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Health and economic scarcity: Measuring scarcity through consumption, income and home ownership indicators in Norway

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ABSTRACT

It is widely recognised that income alone may not accurately reflect people's economic circumstances. In recent years, there has been increasing focus on multidimensional measures of economic scarcity. This study employs the newest survey data from Consumption Research Norway to explore the relationship between economic scarcity and self-reported health (SRH) in Norway. It defines economic scarcity by identifying disadvantaged social groups in terms of consumption, income and wealth/homeownership. Using propensity score matching, we compare health outcomes for economically disadvantaged and advantaged social groups – finding that consumption measures of scarcity are significantly associated with health, while there is no significant relationship between health and homeownership. When using matching estimators, health scores differ significantly between people with higher and lower incomes, but the associations are weakened when other socioeconomic variables are controlled for. This study applies empirical evidence from Norway to the existing health literature and contributes to a relatively new analytical approach by incorporating consumption into the prediction of health outcomes.

1. Introduction

In recent years, consumption-based indicators have become increasingly central to debates on poverty, life quality and health. Consumption has been recognised as a better measure of a household's economic situation than income, especially for households with few resources (Attanasio & Pistaferri, 2016; Deaton, 1992; Meyer & Sullivan, 2003). One advantage of using consumption is that it not only captures the objective aspect of the economic condition, but also involves a social and comparative component, which accounts for deprivation that is disproportionate to resource. In other words, it reflects the health outcomes for those who have lower levels of resources than the majority of society (Townsend, 1979). Therefore, by focusing on comparative levels of living standards, studies using consumption-based indicators can incorporate objective economic situations with subjective wellbeing under certain cultural and structural circumstances (Townsend, 1979).

Conceptualising the term 'economic scarcity', we aim to capture broader aspects of socioeconomic marginalisation in this paper. We combine objective economic conditions, such as income and wealth, with consumption to reflect on relative deprivation and socially defined poverty. Using the 2019 Norwegian Deprivation Survey, this research

explores *whether economic scarcity, measured by consumption, income and wealth, is associated with health in Norway*. It also compares the coefficient sizes of the three measures, attempting to determine *which of the economic components are more important for the health of the economically disadvantaged: income, wealth or consumption*.

This study contributes to the existing literature on the relationship between economic conditions and health by including consumption in the analysis of health, alongside traditional measures of income and wealth. By comparing different measures of scarcity, the research provides a more comprehensive picture of the economically disadvantaged and their health in Norway.

2. Theories

2.1. Economic scarcity

Economists have defined scarcity as a long-term shortage of natural resources, which occurs when a need is not satisfied (Christiansen, 1998; Norgaard, 1990). Economists often examine scarcity based on supply and demand analyses, emphasising individual rational choices. The term is much used in studies of economic growth, technological substitutions and labour and capital changes for extracting resources (Barbier, 2013;

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Howe, 1979).

A broader sociological definition of scarcity may embrace multidimensional understandings of economic hardship –incorporating objective economic resources of income and wealth with available consumption resources in certain customs and social activities. By looking at income and wealth, scarcity may be examined among those at the minimum income level adequate for living or those lacking sufficient purchasing power for their daily needs. By focusing on social custom and activities, we can capture a wider range of social groups that are, not only economically disadvantaged, but also socially excluded.

This study defines economic scarcity as the perception that one has fewer economic resources than required, as based on the majority valuation in society. Both this perception and this valuation focus on those who ‘lack the resources to obtain the types of diet, participate in the activities, and have the living conditions and amenities which are customary, or at least widely encouraged or approved, in the societies to which they belong’ (Townsend, 1979, p. 31). They amplify a person’s resource scarcity in comparison to a broader notion of living style and convey consumption types that express normative deprivation.

2.2. Scarcity and health

Research on economic scarcity and health has been dominated by three approaches, all of which incorporate socioeconomic status into the analysis. The neo-material approach stresses the impact of material access and economic resources on health and often measures an individual’s objective economic position by education, occupation, absolute income and wealth (Gravelle, 1998; Lynch et al., 2004; Rodgers, 2002). The social psychological approach underlines that people’s subjective economic status plays an important role in health (Lundberg, Åberg Yngwe, Kölegård Stjärne, Björk, & Fritzell, 2008; Subramanian & Kawachi, 2004; Wilkinson & Pickett, 2017). Such studies often use measures of relative income or inequality to analyse health. Accordingly, unequal societies face problems, such as low social status, poor social cohesion and harmful health behaviours (Marmot & Wilkinson, 2001; Pickett & Wilkinson, 2015).

