What predicts healthy lifestyle habits? Demographics, health and personality correlates of healthy lifestyle factors in New Zealand

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This study used data from the 2010 New Zealand Attitudes and Values Study (N = 4,441) to examine the demographic, health and personality correlates of healthy lifestyle habits among New Zealand adults. Participants reported their perceived importance of various behaviours (e.g. limiting salt, sugar intake) for leading a healthy lifestyle and regularity of engaging in them. Relative to importance ratings, considerably fewer people reported habitually engaging in positive health behaviours. Women, older, partnered individuals, those living with diabetes, high on Conscientiousness and Honesty-Humility showed increased regularity of healthy dietary behaviours. Māori and Pacific individuals, those living in highly deprived areas and with high BMI and Neuroticism showed reduced behaviour regularity. There were also important group differences in health-related perceptions (e.g. access to resources, social support to live healthy lifestyle).

Keywords: Health Behaviours, Healthy Lifestyle, Personality, New Zealand

Introduction

Dietary habits and lifestyle behaviours are important predictors of one's risk of various illnesses and mortality (Khaw et al., 2008; Loef & Walach, 2012). In New Zealand, lifestyle-related illnesses continue to show a high prevalence and are among the leading causes of death. One in three New Zealanders live with obesity (Ministry of Health [MOH], 2018a), over 240,000 have been diagnosed with diabetes (Virtual Diabetes Register, 2018), and more than 5000 die from ischaemic heart disease each year (MOH, 2018b). Diabetes and obesity rates are particularly high among Māori and Pacific peoples, and those with higher deprivation (MOH, 2014; 2015; 2016; 2018a). This can be linked to their low access to healthcare and negative health behaviours such as tendency to be physical inactive and adopt unhealthy eating habits (MOH, 2016; 2018a). Disparities in health behaviours are also evident among other demographic groups. For instance, women, older and Asian peoples tend to be physically inactive (MOH, 2014; 2015; 2016), whereas men and younger individuals exhibit higher cholesterol and sugar intake (University of Otago and MOH, 2011).

Identifying group disparities in specific health behaviours help us recognise the negative behavioural patterns of and type of intervention required by different groups. To develop more effective interventions, it is not only vital to be aware of demographic differences but to also understand the contribution of psychological factors to one's health behaviours. As personality traits are indicative of one's "enduring pattern of thinking, feeling and behaving" (McCrae & Costa, 1997, p.509), many international studies use personality theories to increase insight into the relationship between psychological characteristics and health behaviours. The most commonly used framework to describe personality is the 'Big-Five' model (McCrae & Costa, 1997; Sibley et al., 2011). People high on Neuroticism tend to be anxious and insecure, while people high on Conscientiousness tend to be diligent and organized. Extraversion is associated with being active and sociable, Openness with being curious and open-minded, and Agreeableness with being co-operative and altruistic (Sibley et al., 2011). More recently, Honesty-Humility (i.e. being fair, sincere) has been identified as the sixth personality dimension (Ashton & Lee, 2007; see Appendix for more detailed definitions).

Conscientiousness has been associated with a range of beneficial health behaviours, including adopting healthy diets with increased fruit and vegetable consumption and lower meat consumption (Bogg & Roberts, 2004; Keller & Siegrist, 2015; Mõttus et al., 2012, 2013). Conversely, Neuroticism has been linked with increased sugar and savoury food intake, emotional eating and a convenience diet (Elfhag & Morey, 2008; Keller & Siegrist, 2015; Mõttus et al., 2013). Openness and Extraversion have also been related with restrained eating (i.e. cognitive restriction of energy-dense food; Elfhag & Morey, 2008) and health-aware diets (Mõttus et al., 2012). However, little is known about the generalizability of these findings to the New Zealand context. One of the few studies conducted in New Zealand found that high Openness and Extraversion, and high Conscientious to a lesser extent, were associated with increased fruit and vegetable intake among young adults aged 17 to 25 years (Conner et al., 2017). As this study solely focused on fruit and vegetable consumption, the influence of personality traits on other specific health behaviours is still largely unknown. Moreover, the association between personality traits and health behaviours among middle-aged or older New Zealand adults has yet been examined.

Using a nationally representative sample of predominately middle-aged/older New Zealand adults, the current study assesses the unique effect of the Big-Six

Table 1. Interpretation of Big-Six personality traits, including example traits, and likely adaptive benefit and costs resulting from high levels of each personality dimension (adapted from Sibley et al. 2011)

Factor	Interpretation	Example Traits	Likely adaptive benefits of high levels (in evolutionary history)	Likely costs of high level (in evolutionary history)
Extraversion	Engagement in social endeavours	Sociability, leadership, exhibition	Social gains (friends, mates, allies)	Energy and time; risks from social environment
Agreeableness	Ingroup co-operation and tolerance; reciprocal altruism in HEXACO model	Tolerance, forgiveness, (low) quarrelsomeness	Gains from cooperation, primarily with ingroup (mutual help and nonaggression)	Losses due to increased risk of exploitation in short-term exchanges
Conscientiousness	Engagement in task-related endeavours	Diligence, organization, attention to detail	Material gains (improved use of resources), reduced risk	Energy and time; risks from social environment
Neuroticism (low Emotional Stability)	Monitoring of inclusionary status and attachment relations; kin altruism in HEXACO model.	Anxiety, insecurity, (low) calmness	Maintenance of attachment relations; survival of kin in HEXACO model	Loss of potential gains associated with risks to attachment relations.
Openness to Experience	Engagement in ideas-related endeavours	Curiosity, imaginativeness, (low) need for cognitive closure and (low) need for certainty	Material and social gains (resulting from discovery)	Energy and time; risks from social and natural environment
Honesty-Humility	Reciprocal altruism (fairness) Fairness, sincerity, (low)	Fairness, sincerity, (low) entitlement and (low) narcissism	Gains from co-operation, (mutual help and non-aggression)	Loss of potential gains that would result from the exploitation of others (and in particular outgroup members)

personality traits, demographic factors and diet-related illnesses on various health behaviours and perceptions. As 'health behaviour' is a very broad concept, we decided to take a more sophisticated approach and assess the correlates of specific health behaviours and relevant health attitudes. This included one's perceived importance and self-reported regularity of limiting salt or sugar intake, consuming fruit and vegetables, and access to resources to live a healthy lifestyle. We aim to identify key demographic, personality and health factors that show independent associations with individual health behaviours. Our findings will provide a framework for future research on the main determinants and nuanced patterns of New Zealanders' health behaviours, and inform the development of tailored interventions for target groups. Table 1 presents a guide to interpretations (and example attributes) of the Big-Six personality traits, and a summary of their likely benefits and costs.

METHOD

Sampling Procedure

The New Zealand Attitudes and Values Study (NZAVS) is a longitudinal postal survey study with a large probability sample of New Zealand adults. Data from this study has been published in numerous studies that examine New Zealanders' social attitudes, personality traits and health outcomes. This study is reviewed by the University of Auckland Human Participants Ethnics Committee every 3 years and has most recently been renewed on 05-September-2017 until 03-June-2021. Time 1 (2009) participants of this study were recruited from across the entire country by randomly selecting samples from the New Zealand electoral roll

(response rate: 16.6%; N = 6,518). In Time 2 (2010), the retention rate from Time 1 was 67.87% (N=4,425) with 16 new opt-ins. The current study used data from the Time 2 (2010) wave of the study (N = 4,441).

