

# Refining Insights on the Impact of SES on Perceived Health: A Positive Health Perspective

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## Research Article

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# Abstract

## Background

Recent insights and developments on health and society urge for a critical look at the positive relationship between socioeconomic status (SES) and health. We challenge the notions that it is sufficient to distinguish only between two groups of SES (low and high) and that only overall health is taken into account.

## Methods

A new grouping of SES was developed based on both income and education, resulting in six SES groups. Health was defined in terms of a new positive health concept, operationalised into six health dimensions generating a measure of total general health (TGH). Next, six socioeconomic and demographic determinants of health were included. Linear regression, T-tests and one-way ANOVA were applied to investigate the relationships in a Dutch sample. A subjective way to measure health was applied: self-rated health.

## Results

Four out of six dimensions of health determined TGH: bodily functions, daily functioning, quality of life, and social and societal participation. Three out of six socioeconomic and demographic determinants impacted TGH: housing situation, age, and difficulties meeting financial obligations. While this is the general picture for the entire sample, there were interesting similarities and differences between the six SES groups. The similarities refer to the positive impact of the evaluation of bodily functions and daily functioning on TGH in all SES groups. The other dimensions affected TGH in some groups and some dimensions only in one SES group. None of the socioeconomic and demographic determinants affected TGH in all SES groups. New insights on health inequalities are provided.

## Conclusions

The well-known positive relationship between SES and health is confirmed in this study. Further refining the health concept into six dimensions provides more detailed insights on which dimensions impact health the most. The subjective approach applied offers more refined information to better understand which health issues really matter to people. This yields new and more effective ways to develop interventions aimed at increasing healthy behaviour.

# Background

The impact of people's socioeconomic status (SES) on health has been studied for quite some time (1, 2). It is commonly accepted that a positive relationship exists between SES and health: the higher the SES score, the better people's health. Most studies make a dichotomous distinction into high and low SES with respect to this important determinant of health, and have chosen the overall concept of total general health (TGH) as outcome variable. In light of recent insights and developments on health and society, we challenge this approach that distinguishes only two groups of SES and includes TGH as single outcome parameter. Instead, we propose a more multidimensional view on both SES and health. We analysed six groups of SES and included six dimensions of health next to TGH in order to gain more refined insights into the complex relationship between SES and health.

## The relationship between SES and health: a global overview

SES is an undisputedly major factor influencing TGH and health behaviour. The socioeconomic determinants of TGH as mentioned and described in the model of Lalonde (3) have been studied elaborately (2, 4–9).

The complexity of the relationships between socioeconomic determinants of health has been conceptualised in the rainbow model of Whitehead and Dahlgren (10). This model, implicitly or explicitly, includes age, gender, marital status, household size and employment as socioeconomic determinants of health and depicts the interactions between them at the level of individual lifestyle, social and community network, and general socioeconomic, cultural and environmental conditions. The rainbow model is still the most abundant and complete to date. Many studies describe the socioeconomic health disparities between people with low and high SES scores. Since synonyms like 'health inequity' and 'health inequalities' are used in the literature for the term 'health disparities', it is important that we use 'health inequalities', following the approach of McCartney et al. (2019) (see next section).

In light of recent insights and developments on health and society, a critical look at the way SES and health are defined and/or operationalised is needed to gain better insight into their relationships and into interventions to increase healthy behaviour and reduce health inequalities. We will reveal that distinguishing more SES groups than the traditional two groups and that applying the concept of positive health and its six dimensions will provide these better and more refined insights. This study therefore addresses the following three research questions:

1. What health dimensions in life determine the perception of TGH?
2. What socioeconomic and demographic variables determine the perception of TGH?
3. To what extent do these relationships differ between various groups of SES distinguishing six instead of the traditional two groups of high and low SES?

The implications of the results on future research and on possible health-promoting interventions regarding diminishing socioeconomic health inequality are discussed. The empirical study was conducted in the Netherlands.

## The relationship between SES and health: more detailed facts of life

In their overview article,(11) define health inequalities as '...the systematic, avoidable and unfair differences in health outcomes that can be observed between populations, between social groups within the same population or as a gradient across a population ranked by social position...'. We will focus on such

systematic and avoidable differences in health outcomes. The issues of fairness or justice will not be discussed in this paper because they refer to an ethical or political viewpoint; our goal here is to reveal actual differences in health between SES groups without giving any moral judgements.

With respect to health inequality, it appears that in the Netherlands, for instance, people from low SES groups report on average living 18 more years with illness and dying 7 years earlier than people from high SES groups (12). In terms of actual behaviour, people from low SES groups show more risky health behaviours than people from high SES groups (13). This is more pronounced in men than women, with men suffering significantly more from chronic diseases. Mortality in non-married persons is higher than in married persons (4). In line with these Dutch outcomes, it was found that in the US and Canada non-married persons rate their health significantly lower than married persons (14). Unemployment or poor job satisfaction have detrimental effects on health (15–17). Only few studies have taken household or household size into account to suggest that this might impact health (18). Most studies on household impact on health refer to detrimental effects of family SES on health, in the sense of low family income and parents as well as grandparents belonging to low SES groups. Hence, these studies suggest a hereditary component of SES and not family size as a determinant for poor health. Whether and how people can 'escape from such an inherited inequality cage' or will remain unhealthy from one generation to the next is a point of discussion. These inherited health inequalities persist for many years and even increase despite interventions to change such situations. Crises like the recession of the early 2000s and the current Covid-19 pandemic can even enhance existing inequalities (19, 20). These health inequalities based on socioeconomic and demographic variables as well as on actual behaviour seem to be systematic, and whether they can be avoided or changed by specific single interventions on health or lifestyle remains debatable.

## **Socioeconomic status: the concept and its operationalisation**

The concept of socioeconomic status usually refers to the description of groups of people and the differences in relation to their social class and financial situation. In most studies, SES is operationalised as a dichotomy distinguishing between people with low education and/or low income (= low SES) versus people with high education and/or high income (= high SES). The relationship between income and education may not be that straightforward though.

As suggested by Flinterman et al. (2019) (21), several participants in their study had low education but were successful high-income entrepreneurs. On the other hand, several participants with high education ended up earning low incomes due to unemployment or negative life events such as divorce or illness. Clearly more combinations of income and education exist than merely the two of low income/low education versus high income/high education. Also, the Covid-19 pandemic is affecting the often-high-educated and mid-to-high-income self-employed, rendering them low-income. This shows that income can fluctuate during life and is not a fixed given (19) Hence, where the traditional dichotomised classification probably discloses the general effects of SES on health, a classification into more SES groups might shed additional and more detailed light on the way SES impacts health. We propose distinguishing six groups of various combinations of income and education.

## **Health: the concept and its operationalisation**

In 1948, the WHO defined health as 'A state of complete physical, mental and social

well-being and not merely the absence of disease or infirmity' (22). Since then, thanks to developments in society, medicine, science, public health and technology, people's views on health have changed. This has been elaborately described, and several attempts have been made to update this definition to one more suitable to the times (11, 23–25)

When evaluating these definitions, we believe they hold a deficit-based perspective and a professionals' perspective: such a health approach is about 'what is lacking' and medical professionals determine what potential is lacking. Huber et al. (2011) (26) took all of this into account and proposed a more 'positive' definition of health, with health as 'the ability to adapt and self-manage, in the face of social, physical and emotional challenges'. Such an approach holds an asset-based focus on meaningful possibilities from a patient-centred perspective. In this respect, the term 'assets' can be defined as 'any factor (or resource) which enhances the ability of individuals, groups, communities, populations, social systems and/or institutions to maintain and sustain health and well-being and to help to reduce health inequities' (27). We would like to emphasise that this approach to health focuses on the potential people have instead of what they lack.

Huber subsequently operationalised this definition with the concept of positive health, this time adding the three dimensions of meaningfulness, quality of life and daily functioning to bodily functions, mental functions, and social and societal participation (the equivalent of the three WHO dimensions of health) (28). The positive health approach relies on people's own perceived (subjective) evaluation of their health instead of on the professional's (more objective) judgement of a patient's health. In investigating the perceived health of a population, this concept of positive health appears to have added value (29).

In most studies, health is gauged by quantitative and rather objective measures, like blood pressure, weight, body mass index and specific diseases. From the literature on consumer behaviour, it is well documented that not only objective information affects people's behaviour but that behaviour is much more affected by the way people perceive those issues subjectively (30, 31). For example, whether they perceive their illness as serious or whether they perceive their smoking habit as pleasant can determine behaviour to a larger extent than mere factual information on e.g. the dangers of smoking. In line with this way of thinking, we will apply a subjective approach towards evaluating participants' own health instead of objective factual judgements made by professionals. We argue that interventions based on such a subjective approach of self-rated health (SRH) might be more effective than interventions based on an objective, professional judgement-based approach. Here using the positive health concept offers the opportunity to focus the interventions on people's own judgement of their health potential (what they can do) instead of their perceived shortcomings (what they cannot do).

