional development

In the second topic the most significant value learnt for each student was highlighted. After the analysis of the answers, classification was performed with regard to the five most repeated values for the students. In order, the most repeated value was Teamwork, followed by Respect, Passion, and Humanization of Care/Compassion, with Communication being the least repeated.

Thirdly, the question "What would you improve in this context and in your context" was asked. This section is about the exchange of improvement, which reflects the different improvements and/or changes that students think can be made both in Spain, where the course took place, and in their country of origin. For the response analysis, the thematic units extracted from the first question have been reused, defined, and finally a selection of the most repeated answers has been presented in Table 3.

Table 3. Topics and student quotations.

Topic	Student's Quotations
Nursing empowerment	"Better understanding of empowerment in nursing." (C1) "We don't have many male nurses there, we feel more empowered now to inspire others." (C2) "We need more empowerment. We are consumed by the system working a lot but we don't think about doing something further" (C3)
Communication between team members	"Teamwork. In Finland they sometimes don't even talk to each other." (C4) "Collaboration between different professionals." (C5) "Collaboration between other health professionals is impossible. I see this here." (C6)
Healthcare professionals' motivation	"I have gained in motivation, inspiration and improvement. We have a lot of motivation now. The course has inspired us." (C7) "We have seen a lot of motivation among nurses in Spain" (C2) "The Spanish nurses are very positive and nice." (C8)

Table 3. *Cont.*

Topic	Student's Quotations
Healthcare flat system/organization	"I like the concept of healthcare flat system but I don't see it in reality." (C9) "We don't have key people in key positions." (C3) "In Finland our system is more rigid." (C10)
Job appreciation and recognition	"Nurses in Spain are highly respected." (C11) "We nurses should feel more proud, not say more: I'm just a nurse." (C12) "There should be more recognition if you keep studying, it should translate into more salary." (C13)
Nursing research	"Now we feel the need to do research." (C1) "We understand that further research is needed." (C14) "This course opened my mind about research." (C15)
Professional development	"In Greece, nurses that do research are increasing." (C6) "More training and updating is needed." (C7) "Recognition of the visible effort in increasing wages is needed." (C16)
Values in healthcare	"Positive about life and work." (C8) "Family involvement." (C17) "More respect and humanization of care." (C14)

Finally, in the Table 4 the fourth topic discussed, "Have you ever had any type of improvement science subject or previous experience?", was analyzed per country and the responses were grouped after reaching a consensus among the participants themselves.

Table 4. HIS experiences per country.

Country	Answer
Greece	"Two modules of management but is more about organizations not improvement or empowerment. We get more empowerment from the community nurse. We have some research subjects. I think the training is improving, the most important is that our teachers are nursing leaders. In other subjects the teachers are MDs, they don't even recognize them. We don't have specific laws that protect us." (C17)
Finland	"We have management but not anything similar to this. There are some improvement courses but are not always in all universities or accessible to everyone. It's something more about our university, not a country standard. In Laurea we have a subject including improvement but not sure about others." (C18)
Scotland	"We had before research at university but improvement is more in hospital not at university or not in my case. However, the promotion of research as carried out in this course is not as strong." (C19)
Spain	"Here the nurse works on many initiatives to improve specific aspects of health care but HIS is not recognized as a concept or discipline. Except for this course we are not aware of any further specific training." (C20)

4. Discussion

This study aimed to evaluate the European nursing students' experiences and perceptions after an educational intervention on healthcare improvement science (HIS). This qualitative study and others have demonstrated how relevant healthcare improvement science is at all professional and educational stages for the nursing profession [1,8,10]. Developing and evaluating this educational intervention from the perspective of the ISTEW project modules will contribute to the ISTEW project main aim by taking a step towards standardizing HIS culture across Europe [7,9]. During the implementation of the modules, the researchers' team agreed to evaluate the intervention every year and integrate students' feedback and needs through participatory action research methodology according to the experience presented in this manuscript. The inclusion of the open session discussion in 2019 permitted a deeper exploration of students' feedback. The study team understood how important it is to have a full understanding of the student's perspective to build bridges between theory and practice, enabling them to succeed in this transition process.

This research contributes to an understanding of how healthcare improvement science education provides nursing students with the confidence to make changes in their future work settings, delivering safe, effective, person-centered, efficient, equitable, and timely care [9]. To assure and follow up on the lessons learned as well as implementation in the work settings by students, further prospective research is needed [17,18]. Future courses with the new HISEF version combined with qualitative PAR are being planned with a virtual format due to the SARS-CoV-2 (COVID-19) pandemic.

The methodology used is effective in capturing student transformation, experiences, and perceptions during the course. The new section during the 2019 course and presented in the tables was perfectly combined with the HISEF to deeply understand students' perspectives and experiences. In relation to the main categories and topics identified, a tendency can be observed. In accordance with the results obtained in the literature reviewed conducted by Lillo et al. [8], keywords like "nursing empowerment", "nursing research" or "healthcare systems" are important with regard to student involvement with HIS education. However, as also mentioned in the previous study, the disparities among European countries create difficulties in healthcare improvement science standardization. This context can be seen as a weakness, but the authors used it as a strength to increase knowledge exchange among students due interactions during the course. From this research and previous publications on the field a conclusion can be made: Due to HIS disparities, educational interventions should include an international perspective. It has been observed that in Europe, HIS is understood and practiced in different ways according to the country. If a more comprehensive and broader perspective on HIS is to be achieved, educators, students, and finally healthcare systems should benefit from international educational exchanges and networking [8]. There is evidence suggesting that supporting staff at the early stages is the key step to driving systems into sustainable changes to promote patient-centeredness [19]. On this basis, the improvement of science education early in nursing careers relies on a common understanding of best practices and improvement methods that have the potential to redirect healthcare settings towards values such as safety or compassion, with a natural impact on patients' quality of care [20]. Improvement science has the potential to develop, but all related interventions must be evaluated [21]. HIS benefits need to be evidenced and all efforts in its development will be crucial for the future of healthcare systems [22,23].

Limitations

The content analysis method selected had a potential risk regarding the researchers' implication when analyzing the data and drawing conclusions. To prevent this, three researchers participated in the analysis process through an analysis triangulation. On the other hand, quantitative data obtained from the HISEF should be prospectively compared with the qualitative information collected, improving both evaluation methods in order to capture the students' experiences as accurately as possible. Moreover, students from other countries and from other health professions should be included towards to provide more evidence. However, despite the limitations, this paper is a starting point that provides useful information about nursing students' interactions within a global HIS perspective.

In relation to the qualitative technique used, the type of open discussion group ran the risk of leaving out feedback from those participants who were less self-confident in expressing their opinion in public. In order to avoid this, all participants were asked one-by-one in a safe and open atmosphere, encouraging them to express their opinions and facilitating the discussion among all members. Finally, further evaluation rounds would be needed in future educational interventions in order to see if the last HISEF version after the 2019 course better captured quantitative data and whether the results were coherent with the qualitative data collected through the open discussions. Further course editions are planned as soon as face-to-face education and travel between countries without restrictions are possible.

5. Conclusions

The new summer course evaluation process was conducted successfully, and the students' experiences and perceptions were well captured, as detailed previously. Students improved their critical thinking and knowledge in HIS and professional values and learned about the ways things are done in other cultural contexts. The educators also had the chance to improve the didactics, contents, and organization of the course. The PAR method is useful for students to reflect about course contents and ideas for improvement.

An increase in students' motivation, inspiration, and willingness for a transformation based on improvement emerged. Nevertheless, with the current available data long-term consequences in healthcare systems cannot be demonstrated at this early stage. A longer follow-up phase for students is needed.

Supplementary Materials: The following are available online at https://www.mdpi.com/1660-4601/18/3/1298/s1, Document S1: The full transcribed notes.

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Institutional Review Board Statement: This study was approved by the IRB/IACUC of the University of Jesenice as project partner (10/01/002/2014-SHT). All participants received information about the research, its purpose, and characteristics (verbal, online, and in paper format). Participants´ rights were explained. Their participation was voluntary and they could stop at any time they wished. It was clarified that the collected notes were anonymous and for private use in this study, and were only to be used for research purposes.

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Job Attractiveness and Job Satisfaction of Dental Hygienists: From Japanese Dental Hygienists' Survey 2019

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Abstract: Job attractiveness and job satisfaction are important factors in the continuity of employment among healthcare professionals. The aim of this study was to assess job satisfaction and job attractiveness among dental hygienists in Japan. The Japan Dental Hygienists Association conducted a survey of the employment status of Japanese dental hygienists in 2019. Questionnaires were distributed to all 16,722 members, and 8932 were returned (Collection rate: 53.4%). Data from 7869 currently working dental hygienists were analysed in this study. We analysed seven items of job attractiveness, 14 items of job satisfaction, and 13 items of request for improving the working environment. Item response theory and structural equation modelling (SEM) were utilized for the analysis. For attractiveness of dental hygienists' work, respondents placed greater emphasis on the fact that dental hygienists needed national qualifications rather than on income stability. SEM showed that job satisfaction consisted of two factors, 'Value for work' and 'Working environment', as did job attractiveness, with 'Contribution' and 'Assured income'. Value for work affects the contribution to people, and, employment environment affects assured income. Improving job satisfaction and work environments could help to improve the employment rate of dental hygienists, which could positively influence patient care.

Keywords: dental hygienist; job attractiveness; job satisfaction; work environment

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1. Introduction

The Japanese Dental Hygienists Law states that the mission of dental hygienists is the prevention of oral disease under the instruction of dentists by following treatments, including the mechanical removal of deposits found on the healthy root surface and under healthy free gingiva, drug application on the tooth and oral cavity, assisting in dental treatment, and oral health instructions [1]. Dental hygienists in Japan play an important role as healthcare professionals and have been asked to perform a wide variety of clinical practice skills in the Japanese super-aging society. There is a demand for visiting home dental care, oral care for hospitalised patients, and oral health management for older people requiring long-term care. Previous studies have revealed that oral health management of dental hygienists for older adults or hospitalised patients is effective in improving not only oral health, but also general health conditions [2–4], thus, emphasizing the social role of dental hygienists as professionals in oral health management. However, the employment rate of dental hygienists in Japan is very low compared to other countries [5,6]. According to a national survey from 2014, the number of registered dental hygienists in Japan was

approximately 250,000, but the number of employed dental hygienists was 116,299 [7]. An insufficient number of dental hygienists may lead to serious problems that affect the supply of dental health care services. Prevention of leaving jobs and support for re-employment are important in maintaining a stable employment rate. Therefore, the development of a positive working environment for dental hygienists is important [7].

Job satisfaction is an important prerequisite for a good work environment [8]. Previous studies have reported that job satisfaction is a key factor in continuing employment, especially for healthcare professionals, including dental professionals [9–11]. Johns et al. reported that perceived job boredom and lack of benefits helped determine whether a dental hygienist would leave clinical practice. However, salary was implicated as a reason for continuing work [12]. Given these findings, perceived job attractiveness and satisfaction, including employment stability and specialty as a dental hygienist, may lead to motivation and positive attitudes toward work, which in turn may promote individual career formation.

To ensure stability of the dental hygienist workforce, it is necessary to determine which issues affect dental hygienists and analyse their effects on job attractiveness and satisfaction. However, little is known about how dental hygienists perceive their job attractiveness and satisfaction in Japan. The aim of this study was to clarify the issues of Japanese dental hygienists regarding their job satisfaction, job demands, and work environment.

2. Materials and Methods

2.1. Study Design and Participants

The Japan Dental Hygienists Association has been conducting surveys on the employment status of dental hygienists in Japan every five years since 1981 [5]. Anonymous questionnaires were distributed to all members of the Japan Dental Hygienists Association on 16 October 2019 by post, and the questionnaires returned by 30 November 2019 were used for the analysis. A total of 16,722 questionnaires were distributed by post, and 8932 were returned (collection rate was 53.4%). Among them, 1063 were from dental hygienists leaving their jobs, which were removed from the analysis, since the data whose did not worked as dental hygienists at the time of the survey, might not reflect the actual situation. This study was approved by the Ethics Committees of the Tsurumi University School of Dental Medicine (approval No. 1837), which was conducted in accordance with the Declaration of Helsinki. Informed written consent was obtained from all participants.

2.2. Questionnaire

The questionnaire used in this study consisted of 101 items related to demographic factors, employment status, work content, value of work, etc. We analysed 34 items regarding job attractiveness and satisfaction in addition to the factors dental hygienists feel would improve the work environment. The questionnaires originally created by authors. Job attractiveness was evaluated by seven dichotomous questions about, for example, being a professional, national qualification, and income stability. The questionnaire regarding job satisfaction consisted of 14 items rated on a five-point ordinal scale. The questionnaire regarding the factors dental hygienists feel would improve the work environment consisted of 13 dichotomous questions.

2.3. Statistical Analysis

Cross-tabulation was performed on age group and the items of job attractiveness, and the factors dental hygienists feel would improve the work environment. Correspondence analysis was performed with this cross-tabulation. To visualize the relationships, the results were illustrated graphically as biplots [13]. A three-parameter logistic model with item response theory (IRT) analysis was applied to calculate item discrimination, item difficulties, and item guesses for job attractiveness and satisfaction [1,13,14]. Item response and information curves are graphically illustrated. The analyses were carried out using R

software version 3.50 (Institute for Statistics and Mathematics, Wien, Australia) with the LTR and irtoys packages using the following formula:

$$P_i(\theta) = \frac{(1 - c_i)}{1 + e^{-Da_i(\theta - b_i)}} \quad (1)$$

where a_i: discrimination, b_i: difficulty and c_i: guessing.

Factor analysis with varimax rotation was performed to determine the latent variables for structural equation modelling (SEM). The structural relationship between job attractiveness and job satisfaction was calculated using AMOS software (24.0, IBM, Tokyo, Japan).

3. Results

3.1. Participant Characteristics

The age of the participants was 46.4 ± 11.9 years (median: 48 years, range: 20–81 years). Thirty-five participants (0.4%) were men. The year of experience as a licensed dental hygienist was 20.2 ± 11.4 years (median: 20, range: 0–61). Figure 1 shows the results of descriptive statistics for the items of job attractiveness (A), job satisfaction (B), and the factors dental hygienists feel would improve the work environment (C). In relation to the reason dental hygienist work was attractive, the highest percentage cited 'National license' (95.8%), followed by 'Highly specialised work' (93.2%) and 'Contributions to people and society' (91.3%). For job satisfaction, the highest proportion cited 'Worthwhile job' (84.3%), followed by 'Liking dental hygienists' work' (83.2%), and 'Feeling the value of hygienist's license' (79.0%). Regarding the factors dental hygienists feel would improve the work environment, the most frequently responses were 'Improved salary' (72.5%), followed by 'Enhanced evaluation of specialisation and qualification' (61.3%). Biplots of age group for each question are presented in Figure S1.

3.2. IRT Analysis for Job Attractiveness and the Factors Dental Hygienists Feel Would Improve the Work Environment

Using factor analysis we categorised the 14 items regarding job satisfaction into two factors: 'Value for work' and 'Working environment'. Similarly, the seven items of job attractiveness were categorised into two factors, 'Contribution' and 'Assured income'. The 13 items regarding the factors dental hygienists feel would improve the work environment were categorised into three factors (Table S1). The attractiveness of dental hygienists' work and the aforementioned factors were analysed using a 3 three-parameter logistic model based on IRT.

Figure 2 shows item response curves and item information curves for the attractiveness of dental hygienists' work (A) and the factors dental hygienists feel would improve the work environment (B). The constructed models are shown in Table S2. For attractiveness of dental hygienists' work, item response curves shifted backward. The steepness of the curve at its inflexion point provides a measure of the discriminatory power of the item. Discrimination refers to how well an item can distinguish between respondents with low ability levels and those with high ability levels. In this case, respondents with high ability indicates responded 'Yes' often for the items, whereas respondents with low ability levels a low are relatively flat have low discrimination.

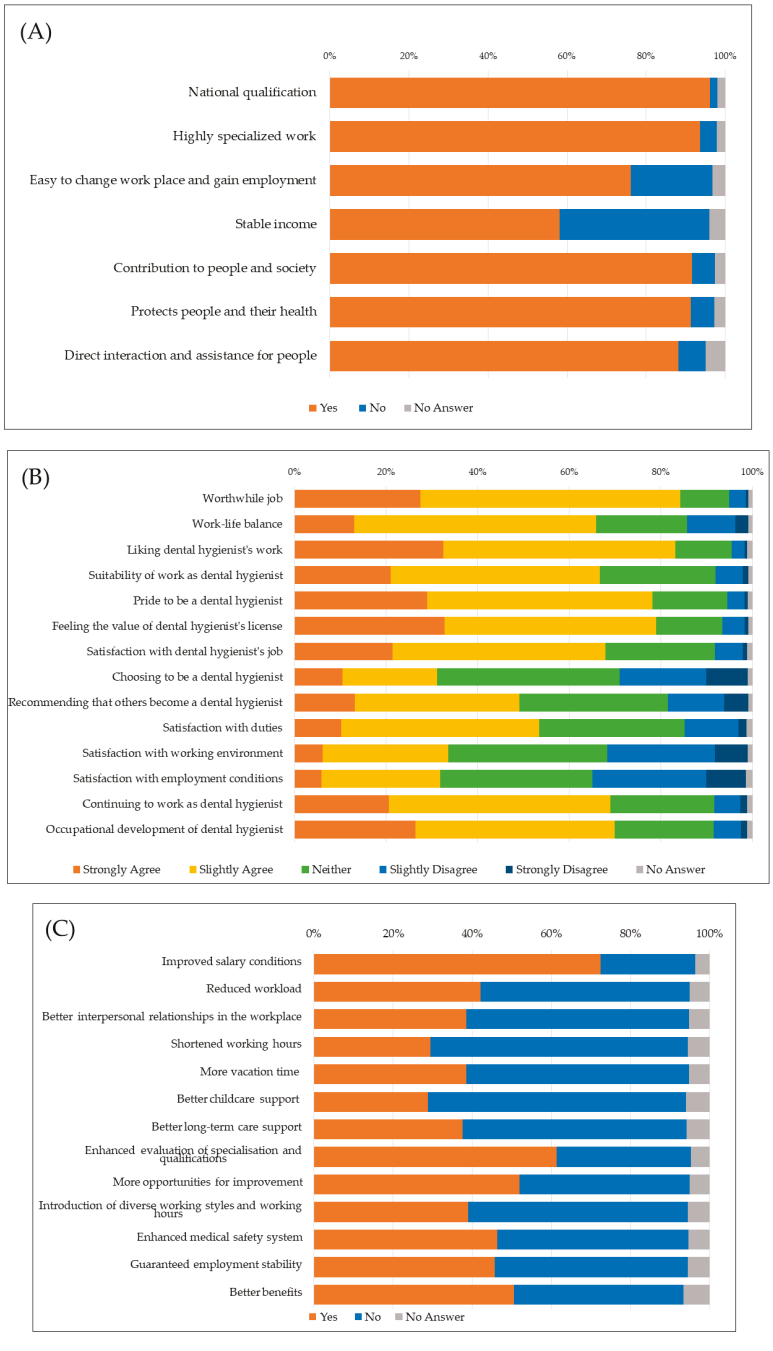

Figure 1. Simple tabulation of participants' response to each questionnaire. Bar graphs shows the participant's response to each questionnaire regarding job attractiveness (**A**), job satisfaction(**B**), and the factors dental hygienists feel would improve the work environment (**C**).

