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ORIGINAL ARTICLE

Effect of personality traits on socioeconomic inequalities in health, a population-based study

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Abstract

Objectives: This study aimed to estimate the effects of positive personality traits (PTs) in income and self-rated dental and general health (SRDH and SRGH) associations in a large South Australian sample.

Methods: Cross-sectional analyses were conducted using self-reported data collected from 3578 adults (2015–2016). Multivariable regression models assessed the main effects and interactions of the Ten-Item Personality Inventory (TIPI) and income with SRDH and SRGH. Prevalence ratios (PR) of poor health ratings were estimated using Poisson regression.

Results: Among all respondents, high-income individuals with stronger Conscientiousness scores had the lowest prevalence of poor SRGH (0.8%), while those with stronger Extraversion (2.9%) and Agreeableness scores (3.4%) had the lowest prevalence of poor SRDH. Poor SRGH was related to weak Conscientiousness (PR = 6.9, 95% CI [2.3–20.8]) and Emotional Stability scores (PR = 6.0, 95% CI [2.0–18.3]), while poor SRDH was associated with weak Extraversion (PR = 2.3, 95% CI [1.2–4.5]), Agreeableness (PR = 1.8, 95% CI [1.0–3.2]) and Conscientiousness scores (PR = 2.1, 95% CI [1.1–4.0]). Among low-income people, poor health ratings were less prevalent in those with stronger positive PTs scores versus weaker scores. Among low-income respondents, poor SRGH was lower in individuals with stronger versus weaker Conscientiousness scores (10.9% vs 16.2%), and poor SRDH showed lower prevalence in participants with stronger versus weaker Agreeableness scores (18.1% vs 22.6%).

Conclusion: Findings showed the association between PTs and the prevalence of poor SRDH and SRGH. Stronger positive PTs modified the self-rated health inequalities associated with low income in a representative sample of the South Australian population.

KEYWORDS
personality, self-rated health, socioeconomic inequalities, subjective health

1 | INTRODUCTION

Income-related social gradients in self-rated dental and general health (SRDH and SRGH respectively) have been reported, associating lower socioeconomic status (SES) with a higher prevalence of poorer oral and general health (OH and GH).[1] However, one critical question remains: Why can some people avoid poor health despite facing severe stressors of SES adversity? Studies

have shown that not everyone from low SES necessarily has poor health.[2,3] According to the biopsychosocial model, the interaction between chronic stressors (e.g. low SES) with psychosocial factors could cause stress-related biological responses (e.g. inflammatory and hormonal responses) that adversely affect health.[4] Psychosocial factors could enhance the ability to cope effectively with stress.[5] Individuals with effective coping strategies can better cope with the chronic stress of low-SES situations because of their personality traits (PTs).[6] Therefore, stress coping management might be a valuable psychological resource for low-SES people with limited resources.[7] Psychological factors could buffer the adverse effects of low SES in health.[2]

Researchers have used the Big Five theory to explain why people behave the way they do by relating PTs in shaping their behaviours. Based on the Big Five theory, the five dimensions of personality are Extraversion, Agreeableness, Conscientiousness, Openness to experience and Emotional Stability (opposite to Neuroticism).[8] The association between PTs and self-rated health (SRH) has been reported,[9] which links poor SRH with high Neuroticism (low Emotional Stability, the tendency to have negative emotions, anxiety and stress).[9] Conscientiousness (being organized and self-disciplined) and Extraversion (being energetic and social) are positively associated with SRH.[9] Evidence for Agreeableness (trust, altruism and being cooperative) and Openness (curiousness and unconventionality) is mixed (positive, negative and no effects).[9]

An individual's oral health (OH) is associated with their general health (GH).[10] Also, OH and GH have common risk factors,[10] and both are affected by PTs in similar ways (health-related behaviours and how individuals interpret and react to symptoms).[11,12] One of the most common measures for assessing OH and GH status is single-item global self-ratings.[13] They allow individuals to integrate their interpretation of the different health dimensions.[13] These non-clinical measures have been effective in predicting mortality and morbidity, as clinical trials' endpoints and high-risk groups' screening,[13] and comparing OH and GH perceptions.[14] According to Wilson and Cleary's model of health-related quality of life (HRQOL),[15] these measures are conceptually considered as GH perceptions.[14] Their model proposes a link between an individual's characteristics (such as personality) and health and quality of life.[15] This model explains the relationship between 'patient-specific factors' like personality, and GH perceptions (SRDH and SRGH measures).[15] However, there is a lack of large-scale cross-sectional studies for assessing the modifying effect of PTs in the SES gradients in health outcomes and their interactions with income in health. Effect modification occurs when the exposure's effect differs across the other exposure's strata. Interaction is the combined effect of both exposures on the outcome.[16]

Thus, this research aimed to estimate the modifying effect of the PTs in the association of income and SRDH and SRGH using a representative South Australian population sample. The hypotheses were: 1—low income and low scores for each PT would be associated with the highest prevalence of each poor health outcome measure (SRDH and SRGH); 2—interactions between income and low scores for PTs would be observed; and 3—in low-income individuals, those with high scores for each PT would have lower prevalence of each poor health outcome measure (SRDH and SRGH) than those with low scores for a PT.