## **Methods**

### **Research model**

The research model as shown in Fig. 1 was used to answer the three research questions. We studied whether and how the six dimensions of the positive health concept and several socioeconomic and demographic variables like age, gender, educational level, labour market status, income, household size and housing situation determined perceived TGH in the average Dutch population. We also included the way people perceive their income situation (ability to meet financial obligations) instead of only looking at the amount of gross household income as an explanatory variable in our models.

## Research population and data collection

In the fall of 2016, an online questionnaire was sent to all internet panel participants of RMI, a Dutch commercial market research company. This panel consists of 30,000 respondents aged 18 years and older, and is a representative sample of age, gender and urban-rural population.

It was judged that approval of a medical ethics committee was not mandatory for this research because participants did not undergo physical examination nor were bodily fluids or other medical data collected. Therefore, the Medical Research Involving Human Subjects Act does not apply to the current study. The Silverbrains Ethical Committee of de Silverbrains Board approved the research design and protocols for the data collection and analysis. Furthermore, the research was carried out in accordance with the rules and guidelines of the Dutch Market Research Organization (MOA) and the Dutch Policy Research Association (VBO) which are in line with the rules and guidelines of the European Association of Market Research (ESOMAR). The respondents are members of the RMI Internet panel and participated in the study voluntarily. At the start of their Internet panel years ago, the RMI obtained an informed consent from all panel members (all aged 18 years or older) agreeing that they participated in this study panel. To encourage people to participate in studies, respondents receive a small fee of one euro for every completed questionnaire.

The 32-item Positive Health questionnaire as developed and kindly made available by Dr. Huber(28) was used with some slight adaptations. Other topics were added to measure socioeconomic and demographic status. The final version consisted of 20 questions and 45 items. Participants were asked to assess their total perceived health and their perceived health on each of the six dimensions of the positive health concept after scoring the 32 items of the positive health scale from 1 (poor) to 5 (excellent). In this way all respondents evaluated their health on the same topics, avoiding different interpretations of health (32).

Data collection was terminated after a representative sample of 1,000 participants had responded. After checking the response for missing data on the SES items income and education, a total of 772 respondents was included in the statistical analysis. Only on educational level did the sample appear not to be representative of the Dutch population. Educational level was slightly higher in the sample compared to the average Dutch population, and was corrected for during statistical analysis of the results.

## Statistical analysis

Data of the 772 respondents were analysed using IBM SPSS Statistics 26. Spearman correlations and linear regression analysis were performed, determining the direct relationships and relative contributions of the health determinants as well as the socioeconomic and demographic determinants to perceived TGH. Linear regression is a justified way to analyse these relationships (32). T-tests and one-way ANOVA were used to test for statistical differences between the SES groups.

We used factor analysis to calculate individual respondents' SES score on the basis of their answers to the two questions on their highest achieved educational level and gross household income. For this calculation the mean score of all respondents was set at zero, defining various groups of respondents according to their individual SES scores (see Fig. 2). In forming these groups, we considered the distances between individual SES scores (e.g. when a 'big break' occurred) and number of respondents in each SES group, as this number should facilitate our regression analysis (meeting the rule that the number of respondents should be larger than the squared number of independent variables in our regression equations).

The distinction between the low and high SES groups in the two-SES group situation was based on whether the individual SES score was lower or higher than zero. This resulted in 369 respondents in the low SES group and 403 respondents in the high SES group. In the six-SES group situation the cut-off points were defined as follows (see also Fig. 2):

\*SES score 2.41 to -1.13 SES very low n = 153

\*SES score 0.77 to -0.71 SES low n = 85

\*SES score 0.695 to -0.25 SES mid-low n = 131

\*SES score 0.05 to 0.153 SES mid-high n = 96

\*SES score 0.48 to 1.00 SES high n = 200

\*SES score 1.35 to 2.66 SES very high n = 107

The six-SES group situation relates to the two-SES group situation in a rather simple way: the three groups with the lowest SES scores in the six-group situation belong to the low-SES situation, whereas the three groups with the highest SES scores in the six-group situation belong to the high-SES situation (Fig. 3).

## Results

### Research population

Respondents' average age was almost 49 years (range 18–93). The sample consisted of 48% women and 52% men; 45% had vocational education, 7% secondary education and 48% university education as highest educational level (see Tables 1 and 2). Table 1 reveals that the relationship between education and income is not linear, given the combinations of low income/high education and high income/low education as suggested by Flinterman et al. (2019). This supports our notion that SES should be based on both factors, income and education.

Table 1  
Sample and SES groups' composition based on education and income

	Total sample	Two SES groups		Six SES groups					
		SES low	SES high	SES very low	SES low	SES mid-low	SES mid-high	SES high	SES very high
<i>Highest educational level achieved<sup>1</sup></i>									
No education/ Elementary/ Basic Dutch (for foreigners)	1.0%	2.1%	-	5.0%	-	-	-	-	-
Primary/ Basic preparatory vocational/ Lower vocational	5.8%	12.0%	-	24.0%	-	5.9%	-	-	-
General preparatory vocational <sup>2</sup> / Lower secondary or lower college-preparatory/ Special preparatory	9.7%	20.1%	-	26.1%	29.0%	7.3%	0.1%	0.1%	-
Higher vocational or Old vocational classification	27.7%	49.3%	7.9%	44.8%	61.0%	46.8%	26.3%	3.2%	-
Upper secondary or Upper college-preparatory	7.4%	3.5%	10.9%	-	10.0%	3.4%	13.3%	14.9%	1.4%
University-level up to Bachelor's equivalent	35.4%	13.0%	56.0%	-	-	36.6%	51.0%	64.4%	44.8%
Master's or doctoral/ Post-graduate	13.1%	-	25.1%	-	-	-	9.3%	17.4%	53.8%
<i>Gross household income per year</i>									
Less than € 25,000	22.9%	45.3%	2.2%	72.5%	10.0%	36.6%	9.3%	-	-
Between € 25,001 and 35,000	20.1%	23.9%	16.7%	20.8%	61.0%	3.4%	51.0%	9.0%	-
Between € 35,001 and 50,000	24.4%	26.0%	22.8%	6.6%	29.0%	46.8%	13.3%	39.6%	-
Between € 50,001 and 70,000	19.8%	4.1%	34.2%	-	-	11.5%	26.3%	42.3%	26.1%
Between € 70,001 and 100,000	9.8%	0.6%	18.3%	-	-	1.7%	0.1%	8.9%	52.2%
Between € 100,001 and 250,000	2.9%	-	5.5%	-	-	-	-	0.1%	20.4%
More than € 250,000	0.2%	-	0.4%	-	-	-	-	-	1.3%
Number of respondents (= 100%)	772	369	403	153	85	131	96	200	107
<sup>1</sup> Note: In the Netherlands, secondary education is subdivided into multiple programmes that are oriented towards the needs of the student and include vocational variants.									
<sup>2</sup> Corresponds with C-level GCSEs in the UK and 10th grade in the US.									