The relative deprivation approach can be distinguished from the first two by its focus on relatively disadvantaged social groups. Embodying elements of both income and expenditure, consumption is central for these studies. Scholars research affordability within various types of custom and social activities and often use deprivation indexes based on customary amenities and activities, selected according to lifestyles and social contexts (see, e.g., Saunders, Naidoo, & Griffiths, 2008; Townsend, 1979). Consumption requires an objective, material basis. This is especially important for a person’s health when considering life necessities (food, clothes, living, etc.) and living conditions (Case & Deaton, 2003; Meyer & Sullivan, 2003). Insufficient resources can produce a certain pattern of thoughts, behaviours and priorities called the ‘scarcity mindset’. It may affect decision-making processes by placing increased attention on the scarce resource but, at the same time, neglecting other information and reducing mental bandwidth (Mullainathan & Shafir, 2013). Relative deprivation may also lead to mental illness due to feelings of shame and stress (Chase & Walker, 2015; Gubrium, 2015; Wilkinson, 2006). For example, the emerging literature on poverty and shame has demonstrated a vicious circle of lowered self-esteem, reduced capacity and fewer possibilities to change one’s economic situation (Gubrium, 2015). Being deprived can lead to social exclusion and a sense of shame. It may also cause mental health problems. In turn, mental illness reduces a person’s capability to participate in the labour market and social life, which reinforces material deprivation and social exclusion.

All three perspectives have a common denominator of resources, ‘by which people can control and consciously direct the conditions of life, and as such they are all likely to be of vital importance to health’ (Lundberg et al., 2008, p. 74). As it embeds deprivation, low levels of income/wealth and the inability to participate in consumer society,

economic scarcity is, therefore, an important factor in people’s health outcomes.

3. Previous literature and research hypotheses

3.1. Income and health hypothesis

In health inequality studies, income is often used to indicate social position and stratification. Income affects economic position and material conditions, which, combined, contribute to exclusion and poor health (Lundberg et al., 2008; Subramanian & Kawachi, 2006). This relationship between income and health has been widely confirmed. Researchers have long noted a positive correlation between income and both physical and psychological health (Feinstein, 1993; Kessler & Neighbors, 1986; Lynch et al., 2004; Marmot, 2002). Even for more egalitarian countries with higher degrees of income redistribution, mortality still declines rapidly among those with high income (Kinge et al., 2019; Mortensen et al., 2016).

Furthermore, the socioeconomic context can explain both mortality and economic inequality (Elstad, 2011; Lundberg et al., 2008; O’Donnell, van Doorslaer, & van Ourti, 2013). Poorer health is associated with living alone, being unemployed, being a single parent, having a disability, experiencing reduced labour market participation and receiving financial support (social assistance) (With, 2017). Studies also debate whether there is a causal relationship between income and health. For example, Mackenbach and de Jong (2018) discuss the possibilities of reverse causation and confounding variables when examining the relationship between income and health. They suggest that assessing causal effect requires both experimental and quasi-experimental studies.

Low income is, in itself, a risk factor for developing mental health problems. It reduces people’s chances of labour market participation and limits their ability to maintain social contacts (Langeland, Furuberg, & Lima, 2017). People with low income are also excluded from various social arenas because they cannot afford to participate in social activities, which further impairs their psychological wellbeing. This may aggravate health problems, and individuals can become trapped in a vulnerable situation.

Therefore, we expect lower income to be negatively associated with health: *H1. Economic scarcity, measured by low income, correlates with health problems in Norway.*

3.2. Wealth and health hypothesis

Wealth often has a stronger impact on health than low income because people can use wealth as a buffer when losing income. Researchers argue that health studies should include wealth as an important indicator for socioeconomic position (Pollack et al., 2007). However, wealth is often difficult to measure because it is hard to assess individuals’ or households’ total financial resources over their lifetimes (Pollack et al., 2007). Nevertheless, in wealth studies, the concept of wealth based on assets or property has become increasingly central (Doling & Ronald, 2010; Mathä, Porpiglia, & Ziegelmeyer, 2017; O’mahony & Overton, 2015). Homeownership, reflecting material living standards and cumulative household wealth, is often used as an indicator of socioeconomic circumstances and has been recognised as one of the most important forms of family wealth (Kurz and Blossfeld, 2004; Shapiro, 2006; Öst, 2012). In the US, homeownership has become the most important contributor to household wealth (Eggleston & Munk, 2015). Non-ownership strongly correlates with economic marginalisation; few renting households can afford homeownership without falling into poverty (Bourassa, 1996; Dewilde & Raeymaeckers, 2008).