2 | METHODS

The sample was drawn from the baseline data of the Dental Care and Oral Health Study (DCOHS). DCOHS is a comprehensive cohort study. In 2015, a random sample of 12 245 adults aged 18 years and older drawn from the South Australian Electoral Roll were invited by mail to participate in the study voluntarily and confidentially. The questionnaires with three reminder followups were sent to them. The University of Adelaide Human Research Ethics Committee approved the research (H-288-2011). The data were weighted using the estimates of the South Australian population's age and sex distribution from the Australian Bureau of Statistics.[17,18]

The outcome variables were SRDH and SRGH, measured using the single-item global ratings on 5-point Likert scales, comprising the questions 'How would you rate your general health?' and 'How would you rate your dental health?'. These valid measures provide a subjective perception of OH and GH.[19,20] Based on previous studies,[21,22] the responses were dichotomised as: (i) good, very good or excellent (reference category) and (ii) poor to very poor SRDH and SRGH.

The main explanatory variable was total household income before tax (in Australian Dollars), collected in 10 categories of $20 000 (from <$20 000 to >$180 000). To have an estimated even distribution, we coded income into three approximately equal-sized categories (approximate tertiles) using a distributional approach (0-$40 000, $40 001–$100 000 and more than $100 000). By using this approach, the low-income level can be compared with medium and high-income levels, regardless of the actual level of income (thresholds). Also, the actual income level could lose its meaning over time (e.g. because of economic factors such as inflation). However, by using tertiles the interpretation remains the same. Additionally, the distribution approach can be used to evaluate the income gradient in health, allowing the assessment of potential 'dose–response' effects.

The effect modifiers were the Big Five PTs as the psychosocial factors assessed by the Ten-Item Personality Inventory (TIPI). TIPI is a brief self-reported test, which Gosling[23] designed to evaluate the Big Five PTs using two options for each trait. In each dimension, one item is reversed. Each item was reported on a 7-point Likert scale (1 = Disagree Strongly to 7 = Agree Strongly). The responses to the five reversed items were coded reversely to match the standard items. The average of related standard and reverse-coded items was used for each dimension's score (a higher score represented a greater propensity to exhibit that trait). Each TIPI scale (ranging from 1 to 7) was dichotomised based on the conceptual approach (splitting the scale based on a score equivalent to being 'agree' or higher) as lower TIPI (<5 reflecting disagree) and higher TIPI (5–7 reflecting agree).[24]

The other explanatory variables (conceptually related covariates) were added to the models to cover the different dimensions of socio-demographic characteristics (age, sex, the main language

spoken at home and birthplace) and health behaviours (dental insurance, smoking status, daily tooth brushing and last dental visit). Details of all explanatory variables are presented in Table S1.

Unadjusted associations of SRDH and SRGH were assessed by the explanatory variables and effect modifiers, followed by evaluation of associations with PTs (using TIPI) stratified by income categories. Multivariable Poisson regression models assessed the adjusted associations between SRDH and SRGH with TIPI and income categories. Initially, the associations between income and each TIPI dimension with SRDH and later SRGH (model 1) were examined, along with the main effect and interaction of income and each TIPI dimension. Then, conceptually related covariates (socio-demographic characteristics and health behaviours) were added in successive blocks. Model 2 was adjusted for sex and age; Model 3 was adjusted for sex, age, the main language spoken at home and birthplace; Model 4 was adjusted for all covariates. All four models of each outcome fit the data, based on Pearson chi-square (Value/*df* >0.05).

The Poisson regression models with robust error variance (to correct for overdispersion) allowed us to calculate Exponential Beta to show the prevalence ratio (PR). PR is an accurate measure to estimate effect size for cross-sectional studies.[25]

Respondents who answered all TIPI, SRGH, SRDH and income questions (complete cases, n = 3798) were used for the analyses. Other variables' missing cases (n = 220) were excluded from the Poisson regression, giving us the final sample size of n = 3578 for the models. We compared the final sample with respondents with missing responses to determine whether the final sample differed from excluded cases (response bias). Also, another comparison using the census data was performed to assess the representativeness of the final sample. The large sample size available for analysis provided adequate statistical power despite some reduction in sample size due to missing data. The sample size calculations for DCOHS were based on OH outcomes estimates from the National Survey of Adult Oral Health (NSAOH) in Australia and a power of 80% (significance level α = 0.05).[17] Also, for the final sample, power was calculated using SPSS and G*Power 3.1.9.7 (significance level α = 0.05). All analyses were performed in SPSS 28.

