dietetics

Review

Diet and Environmental Sustainability: A Review of Australian Evidence

Bradley Ridoutt [1,2]

[1] Commonwealth Scientific and Industrial Research Organisation (CSIRO) Agriculture and Food, Clayton, VIC 3169, Australia; brad.ridoutt@csiro.au; Tel.: +61-3-9545-2159
[2] Department of Agricultural Economics, University of the Free State, Bloemfontein 9300, South Africa

Abstract: Evidence to inform the incorporation of environmental sustainability into public health nutrition policy and dietetics practice needs to be relevant to the local dietary, cultural, environmental, and food system context. Global recommendations and evidence from other countries may not be directly applicable. As this information is scattered across multiple research publications in Australia, a systematic review was undertaken to consolidate evidence and identify practical recommendations. Following the PRISMA 2020 guidelines, the search strategy sought to identify studies based on Australian dietary intake data obtained by surveys combined with an environmental assessment. Theoretical or conceptual studies were deemed out of scope. Included studies were grouped for synthesis based on content relating to total dietary energy intake, nutrient adequacy, foods and food groups, and dietary patterns. Out of 765 records, 14 studies met the eligibility criteria. These studies addressed a variety of research questions using a variety of modelling approaches and environmental indicators. Current evidence suggests encouraging consumption of nutrient-dense foods, especially those that enhance satiety, along with discouraging consumption of nutrient-poor processed foods that contribute little to satiety and can lead to excessive dietary energy intake. Limiting total intake or diversity of protein-rich foods can increase risks of inadequate intake of micronutrients. For lower environmental impact dietary patterns, intake of vitamins A, B6, and B12, and minerals Ca, Mg, Se, and Zn can be below estimated average requirements. The practical implication is that foods that are rich and bioavailable sources of these nutrients need to be prioritized in any strategy to reduce dietary environmental impacts.

Keywords: climate change; diet quality; dietary guidelines; discretionary food; environmental footprint; greenhouse gas emissions; sustainable healthy diets; life cycle assessment; nutrition; sustainable food systems

Academic Editor: Bahram H. Arjmandi

Received: 5 November 2024
Revised: 10 January 2025
Accepted: 24 January 2025
Published: 4 February 2025

Citation: Ridoutt, B. Diet and Environmental Sustainability: A Review of Australian Evidence. *Dietetics* **2025**, *4*, 5. https://doi.org/10.3390/dietetics4010005

1. Introduction

Food-based dietary guidelines have been established in more than 100 countries [1], including in Australia [2]. Primarily, they are designed to promote eating habits that support health and well-being across life stages and to reduce the incidence of diet-related disease, such as cardiovascular disease, diabetes, certain cancers, and dental disease. In making recommendations about the types and amounts of foods needed to meet nutrient requirements, dietary guidelines have also considered cultural traditions, affordability, and the flexibility necessary to accommodate personal preferences [3,4]. More recently, the environmental sustainability of food production and consumption has become a major concern [5,6], and this has become an additional factor that is being considered in dietary guidelines [7–15]. That said, the incorporation of environmental sustainability into dietary guidelines is not straightforward. Nutrition is itself a complex topic where the requirements for specific nutrients are often uncertain and differing between individuals [16,17] and the evidence concerning the relationships between specific foods and health outcomes are often contended [18]. Then, there is the complexity associated with characterizing environmental sustainability, where there are many different environmental aspects (climate, water scarcity and pollution, biodiversity, etc.) and numerous environmental impact pathways to consider. Assessment of the environmental impacts of diets is often limited to only one or a few environmental indicators [19,20], and even the choice of environmental indicator can lead to contradictory findings [21]. Furthermore, some nutrient-dense foods that are an important source of nutrients that tend to be widely under-consumed relative to recommendations can also be a source of environmental impact, indicating the need to consider trade-offs [22–24].

Heathy diets with lower environmental impact may differ substantially across regions. One reason is that food systems differ between countries. For example, most of the food eaten in Australia is produced locally as Australia is a net exporter of most agricultural commodities [25]. This is a major difference compared to countries that import much of their food supply or which import large quantities of crop products for livestock production, which can impact on environmental footprints. Then again, there can be important differences in agricultural production systems. In Australia, production systems vary across the continent, but many are rainfall limited low intensity systems, with some utilizing natural pastures and open rangelands for food production. Environmental challenges also differ across regions. For example, some food production systems utilize irrigation, whereas others rely on natural rainfall, and where irrigation is practised the level of water scarcity can vary greatly, as can the related environmental impacts [26]. Consequently, the environmental metrics for a single food product can vary enormously depending on where and how it is produced. Then, of course, food cultures differ across regions, as does the importance of specific foods in supplying individual nutrients. Some nutrients are widely available across the food system and individuals tend to achieve adequate intake regardless of their dietary patterns. In contrast, there are other nutrients that tend to be widely under-consumed. In Australia, these include calcium, magnesium, vitamin B6, and zinc [27]. For all these reasons, local evidence is essential for determining the dietary patterns that will support health and environmental sustainability.

A variety of approaches have been taken to investigating diet and environmental sustainability. Some studies compare current dietary patterns with hypothetical alternatives. These alternatives may be based on national dietary guideline recommendations, or determined by mathematical optimization, or based on the reasoning of the study practitioners (e.g., nominal vegan, vegetarian, or pescatarian diet). While these approaches can offer some interesting perspectives, they also have some major limitations. To begin with, the modelled alternative may not be representative of any food intake pattern currently occurring in the population (or very few individuals), implying a behavioural shift beyond the present range. Secondly, with optimized diets, the components may not combine naturally into familiar recipes and meals. Most foods are not eaten independently. For example, in the Australian context, individuals with higher consumption of vegetables also tend to eat less bread and cereal foods and more red meat [28,29]. Many studies of this kind make iso-caloric comparison of dietary alternatives. However, food choice influences eating frequency and total dietary energy intake, as protein [30] and potentially also fibre [31,32] are associated with satiety, and the consumption of energy-dense nutrient-poor processed foods risk overconsumption of dietary energy across the day [33]. Other studies assess the nutritional quality and environmental impact scores of dietary intakes obtained from surveys, some of which are nationally representative and delineate data according to age group and sex, and comparisons can be made between sub-groups within the available dataset. There may be issues of under-reporting of food intake in dietary surveys, particularly in relation to foods perceived as unhealthy; however, studies of this kind avoid most of the abovementioned problems, have the least potential for bias introduced by study design, and since they relate to actual reported food intake in a population of interest, have the greatest relevance to public health nutrition.

Evidence concerning sustainable diets in Australia is scattered across multiple research publications which makes it difficult for public health nutrition professionals to understand the practical applications. Global recommendations and evidence from other countries may not be directly relevant. A systematic review of Australian evidence is therefore needed. The objectives of this review were to consolidate evidence, to identify important knowledge gaps, and to identify any practical recommendations that will support high quality diets with lower environmental impacts in Australia.

