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Heterogeneity in the Utilization of Fecal Occult Blood Testing and Colonoscopy among Migrants and Non-Migrants in Austria: Results of the Austrian Health Interview Survey

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Abstract: Many European studies report lower participation in colorectal cancer screening among migrants than non-migrants. A major limitation of these studies is that usually, the heterogeneity of migrants cannot be accounted for. The aim of this investigation was to examine differences in the utilization of fecal occult blood testing and colonoscopy between non-migrants and the five largest migrant groups residing in Austria using data from the Austrian Health Interview Survey 2019. The two outcomes were compared between non-migrants and migrants using multivariable logistic regression adjusted for socioeconomic and health variables. Migrants from a Yugoslav successor state (OR = 0.61; 95%-CI: 0.44–0.83), Turkish (OR = 0.35; 95%-CI: 0.22–0.55), Hungarian (OR = 0.37; 95%-CI: 0.16–0.82) and German migrants (OR = 0.70; 95%-CI: 0.51–0.98) were less likely to have used a fecal occult blood test compared to non-migrants. Participation in colonoscopy was lower among Turkish migrants (OR = 0.42; 95%-CI: 0.27–0.67) and migrants from a Yugoslav successor state (OR = 0.56; 95%-CI: 0.42–0.75) than among non-migrants. The findings are consistent with studies from other countries and highlight barriers migrants face in accessing the health care system. To address these barriers, the heterogeneity of the population must be taken into account when developing educational materials in order to promote informed decisions about whether or not to participate in colorectal cancer screening.

Keywords: colorectal cancer; migrant; screening; Austria; survey; utilization; heterogeneity

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1. Introduction

Colorectal cancer accounts for approximately 12.7% of all new cancer diagnoses and 12.4% of all cancer-related deaths in Europe [1]. Risk factors for colorectal cancer include personal lifestyle factors such as smoking, lack of exercise, high consumption of red meat and a low-fiber diet. In addition, a family history of the disease and advancing age contribute to an increased risk of colorectal cancer [2]. Colorectal cancer screening can significantly reduce colorectal cancer incidence and mortality [3–5]. Screening may comprise both invasive and non-invasive methods. In order to detect microscopic amounts of blood in the stool, non-invasive stool tests such as the guaiac fecal occult blood test (gFOBT) and the fecal immunochemical test (FIT) can be used. Colonoscopy, on the other hand, is an invasive screening method used to examine the colon for polyps and potentially malignant neoplasms, which can be treated accordingly once identified [6].

Despite its benefits, colorectal cancer screening can also be associated with disadvantages and is therefore not without controversy [7]. The advantages of colorectal cancer screening, such as early detection and removal of precancerous lesions and the associated

reduction in colorectal cancer morbidity and mortality, are contrasted with disadvantages, such as false negative or false positive test results and the risk of complications during colonoscopy [8,9]. Therefore, the utilization or non-utilization of colorectal cancer screening should always be based on an informed decision [10].

Non-utilization of colorectal cancer screening is associated with lower age [11], absence of a spouse [12], low socioeconomic status [13,14] and lack of knowledge about colorectal cancer and cancer screening [15]. In addition, different studies conducted in Europe have shown that migrants are less likely to use colorectal cancer screening examinations compared to the majority population [16,17]. For example, a study from Denmark showed a 38% lower utilization rate of fecal occult blood testing among non-Western immigrants compared to the Danish majority population [16]. Similarly, survey data from a Swiss study showed that individuals born in a country outside of Western Europe and North America have a 35% lower colorectal cancer screening rate compared to native Swiss [18]. Other European countries, such as the Netherlands [19] and other regions of the world, such as the United States [20], Canada [21] and Israel [22], report similar findings. The reason for the lower uptake of colorectal cancer screening by migrants could be several barriers this population group encounters in the health care system, such as poor language proficiency, which may hinder participation in colorectal cancer screening [23].