3 | RESULTS

A total of 4494 responses were received. The response rate was calculated at 44.8% after omitting the out-of-scope sample cases (non-contacts due to change of residential address). Table 1 details the descriptive statistics of SRDH and SRGH by the study sample characteristics of the 3578 individuals 18–86 years old in DCOHS, and 95% CIs were used to assess unadjusted associations. The prevalence of poor SRDH and SRGH was 11.3% and 5.4%, respectively. The participants with the lowest prevalence of poor SRDH and SRGH were from the 18–45 years age group, were non-smokers, brushed their teeth twice or more daily and had dental insurance.

Table 2 shows that respondents with greater PT scores had lower rates of poor SRDH and SRGH. A significant gradient across income groups was observed, and high-income (>$100 000) respondents had the lowest prevalence of poor SRDH and SRGH.

The comparison of the study sample with excluded cases (Table S2) showed similar compositions with minor differences in health behaviours (last dental visit, dental insurance and tooth brushing) and age groups of 18–45 and over >60 years old. However, these small differences were statistically significant for age groups, and dental insurance.

The comparison of the final sample with the population data (Table S3) indicated that the final sample was broadly representative of the South Australian population. However, there were higher percentages born in other countries, over 60 years old and low income in census data.

For parsimony, only model 4 (the fully adjusted model) is presented in detail, while all other models were generally consistent and are included as Tables S4-S9. Also, for the final sample, a power of 1.00 was observed for all models. Middle and low-income were significantly associated with poor SRDH (Table 3). Weak Agreeableness (PR = 1.8), Extraversion (PR = 2.3) and Conscientiousness scores (PR = 2.1) were significantly associated with poor SRDH, and these traits' higher PRs showed their greater effect for SRDH. The interaction effect of weaker Extraversion at low-income had a lower PR (PR = 0.4), indicating a relatively greater effect for Extraversion at high-income (reflecting the lower prevalence of poorer SRDH for high-income respondents with stronger Extraversion scores) (Table 3 and Figure 1A). The lower PR (PR = 0.6) for the interaction effect of weak Agreeableness with middle income revealed a relatively greater impact of Agreeableness at high-income, representing the lower rates of poor SRDH among those with stronger Agreeableness scores and high-income.

Low income was also significantly associated with poor SRGH (all PTs) (Table 3). In contrast, middle income was only significantly associated with poor SRGH for Conscientiousness (PR = 3.3). There was a higher prevalence of poor SRGH among those with weak Conscientiousness and Emotional Stability scores, and the higher PR of these traits indicated their greater associations (effects) with SRGH. The lower PR (PR = 0.2) for the interaction of weaker Conscientiousness at low-income indicated a relatively greater effect for Conscientiousness at high-income, reflecting the lower prevalence of poorer SRGH for high-income individuals with stronger Conscientiousness scores.

Also, in low-income respondents, lower prevalence of SRDH was observed in those with strong Agreeableness (18.1%) and Emotional Stability (13.6%) than those with weak scores (22.6% and 25.0%, respectively) (Figure 1B and 1C). Among low-income respondents, those with strong Conscientiousness (10.9%) had a lower prevalence of poor SRGH than those with weak scores (16.2%) (Figure 1D). Low-income respondents had a greater absolute difference in the prevalence of poor SRDH between those with weak and strong Emotional Stability (11.4% vs 1.0%) and Agreeableness (4.5% vs 3.8%) scores than high-income respondents. There was a smaller difference in the prevalence of poor SRGH between those with weak and strong Conscientiousness scores than high-income respondents (5.3% vs 4.4%) (Figure 1D).

TABLE 1 Self-rated dental and general health by study characteristics

	Distributions[a]	SRDH poor to very poor		SRGH poor to very poor	
	N (%)	*N* (%)	95% CI	*N* (%)	95% CI
Total sample (*n* = 3578)		**406 (11.3)**	**10.3–12.5**	**194 (5.4)**	**4.7–6.2**
Health behaviour variables					
Last dental visit					
Less than a year ago	2226 (62.2)	186 (8.4)	7.2–9.6	96 (4.3)	3.5–5.3
More than a year ago	1352 (37.8)	220 (16.3)	13.9–18.3	98 (7.2)	5.9–8.8
Dental insurance					
Insured	2478 (69.3)	193 (7.8)	6.7–8.9	93 (3.8)	3.0–4.6
Uninsured	1100 (30.7)	213 (19.4)	16.8–22.1	101 (9.2)	7.5–11.2
Cigarette smoking					
Non-smoker	1942 (54.4)	148 (7.6)	6.4–8.9	73 (3.8)	2.9–4.7
Former smoker	1233 (34.4)	146 (11.8)	10.0–13.9	88 (7.2)	5.7–8.8
Current smoker	403 (11.3)	112 (27.8)	22.9–33.4	33 (8.2)	5.6–11.5
Tooth brushing					
Twice a day or more	1964 (54.9)	138 (7.0)	5.9–8.3	74 (3.8)	3.0–4.7
Less than twice a day	1614 (45.1)	268 (16.6)	14.7–18.7	120 (7.4)	6.2–8.9
Socio-demographic characteristics					
Birthplace					
Australia	2823 (78.9)	299 (10.6)	9.4–11.9	129 (4.6)	3.8–05.4
Other	755 (21.1)	107 (14.2)	11.6–17.1	65 (8.6)	6.7–11.0
Main language spoken at home					
English	3427 (95.8)	381 (11.1)	10.0–12.3	176 (5.1)	4.4–6.0
Other	151 (4.2)	25 (16.6)	10.7–24.4	18 (11.9)	7.1–18.8
Sex					
Male	1598 (44.4)	219 (13.8)	11.9–15.6	110 (6.9)	5.7–8.3
Female	1989 (55.6)	187 (9.4)	8.1–10.9	84 (4.2)	3.4–5.2
Age groups (mean = 52.7)					
18–45 years	1151 (32.3)	94 (8.1)	6.6–10.0	33 (2.9)	2.0–4.0
46–60 years	1159 (32.4)	145 (12.5)	10.6–14.7	60 (5.2)	3.9–6.7
61 years and older	1264 (35.3)	167 (13.2)	11.3–15.4	101 (8.0)	6.5–9.7

