Gender differences in fresh vegetable intake from 1979 to 2017 in Finland

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Abstract

Purpose – Previous research has shown that in contemporary societies, women have a healthier dietary intake than men. However, no research has examined how this gender gap develops over the long term. The present study examined how gender differences in fresh vegetable intake frequency have evolved from 1979 to 2017 in Finland and whether differences are affected by age or educational level.

Design/methodology/approach – The data were derived from annually repeated, nationally representative "Health Behaviour and Health among the Finnish Adult Population" and "Regional Health and Well-being (RHW)" surveys on the health habits of the Finnish population. The dataset is a time series of repeated cross-sectional surveys. In total, the data sample comprised 161,996 Finns aged 20–64 years. Descriptive methods and logistic regression were used for the analysis.

Findings – During 1979–2017, the prevalence of daily vegetable intake increased from 12 to 35% among men and from 18 to 56% among women. Thus, the magnitude of the gap between genders doubled across the study period. The increased vegetable intake was partly explained by the changing education and age structures of society. Potential explanations and avenues for future research are also discussed. Policy implications depend on whether the findings are interpreted as a case of health differences or health inequality.

Originality/value – This study used a long time series to analyse how gender differences in vegetable intake have evolved in a Nordic welfare state context. It showed that the gap in fresh vegetable intake between men and women has widened.

Keywords Gender, Food habits, Vegetable intake, Change

Paper type Research paper

Introduction

Unhealthy food habits are a leading risk factor for noncommunicable diseases (NCDs), such as cardiovascular disease and type 2 diabetes (World Health Organization, 2003). NCDs cause societal losses in the form of increased healthcare costs and lower productivity. Most contemporary nutritional guidelines recommend that fruits and vegetables comprise half of each plate (Wallace *et al.*, 2020). However, people's consumption of fruits and vegetables fails to meet nutritional recommendations worldwide (Birt *et al.*, 2017; Wallace *et al.*, 2020).

This study aims to elucidate the background of health differences between men and women. In general, mortality rates in men are higher than in women although they report fewer symptoms; consequently, women outlive men (Oksuzyan *et al.*, 2014). However, in societies with high life expectancy, there is only a slight gender difference in the number of healthy life years (Van Oyen *et al.*, 2013). This study analyses healthy food consumption, a behavioural pattern likely to contribute to the health gap between men and women. Existing literature shows that in developed countries, women consume more vegetables and fruits and less red and processed meat than men (Arganini *et al.*, 2012; Wardle *et al.*, 2004). Additionally,

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awareness of the health and environmental effects of food consumption has been on the rise, potentially affecting women's food intake more than that of men (Cramer *et al.*, 2017). The Internet has been a key factor in growing awareness, particularly in the recent decade. Research shows that women are more likely to engage in Internet health information seeking compared to men (Manierre, 2015).

However, no research has been conducted to examine how gender differences in healthy food consumption vary over the long term. This study extends the previous literature by analysing gender differences over the long term using data covering 38 years. The question of changing gender differences is especially interesting in the Nordic context, where both gender equality and food habits have developed favourably (Schwab *et al.*, 2017; Holm *et al.*, 2015). The present study considers two societal trends that might affect gender differences in healthy food consumption, namely, education expansion and population ageing. The expansion of higher education has been remarkable, especially among women (Jalovaara *et al.*, 2019). Moreover, Finland is among the most rapidly ageing societies (United Nations, 2019). Both higher education and age are linked to higher fruit and vegetable intake (Kähäri, 2020; Stea *et al.*, 2020). This research answers the following research questions:

RQ1. How has daily vegetable intake changed from 1979 to 2017?

RQ2. How have gender differences in daily vegetable intake changed from 1979 to 2017?

RQ3. Are gender differences in daily vegetable intake affected by age and education?