Table 2  
Sample and SES groups; socioeconomic and demographic descriptives

	Two SES groups <sup>2</sup>			Six SES groups <sup>3</sup>					
	Total sample	SES low	SES high	SES very low (a)	SES low (b)	SES mid-low (c)	SES mid-high (d)	SES high (e)	SES very high (f)
<i>Type of housing/dwelling</i>									
Home owner	62.2%	43.8% <sup>‡</sup>	79.0%	30.1% <sup>bcdef</sup>	55.6% <sup>aef</sup>	52.1% <sup>aef</sup>	56.8% <sup>aef</sup>	81.9% <sup>abcd</sup>	93.5% <sup>abcd</sup>
Home renter	37.8%	56.2% <sup>‡</sup>	21.0%	69.9%	44.4%	47.9%	43.2%	18.1%	6.5%
<i>Age</i>									
Mean age in years	48.9	51.5 <sup>‡</sup>	46.5	55.3 <sup>cdef</sup>	54.3 <sup>cdef</sup>	45.1 <sup>ab</sup>	46.5 <sup>ab</sup>	46.1 <sup>ab</sup>	47.2 <sup>ab</sup>
<i>Has difficulties meeting financial obligations</i>									
Mean score <sup>4</sup>	3.74	3.34 <sup>‡</sup>	4.11	3.19 <sup>cdef</sup>	3.31 <sup>def</sup>	3.54 <sup>aef</sup>	3.83 <sup>abf</sup>	4.08 <sup>abcf</sup>	4.40 <sup>abcde</sup>
<i>Household size</i>									
Total number of people in household (mean)	2.33	2.16 <sup>‡</sup>	2.49	1.68 <sup>cdef</sup>	2.07 <sup>c</sup>	2.77 <sup>ab</sup>	2.33 <sup>a</sup>	2.54 <sup>a</sup>	2.53 <sup>a</sup>
<i>Labour market status<sup>1</sup></i>									
Has a paid job	52.0%	36.4% <sup>‡</sup>	66.3%	24.4% <sup>cdef</sup>	38.4% <sup>ef</sup>	49.0% <sup>aef</sup>	57.1% <sup>a</sup>	66.2% <sup>abc</sup>	74.7% <sup>abc</sup>
Retired	18.9%	23.1%	15.0%	33.7%	26.2%	8.8%	20.8%	14.0%	11.7%
Unable to work, incapacitated or chronically ill	10.8%	17.0%	5.1%	21.0%	14.5%	14.0%	9.1%	5.9%	0.1%
Unemployed	6.8%	9.8%	4.1%	13.7%	7.6%	6.7%	4.3%	4.1%	3.9%
Homemaker	4.5%	6.7%	2.6%	4.2%	9.5%	7.6%	3.0%	3.0%	1.5%
Has education and does not work	2.7%	2.6%	2.8%	0.8%	0.1%	6.3%	4.4%	2.8%	1.2%
Miscellaneous	4.3%	4.4%	4.1%	2.2%	3.5%	7.6%	1.3%	4.0%	6.9%
<i>Gender</i>									
Male	52.3%	43.7% <sup>‡</sup>	60.1%	39.6% <sup>ef</sup>	38.0% <sup>ef</sup>	52.1% <sup>f</sup>	49.3% <sup>f</sup>	58.3% <sup>ab</sup>	73.2% <sup>abcd</sup>
Female	47.7%	56.3% <sup>‡</sup>	39.9%	60.4%	62.0%	47.9%	50.7%	41.7%	26.8%
Number of respondents (= 100%)	772	369	403	153	85	131	96	200	107
<sup>1</sup> In the regression analysis this variable has been transformed into a dummy factor (having a paid job or not). Statistical differences only relate to this dummy factor.									
<sup>2</sup> In the columns of the two SES groups, statistical significance is based on T-tests with *p < .05; †p < .001; ‡p = .000.									
<sup>3</sup> In the columns of the six SES groups the superscripts a, b, c, d, e and f refer to the statistically significant differences (p < .05) between the value in one SES group and the values in any of the other five SES groups. Statistical differences are based on one-way ANOVA.									
<sup>4</sup> A higher mean score means less difficulties meeting financial obligations.									

## General overview of the results on health

As illustrated in the model in Fig. 3, the analysis was done at three different levels: (1) all respondents, (2) two SES groups, and (3) six SES groups. We will follow the structure of this model while presenting our results.

In general, all respondents perceived their TGH as quite good: more than two-thirds (67.5%) evaluated their TGH as good and/or excellent, in the two-SES groups situation 57.2% for the low SES group and 77.0% for the high SES group. This TGH score was constantly increasing in the six-SES group situation: from 49.9% in the very low group via 58.8% (low), 64.7% (mid-low), 69.8% (mid-high) and 73.2% (high) to 90.3% in the very high group.

When distinguishing between SES groups, average TGH and mean of all the dimensions of health were perceived as better with increasing SES scores while standard deviations decreased (see Table 3). This smaller standard deviation implies that people within a higher SES group have a more common perception

of their health and are a rather homogeneous group in this respect. There was quite some heterogeneity in the perceived health of lower SES participants, as SDs within each of the lower SES groups were quite large.

Table 3  
Health and the SES groups; mean and standard deviation (SD) on the evaluation of health and its dimensions

	Two SES groups <sup>1</sup>				Six SES groups <sup>2</sup>											
	Total sample		SES low		SES high		SES very low		SES low		SES mid-low		SES mid-high		SES high	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
							(a)		(b)		(c)		(d)		(e)	
Total general health	3.64	0.88	3.41 <sup>‡</sup>	0.97	3.86	0.73	3.34 <sup>ef</sup>	0.95	3.47 <sup>ef</sup>	0.93	3.45 <sup>ef</sup>	1.01	3.59 <sup>f</sup>	0.79	3.83 <sup>abcf</sup>	0.72
Bodily functions	3.58	1.00	3.32 <sup>‡</sup>	1.08	3.81	0.87	3.20 <sup>def</sup>	1.11	3.45 <sup>f</sup>	1.02	3.38 <sup>ef</sup>	1.07	3.64 <sup>af</sup>	0.87	3.72 <sup>acf</sup>	0.90
Daily functioning	3.89	0.88	3.67 <sup>‡</sup>	0.97	4.09	0.73	3.62 <sup>ef</sup>	1.01	3.65 <sup>ef</sup>	0.94	3.75 <sup>ef</sup>	0.95	3.81 <sup>f</sup>	0.75	4.07 <sup>abcf</sup>	0.74
Quality of life	3.75	0.82	3.56 <sup>‡</sup>	0.92	3.92	0.67	3.49 <sup>ef</sup>	0.86	3.64 <sup>f</sup>	0.90	3.59 <sup>ef</sup>	0.99	3.70 <sup>f</sup>	0.62	3.89 <sup>acf</sup>	0.69
Social and societal participation	3.60	0.86	3.45 <sup>‡</sup>	0.92	3.75	0.78	3.39 <sup>ef</sup>	0.90	3.48 <sup>f</sup>	0.88	3.49 <sup>f</sup>	0.96	3.61 <sup>f</sup>	0.67	3.66 <sup>af</sup>	0.86
Mental functions and perception	3.86	0.93	3.67 <sup>‡</sup>	1.05	4.03	0.76	3.58 <sup>ef</sup>	1.09	3.81 <sup>f</sup>	0.80	3.69 <sup>ef</sup>	1.14	3.74 <sup>f</sup>	0.84	4.01 <sup>ac</sup>	0.77
Meaningfulness	3.49	0.54	3.36 <sup>†</sup>	1.01	3.61	0.85	3.35 <sup>f</sup>	1.05	3.40 <sup>f</sup>	0.96	3.34 <sup>f</sup>	1.02	3.40 <sup>f</sup>	0.89	3.57	0.85
Number of respondents	772		369		403		153		85		131		96		200	

Data are presented as mean and standard deviation (SD)

<sup>1</sup> In the columns of the two SES groups, statistical significance is based on T-tests with \*p < .05; †p < .001; ‡p = .000.

<sup>2</sup> In the columns of the six SES groups the superscripts a, b, c, d, e and f refer to the statistically significant differences (p < .05) between the value in one SES values in any of the other five SES groups. Statistical differences are based on one-way ANOVA.

Analysing the evaluations of TGH in the different SES groups, Fig. 4 summarises the results for the mean TGH scores per SES group. The inequality in the evaluation of TGH is clear. In the two-SES group situation, TGH was significantly lower in the low SES group than in the high SES group.

In the six-SES group situation, self-evaluation of health shows a gradient in the pattern of better health with increasing SES. The four lowest SES groups' TGH did not differ from each other, but they were all significantly lower compared to the two highest SES groups' TGH. This implies the possible gradual yet critical turning point at which a higher SES has a significant impact on (better) TGH. That turning point did not lie exactly between the low and high SES groups (in the two-SES situation), but is part of the (dichotomous) high SES group.

A similar gradient was found for each of the six health dimensions (Fig. 5 and Table 3). These evaluations were significantly higher in the two highest SES groups than in the four lower SES groups. In all dimensions, the lowest SES group and the highest SES group scored significantly lowest and highest, respectively.

Considering the socioeconomic and demographic determinants associated with TGH, respondents in higher SES groups were significantly more likely to own a house, be employed, have larger households, and have less trouble meeting financial obligations (Table 3). Gender was almost equally distributed among total respondents but showed a gradient of more males with increasing SES. When distinguishing between both two and six groups of SES, the gender distribution shifted towards significantly higher numbers of males. Age seemed to decrease with increasing SES. The mid-high SES group resembled the three lower SES groups more than the two higher SES groups.

## Results on the relationship between SES and health

When performing a single regression on the impact of the SES score on TGH for all 772 respondents, 10.1% of the variance in TGH was explained by the SES score (beta = 0.320; R<sup>2</sup> = 0.101, p = 0.000). This shows that the higher the SES score, the higher the TGH is evaluated, and illustrates that the well-known positive impact of SES on health is also present in our data. Given this 10.1% explained variance, other variables could be added to increase it. To this end, in a multiple regression analysis we included the six health determinants, the socioeconomic and demographic determinants from our model, and participants' SES scores. This model is statistically significant (adjusted R<sup>2</sup> = 0.777, p = 0.000; see first column in Table 4). However, SES does not have an impact on the evaluation of TGH in this multiple regression (standardized beta = 0.025, p = 0.244).