2. Materials and Methods

This review was undertaken following the PRISMA 2020 guidelines [34]; see Supplementary Materials. As the topic of diet and environmental sustainability is broad, the search strategy for relevant literature was also broad, comprising 28 combinations of search terms (Table 1) using the Clarivate™ Web of Science™ database [35]. This search strategy sought to identify studies based on Australian dietary intake data obtained by surveys combined with environmental assessment. Theoretical and conceptual studies without empirical data were deemed out of scope and, for this reason, the search strategy did not include websites, government reports, or other grey literature. The search was undertaken on 4 September 2024, and covered studies published in the last 10 years (i.e., 1 September 2014 to the search date).

Table 1. Electronic search strategy. Keyword 1 AND Keyword 2 AND Keyword 3.

Keyword 1	Keyword 2	Keyword 3
diet* OR nutrition*	sustain* OR environmental* OR footprint* OR LCA OR life cycle a* OR life-cycle a* OR carbon OR climate OR GHG OR greenhouse gas OR biodiversity OR water OR land OR pesticide	Australia*

After screening to remove duplicate records (i.e., those having identical DOI), titles were assessed, and records were removed where they did not pertain to human diets (e.g., diets of farm animals or wildlife) and to environmental sustainability (e.g., socio-economic environment, food environment). Subsequently, abstracts were assessed, and further records were removed that did not report Australian dietary intake data. In some cases, where the abstract was unclear, the complete document was retrieved and examined. At this stage, all remaining records were retrieved and examined to determine whether they contained Australian dietary intake data obtained by survey. As mentioned above, studies describing conceptual or archetypal diets were deemed ineligible. These criteria were not ambiguous, so duplicate screening was not considered necessary.

For each study meeting the eligibility criteria, the following descriptive information was collected: study design, source of dietary intake data, number of participants, as well as age range and sex, any subgroups compared, and environmental indicators used. Subsequently, studies were grouped for synthesis according to whether they reported evidence related to (1) total dietary energy intake, (2) specific nutrients, (3) foods and food groups, and (4) dietary patterns. There were no processes for obtaining or confirming data from study investigators. The included studies addressed a variety of research questions using a variety of modelling approaches and environmental indicators. As such, quantitative comparison of evidence was generally not possible. The variety of evidence was synthesized and critically evaluated in relation to diet quality scores, adequate intake of individual nutrients, and environmental indicator scores. As such, data items for collection were not systematically defined and pre-defined effect measures were not adopted.

To assess for risk of bias in included studies, careful examination was made of environmental indicators used. Some environmental indicators present biased or unreliable environmental information when applied in a life cycle context. For example, land use is not a reliable indicator of environmental sustainability when different types of land use intensity across different locations are aggregated or compared. The most intensive forms of agricultural production on land of the highest innate productivity can achieve the highest yields per area of land (i.e., the least land use per unit production), even though the production could be most environmentally damaging. Another example is the aggregation or comparison of water use without taking into account the local level of water availability or stress where the water is being used. Furthermore, most nutrient profiling models have inherent bias related to the choice of nutrients that are included and whether they are determined to be beneficial or detrimental. For example, the well-known NRF9.3 model has a bias against saturated fats [36] that is not supported by all evidence [18]. Studies were screened for biases of these kinds. Another source of bias was the incomplete coverage of relevant environmental aspects. For example, some studies focus on a single environmental indicator. Again, limitations of this nature were noted for consideration in the synthesis of evidence. Due to the diverse nature of the evidence obtained, formal uncertainty assessment approaches were not applied.

3. Results

3.1. Study Characteristics

The literature search identified 765 records. After a thorough screening (Figure 1), a final number of 14 articles was obtained. The search results are described in the PRISMA flow diagram (Figure 1).

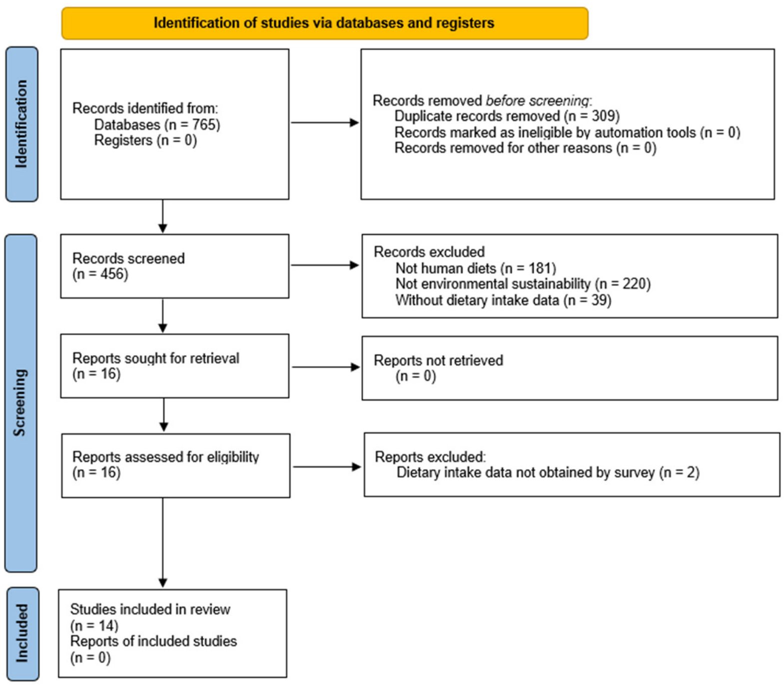

Figure 1. PRISMA flow diagram.

The characteristics of the 14 studies included in the review are presented in Table 2. All were observational cross-sectional studies, with some also including simulation. All the studies utilized data from the 2011 to 2013 National Nutrition and Physical Activity Survey [37], a large, nationally representative survey of dietary intake that included 9341 adults (19 years and above) and was undertaken by the Australian Bureau of Statistics using a 24 h dietary recall process. A variety of environmental indicators were used covering GHG emissions, water, land, material, and energy use, as well as pesticides.

Table 2. Characteristics of the 14 studies included in this systematic review.