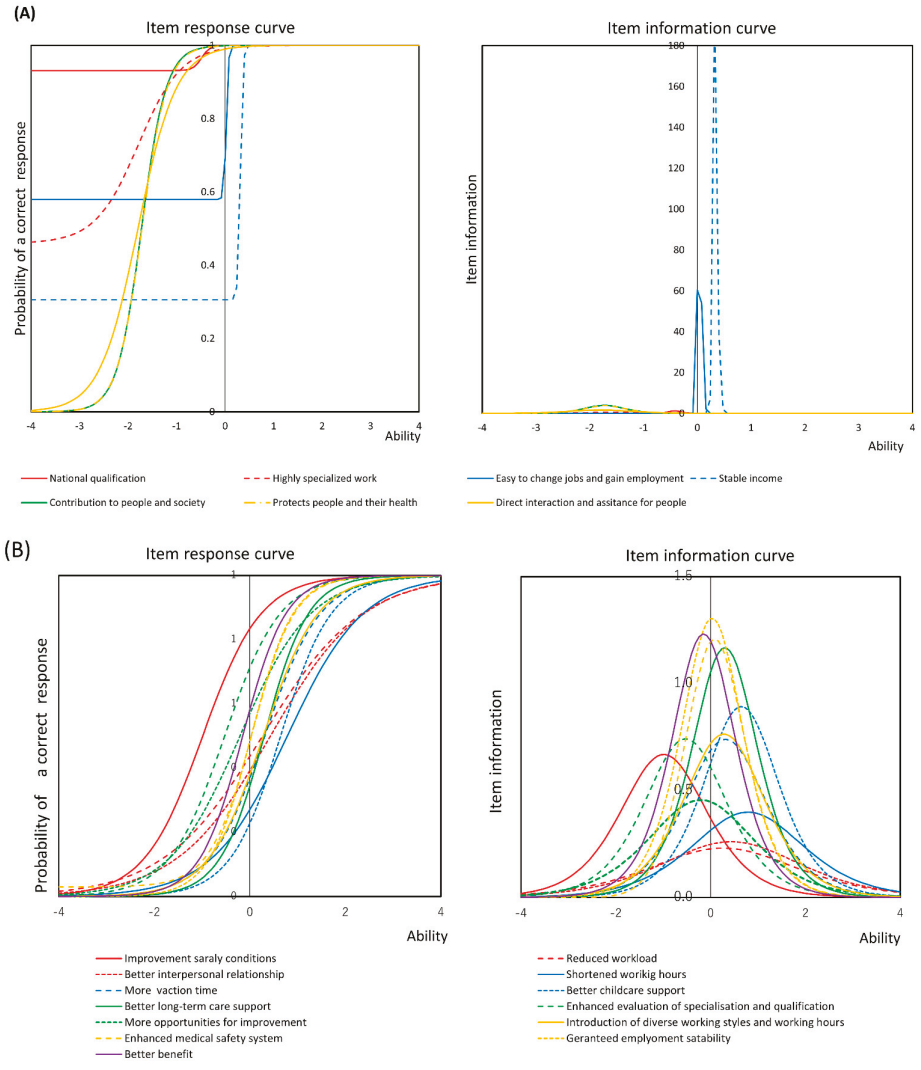

Figure 2. Item response curve and item information curve for the items regarding job attractiveness of dental hygienists' work and the factors dental hygienists feel would improve the work environment. (**A**) Job attractiveness (**B**) The factors dental hygienists feel would improve the work environment.

The horizontal axis shows the participant's ability and the item response curve axis shows the positive response to each item. Ability, shown on the horizontal axis, indicates the standardized weighted sum of the positive response of the items. That is, the closer the forward area, the more negative the question, and the closer the backward area, the more likely the answer is positive. The item response curve shows how precisely each item measures latent traits at various levels. A greater area under this curve indicates that 'Yes' was answered for all items at a higher rate, and these items may shape attractiveness to work for dental hygienists. Among them, items of 'National qualification' and 'Easy to change work place and gain employment' had a probability of higher than 0.5 at the origin point, which indicates that more than half of dental hygienists answered 'Yes' for these

items. The item response curves for 'Stable income' and 'Easy to change work place and gain employment' were steep, which indicates that the responses to these items have a clear cut-off point. The three items of 'Protects people and their health', 'Direct interaction and assistance for people', and 'Contribution to people and society' were located backward direction, which indicates that most of the dental hygienists answered 'Yes 'for these items. Regarding the item information curve of job attractiveness, the item 'National qualification' had little information and was in a backward direction, which indicates that most dental hygienists responded 'Yes' to these items. 'Stable income' had the highest item information, followed by 'Easy to change work place and gain employment'. These curves are located near the Y axis, which indicates that about half of the dental hygienists responded 'Yes' to these items. Where dental hygienists answered 'Yes' to these items, they responded 'Yes' to all other items.

Figure 2B shows the item response and information curves for the working environment. Many participants indicated a need to improve salary conditions, such as having regular pay raises and enhancing evaluation of specialisation and qualification. Neither IRT, nor item information curves regarding the working environment were as systematic as attractiveness to work, and there was no characteristic trend. Item response curves and item information curves for job attractiveness and demands for professional improvement analysed per factor extracted by factor analysis are shown in Figure S2. All items on the item response curve for job attractiveness were shifted in a backward direction; thus, many dental hygienists considered all items to be important, and in the item information curve, peaks for 'Easy to change work place and gain employment' indicated a tendency for dental hygienists to preferentially place importance relative to other items. In relation to the factors dental hygienists feel would improve the work environment, the tendency of the item response curve showed that the proportion of dental hygienists who answered 'Improved salary conditions' was relatively high, and items such as 'Better long-term care support' were less emphasised. Information from item information curves indicated that the items of guaranteed employment stability had greater information.

3.3. SEM for Job Satisfaction and Attractiveness

SEM was conducted to visualise the influence of job satisfaction on the attractiveness of dental hygienists' jobs (Figure 3). All paths were statistically significant. 'Value for work' significantly affected 'Contribution', and 'Working environment' affected 'Assured income' to some extent.

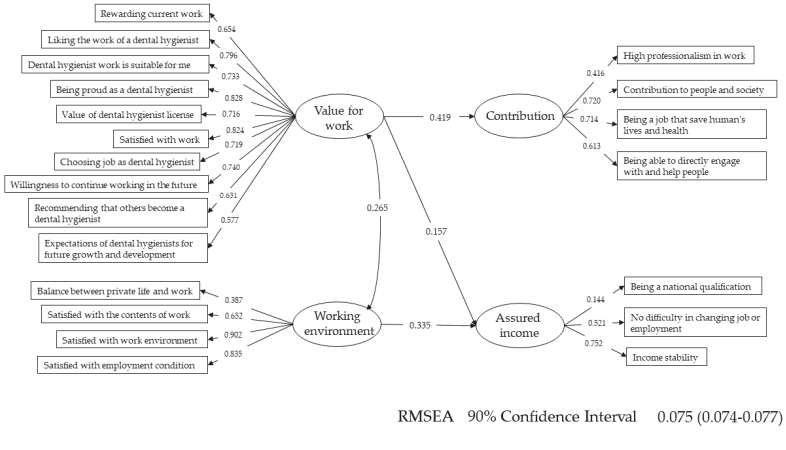

Figure 3. Path diagram of job satisfaction and attractiveness of dental hygienists' work; RMSEA: Root Mean Square Error of Approximation.

4. Discussion

In this large-scale study of dental hygienists in Japan, we investigated the association between job attractiveness and satisfaction, and the current status of the factors dental hygienists feel would improve the work environment. To the best of our knowledge, this is the first report describing the detailed characteristics of occupational awareness among Japanese dental hygienists, which cannot be clarified by the results of simple descriptive statistics. This study has been conducted by the Japan Dental Hygienists Association every five years. Many of the items were dichotomous responses. This survey confirmed the results of the previous survey. Dichotomous responses lack depth of information compared to those rated on a Likert-type scale. However, when applied to item response analysis, results obtained using dichotomous variable are easy to interpret [15]; this study utilized the merits of such variables. Item response theory analysis is a powerful analytical method, especially for dichotomous variables. It is widely used in educational research and tests, such as the widely-known TOEFL. It is also applicable in medical research. Valuable information, rather than a simple descriptive analysis of frequency, can be presented using IRT. The slope and location of item information curve can provide valuable information on the response pattern in a questionnaire. We have been frequently applying IRT for in our research studies. When interpreting the descriptive analysis of job attractiveness, more than 90% of dental hygienists gave positive responses for all items except 'Stable income' and 'Easy to change work place and gain employment'. Moreover, the item response curve revealed that the curves of all items were shifted backward, that is, many respondents responded that the work of dental hygienists was attractive. This result suggests that most dental hygienists find value in their jobs. Therefore, the strength that the dental hygienists perceive attractiveness of these tasks is an important factor for their work continuity. Most dental hygienists recognised attractiveness in the stability of their status as a worker, that is, having a national qualification made it easy to change where they work.

Notably, direct involvement with people and contributions to life and society tended to be perceived as attractive only if other factors were met. According to the item information curve, income stability and easy to change work place and gain employment had high item information. These two items were more attractive than the other items. The results of IRT and factor analysis indicated that many dental hygienists considered that easy to change work place and stable income were more important than national qualifications (Table S1[A]). In contrast, for 'Contribution' factors, all items were presented as sigmoidal curves. This suggests that dental hygienists find more value regarding aspects related to the contribution of their work as job attractiveness increases (Table S1B).

Factors directly linked to daily life, such as employment status and income stability, may be prerequisites for the attractiveness of work as a dental hygienist. With respect to t the factors dental hygienists feel would improve the work environment, item information curves of salary and appraisal of specialty and license were backwards. This indicates that many dental hygienists requested these two items rather than other working conditions. Conversely, item information curves for childcare support and shortened working hours were forward-facing, indicating that a limited number of dental hygienists requested for the improvement of these two conditions. When comparing the item response curve and item information curves of the factors dental hygienists feel would improve the work environment with attractiveness, curves were gentle sloped sigmoid curves and were in a limited area. This indicates that even though the salary and appraisal of specialty were common requests, the need to improve other conditions depended about each dental hygienist. In other words, the perception of the working environment may be influenced by the circumstances and view of each dental hygienist; thus, a subdivided validation of each of these factors is necessary.

A previous study reported that reducing the workload, enhancing welfare, and career developments were associated with job satisfaction among healthcare staff in China [16]. However, the results of this study showed that the demands about salary and employment

stability were more pronounced than the workload. This trend of salary emphasis was like findings from previous studies about dental care providers [17–19].

The results from the SEM showed that factors related to the working environment significantly influenced factors of assured income regarding job attractiveness. Previous studies have also reported that turnover of healthcare professionals is caused by dissatisfaction with their work, but it is inferred that the factors causing dissatisfaction may differ depending on job content and educational background [16,20]. In particular, improvement in salary may improve the job satisfaction of dental hygienists in Japan. Detailed verification is necessary for the improvement of working conditions of dental hygienists for the planning of specific measures to prevent turnover. Therefore, further study is necessary to investigate the association between leaving jobs and job satisfaction. The results of the SEM showed that the job satisfaction of dental hygienists presented their characteristics as professionals. Supporting people's health, such as contributions to people and society, had high loadings. Ayers et al. reported that one of the independent factors associated with career satisfaction among New Zealand dental therapists was whether they felt that they were a valued part of the dental community [19], so increasing the value of work may increase job satisfaction. The improvement of both the contribution to people and society and assured salary may be issues for ensuring dental hygienists' satisfaction and improving the quality of dental services in Japan.

There are some limitations to the present study. First, the participants may have a variety of backgrounds. For example, years of education before obtaining a dental hygienist's license, years of clinical experience, and place of employment may have led to differences in job attractiveness, satisfaction, and the factors dental hygienists feel would improve the work environment. Correspondence analysis also revealed the characteristics of the participants according to their generations, which warrants the need for in-depth examination in the future [21,22]. Second, the duties of dental hygienists are stipulated by the legislation and regulations of each country, and the specific content varies widely, so the results have limited generalizability outside of Japan. Job satisfaction is a key factor in the stable career formation of healthcare providers; therefore, studies comparing and examining differences on a global scale are desirable in the future.

5. Conclusions

In conclusion, the results indicated that Japanese dental hygienists find that the stability of their occupation and employment is equally important to their contribution to people and society, and that these factors are highly relevant to job satisfaction. Improving job satisfaction and work environments could help prevent high turnover among dental hygienists. In particular, it is important to improve their working environment, so that it leads to improved salary conditions, and enhanced assessment of professionalism and qualifications.

Supplementary Materials: The following are available online at https://www.mdpi.com/1660-4601/18/2/755/s1, Table S1: Results of factor analysis of job satisfaction, job attractiveness, and the factors dental hygienists feel would improve the work environment, Table S2: Three parameter logistic model based on item response theory, Figure S1: Biplots of age group and job attractiveness(A), the factors dental hygienists feel would improve the work environment (B). Navy plots correspond to age group of the participants. Closely located plots are meaning highly coincident, Figure S2: Item response curve and item information curve of for the items regarding job attractiveness of dental hygienists' work and the factors dental hygienists feel would improve the work environment by each factor.

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Institutional Review Board Statement: This study was approved by the Ethics Committees of the Tsurumi University School of Dental Medicine (approval No. 1837).

Informed Consent Statement: This study was conducted in accordance with the Declaration of Helsinki. Informed written consent was obtained from all participants.

Data Availability Statement: The data of the present study were used under license for the current study and, therefore, are not publicly available.

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Review

Broken Promises to the People of Newark: A Historical Review of the Newark Uprising, the Newark Agreements, and Rutgers New Jersey Medical School's Commitments to Newark

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Abstract: Many have referred to the coronavirus disease 2019 crisis and intertwined issues of structural racism as "twin pandemics". As healthcare workers in Newark, New Jersey, a city heavily affected by the twin pandemics, we recognize that health workforce changes must be grounded in our community's recent history. The objective of this essay is to briefly describe the relationship between organized medicine, state and local leaders, and the people of Newark. We begin with a discussion of Newark in the 1950s and 1960s: its people experienced poor socioeconomic conditions, terrible medical care, and the many sequelae of abhorrent racism. Plans to establish a New Jersey Medical School in Newark's Central Ward also threatened to displace many residents from their homes. We then describe the Newark Agreements of 1968, which formalized a social contract between the state, business leaders, and people of Newark. In part, the Medical School committed to indefinitely promoting public health in Newark. We share progress towards this goal. Finally, we document key healthcare administrative decisions facing our community today. Stakeholder opinions are shared. We conclude that the Newark Agreements set an important standard for communities across the country. Creative solutions to healthcare policy may be realized through extensive community collaboration.

Keywords: health workforce; workforce policy; health equity; racism; history; medicine; medical education

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1. Introduction

Many have referred to the coronavirus disease 2019 (COVID-19) crisis and intertwined issues of global structural racism as "twin pandemics" [1–3]. Structural racism is defined as overarching systems, large-scale social forces, ideologies, organizations, and processes which interact to contribute to racial injustices and reinforce disparities [4]. The contemporary COVID-19 pandemic has illustrated the convergence of structural racism and health [5]. The United States medical community has renewed its interest in investigating the many effects of broader socioeconomic conditions on public health [6–8]. As medical students and physicians in Newark, NJ, we know that public health interventions are unlikely to prove effective if not informed by the past [9,10]. For Newark, we believe that decisions regarding healthcare administration and education must be grounded in our community's recent history. In our recent history, a premier healthcare organization and training facility were established under conditions agreed upon with community members. Since their establishment, the school and hospital have remained integral pieces of the community and have taken significant steps to improve Newark's public health. The "twin pandemics" are pressing issues which align to exacerbate structural inequalities. In response, changes

to the healthcare system may be necessary, but the sociomedical history of Newark remains significant and informative, with important implications for healthcare decisions today.