Theoretical background and previous research

Health behaviour is often divided into health-promoting and health-damaging behaviours. Studies show that, in general, health-damaging behaviours (such as drug use, smoking and risk-taking behaviours) are more common among men, and health-promoting behaviours (such as healthy food habits, regular check-ups and health information seeking) are more common among women (Manierre, 2015; Neve *et al.*, 1996; Pampel, 2001a, b; Rogers *et al.*, 2010; Waldron *et al.*, 2005). Physical exercise is an exception, which is more common among men (Nomaguchi and Bianchi, 2004).

Many studies have examined gender differences in food preferences and intake in childhood, adolescence, adulthood and old age. The vast majority of the studies conducted in developed countries indicate that in all age groups, women have a healthier diet than men (Baker and Wardle, 2003; Cooke and Wardle, 2005; Kiefer *et al.*, 2005; Morse and Driskell, 2009). Several reasons for this have been reported in the literature (Turrell, 1997), including a greater liking for the flavour of healthy food among females than males (Bere *et al.*, 2008). In addition, women tend to be more knowledgeable about dietary recommendations and their health benefits (Davy *et al.*, 2006; Keyes *et al.*, 2011). Moreover, aesthetic concerns—which manifest as greater awareness of body weight and diet—are more prominent among women and are found to be associated with gender differences in diet quality (Wardle *et al.*, 2004, 2006). Some studies indicate that health beliefs and weight consciousness may explain up to 50% of the gender differences in dietary intake (Westenhoefer, 2005).

While there have been several cross-sectional studies on gender differences in diet, only a few studies have examined how gender differences in healthy food consumption change over time, although within limited time frames. A study conducted in Finland between 1979 and 2002 showed that the difference in daily vegetable intake between men and women increased (Roos *et al.*, 2008). A study conducted in the USA from 1994 to 2005 showed that fruit and vegetable consumption declined slightly, with the decline being greater among men (Michels Blanck *et al.*, 2008). A Norwegian study compared the food habits of children aged 10–12 from 2001 to 2008 and revealed that gender differences remained stable during this period (Hilsen *et al.*, 2011).

Some insights into how gender differences in food habits evolve can be derived from cross-national comparisons. Prättälä *et al.* (2007) examined gender differences in meat, fruit and vegetable consumption between Finland and the Baltic countries. They found that gender differences were similar for all the countries, across all age and educational groups, both in rural and urban areas. Consequently, based on the similarity of gender differences across countries and population subgroups, they concluded that the patterns of masculine and feminine food habits seemed to be constant. However, the results tend to vary in studies conducted in different contexts. For instance, Hall *et al.* (2009) studied the prevalence of low fruit and vegetable intake in 52 low- and middle-income countries. Their study revealed significant gender differences in only 15 countries, of which ten showed a higher prevalence of low fruit and vegetable intake in men and five in women. Therefore, the findings from existing studies indicate that gender differences become more pronounced when resources are more abundant.

In terms of health-damaging behaviour, several researchers have studied whether and how gender differences change over time. For example, many studies have examined gender differences in alcohol use, smoking, marijuana use and accidents (Bratberg *et al.*, 2016; Carliner *et al.*, 2017; Keyes *et al.*, 2011; Pampel, 2001a, b, 2006; Waldron *et al.*, 2005). According to the literature, the gender gap has narrowed in cigarette smoking, but increased in marijuana use. However, existing studies are lacking in research on health-promoting behaviour.

Many studies have suggested that gender roles are a prominent reason for gender differences in diet. Two hypotheses emerge from the premise of changing gender roles and norms. First, the convergence hypothesis predicts decreasing gender differences with an increasing similarity between male and female gender roles. For example, Waldron (1998) links decreasing differences in gender roles to decreasing gender differences in smoking. The convergence dynamic could be expected in a relatively gender-egalitarian context, such as Scandinavia. Therefore, we hypothesised that

H1. Gender differences in daily vegetable intake decreases between 1979 and 2017.