In Austria, 24.4% of the population are migrants, i.e., individuals who have non-Austrian citizenship or who themselves or whose parents were born abroad [24]. The Austrian health insurance system is a contribution-financed compulsory insurance scheme that covers approximately 99.9% of the resident population. Every resident is entitled to the benefits of health insurance regardless of factors such as age, gender, social status, place of residence or origin. The amount of health insurance contributions is independent of individual health risks and is based only on a person's income. As of January 2023, the contribution rate for the majority of the population subject to contributions is 7.65% of earned income. The contribution is shared between employees and their employers, with each covering about 50% of the rate. The Austrian health insurance provides a wide range of services for the care of the population, including, among others, medical and dental treatment, sickness benefits and different types of preventive services [25,26]. In terms of colorectal cancer prevention, these comprise free screening examinations for colorectal cancer to all individuals over the age of 50, including migrants with a residence status. For purposes of screening, individuals have the option of undergoing an annual fecal occult blood test and a colonoscopy every ten years free of charge [27]. With the exception of the province of Burgenland, there is no population-based colorectal cancer screening in Austria. Instead, colorectal cancer screening is performed opportunistically. Compared to other European countries, such as Greece (11%) or Latvia (22%), which also have opportunistic screening programs, Austria shows high participation rates in fecal occult blood tests for individuals aged 50–74 years, with 49% undergoing regular testing. In terms of colonoscopy participation, Austria has the highest utilization rate (52%) in Europe, followed by Germany (51%), Luxembourg (49%) and Iceland (41%) [28].

Little is known about the uptake of colorectal cancer screening among migrants in Austria. A recent study from Germany, a neighboring state which shares a similar migration history to that of Austria, shows that migrants from non-EU and EU countries aged $\geq$50 years are 61% and 27% less likely, respectively, to participate in a fecal occult blood test than non-migrants. Regarding participation in colonoscopy, the results of the study do not indicate any differences between migrants and non-migrants [29]. A major limitation of this study, however, is that it was not able to take into account the heterogeneity of migrants, as it only distinguishes between EU/non-EU migrants and non-migrants. Another study from Germany, which does take the heterogeneity of the population into account and distinguishes between different countries of origin, also shows that migrants, on average, use fecal occult blood testing less frequently than the majority population but illustrates that disparities differ considerably between countries of origin [30]. To the best of the authors' knowledge, no comparable study is available for Austria.

By using data from a representative population-based survey, the aim of the present study was to examine disparities in the use of colorectal cancer screening among non-migrants and the five largest groups of migrants residing in Austria (individuals with a nationality from a Yugoslav successor state, Turkey, Romania, Hungary and Germany [31]). By shedding light on potential heterogeneities, the findings can contribute to tailoring strategies of diversity-sensitive health care in order to ensure the provision of equal access to colorectal cancer screening for migrant communities.

2. Results

Of the 8267 respondents aged 50 and older, 222 (2.7%) were migrants from a Yugoslav successor state, 208 (2.5%) were German, 85 (1.0%) were Turkish, 40 (0.5%) were Romanian and 27 (0.3%) were Hungarian migrants. The population groups differed in their socioeconomic and health profile (Table 1). On average, migrants were younger, were more likely to live in urbanized areas, rated their health status worse than non-migrants and were more likely to have chronic diseases. Turkish migrants, in particular, had a significantly lower level of education than non-migrants. All migrant groups showed a significantly lower utilization of fecal occult blood testing compared to non-migrants. While 80.8% of non-migrants had utilized a fecal occult blood test at least once prior to the survey, the proportion was lower among Turkish (60.9%), Hungarian (63.0%), Romanian (70.0%), migrants from a Yugoslav successor state (72.5%) and German migrants (75%). Regarding the participation in colonoscopy, the proportion of Turkish migrants (43.5%), Hungarian migrants (48.1%), migrants from a Yugoslav successor state (50.0%) and Romanian migrants (55.0%), who had a colonoscopy at least once in their lifetime, was significantly lower than among non-migrants (61.8%). German migrants (62.0%) and non-migrants (61.8%) reported a similar utilization of colonoscopy (Table 1).

The differences in the uptake of the fecal occult blood test, in part, remained significant after adjusting for covariates and partially increased, especially among Turkish and Hungarian migrants as compared to the Austrian majority population. Turkish migrants were 65% (OR = 0.35; 95%-CI: 0.22–0.55; $p < 0.001$) and Hungarian migrants 63% (OR = 0.37; 95%-CI: 0.16–0.82; $p = 0.014$) less likely to participate in fecal occult blood testing in the three years prior to the survey. Romanian migrants (OR = 0.59; 95%-CI: 0.30–1.18; $p = 0.136$), migrants from a Yugoslav successor state (OR = 0.61; 95%-CI: 0.44–0.83; $p = 0.002$) and German migrants (OR = 0.70; 95%-CI: 0.51–0.98; $p < 0.035$) also had a lower utilization of the fecal occult blood test than non-migrants. However, the differences between Romanian migrants and non-migrants were not statistically significant. Age; partnership status; education level; net income (third to fifth quintile); degree of urbanization (low); the regions Burgenland, Styria, Salzburg and Tyrol; and the presence of chronic diseases were significantly associated with fecal occult blood testing (Table 2).