[a]The final sample size used for the analysis, including all variables with non-missing data.

4 | DISCUSSION

Weak Conscientiousness and Emotional Stability scores were associated with poor SRGH. Except for Emotional Stability and Openness, poor SRDH was more prevalent in those with weaker scores for PTs (all models). Low income was consistently associated with poorer SRGH and SRDH in all models. Interactions between low-income and weak Conscientiousness scores with SRGH (all models) were observed. There were significant interactions of low-income and weak Extraversion scores (all models), and middle-income and weak Agreeableness scores (in fully adjusted model) with SRDH.

Congruent with previous findings,[26] Extraversion and Agreeableness had similar associations (effects) with poor SRDH. The strongest associations (effects) were found between low Conscientiousness and Emotional Stability with poor SRGH, consistent with previous research showing that individuals with high levels of irresponsibility and emotional instability report poorer GH.[27] Also, poor SRDH was more prevalent than poor SRGH in our population sample. Although OH and GH are closely linked,[10] they are often approached differently (i.e. separate education and treatment for dental problems from the rest of the body), as well as having different related health services (e.g. separate insurance cover; only GH is universally covered in Australia).[28]

The combined effects (interaction effects) of strong PTs and high income were associated with the lowest prevalence of poor SRDH and SRGH (among high-income respondents with strong PTs). However, the modifying effects of strong Emotional Stability

TABLE 2 Self-rated dental and general health by personality dimensions and income

	Distributions[a]	SRDH poor to very poor		SRGH poor to very poor	
	N (%)	*N* (%)	95% CI	*N* (%)	95% CI
Total sample (*n* = 3578)		**406 (11.3)**	**10.3–12.5**	**194 (5.4)**	**4.7–6.2**
TIPI dimensions					
Extraversion					
Higher	1278 (64.3)	113 (8.8)	7.3–10.6	37 (2.9)	2.0–3.9
Lower	2300 (35.7)	293 (12.7)	11.3–14.3	157 (6.8)	5.8–8.0
Openness					
Higher	2077 (58.0)	207 (10.0)	8.7–11.4	76 (3.7)	2.9–4.6
Lower	1501 (42.0)	199 (13.3)	11.5–15.2	118 (7.9)	6.5–9.4
Agreeableness					
Higher	2300 (64.3)	246 (10.7)	9.4–12.1	115 (5.0)	4.1–6.0
Lower	1278 (35.7)	160 (12.5)	10.4–14.3	79 (6.2)	4.9–7.7
Conscientiousness					
Higher	2897 (81.0)	283 (9.8)	8.7–11.0	126 (4.3)	3.6–5.2
Lower	681 (19.0)	123 (18.1)	15.1–21.6	68 (10.0)	7.8–12.7
Emotional stability					
Higher	2010 (56.2)	179 (8.9)	7.6–10.3	59 (2.9)	2.3–3.9
Lower	1568 (43.8)	227 (14.5)	12.6–16.5	135 (8.6)	7.2–10.2
Income groups					
High (>$100 000)	1066 (29.8)	52 (4.9)	3.6–6.3	15 (1.4)	0.8–2.3
Middle ($40 001–$100 000)	1483 (41.4)	153 (10.3)	8.8–12.1	54 (3.6)	2.7–4.7
Low (≤$40 000)	1029 (28.8)	201 (19.5)	16.9–22.4	125 (12.1)	10.1–14.5

Abbreviation: TIPI, The Ten-Item Personality Inventory.