Second, the modified diffusion of innovation hypothesis proposes that the adoption rates of new behaviours differ between genders according to their compatibility with traditional gender roles. Women are expected to adopt behaviours that are compatible with their greater concerns with preserving health more readily than men (Waldron, 1997). Women's predisposition might contribute to their increasing willingness to adopt healthier food habits compared to men, resulting in increasing gender differences. Therefore, we hypothesised that

H2. Gender differences in daily vegetable intake increased between 1979 and 2017.

Finally, the differential impact of societal trend hypothesis proposes that gender differences in a healthy diet are influenced by societal trends that favour one gender over the other. An example is the expansion of education. Higher education is known to be a strong predictor of healthy food habits (Prättälä *et al.*, 2007). In Finland, women's educational attainment has increased more than that of men over time (Jalovaara *et al.*, 2019). Therefore, in terms of healthy food habits, the expansion of education could benefit women more than men, increasing the gender differences.

Moreover, age contributes to healthy food consumption. Several follow-up studies conducted in Europe revealed that people displayed healthier food habits when transitioning from youth to adulthood and from working life to retirement (Huijbregts *et al.*, 1995; Mikkila *et al.*, 2004; Lake *et al.*, 2006; Plessz *et al.*, 2015). Additionally, cross-sectional studies found that the consumption of fruits, vegetables and fish is more common in older than younger adults (Olsen, 2003; Bojorquez *et al.*, 2015). Since Finland is among the most rapidly ageing societies in the world (United Nations, 2019) and there are more older women than men, we hypothesised that

H3. Controlling for education and age partly explains the observed gender differences in daily vegetable intake.

Research design

Subjects

The data for this study were drawn from the Health Behaviour and Health of the Finnish Adult Population (HBHFA) surveys collected annually from 1978 to 2014 and the Regional Health and Well-being surveys (RHW) from 2013 to 2017. The datasets were collected by the Finnish Institute for Health and Welfare.

The HBHFA surveys were postal surveys conducted annually from 1978 to 2014 to monitor short-and long-term changes in health habits and overall health of the Finnish adult population. The study population was Finns aged 15–64 years with a response rate of 67% on an average (Helldán and Helakorpi, 2015, p. 10). Even though the response rate has been falling, the time series has generally remained comparable (Helldán and Helakorpi, 2015, p. 9). Although the first HBHFA survey was conducted in 1978, it lacked information on vegetable intake; therefore, this study uses surveys from 1979 onwards.

Since 2014, HBHFA surveys have been incorporated as part of the RHW surveys. These surveys were postal, and Internet surveys were conducted between 2010 and 2017 to monitor regional patterns in adult health, health behaviour and health service use. The study population in the RHW surveys was Finns aged 20 years and over, with response rates of approximately 60–70% for the oldest age groups and 40% for women and 30% for men for the younger age groups. Appropriate weights were used in the analyses to correct for response bias. Only participants aged 20–65 years were included in the analyses, as information for this age bracket was found in both datasets. With the appropriate weights used, the samples are considered nationally representative. Additionally, since RHW surveys generated more responses in the preceding years than HBHFA surveys, only the former were used from 2013 onwards. For the analyses, respondents with missing information on the number of education years (n = 3,094) and vegetable intake (n = 3,689) were excluded, resulting in an analytical sample of 161,996.

Dependent variable. The respondents were asked to indicate the frequency and type of food consumption during the preceding week. Fresh vegetable intake was used as the outcome variable. The possible response options were (1) not once, (2) 1–2 days, (3) 3–5 days and (4) 6–7 days. The questions and response options were identical in all surveys. The variable was dichotomised, with "1" indicating fresh vegetable intake on 6–7 days a week and "0" indicating less frequent consumption. The dichotomisation was based on the nutritional recommendation that vegetables should be consumed as part of each meal. This categorisation has been successfully used in previous research (Roos *et al.*, 2008). As a sensitivity analysis, the development of the gender difference in fresh vegetable intake was also examined with the other categories of the dependent variable.