Table 1. Description of the study sample by population group (Austrian Health Interview Survey 2019, respondents aged 50 years and over, n = 8267).

	Population Group							
	Non-Migrants	**Migrants from a Yugoslav Successor State**	**German Migrants**	**Turkish Migrants**	**Romanian Migrants**	**Hungarian Migrants**	**Other Migrants**	***p*-Value ***
N	7376	222	208	85	40	27	309	
Sex								0.229
Male	3408 (46.2%)	107 (48.2%)	86 (41.3%)	48 (56.5%)	17 (42.5%)	9 (33.3%)	139 (45.0%)	
Female	3968 (53.8%)	115 (51.8%)	122 (58.7%)	37 (43.5%)	23 (57.5%)	18 (66.7%)	170 (55.0%)	
Age (years)								<0.001
50–54	1242 (16.8%)	60 (27.0%)	42 (20.2%)	34 (40.0%)	15 (37.5%)	6 (22.2%)	70 (22.7%)	
55–59	1296 (17.6%)	47 (21.2%)	38 (18.3%)	20 (23.5%)	6 (15.0%)	6 (22.2%)	56 (18.1%)	
60–64	1201 (16.3%)	36 (16.2%)	23 (11.1%)	12 (14.1%)	10 (25.0%)	2 (7.4%)	50 (16.2%)	
65–69	1006 (13.6%)	37 (16.7%)	13 (6.3%)	10 (11.8%)	0 (0.0%)	6 (22.2%)	29 (9.4%)	
70–74	840 (11.4%)	21 (9.5%)	36 (17.3%)	6 (7.1%)	0 (0.0%)	1 (3.7%)	33 (10.7%)	
75–79	891 (12.1%)	12 (5.4%)	27 (13.0%)	1 (1.2%)	2 (5.0%)	3 (11.1%)	24 (7.8%)	
80–84	469 (6.4%)	7 (3.2%)	14 (6.7%)	2 (2.4%)	5 (12.5%)	2 (7.4%)	24 (7.8%)	