Homeownership increases intergenerational wealth transfer and becomes more important for people’s life satisfaction and health (Elsinga, 2008; Hohm, 1983; Mathä et al., 2017; Nettleton & Burrows, 1998). Renters in Finland have been shown to have higher mortality

than owners, after controlling for income, occupation and education (Laaksonen, Martikainen, Nihtilä, Rahkonen, & Lahelema, 2008). In the UK, housing tenure significantly relates to self-reported health (SRH), general health status, anxiety, depression and limited longstanding illness (Ellaway, Macdonald, & Kearns, 2016; Munford, Fichera, & Sutton, 2017). This is because homeownership can give people a sense of control, autonomy and physical and emotional security (Chapman, 2013; Elsinga, 2008). It also allows people to improve their housing conditions, such as temperature and humidity, which are health-related.

However, people living with economic hardship often cannot afford to own their homes. While the market value of housing wealth represents about two-thirds of Norwegian household financial wealth (Grindaker, 2018; Statistics Norway, 2017), less than half of low-income households in Norway own their own homes, and the proportion of homeowners among low-income groups and welfare recipients has declined in recent years (Revolv, 2019).

This leads to our second hypothesis: *H2. Economic scarcity of wealth, measured by non-ownership, is associated with health problems in Norway.*

3.3. Consumption and health hypothesis

Levels of expenditure and consumption do not always reflect a person's level of income or wealth. According to the Deaton Paradox, a reduction in income does not cause a corresponding reduction in consumption (Deaton, 1992). Consumption involves several dimensions. First, it has a *material aspect*. The economic situation is related to the level of utility and consumption of commodities. Consumption takes expenditure into account, and considers the cost to a household of reaching a certain level of utility at prevailing prices (Kus, Nolan, & Whelan, 2016; Ravallion, 1998). This is particularly relevant when studying the most economically disadvantaged groups, where material deprivation often has a direct, negative effect on health (Ravallion, 2016).

Second, consumption has *social aspects*, which are manifested in cultural values, norms and inclusion/exclusion (Croghan, Griffin, Hunter, & Phoenix, 2006). Research shows that children and adolescents in low-income families participate less in important social events and arenas, such as kindergarten, before- and after-school programmes and leisure activities (Fløtten, Hansen, Grødem, Grønningsæter, & Nielse, 2011). In this way, consumption may be particularly important for individuals' psychological health.

Third, people may increase their *indebtedness* to maintain or improve their standards of living. Many who struggle with their financial situation must borrow to pay for their daily expenses (Kempson & Poppe, 2018). International research has linked insolvency problems to physical disability and chronic health conditions, obesity and health-related behaviours, such as smoking and drinking (Clayton, Liñares-Zegarra, & Wilson, 2015; Drentea & Lavrakas, 2000). In Sweden, scholars have observed a strong connection between insolvency and mental health problems, such as depression, anxiety and general mental illness (Holmgren, Sundström, Levinsson, & Ahlström, 2019). In both Sweden and Finland, the rate of suicide attempts among the over-indebted is more than five times higher than that in the overall population (Ahlström, Edström, & Savemark, 2014; Hintikka et al., 1998).

Therefore, the consumption-related aspects of economic scarcity might negatively influence health. This leads to the third hypothesis: *H3. Economic scarcity, measured by consumption indicators of deprivation, exclusion and insolvency problems, is strongly and negatively correlated with health.*

3.4. Comparing income, wealth and consumption

Although the relationship between income, wealth and health is fairly solid (see, e.g., Deaton, 2008; Easterlin, Angelescu McVey, Switek, Sawangfa, & Zweig, 2011), scholars have shown that the effects of income on illness become non-significant in people with severe economic

problems, such as those who are over-indebted (Drentea & Reynolds, 2012). Furthermore, disposable income does not differ between those in debt and those not in debt, and psychological factors are more important determinants of economic vulnerability (Livingstone & Lunt, 1992). Similarly, when exploring the reasons for mental disorders among poor people, the correlation between lower income and mental illnesses is often mediated by consumer debt (Jenkins et al., 2008).