Participants

Participants had a mean age of 51 years (age range: 19 to 95; SD = 15.23) and median household income of $70,000 (SD = 71981). Around 62% of participants were female (38.4% male), 85.9% identified as being of European, 15.5% as Māori, 3.6% as Pacific and 4.0% as Asian ethnicity (ethnic categories were not mutually exclusive). Sixty eight percent of participants were parents and 72.7% were employed. The mean Body Mass Index (BMI) of the total sample was 27.30 (SD = 6.07), and 6.6% were diagnosed with diabetes, 6.1% with heart disease, 21.7% with high cholesterol and 21.5% with high blood pressure.

Measures

Participants were initially asked "how important do you think the following behaviours are for a healthy lifestyle, and how regularly do you do them?" Subsequently, above a list of six health behaviours they were asked; "How important do you think this is for leading a healthy lifestyle?" (0=unimportant, 3=important) and "How regularly do you do this on a daily basis" (0= never, 3= always). The six behaviours included: "limit intake of salt," "limit intake of saturated fats," "limit intake of foods/drinks high in sugar," "eat lots of fibre and whole grain," "eat lots of fruit and vegetables" and "engage in regular physical activity." Participants rated their agreement to various statements about health-related perceptions (1= strongly disagree, 7=strongly agree). Example: "It is important for people to know the facts about healthy eating/nutrition" (See notes in Table 4 for all statements). Subjective rating of leading a healthy lifestyle and access to resources to live a healthy lifestyle were reported (1=definitely no, 7=definitely yes). Participants indicated whether they had "been diagnosed by a doctor" with heart disease, diabetes, vitamin/mineral deficiency, high cholesterol or high blood pressure.

Participants reported their gender, weight, height, relationship and employment status, date of birth, and annual household income. Ethnicity was measured using the standard New Zealand Census item, in which participants could indicate each ethnic group they belonged to. The four main ethnic groups of interest in this study were European, Māori, Pacific and Asian peoples. Deprivation was measured using the 2013 New Zealand Deprivation Index, which uses census information to assign a decile-rank index from 1 (least deprived) to 10 (most deprived) to each meshblock unit (Salmond & Crampton, 2014). Socio-economic status was measured using the measured using the New Zealand socio-economic index (Milne, Byun, & Lee, 2013).

Personality traits were measured using the Mini-IPIP6 (Sibley et al., 2011) – a short from measure of the Big-Six personality traits using four-item subscales rated from 1 (very inaccurate) to 7 (very accurate). Exploratory and confirmatory analyses of the 2009 NZAVS (N=5,562) sample validated the Mini-IPIP six-factor structure in the New Zealand context (Sibley et al., 2011). The six personality traits reliability predicted variations in hours spent on different trait-related activities (e.g. Extraversion was strongest predictor of time spent with friends).

RESULTS

A series of multiple linear regressions were conducted to predict people's health behaviour regularity and health-related perceptions.[1] All demographic, health and personality variables were simultaneously included as predictors for each outcome to assess their unique association with the outcome variable. Europeans were used as the reference group for ethnicity. Missing data for exogenous variables were estimated using Rubin's procedure for multiple imputation. Final parameter estimates were obtained by averaging 1000 imputed datasets (thinned using every 200th iteration) generated based on information in the existing data and random elements. Descriptive statistics were calculated using SPSS after applying sample weighting based on gender, ethnicity and region of residence.

As seen in Figures 1 and 2, most participants indicated that healthy dietary behaviours and regular physical activity were highly important for leading a healthy lifestyle (i.e. rating of 3). Of the six behaviours, the least proportion of people reported an importance rating of 3 for limiting salt and the highest proportion for regular physical activity and eating fruits/vegetables. Relative to importance ratings, less participants reported regularly engaging in each health behaviour. For instance, whereas 65.9% of Māori and 75.6% of females indicated that limiting saturated fats was highly important, only 16% and 29.1% respectively reported always engaging in such behaviour (i.e. rating of 3). Compared to Europeans and Asian peoples, fewer Māori and Pacific peoples indicated always engaging in positive dietary behaviours and having 'high' subjective healthy lifestyle or 'high' access to resources to lead a healthy lifestyle (high: ratings of 6-7).

Multiple regression predicting health behaviour importance and regularity

A series of regressions were conducted to assess the demographic, health and psychological correlates of health behaviour importance (0=unimportant, 3= important) and regularity (0=never, 3=always). Only key findings are reported in-text. As seen in Table 2, gender showed a particularly strong association with dietary behaviours (β's >1). Women reported higher ratings of importance for limiting salt (b=-.190), saturated fats (b=-.159), sugar (b=-.198), eating fibre/whole grains (b=-.179), eating fruit/vegetables (b=-.113), and regular exercise (b=-.048). Older age was associated with higher rated importance for limiting salt (b = .005) and eating fibre/whole grains (b = .003) but lower rated importance for regular exercise (b = -.002). High blood pressure was associated with higher rated importance for limiting salt

[1] We chose not to use an ordinal logistic regression as this would increase the number of estimated parameters in our model and increase the complexity of our results.