Table 4  
Results of multiple regression analyses explaining total general health

<i>Evaluation of</i>	<b>All respondents</b>		<b>Two groups</b>		<b>Six groups</b>					
	Total incl. SES variable	Total excl. SES variable	SES low	SES high	SES very low	SES low	SES mid-low	SES mid-high	SES high	SES very high
Bodily functions	<b>.382 (.000)</b>	<b>.380 (.000)</b>	<b>.333 (.000)</b>	<b>.458 (.000)</b>	<b>.261 (.001)</b>	<b>.489 (.001)</b>	<b>.378 (.000)</b>	<b>.273 (.000)</b>	<b>.490 (.000)</b>	<b>.401 (.000)</b>
Daily functioning	<b>.292 (.000)</b>	<b>.289 (.000)</b>	<b>.352 (.000)</b>	<b>.219 (.000)</b>	<b>.330 (.000)</b>	<b>.432 (.000)</b>	<b>.367 (.000)</b>	<b>.307 (.000)</b>	<b>.151 (.004)</b>	<b>.521 (.000)</b>
Quality of life	<b>.261 (.000)</b>	<b>.263 (.000)</b>	<b>.300 (.000)</b>	<b>.182 (.000)</b>	<b>.383 (.000)</b>	.126 (.153)	<b>.219 (.000)</b>	<b>.370 (.000)</b>	<b>.211 (.000)</b>	-.102 (.177)
Social and societal participation	<b>.065 (.007)</b>	<b>.066 (.006)</b>	.032 (.343)	<b>.092 (.008)</b>	.013 (.814)	-.010 (.868)	.078 (.198)	-.115 (.061)	<b>.162 (.002)</b>	.094 (.169)
Mental functions and perception	-.024 (.334)	-.025 (.322)	-.064 (.080)	<b>.110 (.002)</b>	-.091 (.152)	.020 (.737)	-.079 (.198)	.076 (.221)	.077 (.151)	<b>.198 (.002)</b>
Meaningfulness	-.021 (.292)	-.022 (.270)	-.042 (.124)	-.014 (.639)	<b>-.151 (.004)</b>	-.076 (.197)	.009 (.825)	-.052 (.266)	-.022 (.609)	.051 (.429)
<i>Socioeconomic determinants</i>										
SES	-.025 (.244)									
Home ownership or renting <sup>1</sup>	<b>-.084 (.000)</b>	<b>-.077 (.000)</b>	<b>-.112 (.000)</b>	<b>-.059 (.024)</b>	<b>-.216 (.000)</b>	<b>-.112 (.039)</b>	-.076 (.068)	.039 (.388)	<b>-.098 (.009)</b>	.001 (.982)
Age	<b>-.058 (.005)</b>	<b>-.055 (.007)</b>	<b>-.082 (.006)</b>	-.010 (.732)	<b>-.129 (.012)</b>	-.032 (.618)	-.036 (.426)	-.045 (.342)	<b>-.090 (.032)</b>	<b>.197 (.003)</b>
Difficulties meeting financial obligations	<b>.052 (.011)</b>	<b>.045 (.021)</b>	.053 (.056)	.019 (.478)	.031 (.537)	.081 (.099)	<b>.095 (.034)</b>	<b>.130 (.005)</b>	-.008 (.827)	-.075 (.190)
Household size	-.018 (.321)	-.021 (.260)	-.033 (.230)	-.008 (.747)	<b>-.106 (.018)</b>	.039 (.437)	.034 (.426)	.006 (.906)	<b>-.087 (.016)</b>	<b>.174 (.004)</b>
Labour market status: employed or not <sup>2</sup>	-.012 (.555)	-.015 (.446)	<b>-.080 (.005)</b>	<b>.083 (.003)</b>	-.043 (.413)	-.086 (.151)	<b>-.089 (.026)</b>	<b>.218 (.000)</b>	.049 (.209)	.044 (.508)
Gender	.002 (.902)	.005 (.795)	-.026 (.305)	<b>.067 (.012)</b>	-.045 (.348)	<b>.159 (.005)</b>	-.051 (.172)	<b>.100 (.027)</b>	.041 (.295)	-.009 (.869)
Adjusted R2	.777	.776	.785	.758	.726	.852	.856	.868	.763	.730
Significance of the model	<b>.000</b>	<b>.000</b>	<b>.000</b>	<b>.000</b>	<b>.000</b>	<b>.000</b>	<b>.000</b>	<b>.000</b>	<b>.000</b>	<b>.000</b>
F value	207.282	224.337	22.718	13.511	34.573	41.449	65.389	53.012	54.442	24.887
Degrees of freedom	13	12	12	12	12		12	12		12
* Significance level in parentheses and values are in bold										
<sup>1</sup> A minus sign means negative impact of home renting (vs home ownership)										
<sup>2</sup> A minus sign means negative impact of not having a job (vs having a job)										

The disappearing impact of SES might be due to the fact that the influence of SES on the perception of TGH is 'taken over' by other variables in the model. However, SES may still affect TGH one way or another given the significant single regression output. As a next step in our analysis we therefore focus on the possible relationships between the six health determinants together with the six socioeconomic and demographic determinants in explaining TGH in the entire sample as well as within a specific SES group. We performed multiple linear regression analyses both for the traditional two-SES groups and for each of the newly developed six-SES groups. The results of our analyses are presented in detail below.

## Factors determining all respondents' evaluation of TGH

When analysing the data of all respondents without the SES variable, the perception of TGH was explained by four of the six health determinants and by three of the six socioeconomic and demographic determinants (second column in Table 4). Here a higher score on perceived TGH could be largely explained by a higher score on evaluation of bodily function and daily functioning, followed by a higher score on evaluation of quality of life. Additionally, but to a lesser extent, people reporting owning a house, people scoring higher on social and societal participation, younger people, and those with no or less difficulties meeting financial obligations scored higher on their perceived TGH. Perceived TGH was however not influenced by evaluation of the other two health dimensions of meaningfulness and mental function, or by the socioeconomic and demographic variables of gender, household size and labour market status because no significant standardized betas were found.

## Factors determining the evaluation of TGH by distinguishing between two groups of SES

When distinguishing between two groups of SES, multiple regression analyses of both SES groups (Table 4) show that scores on bodily functions, daily functioning and quality of life have a large positive impact on perceived TGH in both SES groups. However, given the size of the standardized betas the positive impact of each of these three health determinants differs: the positive impact of bodily functions was larger in the high SES group, while that of daily functioning and quality of life was larger in the low SES group. In both SES groups home owners perceived better TGH than renters, while the impact of the housing situation was larger in the low SES than in the high SES group.

The low and high SES groups differ on the impact of the health dimensions of mental functions and social-societal participation and the socio-demographic variables of gender, age and labour market status. The two health dimensions impacted TGH positively only in the high SES group. Also, in the high SES group only, women perceived better TGH than men, whereas age only impacted perceived TGH in the low SES group, showing decreasing health with increasing age. Lastly, having a job increased perceived health in the low SES group but decreased it in the high SES group. The health determinant of meaningfulness and the socioeconomic and demographic determinants of household size and difficulties meeting financial obligations did not impact perception of TGH in either of these two SES groups.

In sum, with respect to the health dimensions determining the evaluation of TGH by distinguishing between two groups of SES, both SES groups show similarities as well as differences. In both groups TGH was largely and positively affected by three health dimensions: bodily functions, daily functioning and quality of life. TGH was positively affected by evaluation of social-societal participation and mental function only in the highest SES group. In both SES groups home owners perceived better health than renters. Having a job, on the other hand, impacted TGH positively in the low SES groups but negatively in the high SES group.

## Factors determining the evaluation of TGH by distinguishing between six groups of SES

In all six SES groups the health dimensions of bodily functions and daily functioning contributed positively to perceived TGH. The perception of the quality-of-life dimension impacted TGH in four out of six SES groups – not in the low SES and not in the very high SES group. The size of the standardized beta however reveals that this impact differs per SES group. In the very low SES group, perceived quality of life had the biggest impact on TGH from two perspectives: compared to all other significant impacts in this SES group and compared to the significance of this quality-of-life dimension in all other SES groups. The dimension of mental functioning contributed positively only to the very high SES group's TGH. Evaluation of the meaningfulness dimension impacted on perceived TGH only in the very low SES group: respondents scoring higher in meaningfulness perceived lower TGH. The dimension of social and societal participation explained only perceived TGH in the high SES group.