[a]The final sample size used for the analysis, including all variables with non-missing data.

and Agreeableness scores in the association between low income and poor SRDH suggest potentially greater health benefits in terms of the size of absolute differences in prevalence of stronger scores of these traits for low-income respondents than for high-income respondents. Also, strong Conscientiousness scores modified the association between low income and poor SRGH, showing that strong Conscientiousness conferred greater health benefits in the size of differences in prevalence to low-income group than high-income group. The findings suggest greater opportunities for low-income people to improve their OH and GH through interventions that target these traits. Similarly, previous studies have underlined the importance of PTs as protective psychosocial factors for low-SES groups.[6,29-31] Social adversity affects the health of those with PTs related to poorer health outcomes more than others.[29] Personality significantly affects healthy behaviours (healthy eating) in low-SES groups.[30] Also, coping flexibility could be a moderator of the SES-HRQOL relationship,[6] which is a crucial resource for low-SES people in adaptability to a stressful life. Besides, psychosocial factors can buffer the unfavourable effect of low SES in health disparities.[6] Consistent with our findings, Conscientiousness has been suggested as a beneficial health factor for low-SES groups.[31]

Although many covariates were included in the models, there will be many relevant factors that were not measured. Also, this study used PTs as the explanatory variables rather than clinical case definitions. By dichotomising individuals, we were able to determine where they fell on the personality spectrum (expressing the trait at a high or low level), that is shift the focus from the homogeneity of PTs (as variables) to individual differences (as participants).[32] Thus, we were able to compare how the association between the exposure (income) and outcomes (poor SRDH and SRGH) differed across the different effect modifier categories (greater versus lower PTs).[16] The advantages of categorizing the exposure (assessing effects of each exposure level separately without limitation) outweigh the potential disadvantages (reduced statistical power, loss of some information and requiring additional terms in the model).[33] The risk of such errors is negligible when a large sample size is analysed (such as the present study). Also, VanderWeele et al.[34] argued that dichotomisation has the advantage of avoiding model misspecification in interaction analyses.

Given that tackling SES-health inequalities through broader SES-targeted interventions and anti-poverty social policies could be challenging, better health outcomes for low-SES individuals can be achievable by strengthening psychosocial factors related to better health. This empowerment approach could include personality interventions (by targeting PTs linked with risky behaviours)[35] and community-based interventions using positive psychology among poor individuals,[36] and mental health

TABLE 3 Prevalence ratios from the fully adjusted model[a] (Model 4) of SRDH and SRGH

	Extraversion	Openness	Agreeableness	Conscientiousness	Emotional stability
	PR (95% CI)	PR (95% CI)	PR (95% CI)	PR (95% CI)	PR (95% CI)
TIPI dimension (ref. Category: Greater trait score)					
SRDH	2.3 (1.2–4.5)	1.2^{NS} (0.7–2.3)	1.8 (1.0–3.2)	2.1 (1.1–4.0)	1.0^{NS} (0.6–1.7)
SRGH	2.0^{NS} (0.6–6.8)	1.9^{NS} (0.4–3.4)	0.9^{NS} (0.3–2.7)	6.9 (2.3–20.8)	6.0 (2.0–18.3)
Low-income group (ref. Category: High-income group)					
SRDH	4.3 (2.3–8.0)	2.4 (1.4–4.0)	2.9 (1.7–4.9)	2.7 (1.7–4.2)	1.7 (1.1–2.8)
SRGH	4.8 (1.6–14.7)	5.6 (2.6–12.3)	5.2 (2.1–12.5)	10.5 (4.6–24.0)	9.3 (3.6–24.3)
Middle income group (ref. Category: High-income group)					
SRDH	2.5 (1.3–4.6)	1.8 (1.1–2.9)	2.2 (1.3–3.6)	1.8 (1.2–2.7)	1.7 (1.1–2.6)
SRGH	2.5^{NS} (0.8–8.2)	1.8^{NS} (0.8–4.1)	1.5^{NS} (0.6–3.9)	3.3 (1.4–7.7)	2.4^{NS} (0.9–6.7)
Interaction of low-income group and weak TIPI dimension					
SRDH	0.4 (0.2–0.9)	0.9^{NS} (0.5–1.8)	0.7^{NS} (0.3–1.3)	0.6^{NS} (0.3–1.1)	1.2^{NS} (0.6–2.2)
SRGH	1.1^{NS} (0.3–4.0)	0.9^{NS} (0.3–3.0)	1.2^{NS} (0.4–3.7)	0.2 (0.1–0.6)	0.4^{NS} (0.2–1.3)
Interaction of middle-income group and weak TIPI dimension					
SRDH	0.6^{NS} (0.3–1.2)	0.8^{NS} (0.4–1.6)	0.6 (0.3–1.2)	0.7^{NS} (0.3–1.5)	0.9^{NS} (0.5–1.9)
SRGH	0.7^{NS} (0.2–3.1)	1.3^{NS} (0.4–4.5)	2.0^{NS} (0.6–6.8)	0.3^{NS} (0.1–1.1)	0.7^{NS} (0.2–2.6)

Abbreviations: NS, not significant; PR, prevalence ratios; ref. Category, Reference Category; SRDH, self-rated dental health; SRGH, self-rated general health; TIPI, The Ten-Item Personality Inventory.

[a]Model 4 adjusted for Socio-demographic characteristics (sex, age, main language spoken at home and birthplace) and health behaviour variables (daily tooth brushing, smoking status, dental insurance and last dental visit).