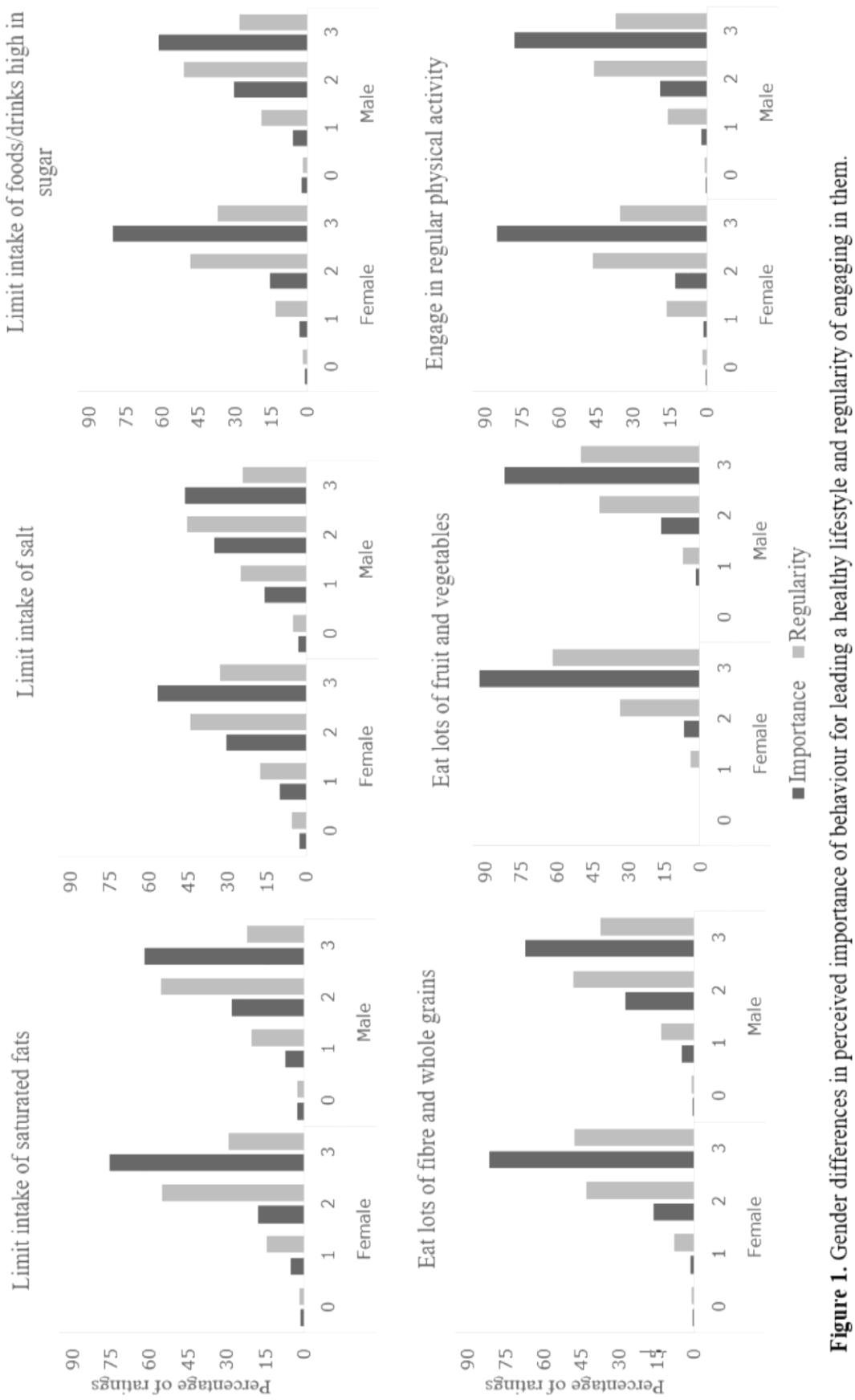

Figure 1. Gender differences in perceived importance of behaviour for leading a healthy lifestyle and regularity of engaging in them.

(b = .136) and sugar (b = .051), and high cholesterol was

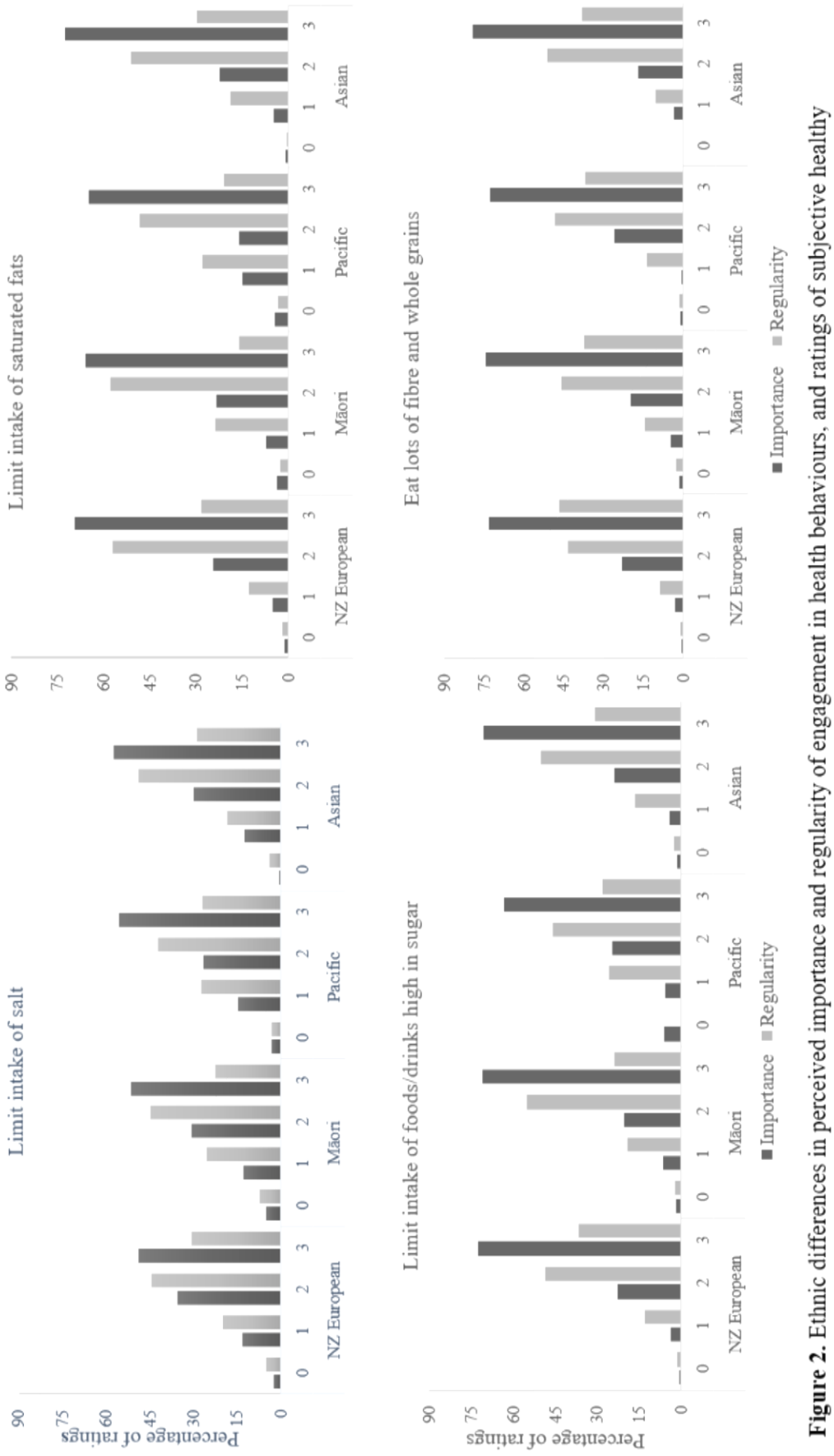

Figure 2. Ethnic differences in perceived importance and regularity of engagement in health behaviours, and ratings of subjective healthy lifestyle and access to resources.