During the 1950s and 1960s, the people of Newark experienced both poor socioeconomic conditions and the effects of abhorrent racism. Concurrently, plans to establish a New Jersey Medical School in Newark's Central Ward threatened to displace many Newark residents from their homes. The historic Newark Agreements of 1968 (sometimes referred to as the Newark Accords), detail a compromise borne out of lengthy negotiations between the state, many business leaders, and Newark's own community leaders. The legitimacy of Rutgers New Jersey Medical School (NJMS) and its primary teaching hospital, University Hospital (UH), is grounded in said Agreements. Moreover, development of Rutgers NJMS and UH in Newark's Central ward established the two entities as critical cornerstones of healthcare provision and a place of work for some of Newark's most impoverished minority groups. Today, ongoing administrative discussions regarding merging these entities with a private health system [11–14] threaten to erode decades of trust built between Newark's people and its medical school. Some fear that valuable resources, indispensable personnel, and employment opportunities may be funneled from a still-ailing Newark community to New Jersey's more affluent suburban communities [12–15]. The diversion of resources from programs meant to benefit Newark's minority populations (including, but not limited to, communities of color and Hispanic communities) is not without precedent: in the 1960s, Mayor Hugh Addonizio diverted funding from the community-led United Community Corporation (UCC) [16]; and in 2018, Rutgers diverted inpatient pediatrics specialists and resources from UH [17].

Therefore, the objective of this essay is to briefly describe the relationship between organized medicine, state and local leaders, and the people of Newark, NJ. We begin with a description of how socioeconomic factors, combined with civic unrest, culminated in the Newark Uprisings of 1967. Discussions to establish a New Jersey Medical School, and the reasons for its location, are shared. The subsequent Newark Agreements and outcomes of said Agreements to present day are discussed. Finally, we consider today's discourse about the future of Rutgers New Jersey Medical School and Newark's UH.

This interdisciplinary work aims to emphasize that local health policy decisions are, and have always been, complex. By specifically describing the relationship between Newark's medical school and its community, we hope that readers of all backgrounds will better appreciate the role that factors such as race, power, and politics play in determining the ultimate health status of a community. The presence and investment in medical training facilities in Newark have helped to curb sociomedical inequities. University Hospital is an essential safety net hospital in Newark. Readers may learn from Newark's local history and apply relevant lessons to improve public health in their own communities. Accordingly, this manuscript is broken down into thematic sections. Readers may therefore gain a specific appreciation for each individual topic while simultaneously appreciating the intersecting themes present in each section.

2. Newark 1950–1967

To appreciate the magnitude of the Newark Agreements, it is imperative to first review the socioeconomic conditions in Newark, New Jersey in the 1950s and 1960s. In 1950, Newark's population was 439,000 [18], where the Black community comprised 17% of that population [19]. Over the next two decades, social segregation was prevalent. Due to population growth as well as concurrent "white flight", in which many white New Jersey residents left urban areas for suburban areas [20], the Black population in Newark reached 63% of the total by 1968 [19]. Unfortunately, the white flight of the 1950s and 1960s left Newark devoid of many of its manufacturing industries [19,20]; rates of unemployment were over 15% in the Black community [16]. Newark had high crime rates [16], and with one-third of the houses "substandard", Newark had "the highest percentage of substandard housing for any city of comparable size" [19]. Forty-five percent of adults over the age of 25 had less than an eighth-grade education [19]. Unsurprisingly, these socioeconomic

circumstances contributed to the community's poor public health metrics: in the late 1960s, Newark had a high burden of substance use [16], sexually transmitted infections [16], the highest incidence of new tuberculosis cases in the country [19], as well as the highest maternal and infant mortality rates in the country [19]. While surrounding suburban towns had some of the best hospitals in the nation [19], Newark City Hospital was referred to as the "Slaughterhouse" or the "Butcherhouse" [19]. In 1969, Newark City Hospital had two nurses for every 39 patients; a rate dramatically lower than the reported state of New Jersey's requirement of 1 nurse per 6–8 patients [19].

In response, the President Johnson administration sponsored an antipoverty program called the Model Cities Program in 1966 [16,19]. Model Cities gave federal funding to local governments with objectives to revitalize urban centers [16]. Newark leaders recognized the applicability of this program to their city; Newark's 1967 Model Cities application stated that, "Today, poverty and the problems of racial transition are common to most older cities, especially in the Northeast. However, there are few cities anywhere in the nation where these and other problems extend so widely and cut so deeply as in Newark" [19]. Concurrently, sponsored by the federal Office of Economic Opportunity, Newark's UCC was developed to help Newark's poor. The UCC was a grassroots community action program aiming to "[enforce] housing codes and [train] minority citizens to qualify for high-paying union jobs in the construction industry" [16]. Given its unique element of community leadership, the UCC was a focal point for emerging Black power [16]. Election laws which prohibited individuals from voting unless they resided in Newark for at least six months, for example, had hindered many poor Black citizens from political engagement [19]. Funding from UCC helped Newark to sponsor a young Black man, Kenneth Gibson, to challenge the white Democratic Mayor Hugh Addonizio [16]. Gibson's initial mayoral bid was unsuccessful [16]. Addonizio lobbied the federal government to divert funding from the UCC (for which funding stagnated by 1967 [16]) towards those programs in which he had more governmental control, such as the Model Cities program [16,21]. Unfortunately, the Model Cities program was poorly coordinated and has been cited to have contributed to Newark's further socioeconomic breakdown [16]. Despite efforts from the federal government and local organizations to improve urban conditions, inequities in Newark persisted.

The social, economic, and medical injustices of the 1950s and 1960s culminated in members of Newark's African American community feeling "despair, rage, impotence, racial pride, and the sense that police had a double standard . . . that condoned brutality toward Black Americans" [16]. Indeed, the civil rights movement of the 1960s was characterized by broader national unrest. Police violence sparked multiple rebellions across the country in the mid-1960s, including in: Watts, California; Detroit, Michigan; Tampa, Florida; Cincinnati, Ohio; Cleveland, Ohio; Chicago, Illinois; and Atlanta, Georgia [16,22]. As early as 1957, multiple African American newspapers and the Mayor's Commission on Intergroup Relations in Newark documented "widespread mistreatment of Black Newarkers by police" [22]. Newark citizens, led by activist Amiri Baraka and the Congress of Racial Equity, joined their counterparts in Philadelphia and New York City in demanding for a civilian review of policing [22]. These activists led public demonstrations demanding a civilian review board for the majority-white Newark police force [22]. Mayor Addonizio sided with the Police Director and Newark Police Benevolent Association in obstructing these reviews [22].

3. Newark Uprising

On July 12, 1967, a Black Newark taxicab driver named John Smith was arrested for a traffic violation and was beaten by police [16,22,23]. The UCC and many community members rallied in support of John Smith, while the police arrived dressed in riot gear [16]. Violence broke out [16,23]. The National Guard was mobilized [16]. White-owned stores were looted [16,23]. From July 12–17, similar community uprisings occurred in Elizabeth, Englewood, Plainfield, and New Brunswick, New Jersey [16]. Twenty-four of the 26 total

deaths were of Black civilians, most of whom were killed by police firearms [22]. The "typical" rioter was found to be "an individual who had resided in Newark for greater than ten years" [19]. As one individual stated, "They had taken all the land over on 12th Ave. by 'eminent domain'. They said they were going to build townhouses but never did. We had no place to move, jobs, housing or schools" [16]. Even when the New Jersey state's Select Commission on Civil Disorders recommended a Newark review board in the aftermath, Mayor Addonizio objected to its formation [22]. Notably, the President Johnson National Advisory Commission on Civil Disorders report stated that "white racism is essentially responsible for the explosive mixture [resulting in widespread national upset] which has been accumulating in our cities since the end of World War II" [20].

In many historical sources, these events have been termed the Newark Riots [16,21,24,25]. A minority of sources instead describe these events as the Newark Uprising or Rebellion [22,26]. Given the historical context, we believe the terms Uprising or Rebellion are more appropriate descriptors of the events in Newark in 1967, in comparison to the more inflammatory term "Riot." Throughout the remainder of this manuscript, we hereby utilize the term "Uprising."

There are many factors that are believed to have contributed to the Newark Uprising. These include racism, widespread political disenfranchisement and voter suppression, poor housing and landlords, unemployment and job discrimination, poor health conditions, poor schooling, the conflicting goals of Newark's multiple anti-poverty programs and the ensuing funding cuts to the UCC, police brutality, and the passing over of selecting a Black community member for a Newark Board of Education position [16,19,20,23,26]. One final factor noted by Marin to contribute to the Newark Uprising was "the New Jersey state medical school's move to Newark's Central Ward" [16]. As Duhl and Steetle stated, the medical school issue "helped create the atmosphere in which only a spark was needed to kindle the riot fire" [19].

4. Medical School Plans

Concurrent with the social segregation, racism, widespread social unrest, poverty, and worsening public health status were developments to organize medicine in northern New Jersey. Nationally, concerns about physician shortages dominated discussions around physician workforce policy during the 1950s, 1960s, and early 1970s [27]. Federal initiatives during this time included construction grants to medical schools to bolster production of new physicians [27]. Leaders in North New Jersey, likewise, recognized the need to increase healthcare workforce training locally. Several developments in local organized medicine were implemented over the next few decades. Reasons for the developments included the provision of ideal workforce training, the provision of care for the poor, improvements to the economy, and (as some residents felt) "community control".

In 1949, Jersey City Medical Center applied for a National Institute of Health (NIH) research training grant and, in response, the National Heart Advisory Council suggested a New Jersey medical school be established [21]. Medical schools formed after World War II were typically not built in impoverished urban areas [21]. The proposal to form a New Jersey medical school was supported by the state of New Jersey, the city of Jersey City, and the American Medical Association (AMA) [21], but it was challenged by Seton Hall College and the local Catholic Church, who proposed that a "Seton Hall Medical School" be erected in Jersey City instead [21]. Seton Hall Medical School was ultimately established in Jersey City in 1956, but it quickly developed financial difficulties, resulting in the state reclaiming its control in 1965 and renaming it "New Jersey College of Medicine and Dentistry (NJCMD)" [11,24]. Due to the Jersey City Mayor's frequent interference with the medical school's affairs, NJCMD planned to move from the city by the mid-1960s [21].

Discussions quickly began regarding NJCMD moving to either Madison, an affluent suburban town in northern New Jersey, or to Newark [19]. Although faculty favored relocation to Madison, there were conflicts with their local community hospital [16]. In comparison, as of 1962, Newark Mayor Addonizio had offered Newark City Hospital "to

any medical school interested in taking it over" [19]. The Newark site was the preferred destination by Essex County's 13-member delegation, as well as reportedly by many "medical, civic, educational, religious, business organizations, and municipalities" [19]. Addonizio saw the medical school as an opportunity to revitalize Newark [16], increase employment within the city [19], gain increased funding through the Model Cities Program [16], and create "one of the finest medical facilities in the country" with research laboratories and a new "University Hospital" [16]. He believed the patients in Newark would be ideal for medical students in training [16]. In turn, Addonizio promised NJCMD a total of 167 acres in Newark's Central Ward, including those occupied by Newark City Hospital [21]. The area, which he declared "blighted", would be claimed by eminent domain [16].

In response to these housing threats, two community organizations formed: the Newark Area Planning Association (NAPA) led by Yale law student Junius Williams, and the Committee Against Negro and Puerto Rican Removal (The Committee) led by Newark public school teacher Harry Wheeler [19] and chairman Louise Epperson [16]. Harry Wheeler stated, "the real reason for courting the medical school was that Addonizio wanted to disperse the Negro's political power" [19]. Both NAPA and The Committee used legal and administrative tactics to fight the medical school proposal [19]. They acknowledged that medical school discussions lacked a plan for the relocation of residents displaced by NJCMD's construction and did not include plans for the inclusion of city construction trade unions in building of the school [19]. In addition, there was a fear that "a new University Hospital . . . would be likely to exclude poor city residents" [21].

In June of 1967, immediately precipitating the Newark Uprising, NJCMD agreed to move to Newark [19]. Both the NAACP Legal Defense Fund and NAPA protested to the federal Department of Housing and Urban Development (HUD) that HUD's relocation procedures were violated by the medical school plan [16]. HUD Undersecretary Robert Wood and Health, Education, and Welfare Undersecretary Wilbur J. Cohen called for community-wide negotiations [16]. Many believed the medical school was "being used as a pawn" in a broader struggle for community control [19]. One individual stated, "no school in the history of medical education has been created under such circumstances" [16].

The ensuing medical school relocation discussions have prompted many poignant reflections:

- The whole question of what is medical education came into play here. The College perceived the function of medical education in classical terms—providing an arena for the development of doctors . . . . The ills of the ghetto are viewed in nonmedical terms . . . the medical profession tends to feel that it is the only group competent to make decisions about medical education; all others . . . pose a threat to good education [19].
- Many medical schools are situated in or near inner-city slums, and indigent patients from these blighted areas traditionally have been important in the training of students [25].
- The College's very existence now hinged on what had previously been peripheral to the interests of medical education: housing, employment, and citizen participation [19].

5. Newark Agreements/Accords

On 1 March 1968, after extensive local meetings and negotiations, the revolutionary Newark Agreements were signed [28], with amendments finalized on April 30 of the same year [16]. These Agreements are a historic social contract between the Newark community, the medical school, and governments at the local, state, and federal level [28]. Parties had agreed to commence construction of the academic medical center in the Central Ward of Newark [11,28]. The following points, as summarized in the excellent article by Marin, were included in the Agreements [16]:

1. NJCMD would reduce the size of the planned site from 167 to 57.9 acres.
2. NJCMD would utilize New Jersey state funding, as well as at least 2.5 million dollars independently fundraised, to "improve the quality of medical care [at Newark City Hospital] to a level equivalent to that expected of the teaching hospital that was to be built on its grounds".

3. NJCMD would provide a comprehensive community health program for the residents of the Newark Central Ward, reviewed by a Newark Community Health Council.
4. Council responsibilities would include, to:
    a. "develop a comprehensive health plan for Newark's low-income community";
    b. "develop a comprehensive community mental health plan for Newark's low-income community";
    c. "operate community health programs";
    d. "formulate and coordinate training programs in health services and professions";
    e. "assist the school in actively recruiting minority students, faculty, and professional staff";
    f. "work with the school to develop 'career ladders' for non-professionals in the health field";
    g. "periodically review the adequacy of community health services being provided by the school and make suggestions for change".
5. Residents would be assured admission to the teaching hospital without bias.
6. A Community Housing Council would be formed to meet the needs of those displaced.
7. Minority group employment would be offered at the construction site, and NJCMD would include affirmative action clauses into contracts and subcontracts.
8. NJCMD would employ community residents in "as many of the 2600 jobs [expected to be produced]" as possible.
9. The Newark City Demonstration Agency would adhere to the regulations of the Model Cities Program.

6. After the Agreements

The Newark Agreements' principles are binding and, therefore, success in fulfilling the aforementioned commitments has varied [21]. Initially, there were many challenges. In the immediate aftermath of both the Uprising and the Agreements, vigilante groups of white individuals formed in Newark under the guise of protecting their "families and homes" [19]. Many more white and middle-class Black individuals moved away from Newark permanently [16]. In 1970, borne out of accusations of poor-quality medical care at Newark City Hospital and the poor treatment of employees, Newark community members protested the hospital [16]; this culminated in resignation of the NJMS president. Then, in the winter of 1971, the community attempted to block construction of a teaching hospital over concerns that it would function as a white referral hospital; ultimately, then-Mayor Kenneth Gibson helped in deciding to construct a single hospital (UH) to meet the needs of all community members [16]. Although perhaps most significantly, the Newark Community Health Council failed in its mission due to supposed in-fighting among members [16]. The Council was replaced in 1971 by the Board of Concerned Citizens, created and governed by the NJMS Board of Trustees [16]. Authors have noted that "the mission of developing a comprehensive health program for the community was substantially lost" and, instead, the new Board served only as an ambassador between school and community [16].

In 1970, Governor William Cahill enacted legislation merging NJCMD into a broader "College of Medicine and Dentistry of New Jersey" (CMDNJ), and the medical school adopted the title of "New Jersey Medical School" (NJMS), which it still holds to this day [29]. By May 10, 1976, the Newark campus was completed, including the medical school, dental school, Community Mental Health Center, and primary teaching hospital and level-one trauma center for the entire state of New Jersey [28]. A 1977 conference held to assess the school's progress in upholding the Newark Agreements found that: NJMS had invested substantially in Newark City Hospital [16]; the majority of the 2600 new jobs created were held by Newark community members [16]; citizen relocation agreements had been upheld [16]; and NJMS had begun to establish community health services, including a

Family Health Center, preventative medicine and substance abuse programs, an ambulance service, and a CompreHealth health maintenance organization/ healthcare delivery system dedicated to Newark citizens [16]. In addition, NJMS had the largest enrollment of minority students of any medical school in the country, excluding two historically Black medical schools [16]. This fact remains true to date [11,13].

In 1981, the College of Medicine and Dentistry of New Jersey was reestablished as the "University of Medicine and Dentistry of New Jersey" (UMDNJ), of which NJMS was a part, making it "the largest freestanding public university of health sciences in the United States" [11,28]. Additionally, in the 1980s, the AIDS epidemic would take a significant toll on both Newark and its healthcare system [30]. By 1989, New Jersey ranked fourth in the nation in the number of reported AIDS cases [30]. It also had the highest percentage of women with HIV infection in the entire nation [30]. Newark was a major focus for infection. Today, New Jersey remains as "the epicenter of the HIV epidemic" [31]. Even early on, UMDNJ-NJMS physicians were at the forefront of the epidemic. Based on clinical experiences at UMDNJ-NJMS, a group led by Dr. James Oleske published a landmark study on immune deficiency syndrome in children, which for the first time drew attention to the fact that AIDS could affect children as well [32].