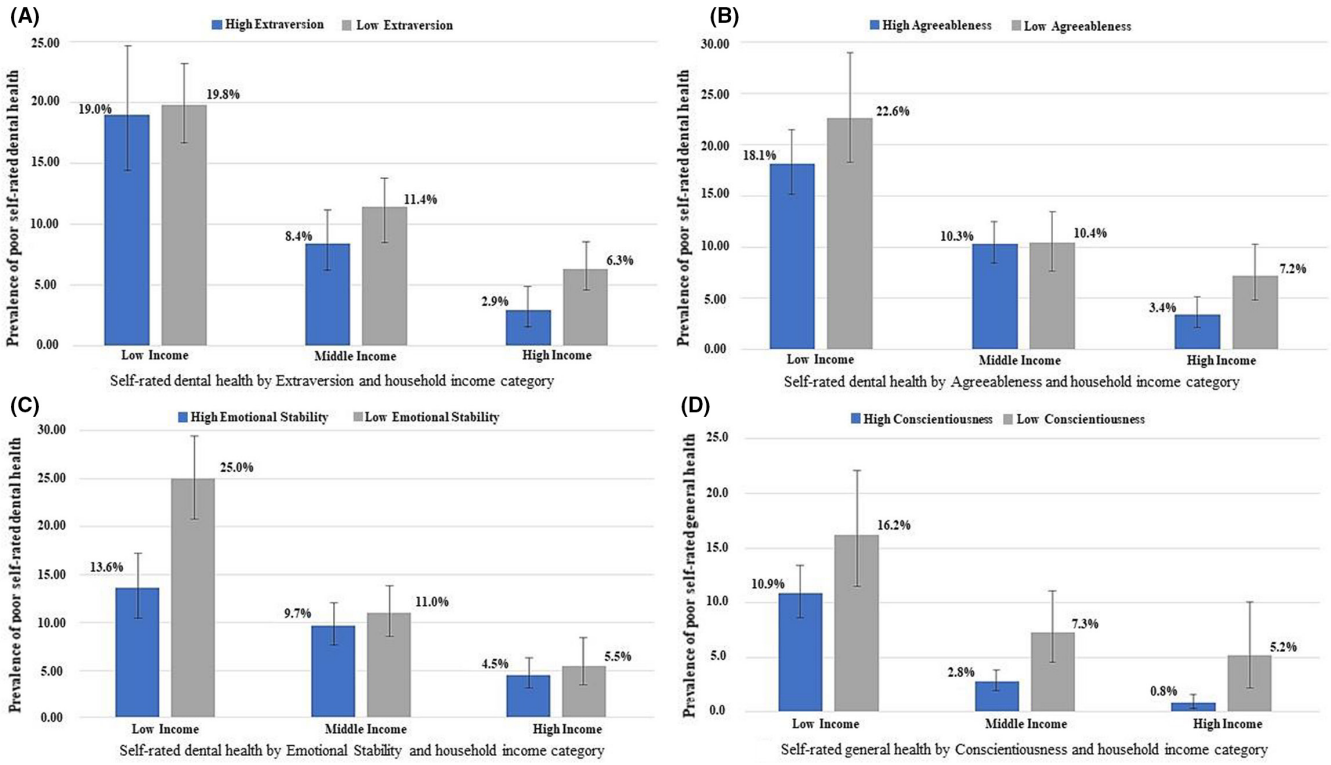

FIGURE 1 Poor self-rated dental and general health (SRDH and SRGH) by personality traits and household income category (A: Poor SRDH by Extraversion; B: Poor SRDH by Agreeableness; C: Poor SRDH by Emotional Stability; D: Poor SRGH by Conscientiousness)

promotion.[37] Other holistic health-promotion approaches (e.g., the WHO healthy city project by providing psychological resources)[38] can provide supportive environments for vulnerable populations. Also, behavioural change interventions have shown promising results in promoting OH behaviours.[39] A debate has raged over whether personality changes persist over time or revert, and whether these interventions actually work at a population level. These interventions are congruent with the personality development framework (short-term situational processes lead to long-term personality changes).[40] The cumulative effect of small changes in a trait's expression over time changes the level of that trait in two general ways: as reflective and associative processes.[40] The reflective process involves consciously collecting information from observing and analysing one's behaviour, feelings, perceptions and thoughts. It is assumed that this process affects the individual's personality and helps maintain it. Alternatively, personality development could result from associative learning, such as habit formation without reflecting (i.e. frequent repeating of behaviour leads to habitual behaviour). While some evidence supports the effectiveness of psychological interventions at the population level,[36,37,41] their practical implications seldom lead to changes at the population level. Three factors contributed to the failed translation of their sustainability and long-term success: short implementation of these interventions at the community/population level, lack of funding and failure because of over scaling and implementation problems (poor management).[41] Thus, to reduce vulnerability to social stressors and promote health in low-income groups, upstream factors and long-term community-based programs with proactive mental health approaches should be emphasized with adequate funding and effective management.