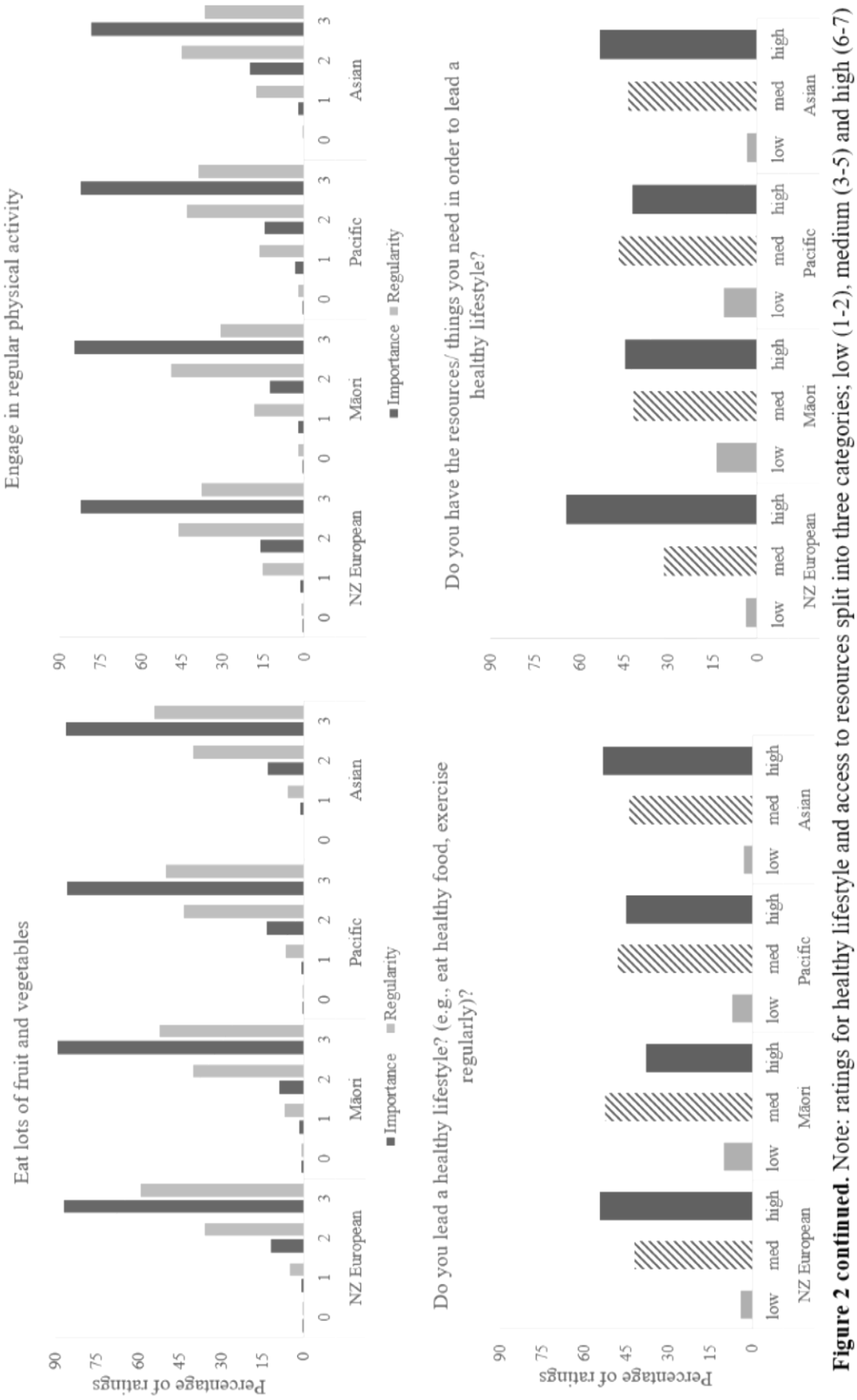

Figure 2 continued. Note: ratings for healthy lifestyle and access to resources split into three categories; low (1-2), medium (3-5) and high (6-7)

associated with higher rated importance for limiting salt (b=.100) and saturated fats (b=.055).

Agreeableness and Conscientiousness were consistently linked with increased ratings of importance

Table 2. Regression coefficients and 95% confidence intervals for regression predicting health behavior importance (IMP).

	Limit salt (IMP)			Limit saturated fats (IMP)			Limit sugar (IMP)		
	B	95% CI	[B]	B	95% CI	[B]	B	95% CI	[B]
Gender [C](0=women, 1= men)	**-.190****	**-.243**	**-.137**	**-.159****	**-.204**	**-.114**	**-.198****	**-.240**	**-.156**
Age	.005**	.003	.007	.001	-.001	.002	.001	-.001	.002
Deprivation	-.007	-.016	.002	-.004	-.011	.004	-.011**	-.018	-.004
Household income (log)	-.007	-.033	.019	.007	-.015	.030	.007	-.015	.028
Māori [C]	.036	-.031	.103	-.038	-.095	.019	-.013	-.065	.039
Pacific [C]	.024	-.120	.169	-.166*	-.305	-.027	-.124	-.249	.001
Asian [C]	.106	-.006	.219	.015	-.080	.109	-.013	-.110	.085
Parent [C]	-.006	-.070	.059	-.021	-.074	.032	-.004	-.051	.042
Partner [C]	.072*	.015	.130	.048	-.001	.097	.033	-.011	.077
Religious [C]	.105**	.057	.154	.061**	.022	.100	.016	-.020	.053
Employed [C]	.041	-.020	.102	.044	-.008	.095	.037	-.010	.084
Urban [C]	.077*	.027	.127	.036	-.004	.077	.018	-.019	.055
SES	-.001	-.003	.001	.002**	.001	.004	.001	.000	.003
BMI	-.002	-.006	.003	.000	-.004	.003	.002	-.002	.005
Heart disease [C]	.054	-.048	.156	.033	-.051	.117	.033	-.042	.107
Diabetes [C]	.034	-.065	.132	-.022	-.107	.063	.085*	.007	.163
High blood pressure [C]	.136**	.075	.196	.036	-.016	.087	.051*	.003	.098
High Cholesterol [C]	.100**	.042	.158	.055*	.006	.104	.034	-.011	.079
Vitamin deficiency [C]	-.022	-.122	.079	.055	-.020	.130	.014	-.059	.086
Extraversion	-.009	-.032	.013	-.007	-.025	.012	-.005	-.021	.011
Agreeableness	.042**	.014	.070	.041**	.018	.064	.041**	.021	.062
Conscientiousness	.059**	.035	.083	.057**	.036	.077	.028**	.010	.046
Neuroticism	-.005	-.028	.018	-.011	-.029	.008	-.021*	-.037	-.005
Openness	-.001	-.026	.023	.011	-.008	.031	.021*	.003	.039
Honesty-Humility	-.005	-.025	.015	.000	-.017	.016	.017*	.002	.032

Notes: * p<.05, **p < .01, R^2*=.059, .059, .062 respectively,* N= 4419. 'C' denotes categorical variable; 0= no, 1=yes. Standardized beta

(Table 2 continued)

	Eat fibre/whole grains (IMP)			Eat fruit and veges (IMP)			Physical activity (IMP)		
	B	95% CI	[B]	B	95% CI	[B]	B	95% CI	[B]
Gender [C] (0=women, 1= men)	**-.179****	**-.218**	**-.140**	**-.113****	**-.142**	**-.084**	-.048**	-.080	-.015
Age	.003**	.001	.004	.000	-.001	.001	-.002*	-.003	.000
Deprivation	-.006	-.013	.000	-.004	-.009	.001	-.009**	-.015	-.004
Household income (log)	-.004	-.022	.015	-.005	-.017	.007	.006	-.009	.020
Māori [C]	.022	-.025	.069	.031	-.001	.063	.040*	.002	.078
Pacific [C]	.015	-.080	.111	-.026	-.102	.049	.008	-.079	.095
Asian [C]	.064	-.012	.141	-.002	-.059	.055	-.046	-.117	.024
Parent [C]	.002	-.043	.047	-.011	-.044	.022	-.010	-.046	.026
Partner [C]	.023	-.017	.063	.023	-.007	.052	.010	-.026	.045
Religious [C]	.053**	.019	.087	.038**	.014	.063	.027	-.002	.056
Employed [C]	.021	-.022	.064	.004	-.027	.036	.018	-.021	.057
Urban [C]	.009	-.025	.043	.000	-.024	.025	.019	-.010	.048
SES	.001	-.001	.002	.001	.000	.002	.000	-.001	.001
BMI	.000	-.003	.003	-.001	-.004	.001	-.002	-.005	.001
Heart disease [C]	-.039	-.111	.033	-.028	-.088	.031	-.040	-.117	.037
Diabetes [C]	.012	-.056	.080	-.007	-.062	.048	-.084*	-.158	-.011
High blood pressure [C]	.000	-.043	.043	.009	-.026	.043	-.007	-.048	.034
High Cholesterol [C]	.040	.000	.080	.009	-.021	.039	.019	-.018	.055
Vitamin deficiency [C]	-.009	-.080	.063	-.012	-.061	.037	-.003	-.063	.057
Extraversion	-.005	-.021	.011	-.001	-.012	.011	-.003	-.015	.010
Agreeableness	.038**	.018	.057	.031**	.017	.045	.035**	.019	.051
Conscientiousness	.022**	.006	.038	.019**	.007	.030	.030**	.016	.045
Neuroticism	.000	-.015	.016	-.012*	-.023	.000	-.016*	-.029	-.003
Openness	.009	-.008	.025	.006	-.006	.018	.015*	.001	.029
Honesty-Humility	.004	-.011	.019	.000	-.011	.011	.002	-.010	.014