Study	Year	Study Design	Intake Data	Age	Sex	*n*	Subgroups	Environmental Metrics [3]
[22]	2021	Cross-sectional, observational	2011–2013 NNPAS [1]	19+	M/F	9341	HQLI [2] dietary pattern; tertiles of dairy intake	GWP100
[38]	2023	Cross-sectional, observational	2011–2013 NNPAS	19+	M/F	5345	% energy from macronutrients; % plant/animal protein	GWP100, WU, MF, EU
[39]	2021	Cross-sectional, observational, and simulation	2011–2013 NNPAS	19+	M/F	9341	HQLI dietary pattern	GWP*, WSF, CSF, WT3
[40]	2021	Cross-sectional, observational, and simulation	2011–2013 NNPAS	19+	M/F	9341	HQLI dietary pattern	WSF
[41]	2022	Cross-sectional, observational	2011–2013 NNPAS	19+	M/F	9341	HQLI dietary pattern; intake of meat and alternatives	GWP*, WSF, CSF, PTF, WT4
[42]	2023	Cross-sectional, observational	2011–2013 NNPAS	19+	M/F	5344	% energy from UPF and non-UPF [4]	GWP100, WU, MF, EU
[43]	2022	Cross-sectional, observational	2011–2013 NNPAS	19+	M/F	7922	Vegan, pescatarian, and omnivorous dietary patterns	GWP100, WU, MF, EU
[44]	2022	Cross-sectional, observational, and simulation	2011–2013 NNPAS	19–50	M/F	5920	Average, lower meat, lower dairy, higher vegetable, lower discretionary food, and higher diet quality dietary patterns	WT3
[45]	2019	Cross-sectional, observational, and simulation	2011–2013 NNPAS	19+	M/F	9341	HQLI dietary pattern	WSF
[46]	2020	Cross-sectional, observational, and simulation	2011–2013 NNPAS	19+	M/F	9341	HQLI dietary pattern	CSF
[47]	2021	Cross-sectional, observational, and simulation	2011–2013 NNPAS	19+	M/F	9341	HQLI dietary pattern	GWP*
[48]	2021	Cross-sectional, observational, and simulation	2011–2013 NNPAS	19+	M/F	9341	HQLI dietary pattern	PTF
[28]	2022	Cross-sectional, observational	2011–2013 NNPAS	19+	M/F	9341	HQLI dietary pattern; intake of vegetables	GWP*, WSF, CSF, PTF, WT4
[49]	2016	Cross-sectional, observational, and simulation	2011–2013 NNPAS	19+	M/F	9341	HQLI dietary pattern	GWP100

[1] Australia's National Nutrition and Physical Activity Survey [37]; [2] HQLI—Higher diet quality and lower environmental impact dietary pattern; [3] GWP100—100-year Global Warming Potential; WU—Water Use; MF—Material Flow; EU—Energy Use; GWP*—Global Warming Potential Star [50,51], WSF—Water Scarcity Footprint, CSF—Cropland Scarcity Footprint; WT3—a 3-factor weighted environmental impact score comprising GWP*, WSF and CSF; PTF—Pesticide Toxicity Footprint; WT4—a four-factor weighted environmental impact score comprising GWP*, WSF, CSF and PTF; [4] UPF—Ultra-Processed Foods [52].

3.2. Total Dietary Energy Intake

Total dietary energy intake and environmental impact scores were found to be always positively correlated (6 studies, Table 3). The variation in environmental impact score that was explained by total dietary energy intake ranged from as low as 10% in the case of dietary pesticide toxicity footprint, to as high as 47% in the case of dietary cropland demand. It is to be expected that the relationship is stronger for some environmental indicators than others. Importantly, total dietary energy intake explained 45% of the variation in environmental impact when a multi-factor environmental indicator was used [39]. This is the strongest evidence of the relationship between total dietary energy intake and overall environmental impact. It is clear is that, aside from the individual foods that make up a diet, the total intake of dietary energy is an important driver of environmental impact. This is an important finding given the common overconsumption of dietary energy and the widespread prevalence of people in Australia who are overweight and obese.

Table 3. Evidence relating to dietary energy intake and environmental sustainability.

Study	Variation in Environmental Indicator Explained by Total Energy Intake (R^2)	Subgroup Total Energy Intake and Environmental Score
[39]	0.45	
[44]		Average diet (9191 kJ, EI [1] score 0.14) Lowest meat intake pattern (8364 kJ, EI score 0.12) Lowest dairy intake pattern (8499 kJ, EI score 0.13) Highest vegetable intake pattern (10,252 kJ, EI score 0.14) Lowest discretionary intake pattern (7178 kJ, EI score 0.15) Highest diet quality score (8912 kJ, EI score 0.15)
[45]	Males (0.3), Females (0.33)	
[46]	Males (0.47), Females (0.43)	
[47]	0.22	
[48]	0.10	
[28]		HQLI [2] dietary pattern (7945 kJ), Average diet (10,458 kJ)
[49]	0.29	HQLI dietary pattern (7508 kJ), Average diet (10,224 kJ)

[1] EI score—Multi-attribute Environmental Impact score. [2] HQLI—Higher diet quality and lower environmental impact dietary pattern.

This finding is further reinforced by examination of evidence obtained for population subgroups (Table 3). Two studies used quadrant analysis to isolate a higher diet quality and lower environmental impact subgroup [28,49]. In both cases dietary energy intake was around 25% below the population average. In one further study, subgroups characterized as having lowest meat intake, lowest dairy intake, highest vegetable intake, etc., were compared [44]. In this study, total dietary energy intake was reported that was both above and below the population average, and environmental impact scores were not clearly related.

3.3. Nutrient Adequacy

Several studies addressed nutrient density or the adequacy of intake of specific nutrients (Table 4). Where quadrant analysis was used to identify a higher diet quality and lower environmental impact subgroup, these diets were more nutrient dense in relation to a broad range of beneficial nutrients as well as being lower in sodium, free sugars, trans-fatty acids, and alcohol [22,28,41]. However, there were also several nutrients identified at risk of inadequate intake, namely vitamins A, B6 and B12, as well as minerals calcium, magnesium, selenium, and zinc (Table 4). Average intake of calcium and zinc were also reported to be below the EAR for dietary patterns low in meat and low in dairy [44]. A further study identified diets rich in UPFs as both lower in nutrient density and higher in GHG emissions [43]. Another study reported that nutrient density and environmental indicators both increased as percentage of energy from protein increased, highlighting the importance of protein-rich foods as a source of nutrients that tend to be widely under consumed across the Australian population, and as a source of environmental burden.

Table 4. Evidence relating to specific nutrients and dietary environmental impacts.

Study	Nutrients Identified at High Risk of Inadequate Intake	Main Finding
[22]	B12, Zn, Ca	Zinc was 5.8% lower and B12 was 5.5% lower in HQLI [1] diets. Few HQLI diets with low dairy intake met the EAR for calcium
[41]	B6, A, Ca, Zn, Mg, Se	Among HQLI diets, those with greater variety in the "Meat and alternatives" [2] food group had greater likelihood of achieving numerous EARs
[42]		Diets rich in UPFs [3] were associated with reduced nutritional quality (NRF9.3) and higher GHG emissions

Table 4. *Cont.*

Study	Nutrients Identified at High Risk of Inadequate Intake	Main Finding
[43]		Nutrient density (NRF9.3) and environmental indicators increased as the percentage of energy from protein increased
[44]	Ca, Zn	Average intake of calcium and zinc were below the EAR for dietary patterns low in meat and low in dairy
[28]	A, B6, Ca, Mg, Zn	HQLI diets were more nutrient dense that average diets, but there remained high prevalence of intake below the EAR for a broad range of nutrients

[1] HQLI—Higher diet quality and lower environmental impact dietary pattern. [2] With the Australian Dietary Guidelines, lean meats and poultry, fish, eggs, tofu, nuts and seeds, and legumes/beans are combined as a food group. [3] UPF—Ultra-Processed Foods [52].