Consumption-based economic hardship may have a stronger association with health than do income and wealth. First, it is irrelevant to examine income levels for the poorest, especially when considering the unemployed. Second, income and wealth may play a less important role in health among countries that provide more generous welfare support, such as minimum wages, unemployment benefits and universal healthcare coverage. Third, being excluded may be more strongly associated with psychological health. One example concerns the custom of drinking tea in Britain (Townsend, 1979). Tea has little nutritional value but is psychologically necessary in Britain due to social customs. It contributes to a person's recognition and maintenance of social relationships. Therefore, it is important to separate physical needs from social and psychological needs. This leads to our fourth hypothesis: *H4. The coefficient size of consumption on health is larger than that of income and homeownership.*

4. Data and methods

4.1. Data and variable

This study uses the latest Deprivation Survey from Consumption Research Norway. The data were collected in July 2019, and respondents were selected from the Kantar Gallup Panel, which consists of individuals over 15 years of age, randomly recruited from the Norwegian population. Invitations to participate in the survey were sent to participants via an e-mail containing a link to the online survey. 2312 individuals responded to the survey, representing a 48% response rate. The dropout rate did not differ significantly for those among other Gallup surveys, which have an average dropout rate of 50%.

The survey consisted of questions that map consumption-related deprivation, household insolvency problems, SRH and information about particular life-events in the household, such as loss of a partner, divorce, sudden illness, etc. Households' and individuals' socio-economic backgrounds were also included and were based on the panel information from Gallup. The sample for data analysis was made up of 2045 individuals aged 18–89.

The dependent variable in this study is *self-reported health* (SRH). SRH is one of the most widely used indicators for measuring health. Although it may not be suitable for comparative studies of aggregate health between countries, it is still valid for a within-country comparison (Haddock et al., 2006; Kuhn, Rahman, & Menken, 2006; Subramanian, Huijts, & Avendano, 2010). Scholars have found that SRH strongly correlates with objective health status, and the prevalence of all diseases is associated with poorer SRH (Franks, Gold, & Fiscella, 2003; Wu et al., 2013). Therefore, the reliability of SRH is as good as, or even better than, that of more specific health questions (Lundberg & Manderbacka, 1996).

SRH is often rated on a five-point scale ranging from poor to excellent health (Hays, Sherbourne, & Mazel, 1993). Some researchers have also measured health on a scale from 0 to 100 (Gholami, Jahromi, Zarei, & Dehghan, 2013; Meng, Xie, & Zhang, 2014) or from 0 to 10 (Vlot-van Anrooij, Tobi, Hilgenkamp, Leusink, & Naaldenberg, 2018). In the Deprivation Survey, respondents were asked: 'How would you rate your health today?' The scale ranged from 0 to 10, where 0 denoted the poorest health and 10 denoted the best health.

The main intervention or treatment in this study is economic scarcity, measured by 1) consumption, 2) income and 3) homeownership.

To measure economic scarcity based on consumption, three indicators were developed: material deprivation, social exclusion and

insolvency problems. The conceptualisations of material deprivation and social exclusion were adapted from Wong, Saunders, Ping Wong, Chan, and Chua (2012), who defines deprivation and exclusion by mapping items of consumption. A list of 24 material items and 16 social activities was drawn up based on the Norwegian Reference Budget for Consumer Expenditures. Three follow-up questions were asked: 1) 'Is the following item/activity essential for everyone in Norway?'; 2) 'Do you have/do it?'; and 3) 'If not, is this because you cannot afford it?'

If less than 50% of the respondents regarded an item as essential, the item is considered unimportant and was excluded from further operations. Respondents were defined as being relatively *deprived* if they could not afford two or more material items and relatively *excluded* if they did not have access to two or more social activities because they could afford them. See Bakkeli and Borgeraas (2019) and Appendix 1 for detailed information about items included in the survey and about the criteria used to identify the deprivation/exclusion thresholds. *Insolvency problems* were identified by the question: 'In the past 12 months, how often did your household have trouble paying rent or your mortgage on the final due date?' Those who chose the options 'always', 'often' or 'sometimes' were defined as having insolvency problems.