In 1994, the American Association of Medical Colleges (AAMC) awarded an Outstanding Community Service Award to the medical school at UMDNJ [16]. UH's mission as a valued community resource has been emphasized throughout its establishment, including in a 2010 New Jersey Higher Education Task Force report [11]. Per this report, UH and the medical school campus have played a fundamental role in Newark's community, economic, and cultural revitalization [11]. UH cares for the most uninsured patients in the state of New Jersey, and is the only public acute-care hospital in the state [14]. The report specifically notes that they believe continued additions to the Newark medical campus "[build] on and [enhance] the historic Newark Agreements" [11]. Several NJMS-sponsored community outreach organizations do important work in Newark, as briefly reviewed later in this article. NJMS is the oldest school of medicine in the state of New Jersey, and today it receives the most NIH funding for basic and clinical sciences out of all schools in the state [13].

However, rumblings of community discontent have persisted: a notable piece in late 1987 in the Newark Star-Ledger, penned by Joan Whitlow, reasserted that the school had engaged in discriminatory hiring practices, as well as failed to further increase minority student enrollment at the medical school [16]. In 2013, oversight of the medical school was restructured such that UH became an independent NJ state entity, while NJMS remained within Rutgers Biomedical and Health Sciences (RBHS) [33].

In the last few years, there have been several notable changes at UH. In early 2018, UH submitted a proposal to the New Jersey Department of Health (DOH) to reduce inpatient beds for children from twenty-three to four due to low patient volume [14,34]. Specialist physicians in pediatric trauma and resident pediatric physicians would be transferred to a different hospital, Newark Beth Israel [34]. Given that UH is the only Level 1 trauma center in New Jersey, many physicians and nurses stated that reducing pediatric care in this hospital would be detrimental for families in Newark [34]. In fact, some feared that the move would jeopardize UH's entire status as a Level 1 trauma center [14,34]. As Dr. James Oleske, professor of pediatrics, stated at the time, "this is a death blow for our medical school's commitment for that segment of the population . . . To abandon the Central Ward and take pediatrics away from University Hospital is a terrible mistake" [34]. Dean of Rutgers New Jersey Medical School and Chair of University Hospital's Board of Trustees, Robert Johnson, stated that the hospital "wasn't built to have pediatrics in it" and that he has attempted to move pediatrics out of UH since the late 1990s [34]. As of July 2018, it was reported that UH withdrew this DOH proposal [35]. New Jersey Governor Philip Murphy ordered the DOH to appoint a monitor to review this situation with UH. The ensuing 2018 report stated that, "[UH] started to decrease its pediatric bed complement without the documented approval of the State . . . in seeming contradiction to the Restructuring Act and the 1968 [Newark] Agreement" [17]. Indeed, this decision was made without even

alerting Newark's mayor [14]. To the best of our knowledge, the inpatient pediatrics unit at UH remains significantly downsized.

In late 2018, the UH CEO John N. Kastanis resigned amid both calls from the mayor and scrutiny from the DOH regarding an *Acinetobacter baumannii* bacterial outbreak at UH, ending a short tenure at a hospital already juggling significant changes [36,37]. The outbreak in question may have claimed the lives of three infants in the neonatal intensive care unit [36]. Just half a year later, in 2019, Rutgers University President Robert L. Barchi announced that he too would step down after the upcoming school year [38]. This resignation ended a seven-year tenure in which Rutgers both joined the Big Ten Conference and completed the largest higher education merger in American history [38].

7. Newark Today

It is critical to acknowledge that economic stability, neighborhood and physical environment, education, food, community and social context, and healthcare system are all known social determinants of health [39]. In other words, the broader lives and lived experiences of those in Newark impacts the ultimate health status of those individuals. As of 2017, Newark has a population of 285,154 individuals [40], representing growth of 4.2% since 2000 [40]. Median age is approximately 34 years [39,40], and 51% are female [39]. The racial demographics have changed since the 1960s: today, approximately 89% of the population are racial/ ethnic minorities, with 48.6% Black and 35.6% Hispanic/ Latino [39]. In addition, 30.6% of the city's population is foreign-born [39], 54.2% speak English only, and 30.9% speak Spanish [39].

It is also critical to acknowledge that the modern socioeconomic state of Newark was largely determined decades ago; systems of structural racism have helped to translate poor conditions for minority groups during the 1950s and 1960s into poor conditions for minority groups now. The estimated poverty rate in Newark is generally 29% and, among children, increases to 39.5% [39]. Newark had an estimated median household income in 2017 of USD 35,167 (compared to the New Jersey average of USD 80,088) [40]. Black and Hispanic or Latino individuals are more likely than their white Newark counterparts to live in poverty [40]. Only 16% have a Bachelor's degree or higher (compared to 37.6% of New Jersey residents) [39]. Accordingly, the unemployment rate, as of March 2019, was 6.7% [39]. Nearly 28% of Newark households have utilized Supplemental Nutrition Assistance Program (SNAP) benefits in the past 12 months [39]. The most common industries in Newark as of 2017 are healthcare (11.2%), followed by construction (9.6%) and accommodation and food services (7.6%) [40]. Notably, 18.4% of women in Newark work in healthcare [40].

Although the demographics of Newark's population have shifted, persistent socioeconomic disadvantages continue to influence a host of poor public health outcomes. Today, an estimated 39.0% of Newark adults have hypertension (vs. 28.6% for NJ overall), 15.7% have diabetes (8.7% NJ), 8.4% have chronic obstructive pulmonary disease (5.1% NJ), 7.6% have coronary artery disease (5.8% NJ), 4.6% have had strokes (2.2% NJ), and 25.0% have lost all of their teeth (13.3% NJ) [39]. The percentage of Newark women giving birth in 2015 without any prenatal care was 3.1%, compared to 1.4% for New Jersey overall [39]. The overall infant mortality rate is 11.6% (vs. 4.4% for NJ overall), with a rate of 15.1% for Black infants (8.7% NJ) [39]. Although only about 3.1% of New Jersey's population resides in Newark, 17.4% of New Jersey's primary and secondary syphilis cases are in Newark [39]. These issues are partially because 28.9% of Newark individuals aged 18–64 lack health insurance (compared to 15.7% in New Jersey, overall) [39]. Although passage of the Patient Protection and Affordable Care Act in 2010 increased rates of covered individuals in Newark from 71.9% to 81.9% in 2015, there are still approximately 50,000 individuals lacking insurance [39].

It is critical to understand the concept of social determinants of health, particularly during the global COVID-19 pandemic. Authors have written extensively about the role of structural racism in exacerbating existing health disparities in the time of COVID-19 [5].

We wish to emphasize that the people of Newark have similarly been impacted [41,42]. Since the beginning of the pandemic, activists warned that people from Black and brown communities in New Jersey would disproportionately be burdened by COVID-related morbidity and mortality [43] and, unfortunately, they were correct [41,42], emphasized in the sobering figure created by the New Jersey Policy Perspective in October 2020 [42]. This new health disparity is a product of Newark having disproportionately fewer medical and economic resources than surrounding wealthy communities in Newark [44]. In October, USA Today did an entire expose on the role of structural racism and health disparities in ravaging Black and Brown communities in Essex County (Newark's county) during the COVID pandemic [45]. We encourage all readers to review this piece. It explains how during the first wave of the COVID pandemic, "Essex County was among the top 10 in the country for its death rate". In addition, Newark's Mayor Ras Baraka emphasized that many Newark citizens do not have the luxury to isolate in a basement or attic, apart from their family members, during quarantine [44]. As a result, many Newarkers have been contracting COVID within their own homes [44]. Even with the rollout of COVID vaccines, offered to various community members at Newark's own New Jersey Medical School campus to date, Mayor Baraka and others have expressed fear that the people of Newark may lack trust in the medical system to such an extent that they are unwilling to receive the vaccine [44].

Violence is also a known public health issue [18]. A 2014 Department of Justice investigation of the Newark Police Department found widespread discriminatory policing and excessive use of force [22]. In 2015, Newark Mayor Ras Baraka signed an executive order to establish the Civilian Complaint Review Board (CCRB) to evaluate the Newark Police Department [22]. Notably, civil rights activists in Newark have persistently demanded for a CCRB since the 1970s [22]; the issue was frequently revisited, politicized, and then opposed by key political leaders until 2015 [22]. Although the crime index in Newark has decreased from 2013 to 2018 [40], issues of police brutality still permeate civic life in Newark as well as in cities across America. Police brutality, which disproportionately affects people of color, may manifest as physical, sexual, and emotional abuse; modulating stress levels and contributing to the development of many downstream acute and chronic health issues [22]. These experiences of stress may be carried forward throughout generations [22]; a sobering reality for families in Newark. To this day, activists and allies continue to advocate for health equity, anti-racism, and safety in their communities. On just one 2020 summer day in Newark, for example, over 12,000 individuals participated in a peaceful protest of police brutality [23]. There is, however, more work to be done.

8. Medical School Today

Certainly, the primary purpose of the medical school is to train tomorrow's physicians. However, it is apparent that the school's unique founding, out of extensive negotiations with its community, has had an enduring impact on the school's values. Below, we present some of the ways in which New Jersey Medical School's student body have demonstrated a deep understanding of the school's mission to address the public health needs of its community. The relative success of these efforts is beyond the scope of this manuscript; we encourage readers to review the specific published manuscripts briefly cited below.

One of the major social determinants of health is the healthcare system [39]. Key system factors include insurance coverage, physician availability and cultural humility, available language services, and quality of care [39]. Rutgers New Jersey Medical School currently has many efforts to address these factors as well as other social determinants of health; it is nationally recognized for its community collaboration [11,13]. It is our privilege to highlight a mere select few civic engagement efforts spearheaded by NJMS' medical students and published in academic journals.

Briefly, the African-American Brain Health Initiative is a university-community partnership which "combines community engagement, education and training, and brain health research" [46]. It aims to promote brain health and participation in brain-related

research initiatives among elderly African Americans in Newark [46]. The Ironbound Initiative is a student-led group at Rutgers NJMS, in conjunction with public and private community organization partnerships, which works to build trust between the healthcare system and the growing Latino community [47]. They have partnered with Mantena Global Care, a Brazilian community organization in Newark, to disseminate COVID-19-related information [47].

Benefits of New Jersey Medical School community endeavors extend beyond the provision of healthcare and connection to resources for the local community; they serve as opportunities for medical students to learn from the people they hope to serve. MiniMed is an outreach program designed to "empower the powerless to communicate more effectively with clinicians" via providing opportunities for medical students to interact with people from disadvantaged social groups in a non-threatening context [48]. For example, medical students have prepared and delivered lectures to inmates at Kintock Group facilities [48]. Through partnering with the Kintock Group and Newark Renaissance House, which is a nonprofit residential therapeutic community to assist chemically dependent women and children, participating medical students may become more familiarized with the circumstances, social programs, and healthcare needs for these patients [48]. Other ongoing school efforts are described online [49,50].

9. Medical School Tomorrow

Presently, Rutgers Biomedical and Health Sciences includes two separate medical schools, as well as colleges of nursing, pharmacy, dentistry, and other health sciences [12,33]. A proposal to merge the medical schools, which have campuses in Newark (NJMS) and New Brunswick (Robert Wood Johnson Medical School), has not yet been decided publicly [12]. However, Chancellor Brian Strom, hired to oversee RBHS in 2013, has proposed to combine the medical schools in the future, believing "a single accredited institution—stretched over two urban campuses—would be better for students and attract more research dollars" [12]. Currently, Strom serves as Chancellor of both medical schools, is on the board of UH, and is also on the board of the New Jersey Barnabas Health System [51]. Rutgers states the arrangement with RWJ Barnabas Health "is designed to create a higher quality, more sustainable health care system throughout northern and central New Jersey" [12]. Additionally, former Governor Chris Christie, who has acted as a lobbyist for several NJ hospitals during the pandemic, has been hired by RWJ as a consultant [52].

Despite Chancellor Strom's vision, several notable groups have expressed concern about the future in Newark. Indeed, UH is the primary teaching hospital for NJMS. These concerns have come in the form of letters by Senator Ron Rice, on behalf of members of the NJ Legislative Black Caucus, and from various health care unions (Health Professionals and Allied Employees; Communications Workers of America Local 1031; American Association of University Professors Biomedical Health Science of New Jersey) and sent to the Rutgers University President and to New Jersey Governor Phil Murphy [12,14]. They have cautioned that "Rutgers' partnership with a massive private hospital system and efforts to reorganize its two medical schools will drain staff and other resources from the urban hospital, which serves many vulnerable patients in Newark and functions as the state's only public acute-care facility" [12]. Indeed, some fear that UH will lose its status as an academic teaching center or close entirely [12]. It has been asserted that Rutgers plans are being developed "without sufficient public and stakeholder input" [12,15]. Over 1500 faculty from both medical schools have publicly opposed any such medical school merger at this time [15,51]. Faculty have contended that even the Council appointed to review the question of a medical school merger [53] does not sufficiently represent elected faculty leaders from either medical school [15].

Newark Mayor Ras Baraka strongly opposes the merger of the two healthcare systems, characterizing it as "an unregulated and premeditated takeover that will leave Newark residents without critical resources" [13,51]. In an open letter published on NJ.com, he stated this is "one of the ways that systemic racism rears its ugly head" [13]. He fears that

Newark's residents will lose access to quality healthcare at UH and, therefore, current health disparities will be exacerbated. Baraka notes that these discussions violate the Newark Agreements [13]. Proper needs assessments, review for compliance with state laws and regulations, and public hearings—per the Mayor and others—have not been performed [13,14,51]. As he states, "somehow, when it affects those that are disadvantaged, there can be found a way to bypass process and procedure altogether" [13]. Of note, CWA president John Rose has pointed out that "many of [RBHS's] other facilities are in suburban areas that tend to generate more lucrative reimbursements, compared with urban hospitals that care for high numbers of patients on Medicaid" [12].

Publicly, a spokesperson for RWJBarnabas Health explained that "RWJBarnabas Health respects and is sensitive to the unique histories of the medical schools, University Hospital and the City of Newark, and always seeks to demonstrate that respect. We are excited about the opportunities for enhancing the health of all New Jersey residents with our plans, and nothing within RWJBH's relationship with Rutgers University negates either the terms or the spirit of the Newark Agreements" [12]. Rutgers states that UH and "public health in Newark remain priorities for the university as it evolves" [12]. Neal Buccino, associate director of media relations for Rutgers University states that "Rutgers is and remains fully committed to University Hospital and Newark, and no future organizational changes, should they occur, will change that" [12]. They have shared that they "understand the mayor's passion" [51].

While reflecting on these current discussions, we are reminded of a quote by New Jersey Governor Richard J. Hughes upon creation of the Newark Agreements. At that time, he stated that, "the lengthy negotiations were designed to ensure that major advances in housing and relocation, community health services, training and employment opportunities, and community participation will in fact occur when the [school] comes to Newark . . . [representing] a pattern of constructive social action that brings together, as full equals, public official and private citizen, Black and white—a pattern that nourishes and dignifies everyone associated with it and that portends only good for Newark" [16].

It appears critical that New Jersey Medical School's future is handled with similar care. The ongoing presence of Rutgers NJMS at 185 South Orange Avenue, Newark, will continue to benefit some of the least privileged members of our society. Continued investment in UH is necessary for it to remain a place of employment, teaching, and healing for Newark's citizens; a 2010 report even stated that, "Rutgers needs to continue to expand not only its academic programming in Newark, but must commit to enhancing an ongoing residential and community presence in the city" [11]. These facts are emphasized by the unprecedented challenges posed by the current COVID-19 pandemic [6,54,55]. Achieving health equity for New Jersey's most vulnerable patients must be a top priority. Striving toward success in this regard requires careful and strategic organization of New Jersey's health workforce. The historic agreements established in the Newark Accords should not be undermined. Accordingly, when considering any business decisions to relocate any faculty, staff, and students from the Newark campus, we believe engaging in a similar approach as the 1968 Newark Agreements is in order. Communication is paramount. Our past teaches us that more creative, and ultimately more mutually beneficial solutions, will be generated by doing so.

10. Conclusions

We believe that it is imperative to know our community's recent history. Elsewhere we have written about the ethical obligation of medical schools, generally, to engage with their communities to improve public health [49]. This article emphasizes that, among medical schools, Rutgers New Jersey Medical School's commitment to Newark is meaningfully unique. Born out of widespread socioeconomic injustices, Rutgers NJMS have committed, indefinitely, to actively promote public health in Newark, codified explicitly in the historic Newark Agreements. We know of no other social contract like this one.

Today's many instances of police brutality against Black and brown people, combined with the global COVID-19 pandemic that disproportionately harms and kills racial and ethnic minorities [7,8,54,55], are reminiscent of the devastation experienced by Newark citizens back in the 1960s. Additionally, current considerations to effectively re-distribute resources from RBHS' Newark medical campus to more affluent hospitals eerily echo Mayor Addonizio's redistribution of funding from the UCC to programs in which he could exert more control in the 1960s.

The Agreements set an important standard for communities across the country: hospital health policy decision-making may be a collaborative endeavor. Accordingly, we believe it is imperative that members of Rutgers NJMS, Rutgers RBHS, and affiliate faculty, staff, residents, and students review Newark's recent history. These members must realign themselves with the commitments made by our own predecessors in the Newark Accords. When considering novel business ventures to potentially alter hospital structures, reorganize the health workforce, or to merge medical schools, all must remember that NJMS as we know it exists only because of extensive negotiations with the people of Newark. The ensuing Agreements lack an expiration date.

Of course, other works have more substantially explored the recent history of our community [19], as well as documented the Newark Accords [16] and the development of New Jersey Medical School [21]. Indeed, Robert Curvin's book *Inside Newark* provides a comprehensive, authoritative analysis of recent sociopolitical developments in our city [26]. The goal of this interdisciplinary manuscript, therefore, is to connect the historical inequities in Newark to the current health care policy discussions in Newark. We found that it was impossible to adequately discuss historical health policy in Newark without simultaneously documenting efforts to achieve racial justice in Newark. Ultimately, we know that Newark's story emphasizes the complex interplay between race, politics, and medicine in shaping a community's past, present, and future public health. We believe the themes of this discussion are universal: Public health matters, local history matters, and creative health policy solutions may be implemented with improved communication. An international audience may find this piece thought-provoking. Hopefully, readers of all backgrounds will apply lessons described in this brief review to pursue health equity within their own communities.