Notes: * p<.05, **p < .01, R^2*= .052, .047, .044 respectively,* N= 4419. 'C' denotes categorical variable; 0= no, 1=yes. Standardized beta greater than .1 bolded.

for all health behaviours. This included limiting salt (b=.042 and .059 respectively), saturated fats (b=.041 and .057), sugar (b=.041 and .028), eating fibre/whole grains (b=.038 and .022), eating fruit/vegetables (b=.031 and .019), and regular exercise (b=.035 and .030). In contrast, Neuroticism was linked with lower perceived importance of limiting sugar (b = -.021), eating fruits/vegetables (b= -.012) and regular exercise (b = -.016).

Women, older individuals and those with low BMI reported increased regularity of all dietary health behaviours (see Table 3). This included limiting salt (b=-.17, .008 and -.006 respectively), saturated fats (b=-.177, .010 and -.009), sugar (b=-.185, .010 and -.004), and eating fibre/whole grains (b=-.162, .008 and -.004) and fruit/ vegetables (b=-.194, .007 and -.005). Gender and age showed particularly strong effects (β's >1). Partnered individuals reported increased regularity of limiting salt (b=.079) and saturated fats (b=.074), and eating fruit/vegetables (b=.076). Diabetes showed a strong association with higher regularity of limiting sugar (b = .331) and was further linked with increased regularity of limiting salt (b = .164), saturated fats (b = .164), eating fibre/whole grains (b = .107) and fruit/vegetables (b = .115). Māori (b = -.078) and Pacific peoples (b = -.129) reported lower regularly of limiting saturated fats. High cholesterol was linked with lower regularity of eating fibre/whole grains (b = -.053) and fruit/vegetables (b = -.083).

Conscientious and Honesty-humility were associated with increased regularity of all dietary health behaviours. This included limiting salt (b=.049 and .036 respectively), saturated fats (b=.041 and .031), sugar (b=.057 and .038), eating fibre/whole grains (b=.053 and .020) and eating fruit/vegetables (b=.050 and .017). Openness was associated with increased regularity of limiting saturated fats (b=.022) and sugar (b=.029) and eating fibre/whole grains (b=.025). Extraversion was linked with increased regularity of eating fruits/vegetables (b = .029) and exercise (b = .039). Conversely, Neuroticism was related to decreased regularity of limiting saturated fats (b=-.022), limiting sugar (b=-.029), eating fibre/whole grains (b=-.020), eating fruit/vegetables (b=-.031), and regular exercise (b=-.058).

Multiple regression predicting health-related perceptions

As shown in Table 4, older age was associated with higher rated importance of public health knowledge (b = .004), women's health education (b = .021), need for money to lead a healthy lifestyle (b = .014), greater social support (b = .008), increased subjective healthy lifestyle (b = .019) and access to resources (b = .018). Men reported lower belief in the importance of public health knowledge (b = -.163), lower perceived social support (b = -.113) and subjective healthy lifestyle (b = -.179). Having a partner was linked with greater social support (b = .176), higher subjective healthy lifestyle (b = .135) and access to resources (b = .229). Being Pacific (b = .369) or Asian (b = .323) were also associated with increased social support. Being Māori, a parent, having higher deprivation and BMI were associated with decreased subjective healthy lifestyle (b = -.126, -.145, -.025 and -.066 respectively) and access to resources (b = -.208, -.179, -.046 and -.046).

Conscientiousness and Agreeableness were linked with higher rated importance of public health knowledge

Table 3. Regression coefficients and 95% confidence intervals for regression model predicting health behavior regularity (REG).

	Limit salt (REG)			Limit saturated fats (REG)			Limit sugar (REG)		
	B	95% CI	[B]	B	95% CI	[B]	B	95% CI	[B]
Gender [C] (0=women, 1= men)	**-.175****	**-.231**	**-.120**	**-.177****	**-.223**	**-.131**	**-.185****	**-.232**	**-.137**
Age	**.008****	**.006**	**.011**	**.010****	**.008**	**.012**	**.010****	**.008**	**.012**
Deprivation	.001	-.009	.011	.000	-.008	.008	.002	-.006	.011
Household income (log)	-.009	-.038	.021	.002	-.027	.023	.006	-.018	.030
Māori [C]	-.043	-.115	.028	-.078**	-.133	-.023	-.057	-.115	.001
Pacific [C]	-.048	-.189	.093	-.129*	-.251	-.007	-.087	-.202	.028
Asian [C]	.074	-.053	.200	.084	-.019	.187	.001	-.114	.116
Parent [C]	.029	-.040	.098	-.030	-.086	.026	-.021	-.078	.037
Partner [C]	.079*	.017	.140	.074**	.024	.124	.029	-.023	.082
Religious [C]	.059*	.007	.111	-.009	-.050	.033	-.041	-.084	.002
Employed [C]	.075*	.010	.140	.043	-.011	.097	.075**	.022	.129
Urban [C]	.011	-.042	.064	-.017	-.060	.025	.012	-.032	.056
SES	.002	.000	.004	.003**	.001	.005	.003**	.001	.004
BMI	-.006*	-.010	-.001	-.009**	-.013	-.005	-.004*	-.008	.000
Heart disease [C]	.100	-.005	.205	.079	-.008	.166	-.026	-.118	.066
Diabetes [C]	.164**	.067	.262	.164**	.080	.247	**.331****	**.246**	**.416**
High blood pressure [C]	.064	.000	.129	-.025	-.078	.027	-.020	-.075	.035
High Cholesterol [C]	.047	-.016	.109	.020	-.031	.071	-.029	-.083	.024
Vitamin deficiency [C]	-.073	-.181	.035	-.047	-.135	.041	-.073	-.163	.018
Extraversion	-.012	-.036	.012	.012	-.007	.032	-.006	-.026	.013
Agreeableness	.000	-.030	.029	.016	-.008	.040	.021	-.003	.046
Conscientiousness	.049**	.023	.075	.041**	.020	.061	.057**	.036	.078
Neuroticism	-.013	-.037	.011	-.022*	-.042	-.002	-.029**	-.049	-.009
Openness	.003	-.022	.029	.022*	.002	.043	.029**	.007	.050
Honesty-Humility	.036**	.015	.058	.031**	.014	.049	.038**	.020	.056

Notes: * p<.05, **p < .01, R^2*=.069, .111, .105 respectively,* N= 4415. 'C' denotes categorical variable; 0= no, 1=yes. Standardized beta greater than .1 bolded.