The survey contained information about both households' and individuals' gross *income*. The income variables were drawn from Gallup's background variables, which were reported by the respondents and recorded in Norwegian kroner (NOK) in discrete income intervals. To make the indicators comparable, the researchers also used dummy variables for income. The treatment group, defined as relatively poor, had a household income below NOK 400,000 (or an individual income below NOK 300,000 for a robustness check) and made up approximately 10% of the sample.

Homeownership, which was also used to approximate wealth, distinguished between owners and renters based on ownership of their current homes. The treatment group comprised those who rented their homes.

Other covariates included *age* (18–84), *gender* (female = 1), *household size* (1–5), *education*, *work situation*, and *type of household*. See Table 1 for descriptive statistics.

4.2. Methods

The study used propensity score matching methods to estimate the association between economic scarcity (the intervention or treatment) and SRH. In the social sciences, it is generally impossible to randomly assign units to the treatment condition or the control condition. Such data may suffer from selection bias, since people who receive the treatment may have different characteristics from those in the control condition (Morgan & Winship, 2007).

In our case, the sample of economically disadvantaged and non-disadvantaged people differed, not only with respect to economic resources, but also with respect to other circumstances that could influence health. The treatment and control groups were, therefore, imbalanced; they were differently composed according to their economic situations and various other relevant characteristics.

By employing the matching method, we reduce this imbalance by constructing a matched control sample corresponding as closely as possible to the sample of economically disadvantaged people with respect to all relevant covariates. Ideally, this would result in two very similar samples, with the only difference being that people in the treatment group were economically disadvantaged, while those in the control group were not. Therefore, matching can to a large degree eliminate the confounding effect (Morgan & Winship, 2007; Rosenbaum & Rubin, 1985). However, the problem of unobserved heterogeneity is universal to propensity scores, and there was uncertainty about the level at which the selection bias was eliminated from the estimation of the treatment effect. As it ensured equal distribution of the measured variables for the control and treatment groups, the matching method did not capture all unmeasured confounders. Therefore, although the method is useful for observational data, we need to be cautious when making a

Table 1
Descriptive statistics.

Variables	N	Mean (sd)	Min/ max	SRH(x = 1)
Outcome variable				
Self-reported health	1996	7.29 (2.04)	0/10	
Treatment				
Deprivation	2017	.184 (.388)	0/1	6.31 (2.23)
Exclusion	2027	.187 (.390)	0/1	6.36 (2.22)
Insolvency	1918	.095 (.293)	0/1	5.98 (2.21)
Low income	1412	.100 (.299)	0/1	6.77 (2.23)
Non-ownership	1648	.139 (.346)	0/1	6.91 (2.12)
Individual traits				
Age (18–84)	2045	47.41 (17.08)	18/84	
Gender (women = 1)	2045	.496 (.500)	0/1	7.39 (2.05)
Household size (1–5)	2045	2.39 (1.17)	1/5	
Education				
Primary & lower secondary	115	.057 (.231)	0/1	6.84 (2.19)
Upper secondary (general)	240	.124 (.330)	0/1	7.09 (2.14)
Upper second. (Vocational)	263	.130 (.336)	0/1	6.96 (2.19)
Tertiary vocational	184	.087 (.282)	0/1	6.82 (2.07)
University/college (≤4 years)	699	.341 (.474)	0/1	7.38 (1.99)
University/college (>5 years)	544	.261 (.439)	0/1	7.67 (1.83)
Household information				
Couple without children	806	.364 (.482)	0/1	7.42 (1.96)
Couple with child(ren)	482	.243 (.429)	0/1	7.31 (2.02)
Single parent	80	.040 (.196)	0/1	6.86 (2.23)
Living with parents	103	.064 (.245)	0/1	7.48 (1.89)
Living alone	470	.227 (.419)	0/1	6.95 (2.14)
Shared accommodation	84	.051 (.220)	0/1	7.81 (1.95)
Other	20	.010 (.101)	0/1	7.36 (2.17)
Employment situation				
Full-time employment	1011	.511 (.500)	0/1	7.60 (1.82)
Part-time employment	178	.090 (.287)	0/1	7.21 (2.05)
Self-employed	73	.035 (.184)	0/1	7.43 (2.15)
Old age pensioner	431	.171 (.376)	0/1	7.22 (2.02)
Unemployed/unempl. benefit	37	.020 (.140)	0/1	6.16 (2.66)
Other types of welf. benefit	130	.060 (.237)	0/1	4.62 (1.88)
Student	150	.095 (.297)	0/1	7.81 (1.54)
Homemaker	10	.005 (.069)	0/1	7.15 (3.03)
Other	25	.013 (.114)	0/1	6.13 (2.41)
Income variables				
Household income				
< NOK 200,000	48	.042 (.201)	0/1	7.42 (2.12)
NOK 200,000–399,999	75	.057 (.232)	0/1	6.31 (2.20)
NOK 400,000–599,999	202	.144 (.351)	0/1	6.99 (2.16)
NOK 600,000–799,999	263	.180 (.384)	0/1	7.19 (1.98)
NOK 800,000–999,999	309	.212 (.409)	0/1	7.43 (1.94)
NOK 1,000,000–1,199,999	242	.171 (.377)	0/1	7.77 (1.74)
NOK 1,200,000–1,399,999	125	.089 (.284)	0/1	7.72 (1.73)
≥ NOK 1,400,000	148	.106 (.308)	0/1	7.91 (1.76)
Individual income				
< NOK 200,000	216	.137 (.344)	0/1	7.51 (1.96)
NOK 200,000–299,999	175	.093 (.290)	0/1	6.48 (2.33)
NOK 300,000–399,999	285	.142 (.349)	0/1	6.72 (2.30)
NOK 400,000–499,999	415	.216 (.411)	0/1	7.27 (2.06)
NOK 500,000–599,999	344	.182 (.386)	0/1	7.58 (1.73)
NOK 600,000–699,999	193	.101 (.302)	0/1	7.71 (1.88)
NOK 700,000–799,999	90	.048 (.215)	0/1	7.88 (1.58)
NOK 800,000–999,999	83	.044 (.205)	0/1	7.56 (1.71)
≥ NOK 1,000,000	69	.037 (.189)	0/1	7.77 (1.73)