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Review

Planning the Future Oral Health Workforce: A Rapid Review of Supply, Demand and Need Models, Data Sources and Skill Mix Considerations

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Abstract: Over the last decade, there has been a renewed interest in oral health workforce planning. The purpose of this review is to examine oral health workforce planning models on supply, demand and needs, mainly in respect to their data sources, modelling technique and use of skill mix. A limited search was carried out on PubMed and Web of Science for published scientific articles on oral health workforce planning models between 2010 to 2020. No restrictions were placed on the type of modelling philosophy, and all studies including supply, demand or needs based models were included. Rapid review methods guided the review process. Twenty-three studies from 15 countries were included in the review. A majority were from high-income countries (n = 17). Dentists were the sole oral health workforce group modelled in 13 studies; only five studies included skill mix (allied dental personnel) considerations. The most common application of modelling was a workforce to population ratio or a needs-based demand weighted variant. Nearly all studies presented weaknesses in modelling process due to the limitations in data sources and/or non-availability of the necessary data to inform oral health workforce planning. Skill mix considerations in planning models were also limited to horizontal integration within oral health professionals. Planning for the future oral health workforce is heavily reliant on quality data being available for supply, demand and needs models. Integrated methodologies that expand skill mix considerations and account for uncertainty are essential for future planning exercises.

Keywords: health workforce; operational models; planning; skill mix; integration

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1. Introduction

The health workforce is the backbone of health systems, fundamental towards achieving universal health coverage (UHC) and meeting sustainable development goals (SDGs) [1–3]. Planning for the future health workforce is a complex process, requiring trade-offs across multiple health professional objectives in education, training and regulation, and numerous uncertainties due to transition health environments (demographic, epidemiologic and technology) [4]. In general health workforce planning aims to achieve a proper balance between supply and demand of health professionals [5]. The philosophy behind planning is to ensure the right number of health personnel, with the right training and skill sets are available at the right place and at the right time to meet population needs, but at an acceptable cost and quality [6]. The process is not just technical, but a political one [6]. Planning decisions on the number, type and distribution of health personnel depend and

are influenced by a range of social, economic and professional values enshrined within underlying health systems.

Planning for the future oral health workforce presents its unique challenges. First, the profession of dentistry, in many countries, has remained historically 'distinct' from the medical, nursing and broader health professions [7]. Silos are visible in the education and practice of dental professionals, that also extend to policy and planning decisions [7–9]. Second, dentists are at the center of the dental profession, entrusted with the responsibility of providing leadership, and serving as the first point of contact for the majority of oral health conditions [7]. The allied dental workforce—dental hygienists, dental therapists, dual qualified hygienist/therapists, dental technicians, denturists, prosthetists and dental assistants—support the dentist in the provision of care. However, the acceptance of allied dental professionals vary country to country and potentially reflect on the use of skill mix in planning decisions [10]. Third, dental specialists are the gatekeepers of the profession, providing exceptional services to 'special' patients, and serving as a focal point for quality benchmarks, innovation and adoption of new procedures, clinical research and education of the dental team [11]. Atleast 10 distinct specialist dental professionals exist: orthodontists, oral and maxillofacial surgeons, prosthodontists, periodontists, endodontists, paediatric dentists, oral pathologists, oral medicine, special needs and dental public health specialists. Not all dental specialities gain equal importance in the planning exercise. A further challenge in oral health workforce planning is consideration for both horizontal (i.e., within profession skill mix) and vertical (i.e., skill mix outside the dental profession) integration in planning models.

Traditionally, four broad approaches to health workforce planning have been identified in the literature: needs-based, utilisation or demand-based, health workforce to population ratio, and target setting approach [4,12]. Each of these approaches includes atleast one or more of the basic building blocks in modelling: supply, demand and need [13]. Supply models estimate the number of health personnel available based on the current stocks, flows/migration, and newly trained personnel. Demand or needs model estimate health personnel required to meet the underlying population demand or needs respectively. Needs are identified through epidemiological surveys, accounting for diseases prevalence and health status. Demand is identified through health service utilisation. Supply and demand/needs models are usually presented together, so the combined model can determine the gap in health personnel availability. Planning models are also classified as being deterministic or stochastic [12]. Deterministic models assume the outcome is certain, and always deliver the same results for the same input values. On the other hand, stochastic models allow for the introduction of random changes and provide means for building an element of uncertainty in the overall planning models.

Over the last decade, there has been a renewed interest in oral health workforce planning [14–16]. The purpose of this review is to examine oral health workforce planning models on supply, demand and needs, mainly in respect to their data sources, modelling technique and use of skill mix. We also identify strengths and weaknesses in these workforce models and provide insights on how oral health workforce planning can evolve in the future to meet changing population needs and demands, improving health outcomes and health systems performance.

2. Methods

The study was based on a rapid review approach adapted from Khangura et al. [17] and Thomas et al. [18]. Rapid reviews are a type of systematic reviews, where components of a regular systematic review are simplified or made more efficient to produce information in a shorter span of time, but with minimal impact to quality [19]. In recent years, rapid reviews have emerged as an efficient solution to synthesizing evidence to support health policymaking and health systems strengthening by providing high-quality evidence in a timely and cost-effective manner [20]. Our rapid review involved the following steps: (i) defining a review/research question (ii) developing a search strategy (iii) establishing

selection/eligibility criteria (iv) screening and study selection (v) data extraction and (vi) synthesis of findings. We have adhered to Khangura et al.'s descriptive synthesis of findings and emphasis on translation of findings to policy and practice [18,19]. Targeted searching of key databases, and data abstraction by mapping study characteristics were adopted from Thomas et al. [17,19]. While no generic trend or adherence to any particular variant of rapid reviews have been observed in recent reviews [19,21], our methodological underpinning to key schools of rapid review thought streamlines our approach and philosophy.

2.1. Research Question

The following question was formulated for this part of the review: What are the main operational models, data sources and techniques used in oral health workforce planning?

2.2. Search Strategy

A comprehensive search strategy was designed in consultation with an expert librarian at Kings College London to capture the relevant literature on the topic of interest. We included four broad categories in our search criteria: healthcare and workforce planning, dental service provision, dental staffing, modelling techniques and skill mix. Specific MeSH terms and keywords, along with Boolean operators were used to build the search. This list was refined by conducting a group discussion among all authors to arrive at a consensus. Electronic searches were carried out in 2 different databases: PubMed and Web of Science. The search strategy was designed for PubMed interface, and later revised for Web of Science. A limited literature search was undertaken for relevant titles, abstracts and keywords (please see Supplementary Tables S1 and S4). Standard techniques such as using truncation methods and searching for relevant references from the bibliography provided in searched papers and were also used. Manual forward-backward search or citation tracking of the identified articles were performed using Scopus and Google Scholar. The search process and identification of articles was carried in the second half of 2020, between September and December.

2.3. Eligibility Criteria

Published original research articles on oral health workforce planning were included in the review. Studies need to have followed a workforce modelling approach to estimate the current or future requirements of oral health personnel (dentists, dental specialists, therapists, hygienists, or other allied dental personnel). No restrictions were placed on the type of modelling philosophy, and all studies including supply, demand or needs-based estimates were included. Studies could range from simple dentist population ratios, to more complex skill mix and scenario-based models. Articles published between 2010 and 2020 in English language were included.

Commentaries, reviews, policy briefs, government reports, working papers, opinions, perspectives, conference abstracts, letter to editors, dissertations/thesis, or evidence summaries were excluded in this review. Oral health workforce modelling should have been the main aspect of the paper—studies that only identified oral health workforce requirements without any supporting methods or modelling approaches were excluded. Studies should have also focused on oral health personnel as the basic unit for modelling—studies focusing on dental practices or facilities were excluded.

2.4. Study Selection

First, one of the reviewers (S.G.) identified all articles via database searching, duplicates were excluded and imported the final list into a web/mobile based systematic review management application called Rayyan (Qatar Computing Research Institute, Doha, Qatar) [22]. The tool is mainly designed to expedite the initial screening of abstracts, titles and keywords using a process of semi-automation while incorporating a high level of usability [22]. Duplicates were removed. Four reviewers (M.B., A.H., A.A., S.G.) carried out the selection of articles. Articles that did not fit the eligibility criteria were excluded. If

limited information was available in the initial scanning process, the full text was obtained to determine eligibility. Later, the full text of all selected articles was read, and further limited to only relevant articles based on the selection criteria. Lack of agreement or conflict arising in the selection of articles were resolved through group discussions and consultation with the senior author (J.G.).

2.5. Data Extraction, Synthesis and Reporting

Extraction of data from selected papers was performed by using pre-defined criteria. We extracted a range of study characteristics including: author/year, country of research, aim of study, workforce/population modelled, model type, supply/demand/needs models, data sources, findings, strengths/limitations, policy implications and conclusion. All authors were involved in discussing the emerging data to decide on relevance and decide any modifications in the data extraction framework for the study. Data extraction was conducted using an MS Excel template, which was later developed into a MS Access database for improved usability. We followed a descriptive approach in synthesis and reporting of data, based on Khangura et al.'s rapid review methodology [18]. The focus of this paper is limited to detailed characteristics of the supply, demand and needs model, how these models were developed and the sources of data for these models.

3. Results

A total of n = 3047 potential articles were identified through database and citation searching. Following the removal of duplicates, n = 2748 articles were available for title/abstract/keyword screening. A total of n = 2727 articles were excluded (n = 64 after group discussion and conflict resolution), providing n = 23 articles for data extraction and qualitative synthesis. Figure 1 provides the PRISMA flowchart of the study selection. A list of selected studies for the rapid review will full citation of articles is provided in Supplementary Table S3.

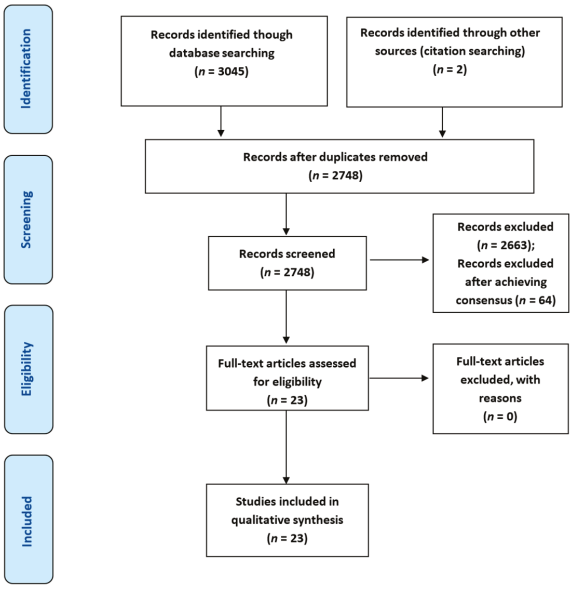

Figure 1. PRISMA Flowchart for the Rapid Review.

3.1. Main Study Characteristics

The main characteristics of the 23 selected studies are provided in Table 1. These publications were from 15 different countries across the world: Australia [23], Canada [24], Chile [25], China [26,27], Japan [28], Kuwait [29], India [30], Ireland [31], Malaysia [32,33], Oman [34], Sri Lanka [35], Taiwan [36], Trinidad & Tobago [37], the United Kingdom [38–41], and the United States of America [42–45]. Seven studies were based in the WHO American Region, followed by the European (n = 5) and Western Pacific Regions (n = 4). Most of the studies were also based on high-income group World Bank countries (n = 17). It is important to note that no studies were identified from the WHO African Region or low-income group World Bank countries Dentists were the dominant oral health workforce group modelled across 13 studies [24–31,34–36,43,44]. Five studies considered both dental and allied dental workforce (including therapists, hygienists, clinical technicians, denturists) in the workforce models [32,33,38–40]. Four studies specifically modelled the dental specialist workforce, including all dental specialities [41] or covering any of the limited specialist groups: oral and maxillofacial surgeons [23], orthodontists [37] or pediatric dentists [45]. One study has modelled all three oral health workforce groups: dentists, pediatric dentists (specialists) and dental hygienists (allied dental professionals) [42]. The population being modelled in the studies ranged from the full population of the country/region (n = 10) [23,25,28–30,34–36,40,43] or limited to include a specific group such as children (n = 4) [26,37,42,45], adults (n = 3) [31–33], or older people (n = 1) [38]. Four studies focused on population-based at a specific catchment area such as province/state (Liaoning Province, China [27]; Kentucky, USA [44]; Georgia, USA [42]) or a service/administrative zone (South Central Strategic Health Authority, England/UK [39]; Canadian Armed Forces service areas, Canada [24])

A number of workforce modelling types were observed in the selected studies, with the most common application being the workforce to population ratio (n = 10) [25,27–30,34,36,37,41,44] followed by a needs-based/demand-weighted (n = 5) [23,35,38,39,45] variant. One article compared both the workforce to population ratio and needs based demand weighted models in the same study [24]. Four studies used a needs-based model [26,31–33]; and three a demand or utilization based model alone [40,42,43].

3.2. Detailed Study Characteristics

Table 2 presents detailed study characteristics of the supply, demand and needs models along with various data sources and techniques used in developing these models.

3.2.1. Supply Models and Data Sources

A total of 18 studies in the review have presented supply models. Existing stock of the dental workforce has been determined in all these studies, with the most common estimation being through the use of dentist registrations data, obtained via a national dental council or a regulatory authority (n = 7) [29–31,35,38,41,42,44]. Two studies from the USA have determined estimates using state dental regulatory authorities, namely from Georgia [42] and Kentucky [44]. Brailsford & De Silva [35], prepared a separate national register for the study accommodating registrations, record matching and panel interview to identify existing stock and currency of practice. Gallagher et al. [38] used a range of sources (registrations, dental practice survey and NHS government data) in determining the existing stock of oral health workforce in England, UK. In addition, four other studies have used mainly dentist surveys in accounting for existing workforce numbers [23,27,28,43]. Studies in Australia [23] and Japan [28] have utilized national dental workforce surveys in determining more detailed estimates on the stock of dentists. A few studies have also used government data from sector specific areas such as health services [36,38,39,42] or armed forces [24].

Table 1. Main characteristics of selected studies in the rapid review.

Study No.	Author(s), Year	Aim of Study	Country; WHO Region; World Bank (WB) Group	Workforce Group Modelled	Population Modelled	Model Type
1	Ab-Murat N et al., 2015	To compare estimates of periodontal dental treatment needs and workforce requirements for different skill mix models using normative and sociodental approaches	Malaysia; WHO South East Asian Region; WB Upper Middle Income Group	Dentists and Dental Therapists	Malaysian adults; 30–54 years old	Needs-based
2	Ab-Murat N et al., 2015	To estimate and compare prosthodontic treatment needs and workforce requirements, using the normative and the sociodental approaches for different skill mix models	Malaysia; WHO South East Asian Region; WB Upper Middle Income Group	Dentists and Denturists	Malaysian adults; 30–54 years old	Needs-based
3	Ahern S et al., 2019	To develop a practical oral health needs based workforce planning simulation tool and apply it in a hypothetical situation using publicly available data in Ireland.	Ireland; WHO European Region; WB High Income Country	Dentists	Irish adults; 15+ years	Needs-based
4	Al-Jarallah KF et al., 2020	To describe the size of the dentist workforce in Kuwait between 1994 and 2006, and to project the future demand for dentists, and supply of Kuwaiti dentists for the years 2007–2020	Kuwait; WHO Eastern Mediterranean Region; WB High Income Country	Dentists	All population in Kuwait	Workforce to population ratio
5	Bourne CO, 2012	To estimate the current orthodontic manpower requirements of Trinidad and Tobago	Trinidad and Tobago; WHO American Region; WB High Income Country	Orthodontists	Children; 11 to 12 years	Workforce to population ratio

Table 1. *Cont.*

Study No.	Author(s), Year	Aim of Study	Country; WHO Region; World Bank (WB) Group	Workforce Group Modelled	Population Modelled	Model Type
6	Brailsford S & De Silva D, 2015	To develop an operational model for informing policy decisions on number of dentists required in Sri Lanka	Sri Lanka; WHO South Asian Region; WB Lower Middle Income Country	Dentists	All population in Sri Lanka	Needs based demand weighted
7	Cao S et al., 2017	To determine the extent of paediatric dental care shortages in Georgia and to develop a general method for estimation that can be applied to other states	USA/Georgia; WHO American Region; WB High Income Country	Dentists; Paediatric dentists; Dental hygienists	Children aged under 18 years in Georgia, USA	Demand based
8	Cartes-Velásquez RA, 2013	To review the changes in academic, economic and workforce issues resulting from the growth in the supply of undergraduate dental vacancies between 1997 to 2011	Chile; WHO American Region; WB High Income Country	Dentists	All population in Chile	Workforce to population ratio
9	Eklund SA & Bailit HL, 2017	To examine factors that are linkely to affect the number of US dentists needed in 2040 and compare estimated number of dentists needed in 2040 to current trends.	USA; WHO American Region; WB High Income Country	Dentists	All population in USA	Demand based
10	Gallagher JE, Kleinman ER & Harper PR, 2010	To explore the required skill mix of the dental team to meet the future need and demand of older people in England.	UK/England; WHO European Region; WB High Income Country	Dentists; Hygienist; Therapist; Hygienist/Therapist; Clinical Dental Technicians	Older people (65 years)	Needs based, demand weighted
11	Gallagher JE, Lim Z & Harper PR, 2013	To explore future scenarios for the use of the skill mix within the dental team to inform the commissioning of dental therapy training.	UK/England/South Central SHA WHO European Region; WB High Income Country	Dentists; Dental therapists	All population based at South Central Strategic Health Authority (SHA), one of the 10 National Health Service (NHS) administrative zones in England.	Needs based, demand weighted