SRDH and SRGH are valid and reliable patient-centred measures. In other words, the individual's perception and interpretation of their health (subjective health) are central to their quality of life[11] and strongly influence their health-related behaviours.[42] People tend to continue their current lifestyles when they rate their health as 'good'.[42] Meanwhile, certain PTs affect subjective health.[11] PTs can affect subjective health through affectivity (positive or negative perceptions, based on one's personality), and can influence objective health (professional assessment) through healthy behaviours. Individuals with strong Extraversion, Conscientiousness, Openness and Agreeableness engage in physical activities and health-promoting behaviours, leading not only to positive evaluations of SRDH and SRGH but also better objective health.[9] Weak Emotional Stability (Neuroticism) is associated with poor subjective (negative perception of health ratings) and objective health (poor health behaviours and many health problems).[9,11] Therefore, the following factors should be considered when interpreting the present study's findings from a multidimensional perspective of health: 1—Those with negative affectivity are influenced to a higher extent by their objective health, thereby negatively affecting their subjective health ratings[11]; 2—The subjective health ratings of those with negative affectivity are more accurate given their greater awareness and sensitivity of their objective health[11]; 3—Psychological characteristics could affect health independent of symptoms and positive affectivity.[9]

Strengths of the study include using the large South Australian representative sample, analysing data with four models that incorporate adjustment for various variables, using valid and standard self-ratings for health and PTs, and evaluating OH and GH outcomes for any consistent patterns. Limitations comprise the low response rate of 44.8%. However, response rates below 50% were common for surveys over the past 30 years. Congruent with the latest comparisons,[17,18] DCOHS broadly represented the age and gender distribution of South Australian adults, considering it was derived from an extensive sampling frame (Electoral Roll). The final sample was also representative of the general population, with slight differences possibly because of the different categorisation of income and age in census data. Additionally, the final sample was similar to the excluded respondents, resulting in minimal response bias.

5 | CONCLUSION

Findings showed cross-sectional associations between PTs and income-health inequalities. There were associations between weaker scores for some PTs and the prevalence of poor SRDH and SRGH. Interactions of weaker scores of Extraversion, Agreeableness and Conscientiousness with low and middle-income were associated with health ratings. The findings contribute to a growing body of literature on the association between PTs and health outcomes and SES-health inequalities. Improving psychological factors to cope with the stress of low-SES conditions can provide a practical method for reducing SES-health inequalities.

DATA AVAILABILITY STATEMENT

All data supporting the findings are available from the corresponding author on reasonable request. The data are not publicly available for ethical and privacy reasons.

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REFERENCES

1. Sabbah W, Tsakos G, Chandola T, Sheiham A, Watt RG. Social gradients in Oral and general health. *J Dent Res*. 2007;86:992-996.
2. Chen E, Strunk RC, Trethewey A, Schreier HM, Maharaj N, Miller GE. Resilience in low-socioeconomic-status children with asthma: adaptations to stress. *J Allergy Clin Immunol*. 2011;128:970-976.
3. Bonanno GA. Resilience in the face of potential trauma. *Curr Dir Psychol Sci*. 2005;14:135-138.
4. Bolton D, Gillett G. *The Biopsychosocial Model of Health and Disease: New Philosophical and Scientific Developments*. Palgrave Pivot; 2019.
5. Carver CS, Connor-Smith J. Personality and coping. *Annu Rev Psychol*. 2010;61:679-704.
6. Atal S, Cheng C. Socioeconomic health disparities revisited: coping flexibility enhances health-related quality of life for individuals low in socioeconomic status. *Health Qual Life Outcomes*. 2016;14:1-7.