Independent variables. The respondents were asked to indicate their gender and year of birth (which was used to calculate their age). Birth year and age were categorised into five-year groups to retain sufficient observations per cell. Additionally, the respondents were asked to indicate the number of years they had devoted to full-time education. The education variable was then categorised according to the International Standard Classification of Education (ISCED 2).

Statistical methods. Logistic regression was used as the main statistical method. The dependent variable was daily fresh vegetable intake as a dichotomous variable. In the first model, the independent variables were survey year (in five-year categories) and gender. In the second model, an interaction term for survey year and gender was included to assess the evolution of gender differences over the survey years. Education and age were included as

control variables in the final model. Graphical representations of the associations were obtained by estimating the marginal means for statistical years and gender from models 1 and 3. All statistical analyses were performed using the StataMP 16.

Results

Table 1 presents the descriptive statistics of the study population. Findings suggest that, on average, respondents' educational years and age increased, which reflects the changing age and educational structure of the population. The prevalence of daily vegetable intake increased from approximately 15–48% (Table 1).

Table 2 presents results from the logistic regression models. The coefficients confirm that daily vegetable intake increased during the study period and was more prevalent among women. The interaction term between gender and period revealed that gender differences

Year	% Men	Age group (mode)	Education years	Daily vegetable intake prevalence (%)	*N*
1979	51.8	30–34	9.6	15.1	4,561
1980	51.6	30–34	9.8	20.2	4,321
1981	51.4	30–34	9.7	21.4	3,761
1982	52.5	30–34	10.1	24.5	3,680
1983	49.3	30–34	10.2	23.0	3,669
1984	45.4	35–39	10.5	25.5	3,443
1985	47.7	35–39	10.7	25.3	3,061
1986	46.4	35–39	10.6	24.7	3,683
1987	46.0	35–39	10.9	26.5	3,634
1988	48.6	35–39	11.0	29.9	3,538
1989	47.3	40–44	11.1	27.9	3,523
1990	47.8	40–44	11.3	31.8	3,476
1991	46.7	40–44	11.5	31.0	3,465
1992	46.5	40–44	11.5	30.3	3,350
1993	46.6	40–44	11.9	34.9	3,120
1994	47.7	45–49	12.0	32.9	3,136
1995	46.8	45–49	11.9	31.8	3,288
1996	46.8	45–49	12.1	32.5	3,274
1997	45.4	45–49	12.3	36.2	3,183
1998	48.5	50–54	12.3	40.5	3,198
1999	45.4	50–54	12.7	39.7	3,037
2000	45.2	50–54	12.6	36.6	3,188
2001	46.1	50–54	12.8	36.3	3,152
2002	46.0	50–54	12.9	36.7	2,968
2003	45.7	50–54	13.3	35.7	3,034
2004	45.2	55–59	13.1	40.1	3,057
2005	46.6	55–59	13.2	39.2	3,028
2006	45.2	55–59	13.4	41.0	2,980
2007	44.0	55–59	13.5	40.8	2,986
2008	42.9	55–59	13.6	43.0	2,969
2009	43.1	60–64	13.8	44.0	2,725
2010	44.3	60–64	13.7	43.5	2,596
2011	43.5	60–64	13.9	44.4	2,605
2012	43.0	60–64	14.1	43.6	2,411
2013	43.3	60–64	14.2	40.1	30,257
2014	43.1	60–64	14.3	45.5	11,471
2015	43.3	60–64	14.3	42.6	11,931
2016	41.0	60–64	14.6	48.8	1,345
2017	44.0	60–64	14.9	47.7	2,341

Table 1. Demographic characteristics and prevalence of daily vegetable intake in the study samples