Table 1. *Cont.*

Study No.	Author(s), Year	Aim of Study	Country; WHO Region; World Bank (WB) Group	Workforce Group Modelled	Population Modelled	Model Type
12	Gallagher JE, Manickam S & Wilson NHF, 2015	To describe trends in the dental workforce in Oman from 1990 to date; compare the dental workforce with its medical counterparts in Oman and with other countries; to consider future dental workforce in the Sultanate.	Oman; WHO Eastern Mediterranean Region; WB High Income Country	Dentists	All population in Oman	Workforce to population ratio
13	Huang CS et al., 2013	To make projections of the dental workforce from 2011 to 2020, based on a survey of the actual workload of 6762 dentists in 2010.	Taiwan; WHO Western Pacific Region; WB High Income Country	Dentists	All population in Taiwan	Workforce to population ratio
14	Ishimaru M et al., 2016	To estimate the future distribution of dentists with different working statuses in Japan and to discuss policy implications about the supply of dentists in any country.	Japan; WHO Western Pacific Region; WB High Income Country	Dentists	All population in Japan	Workforce to population ratio
15	Jaiswal AK et al., 2014	To analyse the changing trends in dental manpower production in India since 1920 and its development to date, including the number of dental colleges and distribution of trained professionals nationwide.	India; WHO South Asian Region; WB Upper Middle Income Country	Dentists	All population in India, broken by States/Territories.	Workforce to population ratio
16	Ju X et al., 2010	To estimate the supply and demand of oral and maxillofacial surgeons and services in Australia	Australia; WHO Western Pacific Region; WB High Income Country	Oral and Maxillo facial surgeons	Overall Australian population	Needs based, demand weighted

Table 1. *Cont.*

Study No.	Author(s), Year	Aim of Study	Country; WHO Region; World Bank (WB) Group	Workforce Group Modelled	Population Modelled	Model Type
17	Mills RW, 2020	To gather data and help contribute towards assessing the need for future specialist training places by mapping General Dental Council (GDC)-listed specialists registered in UK postal areas and plotting specialists' first GDC registration dates.	UK; WHO European Region; WB High Income Country	Dental Specialists	Not available (NA)	Workforce to population ratio
18	Saman DM, Arevalo O & Johnson AO, 2010	To assess geographic distribution of dentists in Kentucky; to estimate the future availability of dental providers and provide policy recommendations so as to improve access to oral health care in Kentucky and other rural states	USA/Kentucky; WHO American Region; WB High Income Country	Dentists	All population in Kentucky, USA	Workforce to population ratio
19	Shaw JL et al., 2017	To compare two methods of allocating general dentists to Canadian Armed Forces (CAF) dental detachments: a dentist-to-population ratio model and a needs-based model.	Canada; WHO American Region; WB High Income Country	Dentists	Canadian Armed Forces population in catchment areas	Workforce to population ratio
20	Sun X et al., 2017	To estimate the required human resources to meet the oral health needs of the WHO reference group of 12-year-olds in China and consider the implications for education, practice, policy and Human Resources for Oral Health nationally	China; WHO Western Pacific Region; WB Upper Middle Income Country	Dentists	Children; 12 year olds	Needs based

Table 1. *Cont.*

Study No.	Author(s), Year	Aim of Study	Country; WHO Region; World Bank (WB) Group	Workforce Group Modelled	Population Modelled	Model Type
21	Surdu S et al., 2016	To evaluate the adequacy of the supply of paediatric dentists	USA; WHO American Region; WB High Income Country	Paediatric dentists	Children, all ages	Needs based demand weighted
22	Wanyonyi KL et al., 2015	To investigate the potential for skill mix use in primary dental care in England based on the undergraduate training experience in a primary care team training centre for dentists and mid-level dental providers	UK/England; WHO European Region; WB High Income Country	Dentists; Dental therapists	All population (adults and children) in England, who avail NHS public dental care.	Demand based
23	Zhang Y et al., 2015	To describe the distribution, structure and allocation of oral health services personnel, evaluate oral health service capacity and predict the future needs for oral health services in northern China.	China; WHO Western Pacific Region; WB Upper Middle Income Country	Dentists	All population based at Liaoning Province, China	Workforce to population ratio

Table 2. Detailed characteristics of supply and demand/needs model of selected studies.

Study No.	Author(s), Year	Supply Model		Demand | Needs Model		Modelling Technique
		Existing Stock; Flows; Newly trained; Workforce participation/Full Time Equivalent (FTE)	Data source(s)	Population; Demand | Needs Workforce requirement	Data source(s)	Approach Skill mix
1	Ab-Murat N et al., 2015	NA	NA	Population: 30–54 year old adults; employees at a public university in Kuala Lumpur, Malaysia (n = 732) Needs: Periodontal treatment needs assessed using Normative and Social Dental Approaches. - Normative Needs (NN) assessed using Community Periodontal Index, where presence of bleeding, calculus and pockets recorded for all indexed teeth. - Socio-Dental Need (SDA) assessed for people with NN. Impact Related Need and Propensity Related Need accounted for quality of life and behavioural assessment respectively in estimating treatment needs. Workforce requirement: Timings for periodontal procedures were used to estimate dental personnel required for both above approaches. Timings and dental personnel were estimated for 100,000 people to make inferences to all adults in Malaysia.	Oral health clinical examination of sample to assess oral health status and periodontal conditions. Face to face questionnaire survey to assess impacts on oral health related quality of life, frequency/severity of impacts, and oral health behaviours. Expert committee consisting of 6 dentists reviewed periodontal procedures and determined minimum and maximum times for periodontal treatments. The annual working hours of 1760 was used to highlight the differences in workforce estimates between the different scenarios	Approach: Dental personnel requirements for both NN and SDA estimated and compared using statistical tests. Comparisons made accounting for minimum and maximum treatment times, and dental personnel required for 100,000 Malaysian adults. Skill mix: Treatment timings for dentists and therapists were taken to be similar. Three scenarios modelled to meet periodontal care under the NN and SDA approaches: - Dentist only; - Minimum skill mix (only scaling and polishing delegated to therapists); - Maximum skill mix (scaling, polishing and root planning procedures delegated to dental therapists; dentists carry periodontal surgery)

Table 2. *Cont.*

Study No.	Author(s), Year	Supply Model	Demand | Needs Model		Modelling Technique
2	Ab-Murat N et al., 2015	NA	NA	Population: 30–54 year old adults; employees at a public university in Kuala Lumpur, Malaysia (n = 732) Needs: Prosthodontic treatment needs assessed using Normative and Social Dental Approaches. - Normative Needs (NN) based on missing teeth, ill-fitting or non-aesthetic prosthesis. - Socio-Dental Need (SDA) assessed for people with NN. Impact Related Need measured via an oral impact for daily performance index. Propensity Related Need i.e., behavioural assessment for people who were in need of bridges or dentures Workforce requirement: Timings for prosthodontic treatment were used to estimate dental personnel required for both above approaches. Timings and dental personnel were estimated for 100,000 people to make inferences to all adults in Malaysia.	Oral health clinical examination of sample to assess oral health status including missing teeth, requirement of dentures or any prosthodontic treatment Face to face questionnaire survey to assess impacts on oral health related quality of life, frequency/severity of impacts, and oral health behaviours. Expert committee consisting of 6 dentists reviewed prosthodontic treatments for dentures and bridges, determined minimum and maximum times for periodontal treatments, 1760 annual working hours.	Approach: Dental personnel requirements for both NN and SDA estimated and compared using statistical tests. Comparisons made accounting for minimum and maximum treatment times, and dental personnel required for 100,000 Malaysian adults. Skill mix: Treatment timings for dentists and denturists were taken to be similar. Three scenarios modelled to meet prosthodontic care under the NN and SDA approaches: - Dentist only; - Minimum skill mix (denturists provide only complete dentures); - Maximum skill mix (denturists can provide all denture procedures except bridges)

Table 2. *Cont.*

Study No.	Author(s), Year	Supply Model		Demand | Needs Model		Modelling Technique

3	Ahern S et al., 2019	Existing stock: Stock of dentists in Ireland was estimated using registration statistics, which included information such as date of registration, year of qualification and primary qualification.
		Flows: Inflows were based on three types:
		- Overseas-trained dentists newly registered to practice
		- Irish trained dentists returning to practice
		- Dentists returning after a period of absence
		Outflows were based on three types:
		- Dentists leaving Ireland
		- Dentists taking career break or period of absence
		- Retirement and death
		Newly trained: Number of undergraduate places in the two dental schools, adjusted for attrition/failure rate. Then, the number is adjusted to account for the percentage entering employment.
		Workforce participation/FTE: Participation rate assumed at 95% of all dentists registered, to account for dentists working in non-clinical activity. Further, activity rate was assumed to be at 85% accounting for part time work. All supply, inflow and outflow estimates were adjusted to reflect this activity rate.
			Registration data of dentists from Dental Council of Ireland
			Registration data of dentists from Dental Council of Ireland
			Dental Schools Data
				Population: Adult population of Ireland (15+ years). Age and gender distributions available.
				Needs: Oral health status mainly identified from four questions used in the population survey:
				- Number of teeth present
				- How often in past 12 months one has experienced difficulty in:
				  - eating food due to oral problems
				  - chewing/biting food due to oral problems
				  - experienced toothache, mouth or denture problems
				Workforce requirement: Frequency and type of dental visits (check-up, routine or emergency) over past 12 months collected. Service timings (overall minutes and FTE dentists required) were estimated based on making assumptions on service timings.
					Special Eurobarometer 330
					Oral Health Survey dataset
					Special Eurobarometer 330
					Oral Health Survey dataset
					Special Eurobarometer 330
					Oral Health Survey dataset
						Approach: Provider supply to requirement ratio estimated under four circumstances:
						- Unchanged current hours/times
						- Treatment times changed
						- Hours worked changed
						- Treatment times and hours worked both changed
						Projections available from 2017 to 2050.
						Skill mix: Not identified in the study/approach

Table 2. *Cont.*

Study No.	Author(s), Year	Supply Model		Demand | Needs Model		Modelling Technique
4	Al-Jarallah KF et al. 2020	Existing stock Dentist estimates based on registrations data. Workforce participation/FTE: Dentist numbers (Kuwaiti and Non Kuwaiti) were used as proxy for workforce participation.	Dental Licensing Department; Ministry of Health Kuwait; Ministry of Planning Kuwait; Faculty of Dentistry, Kuwait	Population: Overall population of Kuwait was considered, including projections.	Ministry of Health Kuwait; Ministry of Planning Kuwait; Department of Statistics and Medical Records, Kuwait	Approach: Dentist supply numbers available from 1994 to 2006, and were projected for years 2007 to 2020. Similarly, population estimates were also available/projected for the given years. Projected supply estimates and dentist to population ratios accounted for growth in previous years. Shortfall in Kuwaiti dentists (based on annual increase estimates) to overall dentists (based on dentist to population ratio estimates) was projected for the years 2007 to 2020. Skill mix: Not identified in the study/approach
5	Bourne CO, 2012	NA	NA	Population: 11–12 year old childrenDemand: Orthodontic treatment preferences and visits of children were estimated through a population survey. Unclear how total children requiring orthodontic treatment were estimated. Workforce requirement: 9 orthodontists from 11 practices, who have been in practice for 10+ years and practice established 5 years ago were surveyed using a workforce questionnaire. Number of patients treated per year was estimated. Unclear how workforce requirements were limited to the specific age group 11–12 years.	Cross sectional study on orthodontic treatment needs of 11–12 years old children. Questionnaire survey administered to all orthodontists	Approach: Gap in total number of orthodontics required and currently available was identified though a survey based approach. Modelling aspects from the survey findings and how it applies to the specific age group is unclear in the description. A broad orthodontists to children/population approach seems to have applied for modelling. Skill mix: Not identified in the study/approach

Table 2. *Cont.*

Study No.	Author(s), Year	Supply Model		Demand | Needs Model		Modelling Technique
6	Brailsford S & De Silva D, 2015	Existing stock: A national register of practising dentists natively prepared using dental registrations from medical council, record matching and panel interviews. Practice activity of dentists Flows: Attrition, Retirement and migration were accounted for in the model. Newly trained: Newly trained dentist practices based on outputs of the single dental school in Sri Lanka. Students were also surveyed on motivations and career expectations. Workforce participation/FTE: Practice activity of dentists surveyed via postal questionnaire, collecting information on socio-demographics, working patterns, hours worked, practice location, and main practice type. Total available clinical hours was estimated.	Sri Lankan Medical Council Registrations; Panel interviews; Dental practice activity survey Student survey	Population: All people in Sri Lanka Demand: FDI/WHO method for estimating services needed for a person, expressed in minutes, is used. Dental disease burden is accounted for in three main categories: caries, periodontal disease, and prosthodontic treatment needs. Local advice sought to identity percentage of people who need care, and who actively express demand for care. Workforce requirement: Timings for dental treatment were estimated via a survey, and treatment times were scaled up for each age groups, and at national level to identify the number of overall treatment hours required.	Sri Lankan Department of Census and Statistics 2003 National Oral Health Survey, Sri Lankan Ministry of Health	Approach: Supply and demands models separately created with the outputs of both models being number of hours available or required. Both these models were superimposed to identify gap in provision of services in treatment hours and number of dentists. A range of supply and demand scenarios were modelled for the years 2010 to 2024. Demand was considered in three main scenarios: low, moderate and high (in hours), and supply estimates were varied based on student intakes, retirements, practice activity restrictions, private sector participation and increased employment opportunities. Skill mix: Not identified in the study/approach

Table 2. *Cont.*

Study No.	Author(s), Year	Supply Model		Demand | Needs Model		Modelling Technique
7	Cao S et al., 2017	Existing stock: Number of dental registrations available from local/state government sources. Flows: Not identified in the study/approach Newly trained: Not identified in the study/approach Workforce participation/FTE: Average work hours of 35.2 and 35.6 h accounted for male and female dentists per week. Time spend for the provision of paediatric dental care was estimated for both general dentists at 22% and paediatric dentists at 84%. This provided overall clinical hours available for treating children.	2015 National Plan and Provider Enumeration System Georgia Board of Dentistry roster for licenses expiring 2010 Survey of Dental Practice	Population: All children in Georgia, USA Demand: Caries risk estimated for children using survey data and prevalence of high risk and low risk children estimated across each census tract (geographic areas). Workforce requirement: Dental care demand per child by age group (0–3, 4–5, 6–7 and 8–18 years) estimated in minutes, and stratified by caries risk. Published data on procedure timings (including MEPS and expert opinions) were used to estimate paediatric treatment need. The timings were estimated for state and each geographic area/county.	2010 US Census data National Health and Nutrition Examination Survey data Medical Expenditure Panel Survey Expert opinion for treatment timings	Approach: Paediatric work hours were estimated both on supply side and demand side, and superimposed at the geographic level (country) to understand shortage areas. Skill mix: Dental hygienists, general dentists accounted for in the calculation of work hours along with paediatric dentists.

Table 2. *Cont.*

Study No.	Author(s), Year	Supply Model		Demand | Needs Model		Modelling Technique
8	Cartes-Velásquez RA, 2013	Existing stock: Current workforce (baseline: 2012) estimated at n = 17,000 dentists. Historical data on number of dentists and graduates available from 1997 to 2011. Flows: Dentist migration and attrition rates were not included in the model. Newly trained: Current number of dental schools and graduates accounted for. Assumptions made that 80% of students in school graduate. Opening of new dental schools not accounted for. Workforce participation/FTE: Number of dentists available in the workforce was estimated based on the available assumptions at 2012, mainly accounting for student graduations. Unclear if any historical data from previous years were used to inform the supply projection model.	Indicadores de Instituciones y Carreras de Edu- cación Superior database of the Consejo Nacional de Educación (Education database from the Ministry of Education, Chile)	Population: Total population in Chile.	Instituto Nacional de Estadísticas de Chile (National Statistics Department of Chile)	Approach: Workforce to population ratios were estimated, and gap in dentist numbers and dentist to population ratios were visually described. Historical trends on dental school enrolments and dentist numbers also provided on the supply model.Skill mix: Not identified in the study/approach
9	Eklund SA & Bailit HL, 2017	Existing stock: Number of dentists (n = 195,722) in USA working across private practices, armed forces, hospitals, resident students or others were identified from a survey. Flows: Not identified in the study/approach Newly trained: Not identified in the study/approach Workforce participation/FTE: 70% of all dentists assumed to provide full time care (n = 136,905) at 30 or more hours per week.	American Dental Association Survey Centre	Population: Overall population for current year (2015) and projections for 2040 available. Demand: Previous publications suggest about 42 to 62% of people visit dentist once every year, estimated at 135 to 215 million single dental visits. Workforce requirement: Based on the number of dental visits, dentist requirements are estimated.	National Centre for Health Statistics Previous publications (Manski et al. 2009, 2016)	Approach: Number of FTE dentists available under the supply model and number of FTE dentists required under the demand model were estimated and compared. A range of theoretical assumptions and policy approaches were discussed, but without a modelling exercise. Skill mix: Not identified in the study/approach