7. Adler NE, Snibbe AC. The role of psychosocial processes in explaining the gradient between socioeconomic status and health. *Curr Dir Psychol Sci*. 2003;12:119-123.
8. Caspi A, Roberts BW, Shiner RL. Personality development: stability and change. *Annu Rev Psychol*. 2005;56:453-484.
9. Stephan Y, Sutin AR, Luchetti M, Hognon L, Canada B, Terracciano A. Personality and self-rated health across eight cohort studies. *Soc Sci Med*. 2020;263:113245.
10. Sabbah W, Folayan MO, El Tantawi M. The link between oral and general health. *Int J Dent*. 2019;2019:7862923.
11. Elran-Barak R, Weinstein G, Beeri MS, Ravona-Springer R. The associations between objective and subjective health among older adults with type 2 diabetes: the moderating role of personality. *J Psychosom Res*. 2019;117:41-47.
12. Thomson WM, Caspi A, Poulton R, Moffitt TE, Broadbent JM. Personality and oral health. *Eur J Oral Sci*. 2011;119:366-372.
13. Fayers PM, Sprangers MA. Understanding self-rated health. *Lancet*. 2002;359:187-188.
14. Baker SR, Pearson NK, Robinson PG. Testing the applicability of a conceptual model of oral health in housebound edentulous older people. *Community Dent Oral Epidemiol*. 2008;36:237-248.
15. Wilson IB, Cleary PD. Linking clinical variables with health-related quality of life. A conceptual model of patient outcomes. *JAMA*. 1995;273:59-65.
16. VanderWeele TJ. On the distinction between interaction and effect modification. *Epidemiology*. 2009;20:863-871.
17. Song Y, Luzzi L, Chrisopoulos S, Brennan D. Dentist-patient relationships and oral health impact in Australian adults. *Community Dent Oral Epidemiol*. 2020;48:309-316.
18. Song Y, Luzzi L, Chrisopoulos S, Brennan DS. Are trust and satisfaction similar in dental care settings? *Community Dent Oral Epidemiol*. 2020;48:480-486.
19. Macias C, Gold PB, Öngür D, Cohen BM, Panch T. Are single-item global ratings useful for assessing health status? *J Clin Psychol Med Settings*. 2015;22:251-264.
20. Thomson WM, Mejia GC, Broadbent JM, Poulton R. Construct validity of Locker's global oral health item. *J Dent Res*. 2012;91:1038-1042.
21. Cislaghi B, Cislaghi C. Self-rated health as a valid indicator for health-equity analyses: evidence from the Italian health interview survey. *BMC Public Health*. 2019;19:1-13.
22. Teusner DN, Anikeeva O, Brennan DS. Self-rated dental health and dental insurance: modification by household income. *Health Qual Life Outcomes*. 2014;12:1-8.
23. Gosling SD, Rentfrow PJ, Swann WB Jr. A very brief measure of the big-five personality domains. *J Res Pers*. 2003;37:504-528.
24. Zakershahrak M, Brennan D. Personality traits and income inequalities in self-rated oral and general health. *Eur J Oral Sci*. 2022;130:e12893.
25. Barros AJ, Hirakata VN. Alternatives for logistic regression in cross-sectional studies: an empirical comparison of models that directly estimate the prevalence ratio. *BMC Med Res Methodol*. 2003;3:1-13.
26. Montero J, Gómez Polo C, Rosel E, Barrios R, Albaladejo A, López-Valverde A. The role of personality traits in self-rated oral health and preferences for different types of flawed smiles. *J Oral Rehabil*. 2016;43:39-50.
27. Atherton OE, Robins RW, Rentfrow PJ, Lamb ME. Personality correlates of risky health outcomes: findings from a large internet study. *J Res Pers*. 2014;50:56-60.
28. Brennan DS, Spencer AJ, Szuster FS. Insurance status and provision of dental services in Australian private general practice. *Community Dent Oral Epidemiol*. 1997;25:423-428.
29. Chapman B, Roberts B, Duberstein P. Personality and longevity: knowns, unknowns, and implications for public health and personalized medicine. *J Aging Res*. 2011;2011:759170.
30. Packard CJ, Cavanagh J, McLean JS, et al. Interaction of personality traits with social deprivation in determining mental wellbeing and health behaviours. *J Public Health*. 2012;34:615-624.
31. Elliot AJ, Turiano NA, Chapman BP. Socioeconomic status interacts with conscientiousness and neuroticism to predict circulating concentrations of inflammatory markers. *Ann Behav Med*. 2017;51:240-250.
32. Richters JE. The Hubble hypothesis and the developmentalist's dilemma. *Dev Psychopathol*. 1997;9:193-229.
33. Rothman KJ. *Modern Epidemiology*. Little Brown & Co; 1986.
34. VanderWeele TJ, Chen Y, Ahsan H. Inference for causal interactions for continuous exposures under dichotomization. *Biometrics*. 2011;67:1414-1421.
35. Edalati H, Conrod PJ. A review of personality-targeted interventions for prevention of substance misuse and related harm in community samples of adolescents. *Front Psych*. 2019;9:770.
36. Appiah R, Wilson-Fadiji A, Schutte L, Wissing MP. Effects of a community-based multicomponent positive psychology intervention on mental health of rural adults in Ghana. *Appl Psychol*. 2020;12:828-862.
37. Castillo EG, Ijadi-Maghsoodi R, Shadravan S, et al. Community interventions to promote mental health and social equity. *Curr Psychiatry Rep*. 2019;21:35.
38. Ritsatakis A. *Healthy Cities Tackle the Social Determinants of Inequities in Health: a Framework for Action*. WHO Regional Office for Europe; 2012.
39. Werner H, Hakeberg M, Dahlström L, et al. Psychological interventions for poor Oral health: a systematic review. *J Dent Res*. 2016;95:506-514.
40. Wrzus C, Roberts BW. Processes of personality development in adulthood: the TESSERA framework. *Pers Soc Psychol Rev*. 2017;21:253-277.
41. Hagger MS, Weed M. DEBATE: do interventions based on behavioral theory work in the real world? *Int J Behav Nutr Phys Act*. 2019;16:1-10.
42. Lee KS, Feltner FJ, Bailey AL, et al. The relationship between psychological states and health perception in individuals at risk for cardiovascular disease. *Psychol Res Behav*. 2019;12:317-324.

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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