Table 1. *Cont.*

	Population Group							
	Non-Migrants	**Migrants from a Yugoslav Successor State**	**German Migrants**	**Turkish Migrants**	**Romanian Migrants**	**Hungarian Migrants**	**Other Migrants**	***p*-Value ***
85–89	277 (3.8%)	1 (0.5%)	7 (3.4%)	0 (0.0%)	1 (2.5%)	0 (0.0%)	7 (2.3%)	
90–94	79 (1.1%)	1 (0.5%)	1 (0.5%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (0.6%)	
95+	75 (1.0%)	0 (0.0%)	7 (3.4%)	0 (0.0%)	1 (2.5%)	1 (3.7%)	14 (4.5%)	
Partnership status								0.060
Partner	4999 (67.8%)	162 (73.0%)	136 (65.4%)	63 (74.1%)	23 (57.5%)	15 (55.6%)	194 (62.8%)	
No Partner	2377 (32.2%)	60 (27.0%)	72 (34.6%)	22 (25.9%)	17 (42.5%)	12 (44.4%)	115 (37.2%)	
Occupational status								0.004
Employed	2356 (31.9%)	88 (39.6%)	82 (39.4%)	31 (36.5%)	21 (52.5%)	10 (37.0%)	103 (33.3%)	
Not employed	5020 (68.1%)	134 (60.4%)	126 (60.6%)	54 (63.5%)	19 (47.5%)	17 (63.0%)	206 (66.7%)	
Educational level								<0.001
Low	4793 (65.0%)	161 (72.5%)	97 (46.6%)	81 (95.3%)	25 (62.5%)	8 (29.6%)	121 (39.2%)	
Moderate	1936 (26.2%)	50 (22.5%)	63 (30.3%)	4 (4.7%)	11 (27.5%)	10 (37.0%)	89 (28.8%)	
High	647 (8.8%)	11 (5.0%)	48 (23.1%)	0 (0.0%)	4 (10.0%)	9 (33.3%)	99 (32.0%)	
Net equivalent income of respondent's household								0.102
1st income quintile group	1969 (26.7%)	66 (29.7%)	56 (26.9%)	33 (38.8%)	13 (32.5%)	12 (44.4%)	98 (31.7%)	
2nd income quintile group	1771 (24.0%)	53 (23.9%)	43 (20.7%)	19 (22.4%)	10 (25.0%)	4 (14.8%)	65 (21.0%)	
3rd income quintile group	1727 (23.4%)	54 (24.3%)	40 (19.2%)	15 (17.6%)	10 (25.0%)	5 (18.5%)	71 (23.0%)	
4th income quintile group	1105 (15.0%)	35 (15.8%)	37 (17.8%)	12 (14.1%)	5 (12.5%)	5 (18.5%)	50 (16.2%)	
5th income quintile group	804 (10.9%)	14 (6.3%)	32 (15.4%)	6 (7.1%)	2 (5.0%)	1 (3.7%)	25 (8.1%)	
Degree of urbanization of place of residence								<0.001
High	936 (12.7%)	70 (31.5%)	32 (15.4%)	21 (24.7%)	10 (25.0%)	9 (33.3%)	134 (43.4%)	
Moderate	2348 (31.8%)	98 (44.1%)	80 (38.5%)	53 (62.4%)	19 (47.5%)	9 (33.3%)	87 (28.2%)	
Low	4092 (55.5%)	54 (24.3%)	96 (46.2%)	11 (12.9%)	11 (27.5%)	9 (33.3%)	88 (28.5%)	
Region (federal state) of residence								<0.001
Burgenland	535 (7.3%)	4 (1.8%)	10 (4.8%)	1 (1.2%)	2 (5.0%)	4 (14.8%)	11 (3.6%)	
Lower Austria	1227 (16.6%)	21 (9.5%)	19 (9.1%)	8 (9.4%)	4 (10.0%)	4 (14.8%)	39 (12.6%)	
Vienna	540 (7.3%)	42 (18.9%)	18 (8.7%)	15 (17.6%)	8 (20.0%)	7 (25.9%)	104 (33.7%)	
Carinthia	499 (6.8%)	16 (7.2%)	21 (10.1%)	1 (1.2%)	1 (2.5%)	0 (0.0%)	21 (6.8%)	
Styria	1573 (21.3%)	31 (14.0%)	22 (10.6%)	1 (1.2%)	9 (22.5%)	4 (14.8%)	23 (7.4%)	
Upper Austria	1333 (18.1%)	48 (21.6%)	33 (15.9%)	16 (18.8%)	13 (32.5%)	0 (0.0%)	31 (10.0%)	
Salzburg	422 (5.7%)	23 (10.4%)	19 (9.1%)	3 (3.5%)	2 (5.0%)	2 (7.4%)	19 (6.1%)	
Tyrol	869 (11.8%)	21 (9.5%)	41 (19.7%)	16 (18.8%)	1 (2.5%)	4 (14.8%)	39 (12.6%)	
Vorarlberg	378 (5.1%)	16 (7.2%)	25 (12.0%)	24 (28.2%)	0 (0.0%)	2 (7.4%)	22 (7.1%)	
Self-rated health (1—"very good" to 5—"very poor")								<0.001
Very good	1575 (21.4%)	23 (10.4%)	48 (23.1%)	6 (7.1%)	4 (10.0%)	7 (25.9%)	63 (20.4%)	
Good	3044 (41.3%)	71 (32.0%)	89 (42.8%)	19 (22.4%)	15 (37.5%)	12 (44.4%)	136 (44.0%)	
Medium	2072 (28.1%)	89 (40.1%)	53 (25.5%)	37 (43.5%)	12 (30.0%)	4 (14.8%)	76 (24.6%)	
Poor	556 (7.5%)	31 (14.0%)	14 (6.7%)	19 (22.4%)	9 (22.5%)	3 (11.1%)	30 (9.7%)	
Very poor	129 (1.7%)	8 (3.6%)	4 (1.9%)	4 (4.7%)	0 (0.0%)	1 (3.7%)	4 (1.3%)	
Presence of chronic disease								<0.001
Yes	3765 (51.0%)	126 (56,8%)	95 (45.7%)	64 (75.3%)	22 (55.0%)	13 (48.1%)	159 (51.5%)	
No	3611 (49.0%)	96 (43,2%)	113 (54,3%)	21 (24.7%)	18 (45.0%)	14 (51.9%)	150 (48.5%)	
Fecal occult blood test								<0.001
Yes (at least once)	5960 (80.8%)	161 (72.5%)	156 (75.0%)	51 (60.0%)	28 (70.0%)	17 (63.0%)	245 (79.3%)	
No (never)	1416 (19.2%)	61 (27.5%)	52 (25.0%)	34 (40.0%)	12 (30.0%)	10 (37.0%)	64 (20.7%)	
Colonoscopy								<0.001
Yes (at least once)	4556 (61.8%)	111 (50.0%)	129 (62.0%)	37 (43.5%)	22 (55.0%)	13 (48.1%)	181 (58.6%)	
No (never)	2820 (38.2%)	111 (50.0%)	79 (38.0%)	48 (56.5%)	18 (45.0%)	14 (51.9%)	128 (41.4%)	

* *p*-value from chi-square test.