3.4. Foods and Food Groups

In most studies, discretionary foods made the largest contribution to overall dietary environmental impact score, ranging from around 25% for water scarcity footprint [40,45] to 30% or more for pesticide toxicity footprint [48], climate footprint [47,49] and cropland scarcity footprint [46] (Table 5). The meat and alternatives food group, and the dairy and alternatives food group also made important contributions to most environmental impact categories. Fruits made important contributions to the dietary pesticide toxicity footprint [48] and water scarcity footprint [40,45]. Where quadrant analysis was used to identify a higher diet quality and lower environmental impact (HQLI) dietary pattern, the main differentiating feature was much lower intake of discretionary choices compared to the average diet (2.3 serves per day, compared to 6.8 serves) [28]. Vegetable intake was also higher, but differences across other food groups were minor and not significant in the case of the meat and alternatives food group. Another study also reported that diets rich in UPFs were associated with higher GHG emissions [42]. Across HQLI diets, dairy intake was found to be nutritionally important with HQLI diets of lower dairy consumers and dairy avoiders having a lower likelihood of achieving the recommended intake of a broad range of nutrients [22]. Within the meat and alternatives food group, greater variety was found to increase the likelihood of achieving EARs, with the highest EAR scores obtained for HQLI diets that included a combination of ruminant and non-ruminant meat [41]. Among HQLI diets, those with higher vegetable intake were characterized by greater variety of vegetables eaten, lower intake of bread and cereal foods, and higher intake of red meat [28], highlighting the importance of assessing the complete diet as variation in the intake of one type of food or food group can influence other food choices and thereby total energy and nutrient intake.

Table 5. Evidence relating to foods or food groups and dietary environmental impacts.

Study	Food/Food Group	Main Finding
[22]	Dairy foods	Intake of dairy foods was common across HQLI [1] diets. Higher diary intake increased likelihood of achieving adequate intake of a range of nutrients.
[39]	Discretionary foods	The largest contribution to EI score [2] came from discretionary foods, at 28.9%. This was followed by meat and alternatives (19.5%) and dairy foods (12.0%).
[40]	Discretionary foods	The largest contribution to water scarcity footprint came from discretionary foods (26.1%), followed by fruits (20.0%) and dairy (14.4%).
[41]	Meat and alternatives [3]	For HQLI diets, greater variety in meat and alternatives increased likelihood of achieving adequate intake of a range of nutrients.
[42]	UPFs [4]	Diets rich in UPFs were associated with reduced nutritional quality and higher GHG emissions.
[44]	Various	For dietary patterns with lowest meat intake, lowest dairy intake, highest vegetable intake, etc., environmental impact scores not clearly related.

Table 5. *Cont.*

Study	Food/Food Group	Main Finding
[45]	Discretionary foods	The largest contribution to water scarcity footprint came from discretionary foods (24.6%), followed by fruits (18.9%) and dairy (16.1%).
[46]	Discretionary foods	The largest contribution to cropland scarcity footprint came from discretionary foods (32.7%), then meat and alternatives (27.4%), and bread/cereal (12.6%).
[47]	Various	Largest climate impacts came from meat and alternatives (35.7%) followed by discretionary foods (32.0%) and dairy foods (12.4%).
[48]	Discretionary foods	Largest contribution to pesticide toxicity footprint came from discretionary foods (29.7%) followed by fruit (28.3%), and meat and alternatives (18.3%).
[28]	Vegetables	HQLI diets were mainly differentiated by much lower intake of discretionary foods and higher vegetable intake. Differences in intake of other food groups were small with no significant difference in intake of meat and alternatives. HQLI diets with higher vegetable intake had greater variety of vegetable intake, lower intake of bread and cereals, and higher intake of red meat.
[49]	Various	Discretionary foods contributed 29.4% of GHG emissions. Meat and alternatives contributed 33.9% (red meat 17.6%). Dairy contributed 10.5%.

[1] HQLI—Higher diet quality and lower environmental impact dietary pattern. [2] EI score—Multi-attribute Environmental Impact score. [3] With the Australian Dietary Guidelines, lean meats and poultry, fish, eggs, tofu, nuts and seeds, and legumes/beans are combined as a food group. [4] UPF—Ultra-Processed Foods [52].

3.5. Dietary Patterns

The most frequently studied dietary pattern was a higher diet quality and lower environmental impact pattern (HQLI) identified by quadrant analysis (10 articles; Table 6). Diet quality was assessed relative to Australian Dietary Guidelines [53] and was up to 44% higher than the population average [39]. Some studies assessed a single environmental aspect [22,40,45–49]. Other studies used a multi-attribute environmental impact score [28,39,41]. When a four-factor environmental impact score was used to define the HQLI subgroup, a reduction of 41% was reported relative to the average diet [28,41]. As such, there is already a large subgroup of Australian adults with dietary habits that are much more closely aligned to dietary guidelines and have substantially lower environmental impacts. These dietary patterns were also found to have a greater likelihood of achieving recommended intakes of a broad range of vitamins and minerals [28]. The importance of this subgroup is that it represents diets that are achievable and culturally relevant as they are already prevalent in the community. The distinguishing characteristic of this dietary pattern was that it included greatly fewer discretionary choices. However, intake of foods from the core food groups was marginally greater.

Dietary patterns were also studied from the perspective of macronutrient ratios, with a special emphasis of the percentage of dietary energy obtained from protein [38,43]. These studies report the importance of protein as a driver of environmental impact. However, nutrient density, assessed using the nutrient rich food index 9.3 [36], also increased with percentage of dietary energy obtained from protein, highlighting the importance of protein-rich foods as important sources of micronutrients. One study assessed diets rich in UPFs and reported reduced nutritional quality and higher GHG emissions [42]. Finally, one study compared the average adult dietary pattern with a variety of alternative patterns [44]. Compared to the average, a high vegetable dietary pattern had higher nutrient density but also higher EI score. Dietary patterns characterized by low meat, or low diary or low discretionary food intake had both lower nutrient density and EI score. This study underscores the problems that can arise through avoidance of nutrient-dense foods that are perceived to have a higher environmental impact.

Table 6. Evidence relating to dietary patterns and environmental sustainability.

Study	Dietary Pattern	Main Finding
[22]	HQLI [1]	Compared to the average, the HQLI dietary pattern had 37% higher diet quality score, 43% lower GHG emissions, and higher nutrient density.
[38]	AMDR [2]	GHG emissions were lower for diets at the lower limit of recommended intake of protein and when protein intake was from plant sources.
[39]	HQLI	Compared to the average, the HQLI dietary pattern had 44% higher diet quality score, and 36% lower EI score. [4]
[40]	HQLI	Compared to the average, the HQLI dietary pattern had 41% lower water scarcity footprint.
[41]	HQLI	Compared to the average, the HQLI dietary pattern had 39% higher diet quality score, and 41% lower EI score.
[42]	Diet rich in UPFs [3]	Diets rich in UPFs were associated with lower nutritional quality and higher GHG emissions.
[43]	Vegan, pescatarian, omnivorous	Proteins, irrespective of their source, drive dietary environmental impact.
[44]	Various	Compared to the average, the high vegetable dietary pattern had both higher nutrient density and EI score. Dietary patterns characterized by low meat, or low diary or low discretionary food intake had both lower nutrient density and EI score.
[45]	HQLI	Compared to the average, the HQLI dietary pattern had 43% lower water scarcity footprint.
[46]	HQLIs	Compared to the average, the HQLI dietary pattern had 43% lower cropland scarcity footprint.
[47]	HQLI	Compared to the average, the HQLI dietary pattern had 56% lower climate impacts.
[48]	HQLI	Compared to the average, the HQLI dietary pattern had 53% lower pesticide toxicity footprint.
[28]	HQLI	Compared to the average, the HQLI dietary pattern had 39% higher diet quality score, 53% lower GHG emissions, 24% lower water scarcity footprint, 29% lower cropland scarcity footprint, and 34% lower pesticide toxicity footprint. These diets also had greater likelihood of achieving recommended intake for a range of vitamins and minerals.
[49]	HQLI	Compared to the average, the HQLI dietary pattern had 29% lower GHG emissions.