(Table 3 continued)

	Eat fibre/whole grains (REG)			Eat fruit and veges (REG)			Physical activity (REG)		
	B	95% CI [B]		B	95% CI [B]		B	95% CI [B]	
Gender [C] (0=women, 1= men)	**-.162****	**-.207**	**-.117**	**-.194****	**-.235**	**-.153**	-.017	-.065	.032
Age	**.008****	**.007**	**.010**	**.007****	**.005**	**.008**	.005**	.003	.007
Deprivation	-.007	-.015	.001	-.008*	-.015	-.001	-.002	-.011	.006
Household income (log)	-.001	-.023	.020	.004	-.016	.025	.006	-.018	.030
Māori [C]	-.083**	-.142	-.024	-.001	-.052	.050	.004	-.056	.064
Pacific [C]	-.011	-.125	.104	-.016	-.122	.091	.147*	.019	.274
Asian [C]	.000	-.097	.097	.034	-.058	.126	-.038	-.152	.076
Parent [C]	-.047	-.101	.008	-.025	-.074	.024	-.061	-.121	.000
Partner [C]	.041	-.007	.089	.076**	.031	.120	.035	-.019	.089
Religious [C]	.016	-.026	.057	.020	-.017	.056	-.037	-.081	.007
Employed [C]	.016	-.036	.068	.005	-.040	.050	.045	-.012	.101
Urban [C]	-.054*	-.096	-.011	-.060**	-.097	-.023	-.037	-.082	.008
SES	.001	.000	.003	.000	-.001	.002	-.001	-.003	.001
BMI	-.004*	-.008	-.001	-.005**	-.008	-.002	-.026**	-.031	-.022
Heart disease [C]	.017	-.068	.102	.019	-.059	.097	-.089	-.186	.008
Diabetes [C]	.107**	.027	.186	.115**	.040	.190	.007	-.089	.103
High blood pressure [C]	-.001	-.054	.051	.006	-.042	.054	-.054	-.113	.004
High Cholesterol [C]	-.053*	-.104	-.003	-.083**	-.129	-.038	-.057	-.113	-.001
Vitamin deficiency [C]	.019	-.067	.106	-.056	-.136	.024	-.123*	-.216	-.030
Extraversion	.025**	.006	.044	.029**	.012	.046	.039**	.019	.060
Agreeableness	.021	-.003	.045	.023*	.001	.045	.016	-.009	.042
Conscientiousness	.053**	.032	.073	.050**	.032	.067	.067**	.045	.089
Neuroticism	-.020*	-.039	-.001	-.031**	-.048	-.013	-.058**	-.079	-.038
Openness	.025*	.005	.045	.015	-.003	.033	-.009	-.030	.013
Honesty-Humility	.020*	.002	.037	.017*	.001	.033	.009	-.010	.027

Notes: * p<.05, **p < .01, R^2= *.082, .094, .098 respectively,* N= 4415. 'C' denotes categorical variable; 0= no, 1=yes. Standardized beta greater than .1 bolded.

Table 4. Regression coefficients and 95% confidence intervals for regression model predicting health-related perceptions.

	Public health knowledge IMP			Women health education			Social Support		
	B	95% CI	[B]	B	95% CI	[B]	B	95% CI	[B]
Gender [C] (0=women, 1= men)	-.163**	-.226	-.100	**-.569****	**-.670**	**-.469**	-.113*	-.203	-.024
Age	.004**	.001	.006	**.021****	**.017**	**.025**	.008**	.005	.012
Deprivation	-.002	-.013	.009	.028**	.010	.045	-.005	-.021	.010
Household income (log)	-.004	-.036	.028	-.044	-.098	.009	.001	-.047	.049
Māori [C]	.109**	.029	.188	.142*	.016	.267	.032	-.082	.147
Pacific [C]	.227**	.064	.391	.418**	.172	.664	.369**	.135	.604
Asian [C]	.002	-.144	.148	.643**	.437	.849	.323**	.121	.525
Parent [C]	-.068	-.142	.006	-.033	-.153	.088	-.109*	-.215	-.004
Partner [C]	-.009	-.077	.058	.026	-.082	.133	.176**	.078	.274
Religious [C]	.109**	.052	.166	.117*	.026	.208	.174**	.093	.254
Employed [C]	-.015	-.089	.060	-.181**	-.299	-.063	-.131*	-.233	-.029
Urban [C]	.018	-.041	.077	-.014	-.108	.079	-.022	-.105	.060
SES	.000	-.002	.002	-.002	-.006	.001	.001	-.002	.004
BMI	-.006*	-.012	-.001	.006	-.002	.014	-.008*	-.015	-.001
Heart disease [C]	.029	-.089	.148	.004	-.199	.207	.168	.002	.334
Diabetes [C]	.175**	.069	.282	-.045	-.238	.147	.160	-.004	.324
High blood pressure [C]	-.038	-.112	.036	-.026	-.145	.092	-.116*	-.223	-.010
High Cholesterol [C]	.078*	.008	.147	-.040	-.155	.074	-.032	-.131	.068
Vitamin deficiency [C]	.003	-.127	.133	-.088	-.284	.109	-.059	-.234	.116
Extraversion	-.012	-.039	.015	.030	-.014	.074	.090**	.052	.129
Agreeableness	**.136****	**.102**	**.169**	.127**	.073	.180	.113**	.063	.163
Conscientiousness	**.106****	**.077**	**.135**	.095**	.049	.141	.083**	.042	.125
Neuroticism	-.037*	-.065	-.008	.044	.000	.089	-.081**	-.122	-.039
Openness	.018	-.011	.047	.014	-.032	.061	.021	-.021	.064
Honesty-Humility	.010	-.015	.035	**-.140****	**-.178**	**-.102**	-.038*	-.072	-.005

Notes: * p<.05, **p < .01, R^2= *.075, .112, .063 respectively,* N= 4441. 'C' denotes categorical variable; 0= no, 1=yes. Standardized beta greater than .1 bolded. Statements used in questionnaire (1= strongly disagree, 7=strongly agree): "It is important for people to know the facts about healthy eating/nutrition," "We need to invest specifically in educating young girls and women about healthy lifestyles for the sake of future generations," "people close to me support and encourage me to lead a healthy lifestyle."