causal conclusion (Elstad & Pedersen, 2012; Morgan & Winship, 2007; Rubin, 2001).

The analytical procedure was rather straightforward. First, we selected covariates to estimate propensity scores for the treatment variables. Five different samples were constructed based on the five indicators/treatments: 1) deprivation, 2) exclusion, 3) insolvency, 4) relatively poor and 5) homeownership.

The propensity score was also the probability of treatment assignment, conditional on observed covariates: $e_i = \Pr(D_i = 1|X_i)$. To estimate propensity scores, logit models were used:

$$\text{logit}(\Pr(D_i = 1|X_i)) = \beta_0 + \sum_{i=1}^k \beta_i X_i,$$

where D_i represented the treatment variables, and each of the treatments was predicted by a different set of k covariates, X_1, \dots, X_k .

Next, we assessed the common support for the propensity scores, carefully tested the balance of the covariate distribution and examined selection bias by approaching standardised biases and bias reduction. Standardised differences were assessed by calculating the mean difference in the covariate between the treatment conditions:

$$d = \frac{|\bar{m}_{t(x_k)} - \bar{m}_{c(x_k)}|}{\sqrt{(s_{t(x_k)}^2 + s_{c(x_k)}^2)/2}}$$

where \bar{m}_t and \bar{m}_c were the sample means of covariates for all cases in the treatment and control groups, respectively, and s_t and s_c were the standard deviations (SDs) for the treatment and control groups, respectively.

Each of the five indicators had a separate, matching sample constructed by a different set of covariates. By examining the balance for each variable included in the matching samples, that the control and treatment groups were equally distributed across all the measured matching variables. Balance was achieved by performing t-tests to compare the groups and determine whether, and to what extent, biases were reduced. For each of the covariates selected to construct the matching samples, we ensure that the means of the treatment and control groups did not differ significantly and that the bias was less than 5%. The covariates included in each of the sample constructions are given in [Appendix 2 \(Table A2a\)](#).

When the matched samples were proven to be balanced, we employed matching methods to estimate the average treatment effects among the treatment group. Nearest neighbour matching was used to match each case in treatment group i with a case in control group j based on the closest absolute distance between their propensity scores: $d(i,j) = |l_{xi} - l_{xj}|$. Other matching methods included Kernel, stratification and caliper matching. The caliper bandwidth for different treatments was estimated by $b = .25 \times s_{p(x)}$, where $s_{p(x)}$ was the SD of the matching variable x . For all matching estimations, the standard errors were obtained by bootstrapping 1000 repetitions.