Table 3 shows that Turkish migrants (OR = 0.42; 95%-CI: 0.27–0.67; $p < 0.001$) and migrants from a Yugoslav successor state (OR = 0.56; 95%-CI: 0.42–0.75, $p < 0.001$) also had 58% and 44%, respectively, lower odds of participation in a colonoscopy compared than non-migrants. Differences between non-migrants and Hungarian (OR = 0.59; 95%-CI: 0.27–1.31, $p = 0.193$), Romanian (OR = 0.91; 95%-CI: 0.47–1.75, $p = 0.779$) and German (OR = 0.93; 95%-CI: 0.69–1.25, $p = 0.609$) migrants were less pronounced and not statistically significant. In terms of the covariates examined, male respondents, respondents at a higher age, with a partner, a higher education level, a higher net income, with chronic diseases and respondents living in urbanized areas were more likely to participate in colonoscopy (Table 3).

For both outcomes, neither interaction effects between migration status and sex nor between migration status and age were identified.

Table 2. Results of the multivariable logistic regression model with utilization of the fecal occult blood test as the dependent variable. Adjusted odds ratios (aOR) and 95% confidence intervals (95%-CI) (Austrian Health Interview Survey 2019, respondents aged 50 years and over, n = 8267).

Independent Variable	aOR	95%-CI	*p*-Value
Population group (Ref.: Non-migrants)			
Migrants from a Yugoslav Successor State	0.61	0.44–0.83	0.002
German Migrants	0.70	0.51–0.98	0.035
Turkish Migrants	0.35	0.22–0.55	<0.001
Romanian Migrants	0.59	0.30–1.18	0.136
Hungarian Migrants	0.37	0.16–0.82	0.014
Other Migrants	0.85	0.63–1.14	0.283
Sex (Ref.: Female)			
Male	0.99	0.88–1.11	0.834
Age (Ref.: 50–54 years)			
55–59 years	1.31	1.10–1.57	0.003
60–64 years	1.39	1.12–1.73	0.002
65–69 years	1.69	1.31–2.18	<0.001
70–74 years	1.69	1.30–2.20	<0.001
75–79 years	1.33	1.03–1.72	0.028
80–84 years	1.48	1.10–1.99	0.010
85–89 years	1.19	0.84–1.68	0.320
90–94 years	1.43	0.79–2.57	0.240
95+ years	1.32	0.77–2.25	0.308
Partnership status (Ref.: No partner)			
Partner	1.19	1.04–1.36	0.013
Occupational status (Ref.: Not employed)			
Employed	0.87	0.72–1.05	0.151
Educational level (Ref.: Low)			
Moderate	1.25	1.09–1.43	0.002
High	1.25	1.01–1.55	0.043
Net equivalent income of respondent's household (Ref.: 1st income quintile group)			
2nd income quintile group	1.10	0.94–1.30	0.211
3rd income quintile group	1.26	1.06–1.49	0.010
4th income quintile group	1.41	1.15–1.74	0.001
5th income quintile group	1.48	1.16–1.89	0.002
Degree of urbanization of place of residence (Ref.: High)			
Moderate	1.03	0.79–1.34	0.826
Low	0.77	0.59–0.99	0.042
Region (federal state) of residence (Ref.: Vorarlberg)			
Burgenland	1.80	1.28–2.53	0.001
Lower Austria	0.94	0.72–1.23	0.670
Vienna	1.22	0.83–1.81	0.314
Carinthia	1.23	0.89–1.69	0.206
Styria	1.34	1.03–1.75	0.032
Upper Austria	1.13	0.87–1.48	0.365
Salzburg	0.73	0.54–1.00	0.048
Tyrol	1.34	1.01–1.77	0.045
Self-rated health (1—"very good" to 5—"very poor") (Ref.: Very poor)			
Very good	0.87	0.54–1.38	0.545
Good	0.97	0.61–1.52	0.884
Medium	1.00	0.64–1.58	0.985
Poor	0.74	0.46–1.19	0.214
Presence of chronic disease (Ref.: No)			
Yes	1.53	1.34–1.74	<0.001

Table 3. Results of the multivariable logistic regression model with utilization of colonoscopy as the dependent variable. Adjusted odds ratios (aOR) and 95% confidence intervals (95%-CI) (Austrian Health Interview Survey 2019, respondents aged 50 years and over, n = 8267).