	Model (1)	Model (2)	Model (3)
Survey year (five-year intervals, ref. 1979)			
1980–1984	0.509*** (0.0465)	0.541*** (0.0704)	0.525*** (0.0715)
1985–1989	0.714*** (0.0464)	0.707*** (0.0705)	0.619*** (0.0717)
1990–1994	0.973*** (0.0462)	0.933*** (0.0702)	0.750*** (0.0714)
1995–1999	1.143*** (0.0462)	1.047*** (0.0703)	0.767*** (0.0715)
2000–2004	1.181*** (0.0463)	1.028*** (0.0707)	0.641*** (0.0720)
2005–2009	1.364*** (0.0463)	1.243*** (0.0706)	0.789*** (0.0720)
2010–2014	1.380*** (0.0440)	1.267*** (0.0668)	0.710*** (0.0683)
2015–2017	1.460*** (0.0461)	1.324*** (0.0703)	0.735*** (0.0719)
Female (ref. Male)	0.631*** (0.0108)	0.483*** (0.0865)	0.485*** (0.0878)
Survey year × gender			
1980–1984 × Female		−0.0579 (0.0936)	−0.0799 (0.0951)
1985–1989 × Female		0.0149 (0.0934)	−0.0135 (0.0949)
1990–1994 × Female		0.0694 (0.0931)	0.0311 (0.0946)
1995–1999 × Female		0.164 (0.0931)	0.127 (0.0947)
2000–1904 × Female		0.261** (0.0935)	0.230* (0.0950)
2005–1909 × Female		0.208* (0.0934)	0.145 (0.0950)
2010–1914 × Female		0.194* (0.0886)	0.135 (0.0900)
2015–1917 × Female		0.232* (0.0931)	0.181 (0.0946)
Education (ref. Lowest)			
Second lowest			0.558*** (0.0175)
Second highest			0.938*** (0.0184)
Highest			1.373*** (0.0188)
Age group (ref. 20 to 24)			
25–29			0.137*** (0.0262)
30–34			0.345*** (0.0256)
35–39			0.478*** (0.0254)
40–44			0.591*** (0.0253)
45–49			0.687*** (0.0251)
50–54			0.781*** (0.0251)
55–59			0.836*** (0.0253)
60–64			0.860*** (0.0257)
Constant	−2.696*** (0.0463)	−1.980*** (0.0652)	−2.906*** (0.0695)
N	161,996	161,996	161,996
Pseudo R^2	0.038	0.038	0.072
BIC	203,451.8	203,467.2	196,502.0

Note(s): Standard errors in parentheses
*$p < 0.05$, **$p < 0.01$ and ***$p < 0.001$

Table 2.
Results of the logistic regression models for daily vegetable intake

became significant in the 2000 and 2010s. The final model also included age and education, both of which are positively associated with daily vegetable intake. Daily vegetable intake increased with an increase in education level and age. The addition of these variables made the interaction terms between genders and periods insignificant for the periods after 2005 (Table 2).

Figures 1 and 2 present the estimated marginal means for gender and period from Models 2 and 3 to explain how the gender differences in daily vegetable intake evolved over time and whether the control variables affected this relationship. They show that at each interval, the prevalence of daily vegetable intake was higher among women than among men. The gender difference increased significantly during the period 1979–2004 but remained constant subsequently. Moreover, controlling for changes in education and age structures revealed

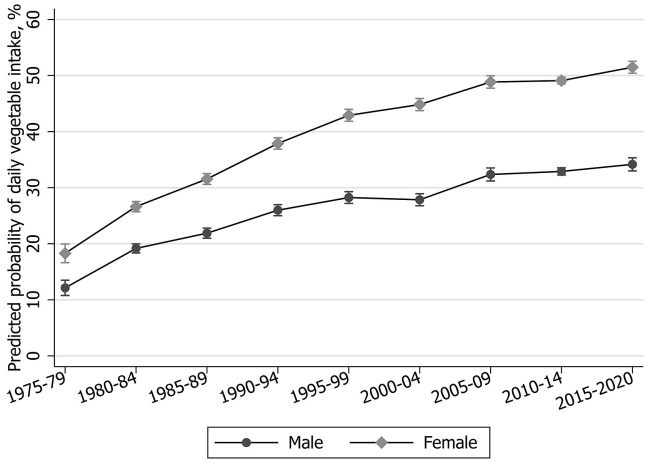

Figure 1.
Association between daily vegetable intake and time period for both genders. Estimated marginal means for period and gender from model 2