Table 2. *Cont.*

Study No.	Author(s), Year	Supply Model		Demand | Needs Model		Modelling Technique
10	Gallagher JE, Kleinman ER & Harper PR, 2010	Existing Stock: Supply of dentists, hygienists and therapists (2006: baseline) determined from registrations, survey and NHS data. The shift to dual qualified hygienists and therapists included, with a gradual increase in hygienist numbers. Flows: Short term recruitment drive (n = 1000 dentists) included; Unclear to what extent migration, attrition and return to work is incorporated. Newly trained: Current student completions, as well as increases in student intake for dentists (n = 170) and dental hygienists/therapists training (n = 150) accommodated. Workforce participation/FTE: Percentage of care provided for older people at NHS was estimated at 14% of all activity data. NHS FTE% for dentists was based on 69% of registrations, converting GDC register headcount to practising FTE dentists. NHS FTE for therapists/hygienists was assumed to be at 80% of NHS FTE of dentists.	Dental Practice Board of NHS England and Wales for old General Dental Services (GDS) and old Personal Dental Services (PDS); Primary Care Health Workforce Survey; General Dental Council Registrations	Population: Older people in England UK, aged 65 to 99 years. Demand: Population demographics (age, sex), oral health status (edentate rates), participation and attendance in NHS, and treatments provided included to estimate demand in terms of dentate and edentate treatments. Treatment rates, treatment times and costs were also accommodated for the services provided. Workforce requirement: Total demand was estimated in terms of treatment time (and cost)—also used in determining the FTE dentists and therapists/hygienists required.	UK Adult Dental Survey; The Information Centre UK; UK Government Actuary's Department Treatment times from the British Dental Association	Approach: Workforce/FTE estimates were calculated using both the supply and demand models, and superimposition of both models identified shortage or surplus. Sensitivity analysis was done via Monte Carlo simulation and linear programming models. Estimates were projected from 2006 (baseline) to 2028. Skill mix: Various skill mix scenarios included that took into account the type of treatments provided by dentists and therapists/hygienists and FTE contribution (and costs). Five scenarios used: - Evolving skill mix - No skill mix - Hygenists/therapists expand tasks to include dental exams - Clinical Dental Technicians (CDTs) provide all dentures - Maximum skill mix, with expanded roles for hygienists/therapists and CDTs

Table 2. *Cont.*

Study No.	Author(s), Year	Supply Model		Demand | Needs Model		Modelling Technique
11	Gallagher JE, Lim Z & Harper PR, 2013	Existing Stock: Dentist and dental therapist numbers were estimated for 1 NHS Administrative Zone: South Central Strategic Health Authority (SHA). Dentist numbers were available for baseline (2007) and past trend was accommodated for future years (2008 and 2013). Therapist numbers based on national dentist to therapist ratio (1:19). Flows: Migration, return to work and attrition were not identified in the model. Newly trained: New dental therapist training places (n = 34) accommodated for projection years 2008 and 2013. Workforce participation/FTE: NHS FTE considered for dentists and therapists; Final estimates are presented in workforce numbers i.e., number of dentists and therapists.	Information Centre UK; NHS South Central SHA; Local survey of skill mix from Buchinghamshire and Milton Keys Dental Workforce Survey	Population: All people at NHS South Central SHA Demand: Oral health trend, and proportion of treatment provided by NHS under 4 bands were available: - Band 1: Examination, diagnosis, preventive - Band 2: Band 1 + Routine treatment including fillings and extractions - Band 3: Band 1 + complex work such as dentures, crowns and bridges - Urgent/Emergency Proportion of care provided by therapists under each of these bands estimated. Three ages groups (0 to 19 years, 20–64 years and 65+ years) were used to estimate future dental demand. The model was developed with key parameters that affect the changes in needs and demand: demographic changes, oral health trends, dental attendance and proportion of treatments attended by each age group. Workforce requirement: NHS FTE potentially estimated to arrived at workforce numbers to meet demand.	The Information Centre UK; NHS South Central SHA	Approach: Supply and Demand models workforce outputs compared. Linear programming developed to obtain optimal makeup of workforce and project the future requirements of workforce supply. The model took various inputs estimates: treatments, cost/volume of activity, staff type or skill mix. Skill mix: A range of future scenarios were accounted in the models, which took into account use of therapists along with dentists.

Table 2. *Cont.*

Study No.	Author(s), Year	Supply Model		Demand | Needs Model		Modelling Technique
12	Gallagher JE, Manickam S & Wilson NHF, 2015	Existing stock: Historical data from registrations/practice of dentists from 1990 to 2012 including stratification by Omani and Expatriate dentists identified. Projects from 2013 to 2020 estimated based on previous years. Flows: Migrant and Omani trained dentists accounted for in the estimates based on previous years. Migration and attrition maintained at constant levels for all years. Newly trained: Addition of new graduates to workforce form Oman Dental College maintained constant (n = 50) Workforce participation/FTE: Number of Oman and expatriate dentists	Ministry of Health Oman; World Health Organization	Population: Overall population of Oman and projections for years 1990 to 2020 available in the study. Population growth continues in an upward trajectory. 1990 to 2012 historical data. Projections 2013 onwards.	Ministry of Health, Oman	Approach: Dentist density or Dentist to population ratios calculated. Ratios—both for Omani dentists and Expatriate dentists. Three projection models were made for dentist to population ratios considered appropriate to meet: - WHO European benchmarks (1:2000) - Gulf Cooperative Council (GCC) benchmarks (1:3000) - Current global benchmarks (1:3800) Skill mix: Not identified in the study/approach
13	Huang CS et al., 2013	Existing stock: Number of total dentists (n = 11,449) and basic information on each dentist registered in Taiwan retrieved from the database of health personnel. Proportion of female dentists were also taken into account Flows: Attrition, retirement and migration were taken into account, and rate determined based on historical data. Newly trained: Yearly pass rates of dental licensing exam for 2006 to 2010 accounted for and average numbers included in the supply model. This pass rate also took into considerate number of foreign trained dentists. Workforce participation/FTE: Survey to dentists accounts for practice type and work hours, but clinical hours and FTE usage is unclear in the study. Workforce participation is represented as number of dentists available.	Department of Health database on health personnel, Executive Yuan (Taipei, Taiwan) Dentist practice activity survey	Population: All people in Taiwan. Both baseline and projections available from published government reports. Demand: A list of factors identified in the demand model including population change, increase in aged people, economic growth, new technology etc. But unclear on how they were used. Dentist to population ratios are presented as the means of comparing supply and demand	Official government reports of Council for Economic Planning and Development, Executive Yuan (Taipei, Taiwan)	Approach: Dentist to population ratios are estimated across 2010 to 2020. Supply and demand estimates are compared. Skill mix: Not identified in the study/approach

Table 2. *Cont.*

Study No.	Author(s), Year	Supply Model		Demand | Needs Model		Modelling Technique
14	Ishimaru M et al., 2016	Existing stock: Number of dentists in Japan was estimated via a survey. Dentists registration number, year of registration, year of birth, sex, main working status, speciality and geographic postcodes of practice location were available from longitudinal survey data (1972 to 2012). Survey data is collected every 2 years. Flows: Retirees were identified as those who did not report to the for two consecutive surveys. Median age of retirees calculated at 65 years, and when dentists reach the retirement age they were considered as retirees. Newly trained: New entrants were identified via the matched cohort at 2012 from NSPDP. Workforce participation/FTE: Work status is identified as 6 main categories: ownership of practice; employed in dental clinic, hospital practice, academic work, and not reported. Workforce participation was represented via dentist numbers based on active registrations and work status.	National Survey of Physicians, Dentists and Pharmacists (NSPDP) for 1972–2012.	Population: Population numbers for Japan for years 1990 to 2012, and 2014 to 2042 used. Both historical estimates and population projections.	National Institute of Population and Social Security Research.	Approach: Dentists to population ratio (involving work status, and male/female dentists differentiators). Dentists work status across the six categories were identified for male and female dentists. Changes in distribution of work status accommodated for selected dentists at 0.5 and 10 years after registration for years 1982, 1992, 2002 and 2012. Probabilities for change in dentists work status were calculate for a wide range of patterns (78 patterns) for age and years of experience. Transition matrix models were developed using Markov chains to estimate future dentists. Skill mix: Not identified in the study/approach

Table 2. *Cont.*

Study No.	Author(s), Year	Supply Model		Demand | Needs Model		Modelling Technique
15	Jaiswal AK et al., 2014	Existing stock: Based on dentists registrations across various states/territories. Number of dental institutions in India, undergraduate and postgraduate student positions obtained from the Dental Council of India. Flows: Not identified in the study Newly trained: Undergraduate placements in schools/colleges identified, but separately and not incorporated in the supply model. Workforce participation/FTE: Number of dentists used to identify workforce participation.	Central Bureau of Health Intelligence; Dental Council of India	Population: Population numbers for India, and individually for the States in India identified.	Ministry of Health and Family Welfare; Previous studies via literature	Approach: Dentist to population ratios were estimated using dentist registrations and population numbers, both for India, and individually for each of the States of India. This was determined for one year only (i.e., 2014). Growth in dental college numbers were provided from 1947 to 2014. Trends in increase in number of registered dentists from 1994 to 2012 was also provided separately, but not included as a main component of the modelling. Skill mix: Not identified in the study/approach
16	Ju X et al., 2010	Existing stock: Oral and maxillo facial surgeons (OMFS) estimates were available through from a survey, with information collected from speciality of practice question from a survey. OMFS estimates were available by age, sex and which state/territory they practised in Australia. Flows: Retirement, migration, cessation of practice or death accounted in the model. Attrition rates calculated based on male general dental practitioner wastage rates. Newly trained: Recruitment of OMFS was determined as the average number of completions between the years 2001 and 2005. This estimate was validated by the number trainees currently enrolled in OMFS training programs in Australia. Workforce participation/FTE: Participation was represented by the number of practising oral and maxillo facial surgeons; work status was obtained from the survey to determine practising oral and maxillo facial surgeons.	National Dental Labour Force Survey, 2006 Previous publication on all dentists in Australia for male general practitioner wastage rates; Source unclear for overseas entrants and returned to practice OMFS. Australasian Council of Dental Schools for recruitment vector;	Population: Population data for all Australians. Age specific information was included for 6 age groups. Demand: Six types of oral and maxillo facial services provided were identified: dentoalveolar, trauma, pathology, orthognathic, reconstructive surgery and other. Population estimates for people with oral and maxillo facial conditions were extrapolated based on service provision identified from the survey. Workforce requirement: Estimates on number of oral and maxillo facial surgeons required to meet the number of services estimated were calculated, and applied under different demand growth scenarios. It is unclear if FTE was used, or what is the ratio of surgeons to services utilised for demand.	Australian Bureau of Statistics for population data and projections Previous published reports on practice patterns and oral and maxillo facial services provided to patients.	Approach: Supply and demand models were developed separately and superimposed to identify gap in OMFS services. Both supply and demand projections were estimated from 2007 to 2037. Seven different types of supply scenarios and five different demand scenarios were used in the projection models. These models were later reconciled into three broad types: - Low supply and NO growth in demand - Medium supply and Half growth in demand - High supply and Continued growth in demand. Skill mix: Not identified in the study/approach

Table 2. *Cont.*

Study No.	Author(s), Year	Supply Model	Demand | Needs Model		Modelling Technique
17	Mills RW, 2020	Existing stock: Number of dental specialists across all specialities in the UK were obtained from registrations data for 20 years (1999 to 2019). Postcode of practice location of these specialists were also obtained from the GDC registrations website information.	General Dental Council Specialist Registrations	NA	NA	Approach: Supply data of dental specialists were matched by postcode of practice location. Differences in practice location of specialities and lack of specialists in certain postcode areas were identified. Geographic information system approaches were used. Skill mix: Not identified in the study/approach
18	Saman DM, Arevalo O & Johnson AO, 2010	Existing stock: Dentist numbers were available from registrations, and location of practice mapped. Flows: Incoming and retiring dentists identified (change in results section). Newly trained: Not identified in the study/approach. Workforce participation/FTE: Number of dentists used for workforce participation.	Kentucky Board of Dentistry	Population: All population of Kentucky.	Kentucky State Data Centre	Approach: Dentist to population ratios were projected for each geographic area in Kentucky from 2007 up to 2016. The simulation model includes aspects of geospatial modelling to identify and map the dentist to population ratios. Skill mix: Not identified in the study/approach
19	Shaw JL et al., 2017	Existing stock: Number of dentists, specialists and allied dental practitioners available in the human resources management system. Flows: Not identified in the approach/study Newly trained: Not identified in the approach/study Workforce participation/FTE: FTE was calculated based on standard hours worked by a full time dentist (n = 1229.5 h). The number of clinical hours were adjusted to reflect clinical FTE, and variations in clinical provision adjusted across army ranks.	Human Resource Management System of Canadian Armed Forces (CAF) Canadian Forces Dental Services (CFDS) RESTORE & CFDS Position Charter (Policy documents)	Population: All people living in catchment areas served by the CAF clinics. Demand: Oral health status information of CAF personnel in catchment areas surveyed, along with treatment plan data. Workforce requirement: FTE requirement were estimated based on hours required to meet the demand.	Dental Information System (DentIS) Oral health surveillance data from a cross sectional sample of CAF personnel	Approach: FTE dentist requirements under both workforce to population ratio, and demand models were estimated. This calculation was extended to all geographic areas served under the CAF catchments. Level of FTE dentists agreement between the dentist to population model and demand model were assessed using Intraclass Correlation Coefficient and Bland-Altman plots. Skill mix: Though Skill mix in CAF is identified, only general dentists FTE seen in models presented.

Table 2. *Cont.*

Study No.	Author(s), Year	Supply Model	Demand | Needs Model	Modelling Technique
20	Sun X et al., 2017	NA	NA	Population: Children; 12 year olds from 31 provinces of Mainland China, except Tibet. Needs: A representative sample of n = 23,508 children (12 years) clinically examined, and questionnaire survey for n = 12,392. Oral health status measured included dental caries experience and periodontal assessment. Oral health behaviours assessed via questionnaire. Four risk groups identified based on caries and behavioural assessment: - High risk - Low risk - Relatively high risk - Relatively low risk Workforce requirement: Risk based intervention models (maximum and minimum intervention) were developed and frequency of required dental visits estimated based on the four risk groups. Timings for care for each child were determined from panel of experts, and were aggregated to represent each child based on the risk level. Total timings for all 12 year olds in China was estimated using a population weighting approach. These timings for treatment were converted to workforce requirement based on average working hours per week (37.85 h per dental professional) to arrive at dental workforce numbers. Percentage of care provided for 12 year olds estimated at 1.27 percent. Similar workforce requirement was made for full population in China, based on 12 year olds.	3rd National Oral Health Survey Panel of nine experts from Peking University for data on timings for dental professionals Previous study (No 22) Wanyonyi et al., 2015 for data on percentage of care for 12 year olds.	Approach: Dental workforce requirements estimated based on a needs informed approach from a national population survey of 12 year olds in China. Percentage of time spent on 12 year olds was estimated, and workforce requirements both for 12 years olds and for all population in China was calculated. Skill mix: Not identified in the study/approach

Table 2. *Cont.*

Study No.	Author(s), Year	Supply Model		Demand | Needs Model		Modelling Technique
21	Surdu S et al., 2016	Existing stock: Active paediatric dentists in the United States estimated using the membership data, and a 6% adjustment for non members. Overall n = 6530 paediatric dentists. Flows: Intended retirement age collected via online survey. All dentists were assumed to retire at 75 years. Age dependent attrition rates calculated either based on US mortality rates (for less than 50 years of age) or using survey responses. Annual cross state migration estimated via a logistic regression model using survey data on all dentists younger than 50 years. Unclear if overseas migration, and long term migration has been accounted for. Newly trained: Number of new graduates entering the paediatric dental workforce assumed based on previous publication/data (n = 448; 63.5% female). Age distribution of new graduates calculated based on new members data. Workforce participation/FTE: Information on patient care hours per week collected from an online survey of all paediatric dentists, who were association members with a US postal address. Ordinary least squares regression analysis used to model total weekly patient hours across various practice setting. FTE defined at 32.6 h per week in patient care activities.	American Association for Paediatric dentists membership data; Online survey of paediatric dentistry practice in 2016; Previous publication from American Dental Association (ADA), Health Policy Institute;	Population: Representative sample of child population for each state collected from US Census and Behavioural Risk Factor surveys (n = 656,400). This sample was weighted to represent the population in each state in the US (at national level summed up to 73.6 million children under 17 years of age). The population data contained information on age, sex, race, ethnicity, income, medical insurance and residence. Population projections 2015 to 2030 were made represent these sample characteristics, by scaling up the weights for the individual people in the sample. Demand: Patterns of care from MEPS survey were modelled to understand annual encounters to dental visits, considering age, sex, ethnicity, insurance, and geographic area as explanatory variables. Poisson regression was used to model patterns of annual care. All visits excluding prophylaxis and visits related to orthodontic procedures considered. Workforce requirement: Number of paediatric dentists required to meet supply were estimated to meet the demand, using various scenarios.	American Community Survey; Centre for Disease Control and Prevention 2014 and 2015 Behavioural Risk Factor Surveillance Data; US Mortality Register; Medical Expenditure Panel Survey (MEPS) 2010 to 2014 data.	Approach: Supply model based on a microsimulation approach to model future supply under a range of assumptions. Demand model for services based on patterns of care and visits using a range of population and oral health data. Sensitivity analysis was used for supply estimates; Weighting for both supply and demand estimates; least squares regression to model total weekly patient care hours; logistic regression to model interstate migration; Poisson regression to model annual care; Scenarios to model derived demand for dentists/paediatric dentists. Derived demand for dentists modelled using scenarios based on how workforce requirement will vary based on services and removal of barriers to access. Scenario 1: Continuation of care Scenario 2: Hypothetical—pediatric dentists provide care for all children under 4 years; 80% care for childre 5–12 years, and 20% care for children 13 to 17 years; - Scenario 3: Hypothetical; All children will have access to care and access barriers removed (approximates a needs-based scenario) - Scenario 4: Builds on Scenario 1 but including FTE estimates for general and paediatric dentists - Scenario 5: Builds on Scenario 3 but models FTE dentists. Kill mix: General and paediatric dentists modelled, but other skill mix considerations not identified.