Independent Variable	aOR	95%-CI	*p*-Value
Population group (Ref.: Non-migrants)			
Migrants from a Yugoslav Successor State	0.56	0.42–0.75	<0.001
German Migrants	0.93	0.69–1.25	0.609
Turkish Migrants	0.42	0.27–0.67	<0.001
Romanian Migrants	0.91	0.47–1.75	0.779
Hungarian Migrants	0.59	0.27–1.31	0.193
Other Migrants	0.80	0.62–1.03	0.081
Sex (Ref.: Female)			
Male	1.14	1.03–1.25	0.009
Age (Ref.: 50–54 years)			
55–59 years	1.50	1.29–1.74	<0.001
60–64 years	2.58	2.15–3.10	<0.001
65–69 years	3.02	2.45–3.73	<0.001
70–74 years	3.88	3.10–4.84	<0.001
75–79 years	3.34	2.68–4.16	<0.001
80–84 years	3.63	2.81–4.70	<0.001
85–89 years	2.04	1.52–2.74	<0.001
90–94 years	2.97	1.80–4.88	<0.001
95+ years	1.88	1.20–2.93	0.005
Partnership status (Ref.: No partner)			
Partner	1.22	1.09–1.37	0.001
Occupational status (Ref.: Not employed)			
Employed	1.08	0.92–1.26	0.34
Educational level (Ref.: Low)			
Moderate	1.04	0.93–1.16	0.553
High	1.25	1.04–1.49	0.015
Net equivalent income of respondent's household (Ref.: 1st income quintile group)			
2nd income quintile group	1.15	1.00–1.31	0.052
3rd income quintile group	1.30	1.12–1.51	0.001
4th income quintile group	1.19	1.00–1.42	0.045
5th income quintile group	1.41	1.15–1.72	0.001
Degree of urbanization of place of residence (Ref.: High)			
Moderate	0.80	0.64–0.99	0.044
Low	0.73	0.59–0.91	0.005
Region (federal state) of residence (Ref.: Vorarlberg)			
Burgenland	0.75	0.57–0.99	0.042
Lower Austria	0.56	0.44–0.71	<0.001
Vienna	0.70	0.50–0.98	0.035
Carinthia	1.02	0.77–1.34	0.913
Styria	0.58	0.46–0.73	<0.001
Upper Austria	0.74	0.58–0.93	0.010
Salzburg	0.81	0.61–1.07	0.135
Tyrol	1.10	0.86–1.40	0.468
Self-rated health (1—"very good" to 5—"very poor") (Ref.: Very poor)			
Very good	0.63	0.43–0.93	0.021
Good	0.72	0.49–1.05	0.083
Medium	0.92	0.64–1.34	0.680
Poor	1.01	0.68–1.50	0.981
Presence of chronic disease (Ref.: No)			
Yes	1.41	1.27–1.57	<0.001

3. Discussion

Different studies have shown that migrants use colorectal cancer screening less frequently than the native populations of the countries they reside in [16,17,29,30]. However, a limitation of many of these studies is that they do not take into account the heterogeneity of migrants. The present study used a nationwide population-based cross-sectional survey to investigate participation in colorectal cancer screening among non-migrants and the five largest migrant groups residing in Austria. The results of the study showed that all migrant groups, with the exception of Romanian migrants, participated less frequently in fecal occult blood testing than non-migrants. Regarding colonoscopy participation, the results showed that Turkish migrants and migrants from a Yugoslav successor state, in particular, had significantly lower utilization rates than non-migrants. These differences were not due to a different distribution of sociodemographic, regional or health factors among the population groups.

The findings are in line with a large number of studies from different countries showing a lower uptake of cancer screening among migrants [32–39]. Non-participation in cancer screening may result from barriers migrants experience in the health care system. Such barriers, for example, may be a low proficiency in the language of the country of residence. Similarly, poor health literacy [40,41], including limited knowledge about colorectal cancer and screening in general, may be barriers to participation [42,43]. They may contribute to migrants' inability to communicate their existing level of knowledge about cancer and cancer prevention, to ask questions and to express themselves openly to health care providers [44]. A general mistrust of the health care system, a poor patient-provider relationship, and unmet expectations about screening may also be associated with lower uptake of colorectal cancer screening [45,46]. Furthermore, non-participation in colorectal cancer screening may be attributed to cultural beliefs and values, such as the discomfort of Muslim women to be treated by a male health care provider, highlighting the need to make female health care providers available to female patients [47,48]. For some patients, religious beliefs also include considering the cure for illness to be in God's hands, thus forgoing cancer treatment and early detection [46,49]. In addition, cancer and cancer prevention may be taboo topics among some population groups and, therefore, not readily discussed within the family [44]. Open discussion of the process of performing a fecal occult blood test or colonoscopy may also contribute to shame and embarrassment among migrants and discourage participation [48].