None of the socioeconomic and demographic determinants impacted TGH in all six SES groups. Home ownership contributed positively to perceived TGH in the two lowest SES groups and the high SES group. The younger people are and the smaller the households, the better they perceived their TGH in the very low and the high SES groups, whereas the opposite was found in the very high SES group. Only the mid-low and the mid-high SES groups perceived that TGH was affected positively by having less difficulties meeting financial obligations. However, having a paid job contributed positively to perceived TGH in the mid-low SES group but negatively in the mid-high SES group. Lastly, women perceived better TGH only in the low SES and mid-high SES groups but not in the other SES groups.

In sum, these results show that different health dimensions and different socioeconomic and demographic dimensions determine the perception of TGH differently per SES group when distinguishing between six groups of SES. All six SES groups had two health dimensions (out of the six) in common that positively determined their TGH: bodily functions and daily functioning. These are two dimensions of health connected to more physical aspects of life. None of the six socioeconomic and demographic variables included in this study impacted TGH in all SES groups – some variables impacted TGH positively in one SES group and negatively in another: for instance, having a paid job had a positive effect on TGH in the mid-low SES group but a negative effect in the mid-high group.

## Discussion

This paper focused on three research questions, all related to the complex relationship between socioeconomic status and perceived total general health. Most respondents perceived their health quite positively: a little more than two-thirds evaluated their TGH as good and/or excellent. The lower standard deviation in TGH scores of respondents within a higher SES group shows a more common perception of their health; they are quite a homogeneous group in this respect. By contrast, there was a wide difference in perception of TGH between respondents within the lowest SES group, as shown by their higher standard deviation. In general, respondents in higher SES groups apparently not only perceived better TGH but also shared a more common evaluation of their health.

## Answering the research questions

The first research question was about which health dimensions in life determine the perception of TGH. Using the concept of positive health, it appears that four out of the six dimensions impact evaluation of TGH. Evaluation of bodily functions, daily functioning, quality of life, and social and societal participation had a positive impact on the evaluation of TGH, and are also the most important health dimensions in determining TGH.

All SES groups had in common the positive impact of bodily functions and daily functioning on their TGH. However, the magnitude of the impact of these two more physical health dimensions as well as of the other two more social ones (as measured via the standardized betas) differed per SES group. The impact of the two more psychological health dimensions seemed to be rather small and only present in a few SES groups. This is in line with findings of Stronks et al. (2018) (33) showing in a concept map that, regardless of educational level, more physical aspects like 'absence of disease and functioning' and 'health-related behaviours' and more social aspects like 'social life' and 'attitude towards life' were perceived as important characteristics of health.

Evaluation of the other two dimensions (mental functions and meaningfulness) did not impact all respondents' TGH. It could be argued that these two dimensions are perceived to overlap with the dimensions of daily functioning and quality of life and hence are not perceived as contributing to TGH as separate dimensions. Another interpretation could be that people only become aware of the importance of these dimensions when perceiving illness in TGH, as is the case only in the very low SES group. More research on this specific topic is needed, given the inconclusive results in this respect.

The second research question was about which socioeconomic and demographic variables determine the perception of TGH. It turned out that type of housing, age, and difficulties meeting financial obligations impacted on all respondents' perceived TGH, which proportionately worsens with increasing home renting, age, and difficulties meeting financial obligations. Gender, household size and labour market status (= having a job or not) did not impact respondents' TGH.

These determinants of perceived TGH are thus in line with earlier findings on determinants of objective health. First, it is established that objective health decreases and use of healthcare increases with age (34, 35). Second, it is widely known that housing conditions are a determinant of health. People living in substandard, often rented housing in deprived neighbourhoods have more impaired health than home owners in affluent neighbourhoods (1, 10, 36). Third, having trouble meeting financial obligations is at the core of socioeconomic inequality in objective and self-rated health (9, 37, 38).

Concerning gender differences in health, the present study shows no differences in perceived TGH between men and women. However, since men show more risky health behaviour and suffer significantly more from chronic diseases than women (4, 13), they might have been expected to perceive lower TGH than women. As we did not check for risky behaviour or chronic diseases, it is impossible to directly relate these findings to our results on perceived TGH. It might be speculated that good TGH can be perceived despite having a chronic disease, since other dimensions of health like daily functioning or quality of life might compensate for the impaired bodily function caused by the disease. Concerning risk behaviour, it might be speculated that men do not perceive their behaviour as risky but more as a social subjective norm which therefore does not influence their perception of TGH.

The determinant of household size not affecting perceived health confirms the results of a study suggesting a more social, hereditary component of SES negatively impacting health rather than family size (18).

Lastly, the determinant of labour market status might have been expected to affect perceived TGH, as unemployment or poor job satisfaction have detrimental effects on health (15–17). Our findings do not corroborate this expectation. However, being unemployed in general means less income and thus a higher likelihood of having difficulties meeting financial obligations. Hence, a possible explanation for perceived TGH being unaffected by the determinant of labour market status is that the determinant of having trouble meeting financial obligations is compensating for that. Besides, having a job is not a guarantee for health as such, but adequate payment for a job is (1, 39).

The third research question was about the extent to which the relationships between TGH, health determinants, and socioeconomic and demographic determinants differ between various groups of SES, distinguishing six instead of the traditional two groups of high and low SES. Our six-SES groups approach provided more detailed information than the traditional two-SES groups approach. It also produced more refined information on the similarities and differences between the SES groups. Similarities between all six groups could be found for impact of two additional physical health determinants of perceived TGH – bodily functions and daily functioning. The mean perceived TGH score did not differ between the four lowest SES groups, while these differed significantly from the mean perceived TGH score in the two highest SES groups. None of the socioeconomic and demographic determinants impacted perceived TGH in all the SES groups. The impact of all these health, socioeconomic and demographic determinants was contingent upon the specific SES group. There were different gestalts of the health dimensions and the socioeconomic and demographic variables, suggesting that health was perceived differently by each SES group. These findings on subjective SRH evaluation are in line with existing literature on the inequality of health defined in terms of the more objective health indicators by professionals: health is evaluated better as people's SES is higher (38, 40). In terms of the methodology applied, the finding that our subjective approach leads to a similar conclusion as the professionals' opinion used thus far is new to the existing literature. This corroborates the findings of Stronks et al. (2018) (33) showing differences between three levels of educational groups by conceptualising health using concept maps.

In general, it is important to emphasise that the six-SES group approach shows there is a gradient instead of a linear pattern in the magnitude of perceived TGH and its six health determinants across the six SES groups. The four lower SES groups (very low, low, mid-low and mid-high) did not differ from each other on perceived TGH score or the score on its six health determinants. However, all of these scores were significantly higher in the two highest SES groups (high and very high) than in the other four SES groups.

A similar three-step gradient seems to be present in the scores on the significant socioeconomic and demographic determinants in the six SES groups, as these determinants impacted perceived TGH the most in the very low SES group, less in the following three SES groups (low, mid-low, mid-high), and little in the high and very high SES groups.

The gradient instead of linear trend in the relationship between SES and health inequality has been reported in several studies (9, 11, 37, 41). By simply dichotomising SES at a median cut-off point, possible socioeconomic effects on perceived health might have been obscured though. More SES groups should be distinguished, also in order to develop more effective interventions to improve people's health.

The results of our study on the determinants of perceived TGH as a measure of SRH are not only in line with the existing literature, they also add to it on three accounts. First, perceived TGH and hence SRH were operationalised by elaborately scoring on 32 items corresponding not only to the physical and psychological dimensions but also to the social-societal, quality of life, meaningfulness and daily functioning dimensions. Instead of covering the 5-point scale used in the SHQOL and SF12 scores (9, 36, 42, 43) we covered the six health determinants, or dimensions as they are called in Huber's concept of positive health (28) .

Second, we calculated a six-level SES score based on factor analysis of gross family income and education instead of using a dichotomised SES score. In this way we corrected for the possibility that during the life course income can rise or fall regardless of educational level. As has been shown, detrimental life events like divorce or unemployment due to crises like the recession of the early 2000s or the current Covid-19 pandemic (19, 20, 44) can cause serious loss of income for the higher educated. On the other hand, there are successful high-SES entrepreneurs with low educational levels.

Third, we evidenced a nonlinear gradient in SES impacting perceived TGH and its six health determinants. With regard to possible health-promoting interventions to improve health or TGH and reduce the socioeconomic gap in health, our findings support the suggestion made by Stronks et al. (2018, pp. 8) (33) that 'the way health is conceptualized, challenges the legitimacy of policies that are based on a notion of health that resonates the conceptions that are valued in higher socioeconomic groups...'. Translated from policies to health-promoting interventions, this means that health-promoting interventions should be tailored to the way health is perceived and valued by the target population. More specifically, such customisation should be oriented towards the importance and magnitude of the six health dimensions perceived by the specific SES group being targeted. This topic will be elaborated upon below.