(Table 4 continued)

	Need for money			Subjective healthy lifestyle			Access to resources		
	B	95% CI	[B]	B	95% CI	[B]	B	95% CI	[B]
Gender [C] (0=women, 1= men)	-.085	-.205	.035	-.179**	-.266	-.092	-.071	-.163	.020
Age	**-.014****	**-.019**	**-.009**	**.019****	**.016**	**.023**	**.018****	**.015**	**.022**
Deprivation	-.001	-.022	.020	-.025**	-.041	-.010	-.046**	-.062	-.029
Household income (log)	.008	-.048	.065	-.027	-.069	.015	**.128****	**.072**	**.184**
Māori [C]	.058	-.102	.218	-.126*	-.242	-.010	-.208**	-.338	-.077
Pacific [C]	-.093	-.423	.237	.270*	.031	.508	.094	-.170	.359
Asian [C]	-.212	-.473	.049	.059	-.126	.244	.024	-.181	.228
Parent [C]	-.023	-.170	.124	-.145**	-.249	-.041	-.179**	-.291	-.067
Partner [C]	.081	-.051	.213	.135**	.041	.230	.229**	.124	.333
Religious [C]	-.081	-.192	.031	.046	-.031	.124	-.023	-.105	.059
Employed [C]	-.123	-.265	.020	.062	-.043	.167	.213**	.101	.326
Urban [C]	.087	-.027	.200	-.113**	-.193	-.034	-.012	-.098	.073
SES	.006*	.001	.010	.001	-.002	.004	.001	-.003	.004
BMI	.017**	.007	.027	**-.066****	**-.075**	**-.058**	**-.046****	**-.054**	**-.038**
Heart disease [C]	.133	-.093	.358	-.084	-.264	.096	-.219*	-.409	-.029
Diabetes [C]	-.209	-.441	.023	.021	-.160	.202	.038	-.153	.229
High blood pressure [C]	.046	-.100	.191	-.018	-.123	.086	-.034	-.144	.076
High Cholesterol [C]	-.059	-.198	.079	-.157**	-.260	-.055	-.007	-.111	.096
Vitamin deficiency [C]	-.023	-.251	.205	-.156	-.327	.015	-.324**	-.524	-.124
Extraversion	-.050	-.103	.003	.066**	.029	.103	.072**	.032	.112
Agreeableness	-.037	-.103	.028	.012	-.035	.059	.055*	.004	.106
Conscientiousness	-.062*	-.118	-.006	**.172****	**.132**	**.212**	.109**	.066	.151
Neuroticism	.068*	.013	.122	**-.159****	**-.198**	**-.120**	**-.147****	**-.190**	**-.105**
Openness	.021	-.035	.078	.022	-.018	.061	.014	-.028	.057
Honesty-Humility	**-.339****	**-.386**	**-.292**	.022	-.013	.057	.094**	.057	.132

Notes: * p<.05, **p < .01, R^2= *.099, .209, .191 respectively,* N= 4441. 'C' denotes categorical variable; 0= no, 1=yes. Standardized beta greater than .1 bolded. Statements used in questionnaire (1= strongly disagree, 7=strongly agree): "It is easy to lead a healthy lifestyle if you make lots of money", "Do you lead a healthy lifestyle? (e.g., eat healthy food, exercise regularly)?" "Do you have the resources/ things you need in order to lead a healthy lifestyle?"

(b = .106 and .136 respectively), increased social support (b = .083 and .113) and access to resources (b = .109 and .055). Extraversion was associated with increased social support (b = .090), subjective healthy lifestyle (b = .066) and access to resources (b = .072). Alternatively, Neuroticism was related to lower rated importance of public health knowledge (b = -.037), decreased social support (b = -.081), subjective healthy lifestyle (b = -.159) and access to resources (b = -.147). Honesty-Humility was strongly linked with lower belief in the need for women's health education (b = -.140) and money to lead a healthy lifestyle (b = -.339).

DISCUSSION

The current study examined the patterns and correlates of health behaviours and perceptions among a large sample of predominately middle-aged/older New Zealanders. This included one's perceived importance of and regularity of engagement in specific health behaviours, and access to resources for leading a healthy lifestyle. Most participants regarded all health behaviours, especially fruit/vegetable consumption and exercise, as being highly important for leading a healthy lifestyle (51-87%). However, a considerably lower proportion reported always engaging in such behaviour (26-56%). Compared to European and Asian peoples, a lower proportion of Māori and Pacific peoples reported always engaging in health behaviours and having high access to resources. To increase insight into group differences in health behaviours, we further examined the unique demographic, health and personality correlates of various health behaviours and health-related perceptions.

Demographic characteristics

Consistent with other New Zealand studies (MOH, 2014; 2015; 2016; University of Otago and MOH, 2011), being female and older were associated with increased engagement in all positive dietary behaviours. Similarly, having a partner was associated with increased regularity of limiting salt and saturated fats, and greater fruit/vegetable consumption. Women, older and partnered individuals all reported higher social support and subjective healthy lifestyle ratings. Both women and older individuals showed stronger belief in the importance of public health knowledge, whereas partnered and older individuals indicated having greater access to resources. An interesting point to note is that older and partnered individuals did not report higher importance ratings for at least half of the dietary behaviours they regularly engaged in. Perhaps due to their greater access to resources and social support, maintaining a healthy diet is less effortful and regarded as a normal part of daily life for these groups.

Previously, parenthood has been linked to lower physical activity and young mothers were found to show higher energy intake (Berge, Larson, Bauer, & Neumark-Sztainer, 2011). In our study, parenthood was not significantly associated with ratings of health behaviour importance or regularity, but parents reported lower ratings for subjective healthy lifestyle, social support and resource accessibility. Those with higher deprivation and BMI also reported lower access to resources and subjective healthy lifestyle. In line with previous studies

(MOH, 2014; 2015; 2016; University of Otago and MOH, 2011), higher deprivation was linked with lower consumption of fruit/vegetables and lower perceived importance of limiting sugar. Although high BMI was not associated with lower importance ratings for any specific health behaviour, it was linked with lower regularity of all healthy dietary behaviours, exercise and decreased belief in the importance of public health knowledge. It is thus essential to provide focused health education and dietary interventions for those with high BMI.

In New Zealand, Māori and Pacific peoples are typically found to have lower income, poor housing, greater unmet need for healthcare and higher rates of physical illnesses (MOH, 2015, 2016, 2018a; Statistics New Zealand, 2014, 2015). Thus, it is not surprising that a lower proportion of Māori and Pacific peoples reported always engaging in healthy dietary behaviours and having high access to resources. Some of these ethnic differences were evident even after controlling for multiple health, demographic and psychological factors. Compared to Europeans, Māori and Pacific peoples showed lower regularity of limiting saturated fats, and Māori individuals exhibited lower subjective healthy lifestyle and access to resources. On a more positive note, Pacific peoples reported increased regularity of exercise and greater social support to lead a healthy lifestyle, and both ethnic groups showed stronger belief in the importance of public health knowledge. Capitalizing on this belief could help encourage Māori and Pacific participation in health education initiatives.

Our findings highlight important group differences in healthy lifestyle behaviours. Whereas some groups acknowledge the importance of health behaviours and regularly engage in them, others are less likely to recognize the importance of or experience various barriers to adopting positive health behaviours. It is thus imperative to identify the unique barriers encountered by different groups and implement tailored interventions accordingly. For Māori and Pacific peoples, financial barriers or access to resources may be a key factor preventing them from leading a healthy lifestyle. Additional research on the reasons why these groups have trouble limiting saturated fats is needed to identify the most appropriate way to address this specific health behaviour. On the other hand, men and those with high BMI are likely to require focused education about the benefits and importance of healthy eating. Understanding group differences in health beliefs and health-promoting factors can further inform interventions. For instance, as Pacific peoples report greater social support to live a healthy lifestyle, they may benefit most from interventions that cultivate community or family-oriented support groups.