[1] HQLI—Higher diet quality and lower environmental impact dietary pattern. [2] AMDR—Acceptable Macronutrient Distribution Range described by Australian Nutrient Reference Values for Australia and New Zealand [54]. [3] UPF—Ultra-Processed Foods [52]. [4] EI score—Multi-attribute Environmental Impact score.

4. Discussion

Studies combining Australian dietary intake survey data and environmental impact metrics have grown considerably since 2021 (Table 2) and have now reached 14. While this number is small relative to the number of international studies, the evidence is specific to the Australian context, which, as described in the Introduction, can differ in a variety of ways to other countries, including in agricultural practises, natural resource availability and environmental constraints, cultural norms around food, as well as specific public health nutrition challenges. The Australian evidence base is also rich, being characterized by a range of cross-sectional research designs and objectives, as well as variety in environmental indicators used. While 14 studies out of an original 765 records were finally chosen for inclusion in this systematic review, it is important to mention two studies which initially appeared to meet the inclusion criteria but were excluded. One study assessed the climate footprint of alternative therapeutic diets for people with chronic kidney disease [55]. This study was excluded because the dietary intake data were not obtained by survey but based only on a meal plan. The other study [56] was a modelling exercise that explored potential shifts from the current average Australian dietary pattern, again not based on dietary intake data obtained by survey. The available evidence from the 14 included studies has implications for practice, policy and future research, especially in relation to overconsumption, protein-rich foods, and nutrient-dense foods that provide nutrients of concern.

4.1. Overconsumption

An important observation was that HQLI dietary patterns had around 25% less dietary energy intake across the day compared to the average adult diet [28,49]. This subgroup of adult diets had 39% higher diet quality score as well as substantial improvement across all environmental indicators, including 53% lower climate impact [28]. It is therefore evident that the overconsumption of dietary energy is a major health and sustainability concern. Dietary patterns that lead to overconsumption of dietary energy have poorer diet quality scores and higher environmental impacts. This is explained by the moderately strong correlation between total dietary energy intake and environmental impact score [39]. It is well known that, on average, Australians consume excessive dietary energy, with the Australian Institute of Health and Welfare reporting that in 2022 an estimated 66% of adults aged 18 and over were living with overweight or obesity [57]. Therefore, one of the most compelling practical implications is that higher quality diets with lower environmental impacts can be encouraged by supporting greater consumption of nutrient-dense foods that enhance satiety, along with discouraging consumption of nutrient-poor processed foods that contribute little to satiety and can easily become overconsumed [58,59]. The HQLI dietary pattern was mainly characterized by a greatly lower intake of discretionary foods compared to the average adult diet [22,28]. There was also a marginally higher intake from the core food groups. Unfortunately, the solution is not as straightforward as lowering discretionary food intake, as diets selected on this basis alone may have lower total energy intake, but not necessarily provide sufficient micronutrients [44]. There is clearly a need for further research to understand the characteristics of the HQLI subgroup. Nevertheless, it is apparent that foods with high satiety that lead to less overall consumption of food energy will also contribute to lowering total dietary environmental impacts. The satiating efficiency of foods is itself a subject that is under active investigation [60–62]. Nevertheless, there is an opportunity to frame future research on sustainable diets around dietary patterns that are based on nutrient-dense foods that enhance satiety and maintain a sensation of fullness, thereby avoiding overconsumption.

4.2. Protein-Rich Foods

In Australia, protein-rich foods are represented by the "Meat and alternatives" food group, which includes different types of meat, poultry, fish, eggs, tofu, nuts and seeds, and legumes [2]. This food group has been a major focus in sustainable diets research internationally, often with a view to reducing the intake of animal sourced varieties [6,63,64]. In the Australian context, protein-rich foods make a relevant contribution to environmental impact; however, their contribution is generally less than discretionary choices, and therefore they should not be considered to be an overwhelmingly important driver of environmental impact. They contribute in the order of 20% of environmental impacts when multiple environmental impacts categories are considered jointly. Their contribution may be assessed more highly for some individual environmental impact categories, such as GHG emissions [38,43,47], and lower for others, such as water scarcity footprint [40,45]. A further consideration is that nutrient density increases as percentage of energy from protein-rich foods increases [43], and that greater variety of intake from this food group increases the likelihood of achieving adequate intake of a broad range of nutrients [41]. Furthermore, diets that include protein-rich foods of animal origin have greater likelihood of achieving EARs than diets that include only plant-based sources [41]. The practical implication is that, despite the attention ascribed to this food group by some researchers and commentators, the Australian evidence suggests that caution is warranted toward any approach that involves limiting total intake or diversity within this food group, as there are trade-offs that could lead to unintended negative outcomes.

4.3. Nutrient-Dense Foods and Nutrients of Concern

The HQLI dietary pattern was more likely to achieve adequate intake of a broad range of vitamins and minerals than the average Australian adult diet [28]. Nevertheless, there were three vitamins (A, B6, and B12) and four minerals (Ca, Mg, Se and Zn) where intake relative to estimated average requirements could be at risk. The practical implication is that foods that are rich and bioavailable sources of these nutrients need to be deliberately considered in any approach to reducing dietary environmental impacts. Vitamin A is a fat-soluble vitamin found only in animal foods, such as eggs, dairy foods, and fish, but precursors to vitamin A are also found in many vegetables and fruits. Vitamin B6 is also found in a wide variety of animal-sourced foods as well as vegetables, and fruits like bananas and avocadoes. Vitamin B6 can also be added to fortify commercial bread and breakfast cereals in Australia. Vitamin B12, in contrast, is almost exclusively obtained from animal-sourced foods. Calcium is the most widely under-consumed nutrient in Australia [27]. Dairy foods are the main natural source of calcium, with smaller amounts in bony fish, legumes, and certain nuts. Additionally, calcium can be obtained from fortified beverages and breakfast cereals although the absorption may be less [65]. Low dairy consumers among the HQLI dietary subgroup had less than a 10% likelihood of achieving the EAR for calcium. Magnesium is widely available in the food system in both plant- and animal sourced foods. Likewise, selenium is available in a wide range of both plant- and animal-sourced foods. Availability in plant-based foods can depend on geographical sourcing [66]. For zinc, red meat, poultry, fish, and dairy foods are the main natural sources in the Australian diet, with fortified cereals being another source. The practical implication of this discussion is that any strategy to reduce dietary environmental impacts by limiting these important nutrient-dense foods can inadvertently increase risks of inadequate intake of micronutrients. While risks can be reduced for individuals through careful meal planning, it would seem unwise to communicate sustainability messages that involve limiting or avoiding these nutrient-rich core foods to the broader community.