Table 2. *Cont.*

Study No.	Author(s), Year	Supply Model		Demand | Needs Model		Modelling Technique
22	Wanyonyi KL et al., 2015	Dentists and mid level providers (dental therapists) are identified as components of the overall model presented, but not accounted in the analysis or study results which focusses on alternative scenarios based on workforce requirements (based on demand but not compared with supply)	General Dental Council	Population: All population in England (both adults and children), who avail public dental care Demand: NHS dental services and treatment provided at a single site at South England were used to estimate age specific treatment rates across all NHS services for England. Timings for treatments were accounted using British Dental Association timings, and verified with expert panel. Total demand was expressed in age specific clinical hours. Workforce requirement: Workforce estimates were calculated based on the basis that dentists spend 0.4 FTE and hygienists/therapists spend 0.3 FTE of clinical hours for NHS work. Overall number of dentists and therapists required was expressed as alternative scenarios accounting for skill mix, and costs.	NHS Electronic Health Records Treatment data (single site at South England) British Dental Association timings for services Expert panel to validate treatment timings Salaries from National Career Service Advice	Approach: Treatment provision or utilisation data used in determining age specific treatment rates and timings of service. The later used to account for dentist/therapist FTE and costs based on skill mix alternative scenarios. Skill mix: Four NHS activity scenarios were used that accounted for delegation of tasks to dental hygienists/therapists: - Not skill mix - Minimal direct access - More prevention - Maximum delegation
23	Zhang Y et al., 2015	Existing stock: Survey of all practices in a single Province in China, including n = 2155 dental practices and n = 8611 oral health personnel (including dentists, nurses and technicians). Education, professional level, area of practice captured in the survey. Flows: Not identified in the study. Newly trained: Not identified in the study. Workforce participation/FTE: Hours worked collected in the survey, but its application towards the supply model is unclear.	Questionnaire survey sent to all dental facilities by Sanitation Bureau and Health Supervision station	Population: All population from a single Province (Liaoning) in China	Survey; Unclear	Approach: Number of dentists per population for the Province estimated (at current levels). Population projection for 2020 and workforce requirements to meet the population at 2020 was determined by using WHO recommended ratios. The gap in dental workforce for future identified, accounting a list of scenarios based on needs, amounts of time worked by dentists and dentist to population ratios Skill mix: Not identified in the study/approach

Surdu et al. [45] documented an elaborate use of national dental association registrations data for determining supply estimates of pediatric dentists, in addition to survey and workforce publications from government sources. Nine studies have included flow estimates within their supply models, through the inclusion of migration, retirement, absence, return to work and deaths [23,28,31,34–36,38,39,45]. Ten studies have included newly trained dentists in the supply model [23,25,28,30,31,34–36,38,39,45], mostly through information available from dental school completions. Brailsford & De Silva [35] also incorporated a student survey to understand student motivations and career expectations. A few studies have also accommodated government regulations and potential for newly created dentists/hygienist places in their supply estimates [34,38,39].

Studies have represented overall workforce participation either through dental personnel numbers alone (n = 5) [25,29,30,34,44] or accounting for clinical or part time hours worked and determining full time equivalent dentists (n = 7) [24,31,35,38,39,42,45]. Ju et al. [23] and Ishimaru et al. [28] have used work status questions from surveys in determining workforce participation.

3.2.2. Demand Models, Population Only Estimates and Data Sources

Demand models, represented as a needs-based demand weighted or utilization/demand model were presented in nine studies [23,35,38–40,42,43,45]. At the basic level estimates were presented as only population numbers in eight studies [25,27–30,34,36,44]. Population estimates were sourced from national or state-based census sources, government departments, or a combination of both. Seven studies [23,24,35,38–40,45] estimated the expressed demand through available data on oral health status, and converted the demand to workforce requirements as minutes, dentists or FTE dentists. Brailsford De Silva [35] used FDI/WHO method in estimating services needed per person—based on people who actively express the need for care from a population survey. Three studies in the UK (Gallagher [38,39]; Wanyoyi, [40]) have used NHS treatment data to arrive at a very detailed estimates of demand and workforce requirement. A simple estimation of demand was reported in Eklund and Balit [43]—the proportion of dental visits people make in a year (determined form a previous publication) in estimating workforce requirements.

3.2.3. Needs Models and Data Sources

The review identified four studies [26,31–33] that have predominantly used a needs model in determining workforce requirements. All four studies used a population survey to determine oral health status and treatment needs. Three studies were limited in survey design or sample size or research question: Sun et al. [26] surveyed only 12-year-olds in China, and Ab-Murat et al. [32,33] surveyed 30–54-year-old university employees at a single site (public university) in Malaysia. Ab-Murat et al. [32,33] also focused on specific aspects covering periodontal and prosthodontic treatment needs, which were measured through two approaches: a normative approach and socio dental approach. Face-to-face questionnaires were also used to determine oral health impacts and behaviours. Both Ab-Murat et al. [32,33] and Sun et al. [26] used panel interviews to determine treatment timings, helping in the estimation of workforce requirement. Sun et al. [26] further expanded the needs aspect (determined for 12-year olds) to whole population in China by utilizing care provision ratios, adopted from a previous study. In contrast, Ahern et al. (2019) [31] used a more comprehensive oral health survey dataset that covered all adults (15+ years old) in Ireland. The population survey included questions on oral health status, behaviours, impacts and visiting patterns to determine service timings and workforce requirements in FTE dentists.

3.2.4. Skill Mix Considerations

The use of skill mix in modelling that take into account the contribution or influence of different workforce groups towards supply, demand and/or need models has been limited. Only seven studies accounted for skill mix variations [32,33,38–40,42,45]. The common

application of skill mix was the use of allied dental teams (dental therapists, hygienists, denturists) along with dentists [32,33,38–40,42]. Surdu et al. [45] have applied specialist pediatric dentists along with general dentists in skill mix models for planning pediatric dental workforce. Studies that used skill mix accounted for changes in the provision of services by the extended dental team and how their participation effectively altered the future workforce requirements for oral health care. None of the studies examined the provision of oral health care outside the main oral health workforce groups i.e., accounting for possible care provision by medical, nursing, pharmacy or broader allied health workforce teams. While a few studies have discussed the concept of skill mix within dental teams, they haven't included it within the modelling approaches.

Almost all the models being presented were deterministic; only one study included a stochastic element in their modelling approach [38]. A number of studies identified limitations in relation to data sources, either data being unavailable or on the quality of planning data. Other limitations highlighted were being single site studies, small sample size (see Supplementary Table S3).

4. Discussion

The review examined oral health workforce planning models within the published scientific literature over the last 10 years. Many studies were from high-income countries; no studies were identified from low-income countries and the WHO African region. Calculating workforce to population ratios were the most common modelling approach, followed by needs-based demand weighted approaches. Needs-based approaches had limitations in the population being studied and/or the nature of oral health need assessments being undertaken. Lack of quality data for the modelling exercise is omnipresent in all sources of supply, demand and needs. Very few studies have made use of skill mix considerations in their models. Studies have not accounted for uncertainty of outcomes, or randomness in their modelling exercises, and were mostly deterministic in nature.

Workforce to population ratios, though commonly used in oral health workforce planning studies, represent a crude ratio and bring several shortcomings to the planning process. First, this ratio is based on assumptions of homogeneity across the numerator (i.e., all dental personnel are active and equally productive and will remain so) and that the denominator (i.e., all populations) will have similar oral health needs and will remain constant) [6,12]. This ratio does less justice to address differences in dentist practice activity or productivity (across age, sex, levels of experience, area of practice) or varying levels of oral disease prevalence, dental care utilisation or demographic, socio-economic differences of across population groups. Second, maldistribution of health personnel across different geographic areas, practice types (public or private) or facilities (hospitals, clinics) cannot be adequately represented using a single workforce to population ratio [5]. While it is possible to offer some comparisons using workforce to population ratios at global, region, country, state/area, facility levels, its inability to account for the intrinsic differences in dentist and disease characteristics would still prevail. Third, the ratio does not help us in understanding progress made in achieving wider health system objectives and performance benchmarks in regard to accessibility, equity, quality and efficiency, [6] particularly as the most basic aspect of access 'coverage' within countries can differ, particularly between urban and rural areas (ref)Nevertheless, the workforce to population ratio approach is less demanding in terms of data and it brings simplicity in terms of providing a snapshot estimate to health planners [4,5,46]. Our review identified studies from Kuwait [29], Trinidad and Tobago [37], Chile [25], Oman [34], Taiwan [36], India [30], China [26], UK (dental specialists) [41], and Kentucky (USA) [44] using a workforce to population ratio approach. It should be noted that all these studies also identified limitations in data sources or non-availability of quality data and they have resorted to using workforce to population ratio as a means of commencing the oral health workforce planning process [47].

Demand based planning approaches primarily make use of health service utilisation data. Our review has identified studies that use both dentist surveys [43] and administrative

data such as electronic health records (EHR) [40] for extracting oral health service utilisation data. Traditionally, survey-based methods have been popular in understanding practice activity of oral health personnel, and the nature and type of services they offer to patients. For example, in Australia, dentist practice activity surveys have been the cornerstone of oral health workforce policy and planning since early 1980's [48–51]. In recent years, however, the adoption and use of computerised systems and use of EHRs in dental practices and hospitals are becoming more common in many counties [52]. EHRs provide a viable, cost efficient and timely alternative to understand dental service utilisation data, against surveys that are more time consuming and resource intensive [53,54]. However, the use of EHRs is still in its infancy in terms of data quality and consistency in systems across public and private sectors [55–57]. As a large proportion of dentists practice in the private sector [7], it becomes important to find avenues to improve consistency as well as building data repositories for research and planning purposes. The International Association for Dental Research (the peak global dental research body), and its Network for Practice Based Research [58] has raised the importance of partnerships across private and public dental sector and Universities to improve quality, consistency and use of oral health service data collected in dental clinics or hospitals for research purposes.

Needs based approaches are more reflective of the underlying oral health needs of population. Such models take into account oral health conditions such as caries levels, periodontal status or missing teeth [26,31–33]. Data for needs in selected studies in the review are from population oral health surveys. However, not all studies were comprehensive, and were limited in the type of population group being surveyed or type of needs being assessed, or oral health status questions being studied.

The use of skill mix is a vital component in health workforce models, as it helps to accommodate task sharing and team work both across members of the dental team and wider medical, nursing and allied health teams. Prior planning theories and methods have to failed to incorporate skill-mix in planning designs [59]. The use of skill mix is an important factor when undergoing oral health workforce planning as it helps to determine the future framework of the oral health team in terms of number, size and consequently patient base [38]. In order to predict the future of the oral health workforce, it is important to appreciate the changes within society in terms of comparing and contrasting oral health need and demands, whilst balancing this against the supply of the dental workforce [60]. Vertical integration of the oral health workforce with other health professionals is also vital moving in the future, as in a post COVID era its logical to argue for greater collaboration with all members of the medical, dental and social teams so as to meet the growing needs and demands of the population [7]. Future research in oral health workforce planning needs to accommodate both horizontal and vertical integration within their planning exercises. A major issue for concern is planning the future dental speciality workforce. As gatekeepers of the dental profession, dental specialists are vital towards setting quality benchmarks, identifying divers for innovation and change. Planning exercises will need to extend to involve dental specialists along with general dentists and other members of the dental team in order to best serve the needs of the population.

The study identified lack of consistency and quality of workforce data arising from a wide variety of data sources. Supply data sources have particularly problematic due to the number of sources required to identify the stock, flows and newly trained. Our prior research has identified a range of inconsistencies across countries in these supply data sources and necessity for advocacy and solutions in improving registration and migration data on dental professionals [8].

Limitations

This rapid review included only published scientific research articles between 2010 to 2020. We limited our focus only on the past decade, as several advocacy and major progress on health workforce planning by global, regional and national organisations were prevalent during this period. Health workforce planning could also be conducted as an

'in-house' exercise by planning organisations which is more prevalent in grey literature. Our decision to include only published peer reviewed articles was conscious, mainly due to the rapid review method adopted [17,18], but also able to understand how well oral health workforce planning is represented in our scientific literature. One possible limitation is the fact that the senior author of this review is also active in workforce modelling and has authored several of the publications; however, we took account of this by having a wider research team work on the data extraction and analysis, recognising the importance also of having an expert in the field involved. We also identify a recent review published by a different group of colleagues on a similar topic [61]. Whilst our study differs in terms of review question, methods, and framework used in synthesis, the findings together make a major contribution to this important but relatively unexplored field of oral health workforce planning. The purpose of our review was to distinctly focus on data sources, techniques and skill mix considerations. Our method of synthesis was comprehensive to the above three parameters.

5. Conclusions

Planning for the future oral health workforce is heavily reliant on quality data being available for supply, demand and needs models. Studies have presented with a lack of uniformity and accepted standards in oral health workforce modelling approaches and reporting. Integrated methodologies that expand the skill mix considerations and introduce randomness and system dynamics to account for uncertainty are essential for future planning exercises.

Supplementary Materials: The following are available online at https://www.mdpi.com/1660-4601/18/6/2891/s1, Supplementary Table S1: Search Strategy for the Rapid Review; Supplementary Table S2: Limitations mentioned in selected studies. Supplementary Table S3: List of selected studies for Rapid Review with full citation. Supplementary Table S4: PubMed Search with MeSH terms.

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Comment

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The recently published article of RC Franklin et al. in the *International Journal of Environmental Research and Public Health* [1] provides a detailed historical review, beginning with the decades of the 1950s and 1960s, of health disparities of Black and Hispanic Newark, New Jersey residents that included substance abuse and sexually transmitted infections, as well as the highest incidence of tuberculosis and maternal and infant mortality in the United States. The manuscript also notes that current Newark residents continue to experience a high incidence of chronic diseases and deficiencies that include food insecurity, hypertension and strokes, diabetes, coronary artery disease, and loss of all their teeth. The article, however, does not describe another serious and glaring health disparity, the long history of high past and current blood–lead concentrations and lead poisoning in Newark children.

One author of this article (JDB) started work as a postdoctoral researcher at New Jersey Medical School in 1971, and was responsible for developing the initial "Lead Laboratory". This laboratory analyzed blood samples of Newark children 5 days a week, with 50–100 + samples received daily; many were "stat" samples. The other author (JMO) was a recent New Jersey Medical School graduate beginning a residency in Pediatrics at the Martland Medical Center; his inpatients included children hospitalized with lead poisoning. The high blood–lead levels (BLLs) of children revealed by our laboratory analyses at that time were primarily the result of ingestion of small paint chips from peeling indoor paint and/or inhalation of indoor lead-containing paint dust. A key factor was a lack of adequate maintenance and remediation/renovation of painted surfaces in Newark housing rented by low-income families. Inhalation of airborne lead from automobile exhaust was also a major source of exposure for both children and adults. Lead is a cumulative toxin and continued daily exposure can eventually result in elevated BLLs with significant negative multi-organ system health consequences, including hematological and neurological abnormalities. A significant percent of Newark children during this era had elevated blood–lead concentrations high enough to require emergency hospitalization for multi-organ system abnormalities that even became life-threatening in scope. Lead is a neurotoxin and many of these children were diagnosed with mild cognitive dysfunction and even more severe permanent brain damage.

Although other large USA cities in the Northeast (Philadelphia, Baltimore, New York City) also had poorly maintained housing and many children with lead poisoning,

Newark had an especially severe problem [2], with 41.2% of 25,260 mostly Newark children tested between 1970 and 1976 having BLLs ≥30 mcg/dL. Of these 15.6% had high BLLs ≥ 40 mcg/dL and 1.8% had dangerously high BLLs ≥60 mcg/dL that typically required hospitalization for observation for toxicity and intravenous pharmacologic therapy. The substantial number of Newark children found to have high BLLs during the early 1970s may be explained by the older age of much Newark housing, inadequate maintenance efforts to prevent and remove peeling and flaking paint, and our extensive testing of children's BLLs—enabled by substantial funding. In contrast, more than 95% of young New Jersey children currently have BLLs less than 2.0 mcg/dL, but we could not find a single Newark child in the 1970s with a BLL below 5.0 mcg/dL.

The lead crisis of the 1960s and 1970s would have been worse without the dedicated care provided by Newark pediatricians at St Michael's Medical Center, Newark Beth Israel Medical Center, and our faculty at Martland Hospital. A clinical challenge in the 1970s for pediatricians was the collection of an adequate volume (1.5 mL or more) of venous blood for lead analysis from screaming children in the presence of their anxious parents —most often the mothers, but sometimes the more threatening fathers. Handing out lollipops helped, but it was the skill and rapidity of the blood drawer as well as the good work of the holder of the squirming/moving/crying child that saved the day.

New Jersey law requires pediatricians to order testing of BLLs of all children at both 12 and 24 months of age, and also prior to age 6 for all children not tested when younger. Children with known or suspected lead exposure should also be tested. Compliance with these regulations in New Jersey has been very good, with 86% of these children tested in 2018. This testing reveals that, although the mean BLLs of Newark and other New Jersey children are much lower now [3], there are still New Jersey children with elevated BLLs greater than the current guideline of 5.0 mcg/dL.

As an element, lead cannot decompose, and thus has an infinite environmental half-life. It was present in paint used in almost all older homes built in the United States before the 1970s. Although much of this housing in Newark and elsewhere in the United States has been professionally "de-leaded", in other housing the lead is still there in lower layers of dried paint on painted surfaces such as walls and windows, where it is especially prone to flaking and chipping. The city of Newark is using funding from a US Department of Housing and Urban Development (HUD) grant to continue abatement/removal of lead paint in housing and is also finishing its effort to the replace about 18,000 "lead service" plumbing lines to provide lead-free water to many of Newark's houses.

In older housing that has not undergone lead abatement, layers of dried lead paint will still be on painted surfaces dozens and even hundreds of years from now. Thus, lead exposure will continue to be a threat to young children and the need to test them for elevated BLLs should be recognized and continued.

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