To avoid the discomfort of colonoscopy, alternative methods used for the early detection of colorectal cancer are available. These include, for example, genetic stool tests that detect mutations in the stool of patients with colorectal cancer and, with lower frequency, patients with adenomas [7]. The assumption here is that tumor appearance and development are associated with somatic genetic alterations, which, however, are rarely found in general populations. A study from China has investigated the utility of copy number variation (CNV) as a potentially clinically useful biomarker for the detection of early colorectal cancer, achieving an acceptable sensitivity of 91.7% and specificity of 88.9% for early colorectal cancer detection. These results suggest that CNV in plasma may be a potential tumor biomarker with high sensitivity and specificity. However, some limitations of this study must be considered, including the limited number of samples [50]. In addition to genetic stool examinations, there are also virtual colonography procedures, which include CT and MR colonography. CT colonography involves performing an abdominal CT scan of the colon to investigate the presence of neoplasia based on images. Patients with colorectal lesions are referred for colonoscopy. CT colonography is controversial. Thus, the implementation and evaluation of the examination have not yet been standardized [7]. In addition, data suggest that although CT colonography can detect polyps >9 mm in size with high sensitivity, smaller polyps have a lower detection rate [51–53]. This limitation adds to radiation exposure, which is considered to be associated with an increased risk of malignancies. MR colonography is unlike CT colonography, free from radiation exposure; however, it has so far been insufficiently investigated. Due to the aforementioned

disadvantages, virtual colonography procedures are currently only recommended in cases where colonoscopy is not possible [7].

Other reasons for lower participation in colorectal cancer screening could be that migrants perceive their risk of colorectal cancer as lower than the native population [36,54,55] and that they are more likely to be unaware of the symptoms [44]. Culturally sensitive information on colorectal cancer screening, which is tailored to the linguistic specificities of migrants and takes the heterogeneity of this population group into account, can promote informed decision-making [23].

By taking into account different countries of origin, the present study shows that the utilization of cancer screening is particularly low among Turkish migrants and migrants from a successor state of Yugoslavia. This could possibly be attributed to the fact that Turkish migrants and migrants from a successor state of Yugoslavia have a poorer command of the national language than Romanian and Hungarian migrants. Studies show that Turkish migrant women, in particular, often have low German language skills [56]. Studies from other countries also show that Turkish migrants, in particular, are less likely to attend cancer screening [57,58]. The lower participation of Turkish migrants and migrants from a successor state of Yugoslavia may also be related to lower acculturation, as research from the Netherlands has illustrated [59]. Studies from the US have shown that long residence in the country of immigration is associated with higher screening rates [43,60,61]. Since information on the duration of residence was not available in the data, this association, however, could not be further examined in our study and should be the subject of future research.

The strengths of the present study include the large sample size and data that are representative of the population of Austria. A major limitation, however, is that the data are not based on administrative or routine data but on self-reporting by the survey participants. Since the survey refers to previous screenings that may have occurred up to 10 or more years ago, recall bias may be present. While individuals who have recently undergone screening may be overrepresented in the present sample, potentially overestimating the use of screening, we do not consider this proportion to differ between the population groups studied. Furthermore, in the analysis of the present study, only respondents aged 50 years and older were included, as in Austria, colorectal cancer screening is only recommended for this age group. However, studies show that the number of people who develop colorectal cancer at a young age has increased in recent decades [62,63]. For this reason, the U.S. Multi-Society Task Force recommends that colorectal cancer screening begins at age 45 for individuals at average risk [64]. This is consistent with the recommendations of other U.S. professional societies such as the American Cancer Society (ACP) [65], the American College of Gastroenterology (ACG) [66] and others. However, it has to be considered that there are no clinical data on the impact of colorectal cancer screening in individuals younger than 50 years with respect to colorectal cancer incidence and mortality. In contrast, European guidelines still recommend that colorectal cancer screening starts at age 50 [67,68]. Another limitation is that the survey was conducted exclusively in German. Consequently, migrants with poor language skills could not participate in the survey and are, therefore, underrepresented in the study. As migrants with poor language proficiency are particularly vulnerable to experiencing barriers in the health care system [69], excluding this group by means of the study design may underestimate the true amount of differences in colorectal cancer screening utilization between migrants and non-migrants. It also must be given due consideration that information such as a family history of (colorectal) cancer, which could potentially increase the awareness of individuals towards the relevance of screening services, was not available. Likewise, we were only able to broadly distinguish between three educational groups, with no information available on health literacy or a health-related background, which could likely affect the decision to undergo screening.