4.4. Risk of Bias

The main risk of bias in sustainable diet studies is researcher bias introduced when comparisons are made between dietary scenarios that are chosen and defined by the researchers themselves. Such studies typically involve assumptions about food substitutions, or assumptions about dietary composition that often ignore discretionary choices such as cakes, doughnuts, muffins, biscuits and other snack bars, confectionary, salty crackers or crisps, sugar sweetened beverages, sports drinks, and many other types of UPFs that can make up a substantial proportion of dietary energy intake in Australia. These studies also typically compare dietary scenarios on an iso-caloric basis, ignoring, as shown in Table 3, that food choices impact frequency of eating and total dietary energy intake across the day. In this systematic review, this source of bias was avoided by only including studies reporting dietary intake obtained by survey. Two of the studies used the Nutrient Rich Food Index 9.3 [42,43], which has not been designed specifically for the Australian nutritional context, is selective in the nutrients included, and has a bias against saturated fats. That said, the index is considered generally reliable in indicating the direction of nutrient density and was not considered a major risk. Several of the studies included environmental metrics that are not considered a reliable indicator of environmental impact when used in a life cycle assessment context (e.g., water use, land use; see Section 2 for further description), and can be potentially misleading. To avoid potential bias, the evidence obtained from these indicators was not included.

4.5. Limitations

All the included studies were based on the most recent nationally representative Australian dietary intake survey (Table 2). This survey is more than a decade old, and while population-level food habits shift relatively slowly in Australia [67], this dataset may not fully represent recent food trends. This systematic review included 14 studies. However, due to the broad nature of the topic, the different research questions, and study designs used, many of the studies were not directly comparable. As such, evidence was grouped according to total dietary energy intake, nutrient adequacy, foods and food groups, and dietary patterns, and broad conclusions were drawn. The heterogeneity between studies did not permit formal sensitivity analysis or quantitative assessments of uncertainty. Finally, it is important to note that sustainability is a complex and multi-dimensional challenge, and this review did not address economic, social, or animal welfare aspects.

5. Conclusions

Current evidence suggests that in Australia, higher quality diets with lower environmental impacts can be achieved by encouraging greater consumption of nutrient-dense foods, especially those that enhance satiety, along with discouraging consumption of nutrient-poor processed foods that contribute little to satiety and can lead to excessive dietary energy intake. Regarding protein-rich foods, the Australian evidence suggests that caution is warranted toward any approach that involves limiting total intake or diversity of choice, as this could risk inadequate intake of micronutrients. The higher diet quality and lower environmental impact dietary pattern was more likely to achieve adequate intake of a broad range of vitamins and minerals than the average Australian adult diet. However, there were three vitamins (A, B6, and B12) and four minerals (Ca, Mg, Se, and Zn) where intake relative to estimated average requirements could be particularly at risk. The practical implication is that foods that are rich and bioavailable sources of these nutrients need to be prioritized in any strategy to reduce dietary environmental impacts. None of the studies addressed environmental aspects of children's diets. This is an area where further research is warranted.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/dietetics4010005/s1, PRISMA checklist.

Funding: This study received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Detailed search criteria are reported in the manuscript. All studies included in the review are cited in the list of references.

Conflicts of Interest: The author has previously conducted research projects and assessments around food systems and sustainability for a variety of private sector organizations, Australian government agencies, and nongovernmental organizations. The author is currently a member of the Australian National Health and Medical Research Council (NHMRC) Dietary Guidelines Sustainability Working Group.

References

1. Food-Based Dietary Guidelines. Available online: https://www.fao.org/nutrition/education/food-dietary-guidelines/home/en/ (accessed on 10 October 2024).
2. National Health and Medical Research Council. *Australian Dietary Guidelines Summary*; National Health and Medical Research Council: Canberra, Australia, 2013.
3. National Health and Medical Research Council. *A Modelling System to Inform the Revision of the Australian Guide to Healthy Eating*; National Health and Medical Research Council: Canberra, Australia, 2011.
4. U.S. Department of Agriculture and U.S. Department of Health and Human Services. *Dietary Guidelines for Americans, 2020–2025*, 9th ed.; 2020. Available online: https://www.dietaryguidelines.gov/sites/default/files/2020-12/Dietary_Guidelines_for_Americans_2020-2025.pdf (accessed on 10 October 2024).
5. Sustainable Healthy Diets: Guiding Principles. Available online: https://www.who.int/publications/i/item/9789241516648 (accessed on 10 October 2024).
6. Willett, W.; Rockström, J.; Loken, B.; Springmann, M.; Lang, T.; Vermeulen, S.; Garnett, T.; Tilman, D.; DeClerck, F.; Wood, A. Food in the Anthropocene: The EAT-Lancet Commission on healthy diets from sustainable food systems. *Lancet* **2019**, *393*, 447–492. [CrossRef]
7. Nordic-Nutrition Recommendations 2023: Integrating Environmental Aspects. Available online: https://www.norden.org/en/publication/nordic-nutrition-recommendations-2023 (accessed on 10 October 2024).
8. The Danish Official Dietary Guidelines. Available online: https://en.fvm.dk/news-and-contact/focus-on/the-danish-official-dietary-guidelines (accessed on 10 October 2024).
9. Healthy and Sustainable Dietary Recommendations 2023. Available online: https://www.aesan.gob.es/AECOSAN/docs/documentos/nutricion/RECOMENDACIONES_DIETETICAS_EN.pdf (accessed on 10 October 2024).
10. Eating and Activity Guidelines for New Zealand Adults. Available online: https://www.tewhatuora.govt.nz/assets/For-the-health-sector/Health-sector-guidance/Active-Families/eating-activity-guidelines-new-zealand-adults-updated-2020-oct22.pdf (accessed on 10 October 2024).
11. Canada's Dietary Guidelines for Health Professionals and Policy Makers. Available online: https://publications.gc.ca/collections/collection_2019/sc-hc/H164-231-2019-eng.pdf (accessed on 10 October 2024).
12. Dietary Guidelines for the Brazilian Population. Available online: https://bvsms.saude.gov.br/bvs/publicacoes/dietary_guidelines_brazilian_population.pdf (accessed on 10 October 2024).
13. Qatar Dietary Guidelines. Available online: https://openknowledge.fao.org/server/api/core/bitstreams/34c007a7-9cea-4e90-a100-1dfc48ceba5c/content (accessed on 10 October 2024).
14. Eating Habits and Dietary Guidelines. Available online: https://www.livsmedelsverket.se/en/food-habits-health-and-environment/dietary-guidelines (accessed on 10 October 2024).
15. Dutch Dietary Guidelines 2015. Available online: https://www.healthcouncil.nl/documents/advisory-reports/2015/11/04/dutch-dietary-guidelines-2015 (accessed on 10 October 2024).
16. Dietary Fibre. Available online: https://www.eatforhealth.gov.au/nutrient-reference-values/nutrients/dietary-fibre (accessed on 10 October 2024).
17. Sodium. Available online: https://www.eatforhealth.gov.au/nutrient-reference-values/nutrients/sodium (accessed on 10 October 2024).
18. Astrup, A.; Magkos, F.; Bier, D.M.; Brenna, J.T.; de Oliveira Otto, M.C.; Hill, J.O.; King, J.C.; Mente, A.; Ordovas, J.M.; Volek, J.S.; et al. Saturated fats and health: A reassessment and proposal for food-based recommendations. *J. Am. Coll. Cardiol.* **2020**, *76*, 844–857. [CrossRef]
19. Aceves-Martins, M.; Lofstedt, A.; Godina Flores, N.L.; Ortiz Hernández, D.M.; de Roos, B. What environmental metrics are used in scientific research to estimate the impact of human diets? *Nutrients* **2024**, *16*, 3166. [CrossRef]
20. Ridoutt, B.G.; Hendrie, G.A.; Noakes, M. Dietary strategies to reduce environmental impact: A critical review of the evidence base. *Adv. Nutr.* **2017**, *8*, 933–946. [CrossRef] [PubMed]
21. Ridoutt, B. Climate impact of Australian livestock production assessed using the GWP* climate metric. *Livest. Sci.* **2021**, *246*, 104459. [CrossRef]
22. Ridoutt, B.G.; Baird, D.; Hendrie, G.A. The role of dairy foods in lower greenhouse gas emission and higher diet quality dietary patterns. *Eur. J. Nutr.* **2021**, *60*, 275–285. [CrossRef] [PubMed]
23. Magkos, F.; Tetens, I.; Bügel, S.; Felby, C.; Schacht, S.R.; Hill, J.O.; Ravussin, E.; Astrup, A. A perspective on the transition to plant-based diets: A diet change may attenuate climate change, but can it also attenuate obesity and chronic disease risk? *Adv. Nutr.* **2020**, *11*, 1–9. [CrossRef] [PubMed]
24. Payne, C.L.R.; Scarborough, P.; Cobiac, L. Do low-carbon-emission diets lead to higher nutritional quality and positive health outcomes? A systematic review of the literature. *Public Health Nutr.* **2016**, *19*, 2654–2661. [CrossRef]