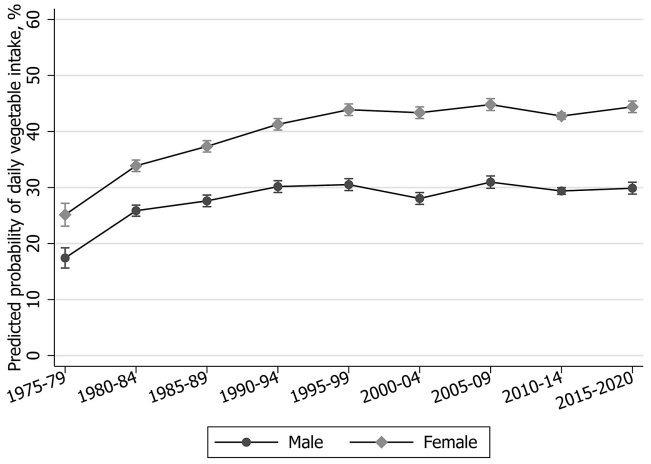

Figure 2.
Association between daily vegetable intake and time period for both genders. Estimated marginal means for period and gender from model 3

that vegetable intake and gender differences remained constant in the 2000 and 2010s. Thus, at the population level, education expansion and the ageing population partly explain the increase in vegetable intake.

Sensitivity analysis

The robustness of the results was tested by examining the temporal changes in the gender difference in fresh vegetable intake using all the categories of the dependent variable. This procedure revealed a more detailed picture about how the gender difference in vegetable intake evolved over time. The respondents in the surveys were asked to indicate on how many days during the preceding week they had eaten fresh vegetables. The most common answer among men was 3–5 times a week, whereas the most common answer for women was 6–7 times a week. During the study period, the prevalence of not eating fresh vegetables at all fell from 10 to 2% among women and from 16 to 5% among men. Eating fresh vegetables only on one or two days a week fell from 36 to 15% among women and from 40 to 24% among

men. Eating fresh vegetables on three to five days a week increased from 31 to 36% among men and fell from 36 to 32% among women.

Discussion

This study demonstrated an increase in the prevalence of fresh vegetable intake in Finland from the year 1979–2017, which supports the first hypothesis. The results suggest that, in the 2000s, this trend was partly explained by the ageing of the population and the expansion of education. In addition to better availability, the increase in daily vegetable intake may also be related to the growing political importance placed on a healthy diet. Finland has an extensive history of health and welfare policies, including the implementation of several nutrition policies and interventions (Popkin, 2006; Puska *et al.*, 2002). For instance, the National Nutrition Council issued official nutritional recommendations, which have been implemented since 1987, emphasising the role of vegetables as a central part of a healthy diet. Another illustrious measure adopted by Finland is the provision of a free daily school meal to children, which every student is entitled to since 1957 (Tikkanen and Urho, 2009). The use of catering services at school or work is associated with healthier food choices (Raulio *et al.*, 2010). These nutritional policies exemplify the preventive nature of the Finnish welfare state.

The gendered analysis of this trend indicated an increase in the gender gap in daily vegetable intake, which supports the second hypothesis, namely, the modified diffusion of innovations hypothesis. It proposes that the adoption rates of new behaviours differ between genders according to their compatibility with traditional gender roles. Women exhibit a greater willingness to adopt behaviours that are consistent with their health concerns compared to men (Waldron, 1997). Consequently, with regard to a healthy diet, women tend to adopt healthier food habits more readily than men, resulting in increasing gender differences. Furthermore, the results suggest that gender equality might not always lead to decreasing gender differences in behaviour.