4. Methods

4.1. Data

The study draws on data from the "Austrian Health Interview Survey 2019", which was conducted by Statistics Austria on behalf of the Federal Ministry of Social Affairs, Health, Care and Consumer Protection and the Federal Health Agency in 2018/2019 following the approach of the European Health Information Survey. It is a representative population-based cross-sectional survey providing data on 15,461 randomly selected individuals aged 15 years and older recruited on the basis of the Central Population Register and spatially stratified according to the 32 health care regions of the Austrian Structure Plan. Computer-assisted face-to-face and web-based interviews, amended by self-administered questionnaires completed by the respondents themselves, were used for data collection. Participation in the survey was voluntary, and the response rate was 50.5%. For the present study, only respondents $\geq$50 years of age were included since, from this age onwards, colorectal cancer screening is recommended in Austria [70]. The final sample studied consists of n = 8267 individuals.

4.2. Study Variables

Utilization of colorectal cancer screening was assessed by asking respondents when they last had a test for hidden blood in the stool ("within the last 12 months", "1 to less than 2 years ago", "2 to less than 3 years ago", "3 years ago or more", and "never") and when they last attended a colonoscopy ("within the last 12 months", "1 to less than 5 years ago", "5 to less than 10 years ago", "10 years ago or more" and "never"). We dichotomized each of these two outcome variables to distinguish between respondents who had had a fecal occult blood test or colonoscopy at least once in their lifetime and those who had never had one. The outcomes were compared between non-migrants and the five largest migrant groups living in Austria, i.e., individuals with a nationality from or born in a Yugoslav successor state, Turkey, Romania, Hungary and Germany. Respondents were considered migrants if they either had non-Austrian citizenship or were born outside of Austria [24]. Several covariates were taken into account. Aside from sex (male, female), we included age (five-year age groups), partnership status (living with a partner in the same household vs. not living with a partner in the same household), occupational status (employed, not employed), household income (quintiles) and the educational level (low, moderate, high). In addition, the region (province) of residence of the respondents, the degree of urbanization (high, moderate, low), the self-rated health status (1—very good to 5—very poor) and the presence of chronic diseases (yes, no) were also included to account for contextual and health differences between the population groups.

4.3. Analysis

For purposes of sample description, differences between the population groups were analyzed using chi-square tests with the significance level set to $p < 0.05$. Two multivariable logistic regression analyses were conducted to examine adjusted differences between the population groups in terms of the two outcomes of interest (fecal occult blood testing and colonoscopy). The results were reported as adjusted odds ratios (aOR) with 95% confidence intervals (95%-CI). Moderation effects by age and sex were studied by means of interaction terms included in each of the two regression models. All analyses were conducted using IBM SPSS Statistics version 26.

5. Conclusions

To the best of the authors' knowledge, this is the first study to investigate differences in the uptake of colorectal cancer screening between non-migrants and the five largest migrant groups in Austria. Although the findings show that many of the included migrant groups tend to have lower utilization of fecal occult blood testing and colonoscopy, disparities are particularly pronounced for Turkish migrants and migrants from a successor state of

former Yugoslavia. This corresponds to findings from others fields of health care and is likely due to barriers migrants face in accessing the health care system.

Policies to remove such barriers are essential. They need to take into account the heterogeneity of migrants when developing educational materials in order to enable this population group to make an informed decision about whether or not to participate in colorectal cancer screening. In addition, health care providers need to be aware of the needs and expectations of this population group and, in case of language barriers, should be assisted by professional interpreters. Future research should particularly examine the barriers migrants experience with regard to making informed decisions about colorectal cancer screening utilization, their expectations and needs related to colorectal cancer screening, and develop strategies and interventions that promote informed decision-making with respect to participation among this population group.

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Institutional Review Board Statement: The study is based on a secondary analysis of data collected by Statistics Austria on behalf of the Federal Ministry of Social Affairs as part of an anonymous and voluntary national survey. Before participation, participants provided informed consent. In line with previous analyses of the same and similar data and following national guidelines and recommendations for secondary data analyses, no further ethical approval was required for the present study.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data examined in the present study can be obtained from Statistics Austria free of charge upon reasonable request. (https://www.sozialministerium.at/Themen/Gesundheit/Gesundheitssystem/Gesundheitsberichte/%C3%96sterreichische-Gesundheitsbefragung-2014-(ATHIS).html (accessed on 18 January 2023); information is only available in German language).

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