25. Ridoutt, B.; Baird, D.; Bastiaans, K.; Darnell, R.; Hendrie, G.; Riley, M.; Sanguansri, P.; Syrette, J.; Noakes, M.; Keating, B. Australia's nutritional food balance: Situation, outlook and policy implications. *Food Sec.* **2017**, *9*, 211–226. [CrossRef]
26. Boulay, A.M.; Bare, J.; Benini, L.; Berger, M.; Lathuillière, M.J.; Manzardo, A.; Margni, M.; Motoshita, M.; Núñez, M.; Pastor, A.V.; et al. The WULCA consensus characterization model for water scarcity footprints: Assessing impacts of water consumption based on available water remaining (AWARE). *Int. J. Life Cycle Assess.* **2018**, *23*, 368–378. [CrossRef]
27. Ridoutt, B. An alternative nutrient rich food index (NRF-ai) incorporating prevalence of inadequate and excessive nutrient intake. *Foods* **2021**, *10*, 3156. [CrossRef] [PubMed]
28. Ridoutt, B.; Baird, D.; Hendrie, G.A. Diets with higher vegetable intake and lower environmental impact: Evidence from a large Australian population health survey. *Nutrients* **2022**, *14*, 1517. [CrossRef] [PubMed]
29. Jenkins, L.; McEvoy, M.; Patterson, A.; Sibbritt, D. Higher unprocessed red meat, chicken and fish intake is associated with a higher vegetable intake in mid-age non-vegetarian women. *Nutr. Diet.* **2012**, *69*, 293–299. [CrossRef]
30. Raubenheimer, D.; Simpson, S.J. Protein leverage: Theoretical foundations and ten points of clarification. *Obesity* **2019**, *27*, 1225–1238. [CrossRef]
31. Burton-Freeman, B. Dietary fiber and energy regulation. *J. Nutr.* **2000**, *130*, 272S–275S. [CrossRef] [PubMed]
32. Clark, M.J.; Slavin, J.L. The effect of fiber on satiety and food intake: A systematic review. *J. Am. Coll. Nutr.* **2013**, *32*, 200–211. [CrossRef] [PubMed]
33. Biltoft-Jensen, A.; Matthiessen, J.; Hess Ygil, K.; Christensen, T. Defining energy-dense, nutrient-poor food and drinks and estimating the amount of discretionary energy. *Nutrients* **2022**, *14*, 1477. [CrossRef]
34. Page, M.J.; McKenzie, J.E.; Bossuyt, P.M.; Boutron, I.; Hoffmann, T.C.; Mulrow, C.D.; Shamseer, L.; Tetzlaff, J.M.; Akl, E.A.; Brennan, S.E.; et al. The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ* **2021**, *372*, 71. [CrossRef] [PubMed]
35. Web of Science^{TM}. Available online: https://www.webofscience.com/wos/woscc/basic-search (accessed on 4 September 2024).
36. Drewnowski, A. Defining nutrient density: Development and validation of the nutrient rich foods index. *J. Am. Coll. Nutr.* **2009**, *28*, 421S–426S. [CrossRef] [PubMed]
37. Australian Bureau of Statistics. Australian Health Survey: Nutrition First Results—Food and Nutrients, 2011–2012. Available online: http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/4364.0.55.007main+features12011-12 (accessed on 15 October 2024).
38. Liyanapathirana, N.N.; Grech, A.; Li, M.; Malik, A.; Lenzen, M.; Raubenheimer, D. Nutrient-sensitive approach for sustainability assessment of Australian macronutrient dietary recommendations. *Am. J. Clin. Nutr.* **2023**, *117*, 298–307. [CrossRef] [PubMed]
39. Ridoutt, B.G.; Baird, D.; Hendrie, G.A. Diets within planetary boundaries: What is the potential of dietary change alone? *Sustain. Prod. Consum.* **2021**, *28*, 802–810. [CrossRef]
40. Ridoutt, B.G.; Baird, D.; Anastasiou, K.; Hendrie, G.A. An assessment of the water use associated with Australian diets using a planetary boundary framework. *Public Health Nutr.* **2021**, *24*, 1570–1575. [CrossRef] [PubMed]
41. Ridoutt, B.G.; Baird, D.; Hendrie, G.A. The importance of protein variety in a higher quality and lower environmental impact dietary pattern. *Public Health Nutr.* **2022**, *25*, 3583–3588. [CrossRef] [PubMed]
42. Liyanapathirana, N.N.; Grech, A.; Li, M.; Malik, A.; Ribeiro, R.; Burykin, T.; Lenzen, M.; Raubenheimer, D. Nutritional, environmental and economic impacts of ultra-processed food consumption in Australia. *Public Health Nutr.* **2023**, *26*, 3359–3369. [CrossRef] [PubMed]
43. Liyanapathirana, N.N.; Grech, A.; Li, M.; Malik, A.; Lenzen, M.; Raubenheimer, D. Nutrient-sensitive approach for sustainability assessment of different dietary patterns in Australia. *Am. J. Clin. Nutr.* **2022**, *115*, 1048–1058. [CrossRef]
44. Hendrie, G.A.; Rebuli, M.A.; James-Martin, G.; Baird, D.L.; Bogard, J.R.; Lawrence, A.S.; Ridoutt, B. Towards healthier and more sustainable diets in the Australian context: Comparison of current diets with the Australian Dietary Guidelines and the EAT-Lancet Planetary Health Diet. *BMC Public Health* **2022**, *22*, 1939. [CrossRef]
45. Ridoutt, B.G.; Baird, D.; Anastasiou, K.; Hendrie, G.A. Diet quality and water scarcity: Evidence from a large Australian population health survey. *Nutrients* **2019**, *11*, 1846. [CrossRef]
46. Ridoutt, B.; Anastasiou, K.; Baird, D.; Garcia, J.N.; Hendrie, G. Cropland footprints of Australian dietary choices. *Nutrients* **2020**, *12*, 1212. [CrossRef] [PubMed]
47. Ridoutt, B.; Baird, D.; Hendrie, G.A. Diets within environmental limits: The climate impact of current and recommended Australian diets. *Nutrients* **2021**, *13*, 1122. [CrossRef]
48. Ridoutt, B.; Baird, D.; Navarro, J.; Hendrie, G.A. Pesticide toxicity footprints of Australian dietary choices. *Nutrients* **2021**, *13*, 4314. [CrossRef] [PubMed]
49. Hendrie, G.A.; Baird, D.; Ridoutt, B.; Hadjikakou, M.; Noakes, M. Overconsumption of energy and excessive discretionary food intake inflates dietary greenhouse gas emissions in Australia. *Nutrients* **2016**, *8*, 690. [CrossRef] [PubMed]
50. Allen, M.R.; Shine, K.P.; Fuglestvedt, J.S.; Millar, R.J.; Cain, M.; Frame, D.J.; Macey, A.H. A solution to the misrepresentations of CO_2-equivalent emissions of short-lived climate pollutants under ambitious mitigation. *NPJ Clim. Atmos. Sci.* **2018**, *1*, 16. [CrossRef]