Health conditions

Generally, people show minimal lifestyle changes after being diagnosed with diet-related illnesses (Booth et al., 2013; Chong et al., 2017; Ma et al., 2008). Difficulty in altering routine behaviour, lack of motivation or knowledge and cost of a healthy diet are commonly cited reasons for minimal change. Somewhat consistent with these studies, those previously diagnosed with heart disease or vitamin deficiency did not report increased importance or engagement ratings for any health behaviour. These groups also reported lower access to resources, suggesting that barriers to healthcare or financial strain may be playing a role. High blood pressure and high cholesterol were linked with higher importance ratings for limiting salt, saturated fats or sugar. However, high blood pressure was not associated with differences in behaviour regularity and high cholesterol was linked with decreased regularity of eating fibre/whole grains and fruits/vegetables. Hence, it is especially essential to emphasize the importance of consuming healthy food for those with high cholesterol. As for physical activity, those with diabetes reported lower importance ratings whereas those with vitamin deficiency reported lower behaviour regularity.

Despite only rating limiting sugar as having higher importance, those with diabetes reported increased regularity of all five healthy dietary behaviours and stronger belief in the importance of public health knowledge. Relative to those with other health conditions, individuals with diabetes appear more likely to actually adopt a healthy diet following their diagnosis. In line with ratings of importance, diabetes showed a particularly strong association with increased regularity of limiting sugar. This raises the potential that those with diabetes may further increase their regularity of other dietary behaviours if health professionals can effectively convey their vital importance. However, it is yet unclear whether New Zealanders with diabetes maintain long-term dietary changes or gradually divert to their original eating habits over time. In an Australian sample, amount of physical exercise decreased and body weight increased with increasing time since receiving a diabetes diagnosis (Chong et al., 2017). Further longitudinal research is needed to better understand these nuanced effects and identify key factors that foster long-term lifestyle change among New Zealanders.

Personality traits

Personality traits showed significant associations with health behaviours and perceptions independent of demographic and health factors. Generally, high Conscientiousness and low Neuroticism have been linked with positive health behaviours, health outcomes and longevity (Bogg & Roberts, 2004; Elfhag & Morey, 2008; Goodwin & Friedman, 2006; Keller & Siegrist, 2015). Our findings further substantiate these two traits as unique correlates of health behaviours and perceptions in the New Zealand context. Conscientiousness was found to be associated with both higher rated importance and regularity of all six health behaviours. Neuroticism was linked with lower rated importance and regularity of limiting sugar, eating fruits/vegetables and exercising, as well as decreased regularity of limiting fats and eating fibre/whole grains. In terms of health-related perceptions, Conscientious was associated with increased importance ratings for public health knowledge, higher social support, access to resources and subjective healthy lifestyle. Unsurprisingly, Neuroticism showed decreased ratings on these same measures.

There have been somewhat mixed findings on the effect of Openness, Extraversion and Agreeableness on health behaviours (see Conner et al., 2017; Keller &

Siegrist, 2015; Mõttus et al., 2012). In our study, Openness was associated with higher rated importance of limiting sugar and exercise, and increased regularity of eating fibre/whole grains and fruits/vegetables and limiting fats and sugar. Extraversion did not have a significant effect on ratings of importance but was associated with increased regularity of eating fibre/whole grains and fruits/vegetables, and exercise. Extraversion, along with Agreeableness, also showed associations with positive health-related perceptions such as increased social support and access to resources. Ironically, despite reporting higher importance ratings for all positive health behaviours and public health knowledge, Agreeable individuals only reported increased regularity of eating fruit and vegetables. As Agreeable individuals tend to adhere to group norms (Sibley et al., 2011), they may support the general consensus that dietary behaviours and exercise are important for leading a healthy lifestyle but lack sufficient motivation to actually carry out these behaviours.

Honesty-Humility is a relatively recently identified personality trait and thus few studies have examined its relation to health behaviours. This personality trait is characterized by low self-centredness, high pro-social motivation and humbleness (Ashton & Lee, 2007). Our results indicated that Honesty-Humility was associated with increased regularity of all positive dietary behaviours. Honesty-Humility was also significantly related to an interesting mix of health-related perceptions. This included greater access to resources, but lower social support, belief in the importance of women's health education and necessity of money to lead a healthy lifestyle. In regard to dietary behaviours, as humble individuals are better able to resist self-enhancing tendencies (Tangney, 2009), they may be capable of cognitively restraining their intake of tempting but unhealthy food. Tong et al. (2016) found that participants who recalled experiences of humility exhibited higher self-control in resisting consumption of chocolates. Although this study did not treat humility as a stable 'trait', it suggests that certain facets of Honesty-Humility may help maintain control over their dietary behaviours and resist unhealthy food.

As personality traits provide a useful framework for organizing groups of behaviours, they can help inform future policies and interventions (Bleidorn, 2019). We are not advocating that policies should strive to shape or change people's personality but intend to highlight the utility of personality frameworks in providing useful insight into the patterns of and motivations behind people's health behaviours. Greater knowledge about the psychological contributors of and barriers to health behaviours faced by different groups help us better identify the specific type of support or intervention they require. For instance, as one's personality traits influences the persuasiveness of differently framed healthy eating messages (Thomas, Masthoff, & Oren, 2017), health professionals may alter their communication style and health advice to best suit the patient's personality. Personality traits could also be used to help increase people's awareness about their own thought processes and behavioural tendencies that promote unhealthy habits – a valuable understanding that would aid health attitude or behaviour change.

Limitations and future research

Limitations of the current study include the use of self-reported and cross-sectional data. Thus, we are unable to infer causality form our results. We also did not examine the reasons why those from distinct groups reported greater engagement in certain health behaviours or expressed different health-related perceptions. Longitudinal research methods are needed to gain a deeper insight into the trajectories of New Zealanders' health behaviours and perceptions. This includes potential changes in the effect of certain variables on health behaviours over time, and how significant life events such as an illness diagnosis may initiate short-term or long-term lifestyle behaviour change. Additional research is needed on the specific thought processes that promote or discourage specific health behaviours among those with different personality traits. Such findings will assist the identification of more effective strategies to deliver health information and promote lifestyle changes to groups with distinct needs and characteristics.

Conclusion

The current study examined the demographic, health and personality correlates of various health behaviours and health-related perceptions using a nationally representative sample of New Zealand adults. Most people rated all positive health behaviours as being highly important for leading a healthy lifestyle, but a considerably lower proportion reported always engaging in them. Women, older, partnered individuals and those living with diabetes showed increased regularity of healthy dietary behaviours, whereas those of Māori and Pacific ethnicity, with high BMI or deprivation showed reduced regularity. High Conscientiousness and Honesty-Humility but low Neuroticism were linked with increased regularity of health behaviours. There were also notable group disparities in perceived importance of public health knowledge, access to resources and social support to live a healthy lifestyle. Taken together, our findings provide a useful framework for future research on the unique demographic and psychological barriers to a healthy lifestyle encountered by different groups. Increased insight into these factors will inform the development of improved health promotion interventions that tailor to the specific needs of diverse groups.

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