Implications of the significant relationships between TGH and the six health determinants in the six SES groups

From marketing literature, it is known that the combination of mean scores and importance is critical in making decisions and setting priorities about which changes should be made in marketing strategy, for instance to better meet customer needs (45). In this analogy, combining the *significant impact* of the evaluation of each of the six health dimensions on TGH in each SES group from Table 4 (importance scores based on standardized betas) with how high or low the evaluations are in each of the six SES groups from Table 3 (mean scores) yields the basis for setting priorities in potential interventions (Fig. 6).

Health inequality is shown by placing the very high SES group above and moving in roughly descending order to the lower left of the graph to very low SES. Some remarkable patterns do stand out. First, the importance score for evaluation of the significant health dimensions in the mid-high and high SES groups is rather low (i.e. placed more to the left of the graph) compared to the scores in the other lower SES groups. This indicates that health on these determinants is perceived the same but rated as more important by the lower SES groups and hence closer to their perception. Health-improving interventions aimed at daily functioning would therefore be more effective in the lowest three groups, whereas interventions aimed at bodily functions would yield a higher effect in the low and high SES groups.

Second, other significant dimensions are placed more to the upper left portion of the graph, indicating a smaller importance but still a rather high score on the evaluation itself. Determinants in this part are perceived as good-very good and of low(er) importance, meaning that interventions aimed at improving these determinants will have no to little effect in these SES groups.

Third, the middle portion of the graph shows a scattered pattern for the very low, low, mid-low and mid-high SES groups (it has been shown that these four – lower – SES groups are quite similar and differ significantly from the two higher SES groups). This indicates that perceived TGH was determined by different gestalts of the evaluation of the health dimensions and their importance to respondents from these four SES groups. These gestalts were different from those in the two higher SES groups. When aiming to reduce socioeconomic differences, mixed interventions targeting the determinants of bodily functions, daily functioning and quality of life would be indicated. The higher health-promoting effectiveness of applying an intervention mix has been shown in a study stimulating physical activity in prevocational secondary education (46).

Lastly, meaningfulness in the very low SES group was the only dimension with a negative impact on TGH, while the score was the lowest of all evaluations. As mentioned previously, this might suggest that people become aware of the psychological dimension of meaningfulness only when TGH is perceived as low, as was the case in the very low SES group. Further research is needed to gain more insight into this determinant affecting perceived TGH in the very low SES group.

In summary, in all six SES situations investigated the evaluation of daily functioning and bodily functions had a very large and positive impact on the evaluation of TGH. Given their high-importance score, these dimensions are the ones most determining equality or inequality in health. Also, quality of life often plays an important role. It appears that the evaluation of some health dimensions (i.e. mental functions and meaningfulness) did not have an impact on TGH in this sample. It may be that participants did not (yet) realise that these dimensions are also relevant in determining TGH. This study shows that different SES groups perceive different health determinants as important to their health, so there is no one-size-fits-all intervention. This could be the starting point for two approaches: to raise awareness in the SES groups for the importance of the other determinants participants do not (yet) perceive as important, and to apply health-promoting interventions matching the perceptions of the SES group. From a salutogenic and capability perspective, the latter might be preferred.

## Possible limitations and critical reflections

Whereas our study adds to current conceptions of health and its socioeconomic determinants, especially the importance of discriminating between more than two levels of SES, some critical reflections are in place.

First, as mentioned, there was a slight overrepresentation of higher-educated respondents in the whole sample that might have affected analysis and results. We were aware of this possible bias and corrected for it by calculating SES scores using a factor analysis diluting this relative educational disbalance. It is therefore unlikely for this disbalance to have affected the analysis and results.

Second, when forming SES groups using factor analysis, the number of respondents differed per SES group, and especially the low and mid-high SES groups have fewer respondents than the rest. We did account for that by meeting the rule that the number of respondents should be larger than the squared number of independent variables in our regression equations, which allowed our regression analysis.

## Abbreviations

SD = standard deviation

SES = socioeconomic status

SRH = self-rated health

TGH = total general health

WHO = World Health Organisation

## Declarations

### • Ethics approval and consent to participate:

It was judged that approval of a medical ethics committee was not mandatory for this research because participants did not undergo physical examination nor were bodily fluids or other medical data collected. Therefore, the Medical Research Involving Human Subjects Act does not apply to the current study. The Silverbrains Ethical Committee of de Silverbrains Board approved the research design and protocols for the data collection and analysis. The research was carried out in accordance with the rules and guidelines of the Dutch Market Research Organization (MOA) and the Dutch Policy Research Association (VBO) which are in line with the rules and guidelines of the European Association of Market Research (ESOMAR). The respondents voluntarily participated in the study; they are members of the RMI Internet panel. When RMI started their Internet panel years ago, all respondents agreed that they participated in this panel study and informed consent was obtained from all panel members (they all are 18 years or older). To encourage people to participate in studies, respondents receive a small fee of one euro for every completed questionnaire.

### • Consent for publications:

Not applicable.

### • Availability of data and materials:

The datasets used and/or analysed for the current study are available from the corresponding author upon reasonable request.

### • Competing interests:

The authors declare that they have no competing interests.

### • Funding:

Not applicable.

### • Authors' contribution:

Both authors contributed equally to this study. Prof. Kasper applied his expertise in marketing research, especially on the socioeconomic and demographic determinants of health, developed the questionnaire and collected the data. Prof. Dierx is an expert in health determinants and the concept of positive health, including theories on health inequalities. Close collaboration in the two areas of expertise revealed new insights into the complexity of socioeconomic inequality and health. Prof. Kasper prepared the figures and performed regression analysis, Prof. Dierx added One-way ANOVA analysis. Both authors wrote and reviewed the manuscript