51. Cain, M.; Lynch, J.; Allen, M.R.; Fuglestvedt, J.S.; Frame, D.J.; Macey, A.H. Improved calculation of warming-equivalent emissions for short-lived climate pollutants. *NPJ Clim. Atmos. Sci.* **2019**, *2*, 29. [CrossRef] [PubMed]
52. Monteiro, C.A.; Cannon, G.; Levy, R.B.; Moubarac, J.C.; Louzada, M.L.; Rauber, F.; Khandpur, N.; Cediel, G.; Neri, D.; Martinez-Steele, E.; et al. Ultra-processed foods: What they are and how to identify them. *Public Health Nutr.* **2019**, *22*, 936–941. [CrossRef] [PubMed]
53. Golley, R.K.; Hendrie, G.A. The Dietary Guidelines Index for children and adolescents: What is the impact of the new dietary guidelines? *Nutr. Diet.* **2014**, *71*, 210–212. [CrossRef]
54. Macronutrient Balance. Available online: https://www.eatforhealth.gov.au/nutrient-reference-values/chronic-disease/macronutrient-balance (accessed on 22 October 2024).
55. Clay, N.; Charlton, K.; Stefoska-Needham, A.; Heffernan, E.; Hassan, H.I.C.; Jiang, X.; Stanford, J.; Lambert, K. What is the climate footprint of therapeutic diets for people with chronic kidney disease? Results from an Australian analysis. *J. Hum. Nutr. Diet.* **2023**, *36*, 2246–2255. [PubMed]
56. Candy, S.; Turner, G.; Larsen, K.; Wingrove, K.; Steenkamp, J.; Friel, S.; Lawrence, M. Modelling the food availability and environmental impacts of a shift towards consumption of healthy dietary patterns in Australia. *Sustainability* **2019**, *11*, 7124. [CrossRef]
57. Overweight and Obesity. Available online: https://www.aihw.gov.au/reports/overweight-obesity/overweight-and-obesity/contents/overweight-and-obesity (accessed on 12 October 2024).
58. Fillon, A.; Beaulieu, K.; Mathieu, M.E.; Tremblay, A.; Boirie, Y.; Drapeau, V.; Thivel, D. A systematic review of the use of the Satiety Quotient. *Br. J. Nutr.* **2021**, *125*, 212–239. [CrossRef] [PubMed]
59. Marchese, L.; Livingstone, K.M.; Woods, J.L.; Wingrove, K.; Machado, P. Ultra-processed food consumption, socio-demographics and diet quality in Australian adults. *Public Health Nutr.* **2022**, *25*, 94–104. [CrossRef]
60. Sui, Z.; Wong, W.K.; Louie, J.C.; Rangan, A. Discretionary food and beverage consumption and its association with demographic characteristics, weight status, and fruit and vegetable intakes in Australian adults. *Public Health Nutr.* **2017**, *20*, 274–281. [CrossRef] [PubMed]
61. Stribiţcaia, E.; Evans, C.E.L.; Gibbons, C.; Blundell, J.; Sarkar, A. Food texture influences on satiety: Systematic review and meta-analysis. *Sci. Rep.* **2020**, *10*, 12929. [CrossRef] [PubMed]
62. Hansen, T.T.; Astrup, A.; Sjödin, A. Are dietary proteins the key to successful body weight management? A systematic review and meta-analysis of studies assessing body weight outcomes after interventions with increased dietary protein. *Nutrients* **2021**, *13*, 3193. [CrossRef] [PubMed]
63. de Boer, J.; Aiking, H. Strategies towards healthy and sustainable protein consumption: A transition framework at the levels of diets, dishes, and dish ingredients. *Food Qual. Prefer.* **2019**, *73*, 171–181. [CrossRef]
64. Graça, J.; Truninger, M.; Junqueira, L.; Schmidt, L. Consumption orientations may support (or hinder) transitions to more plant-based diets. *Appetite* **2019**, *140*, 19–26. [CrossRef] [PubMed]
65. Shkembi, B.; Huppertz, T. Calcium absorption from food products: Food matrix effects. *Nutrients* **2021**, *14*, 180. [CrossRef]
66. Selenium. Available online: https://www.eatforhealth.gov.au/nutrient-reference-values/nutrients/selenium (accessed on 24 October 2024).
67. Ridoutt, B.; Baird, D.; Bastiaans, K.; Hendrie, G.; Riley, M.; Sanguansri, P.; Syrette, J.; Noakes, M. Changes in food intake in Australia: Comparing the 1995 and 2011 National Nutrition Survey results disaggregated into basic foods. *Foods* **2016**, *5*, 40. [CrossRef] [PubMed]