However, the question as to why women are more willing to adopt a healthy diet than men cannot be answered within the current study design. While the question remains, potential sociological, psychological and biological explanations can be hypothesised, setting the ground for future research. A potential sociological reason for the faster adoption of vegetable consumption in women could be related to macro-level factors. For example, women's greater representation in the fields of health care and catering makes the question of a healthy diet more proximate from an occupational point of view. This could be especially relevant in a welfare state context, which is characterised by "high levels of female labour force participation, along with a high concentration of women in female-typed occupations" (Mandel and Semyonov, 2006, p. 1910).

Additionally, women's greater use of the Internet for social networking and seeking health information could be a social psychological factor contributing to their greater willingness to adopt healthier diets. Previous research has shown that a significant contributor to women's greater adoption of healthier diets can be attributed to aesthetic concerns, which are more prominent among women than men (Wardle *et al.*, 2004; Westenhoefer, 2005). This dynamic could be exacerbated in the era of the internet and social media (Åberg *et al.*, 2020). Over the past few decades, the Internet has established itself as the principal medium for the exchange of health information. Seeking health information on the Internet is more prominent among women than men (Manierre, 2015; Moretti *et al.*, 2012). In addition to official sources, this dissemination of health information is increasing through the use of blogs and social media platforms. Consequently, this has contributed to an increase in the volume and diversity of online health information resources.

The third hypothesis predicted that the ageng population and education expansion would partly explain the gender differences in daily vegetable intake. However, although the

addition of age and education in the model accounted for an increase in vegetable intake in the 2000s, its effect on gender differences was insignificant. Thus, the results do not support the third hypothesis. It is suggested that trends in vegetable intake might be affected by the changing population structure, as groups that are characterised by higher vegetable intake become more represented over time.

In terms of policy implications, it must be considered whether the gender gap in healthy food consumption is a case of health differences or health inequality, that is, whether the female propensity to consume more vegetables is a matter of personal choice or societal constraints. When addressing the gender gap, a suitable target could be adolescent males, as the basis of food habits is formed early in life (Kelder *et al.*, 1994).

Finally, future research would be wise to ask how the gender gap in healthy food habits varies over time cross-nationally. In addition, future research should utilise multiple indicators of health behaviour and compare changes in male-typical and female-typical health behaviours. Cultural, political and economic explanations for observed gender differences should be explored, for example with macro-level factors through cross-national comparisons. These could not be explored here because of concerns about small sample size and subject anonymity.

Strengths and limitations

This study was conducted to examine the change in gender differences over a remarkably long time, spanning 38 years. To the best of the author's knowledge, this is the first study to explicitly explore the variation of gender differences in vegetable intake over the long term at the population level. However, a limitation of this study was that vegetable intake was assessed using a food frequency questionnaire. Respondents indicated their subjective assessments of the frequency of food consumption. Some evidence suggests that self-reported dietary measures are subject to social desirability bias, especially among young women and overweight individuals (Hebert *et al.*, 1997; Paalanen *et al.*, 2006). Another limitation that should be stated is that the general trend of falling response rates has happened faster among men than women and also faster among the young age groups than the old age groups (Tolonen *et al.*, 2006). This affects the comparability and representativeness of the results.

Conclusion

This study examined changes in the association between gender and daily vegetable intake from 1979 to 2017 in a northern welfare state context. Findings revealed that daily vegetable intake is more prevalent among women than men, which is in conformance with previous research conducted in developed nations. Furthermore, it demonstrated an increase in gender differences during the study period. The prevalence of daily vegetable intake increased from 12 to 35% among men and from 18 to 56% among women. Thus, the magnitude of the gap between genders doubled across the study period. Increasing vegetable intake was partly explained by the changing education and age structures of society.

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