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## Figures

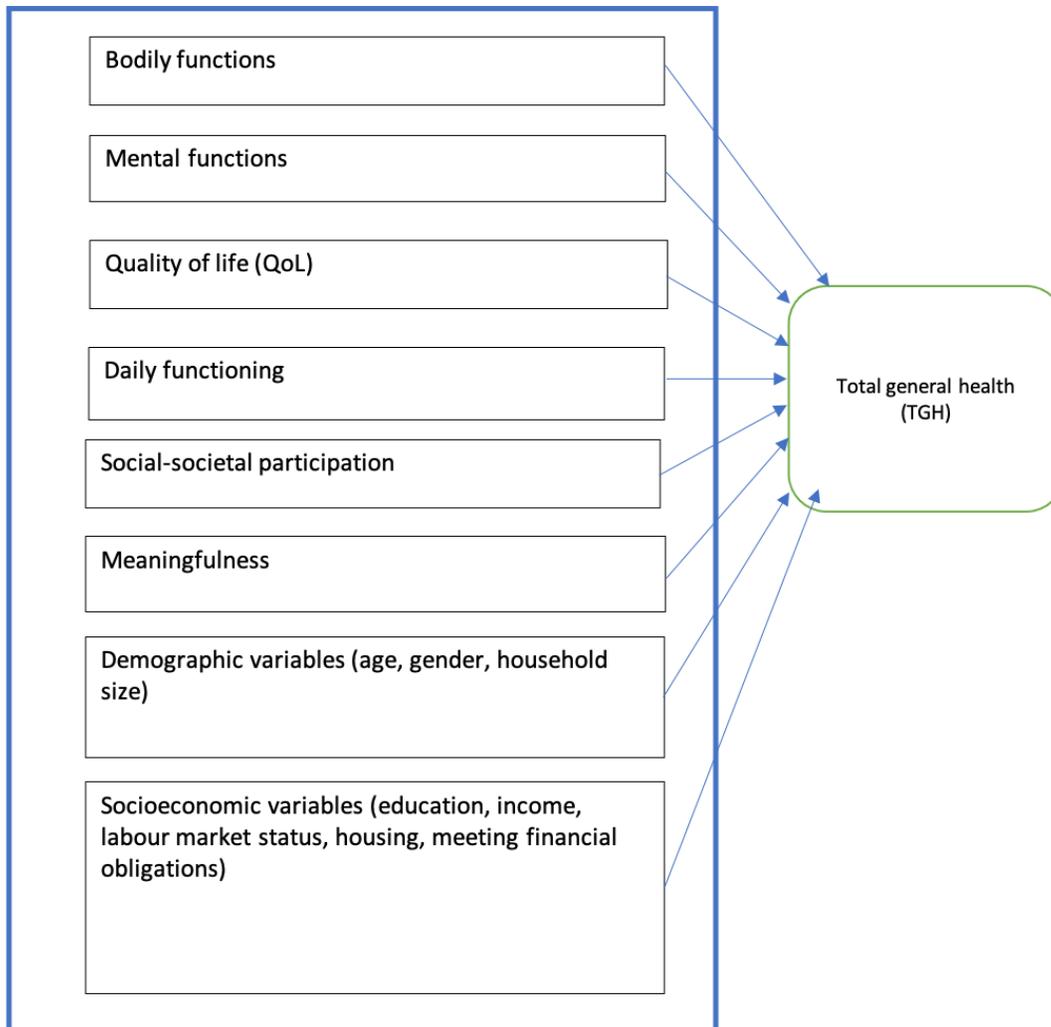


Figure 1

Research model

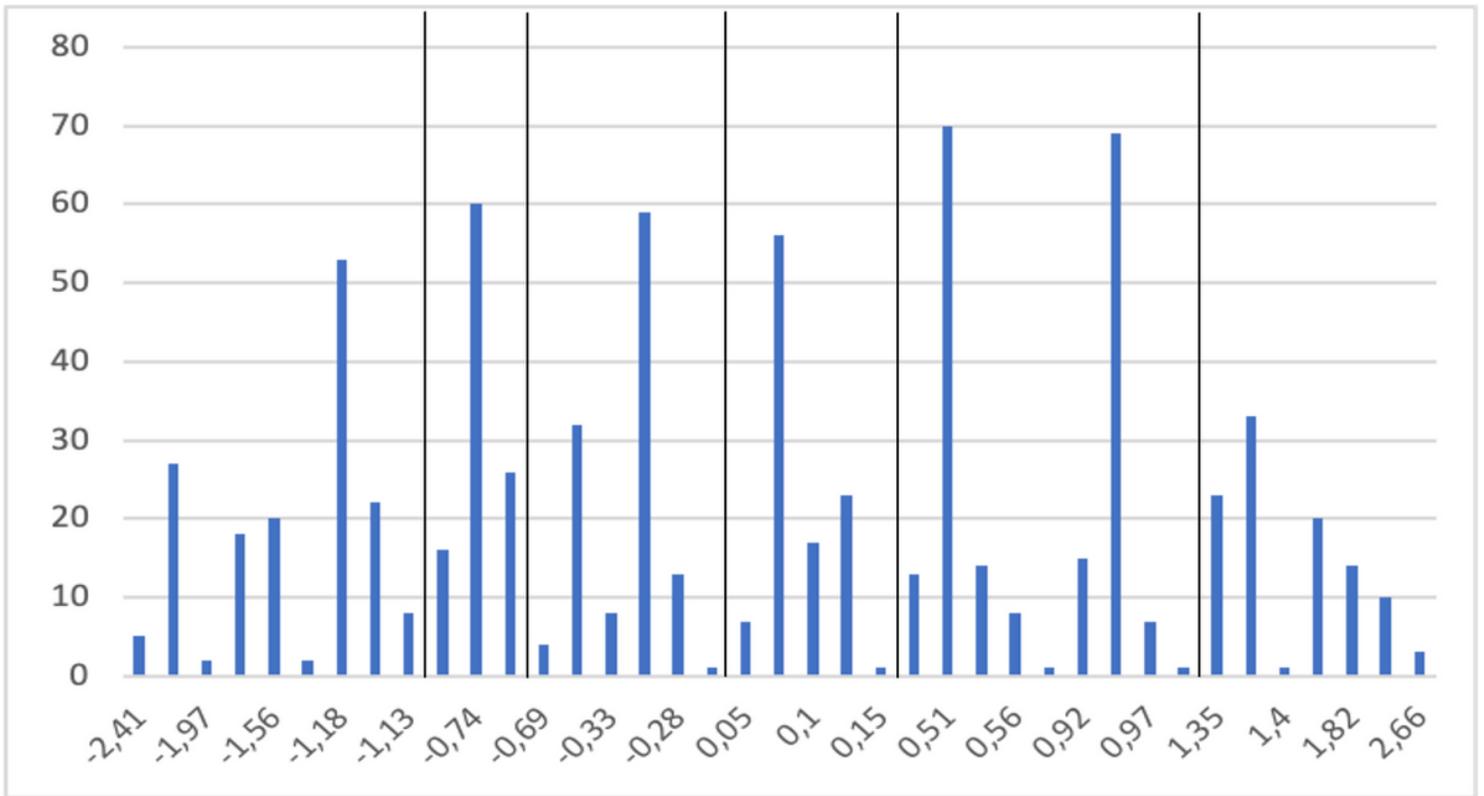


Figure 2

Distribution of individual SES scores

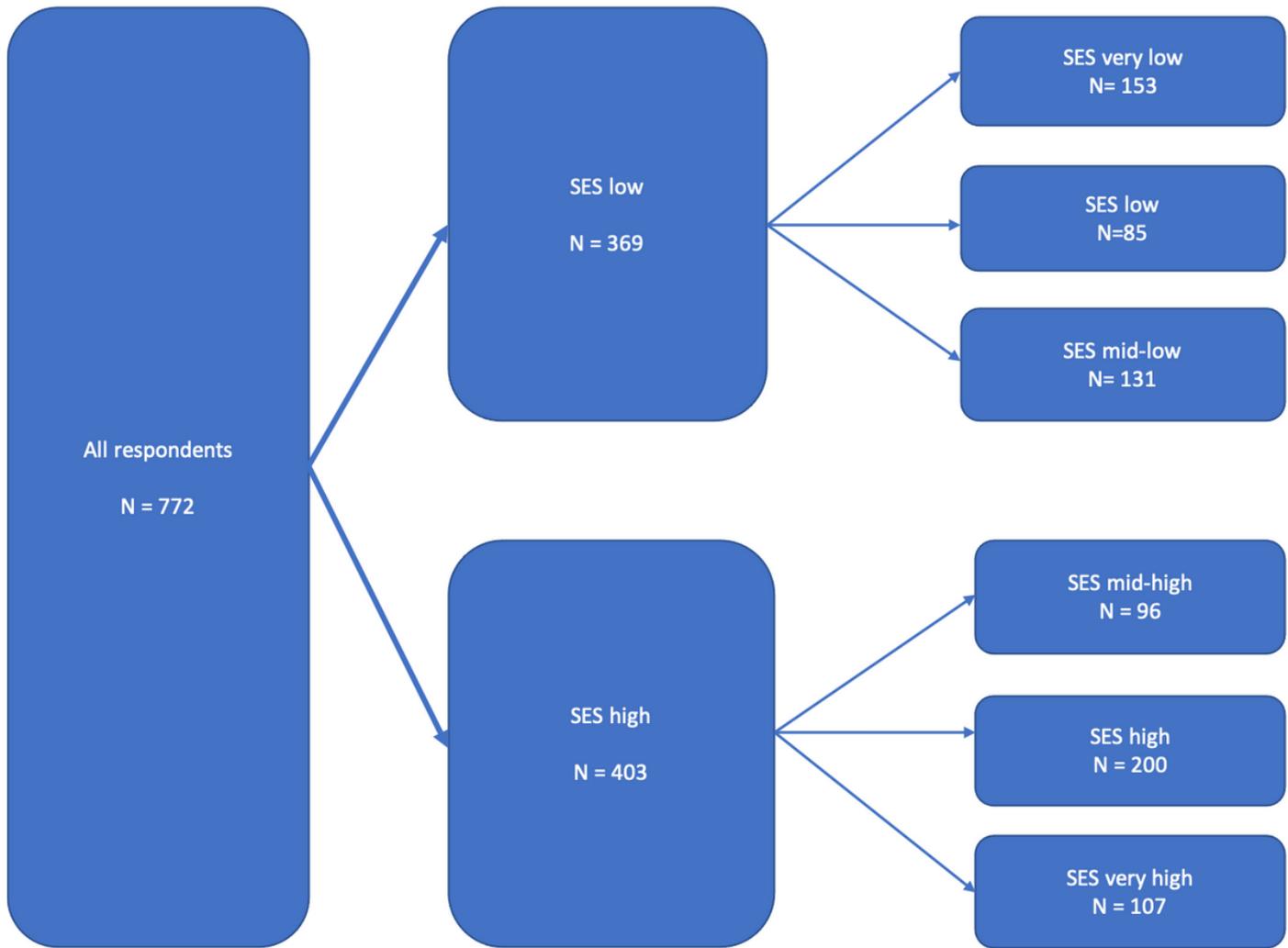


Figure 3

Structure of the analysis

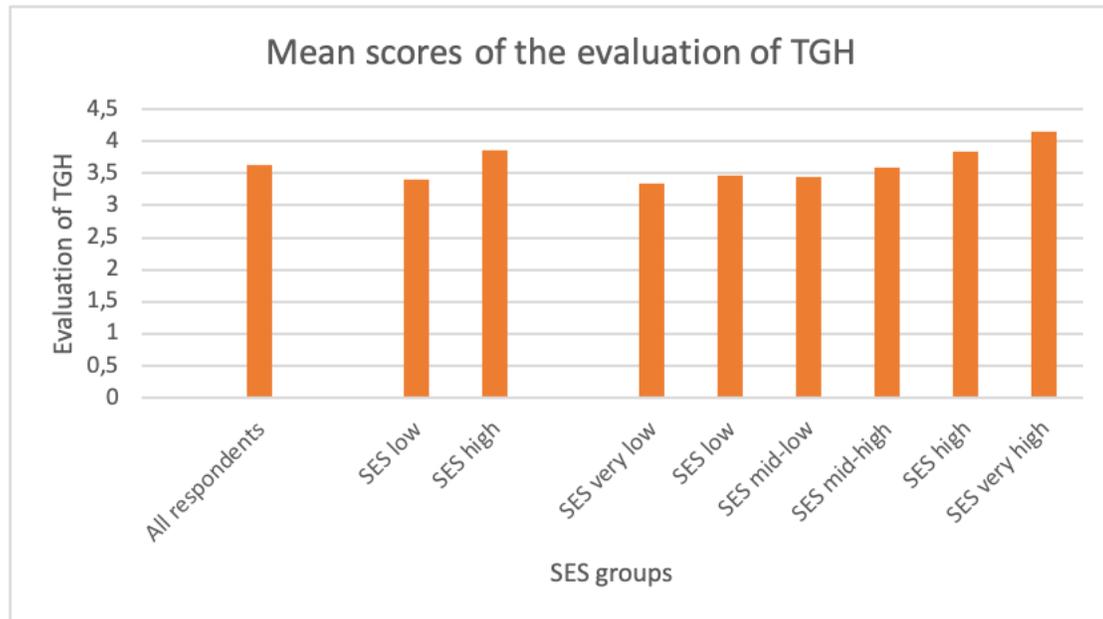


Figure 4

Mean scores of the evaluation of TGH

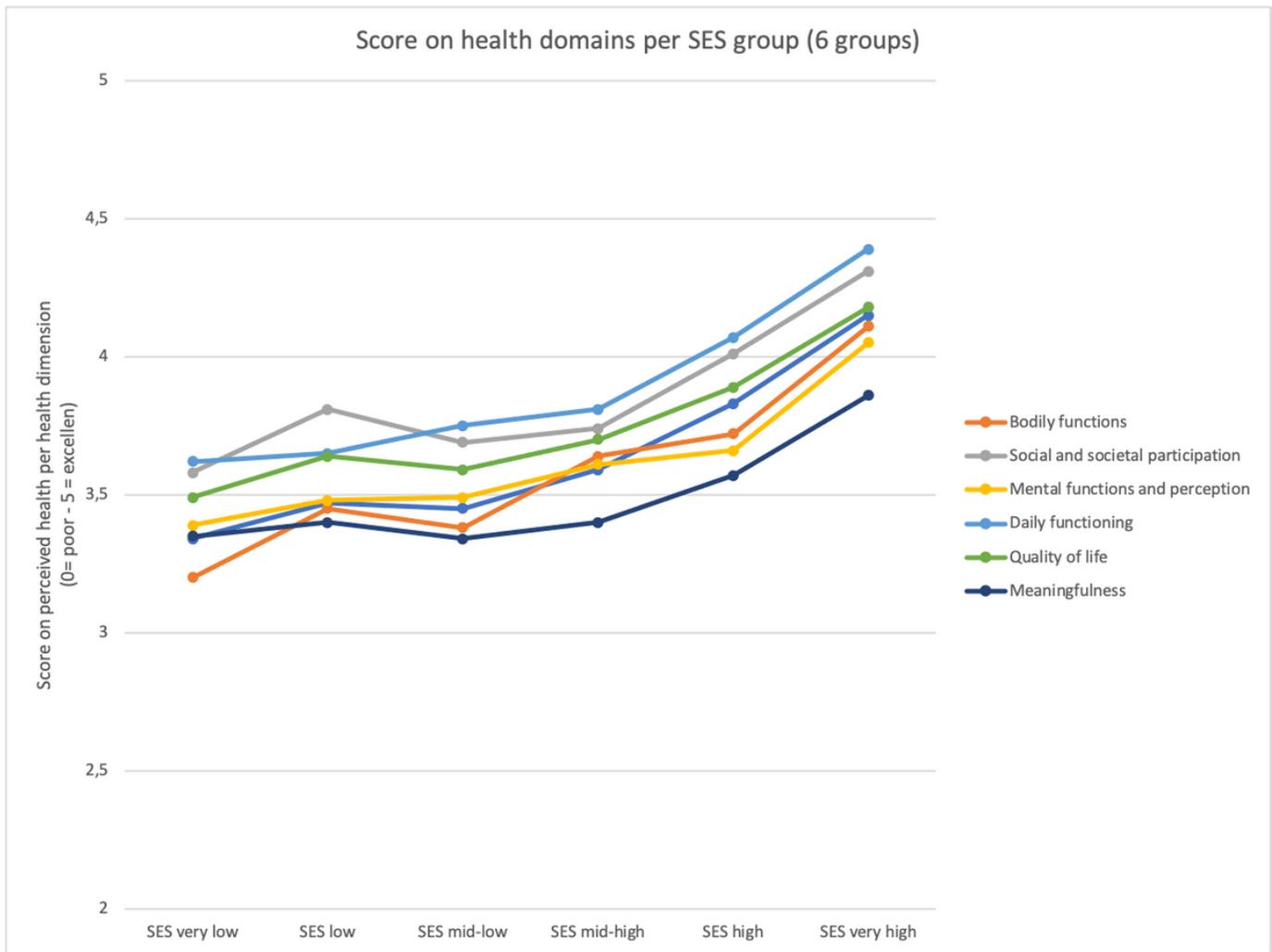


Figure 5

Score on perceived health per health dimension

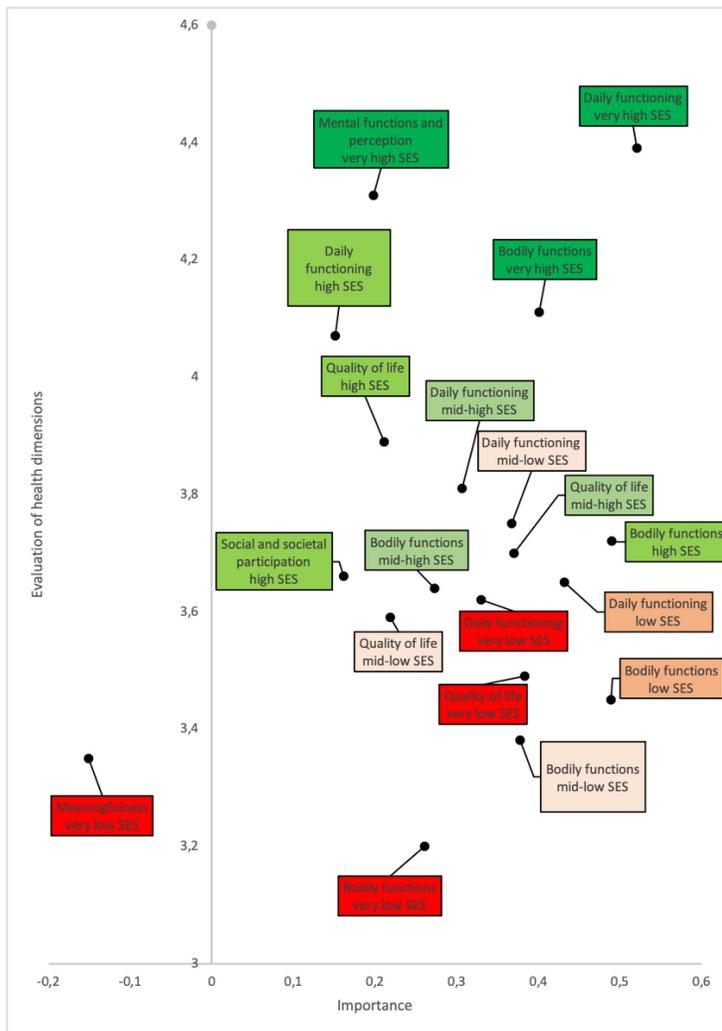


Figure 6

Significant importance and mean scores per health dimension for all six SES groups