Additional robustness checks included the inverse probability of treatment weighting with regression adjustment (IPTWRA) combined with Wooldridge’s double-robust estimators. This was done to estimate the average treatment effect across the treatment group. We also checked estimations by combining a regression model with weighting using the propensity scores.

5. Results

[Appendix 2](#) shows the sample distribution of propensity scores before and after matching. For each of the five indicators, overlapping between the treatment and control groups is evident after matching ([Fig. A.2a](#)). When looking at the standardised differences in key baseline characteristics for the unmatched and matched datasets, the biases are clearly reduced ([Fig. A.2b](#)). This was consistent with the statistics of Rubin’s B, which measured the absolute standardised differences of the means for the linear index of the propensity score between the treated and matched control groups. [Rubin \(2001\)](#) suggests that a sample is sufficiently balanced when this value is lower than 0.25. For all five measures of economic scarcity in our study, the Rubin’s B was below 0.25, indicating balanced differences in covariates ([Table A2b](#)).

[Table 2](#) shows the results based on different matching methods. The columns represent different estimation techniques to predict the associations between the five indicators and health. For example, using nearest neighbour matching, the health score was reduced by 0.78 on a scale from 0 to 10 when comparing the deprived with the non-deprived.

The coefficient size was a little larger when using Kernel matching (−0.99), stratification matching (−0.90) and IPTWRA estimation (−0.90), but the estimators did not vary much from each other. The estimations for exclusion varied from −0.72 to −0.84, indicating a trend similar to that found using deprivation measurement. For people with insolvency problems, the difference was particularly large; their health was more than one score lower than those who did not have insolvency problems.

Health differences between lower and higher income groups were also statistically significant. The health of people with relatively low income was 0.43 scores lower than that of higher income groups using nearest neighbour matching. When employing caliper matching, the predicted health differences between lower and higher income groups were notably larger than when using other estimation methods. In this case, SRH was one score lower for people with lower income.

It is worth noting that we have checked the robustness of the income indicator by using different cut-off points between the relatively low- and high-income groups. The same procedure was also performed using individual income instead of household income. The results were very similar, both in terms of significance levels and coefficient sizes (not shown).

Finally, using Kernel matching, stratification matching and IPTWRA, home renters were estimated to have about 0.44 points poorer health than homeowners on a scale from 0 to 10. However, when estimated using nearest neighbour matching and caliper matching, health did not differ significantly between owners and renters. Therefore, it cannot be concluded that there was a robust association between homeownership and health scores.

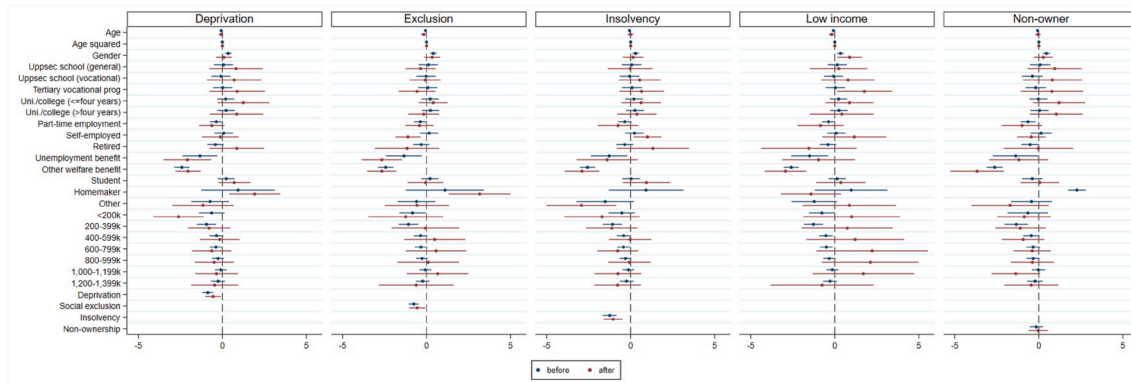
A more direct way of interpreting the result was to convert the estimations into percentage changes compared to average health. For example, when considering the deprived, the excluded, the insolvent, the poorer and home renters, their respective health scores were 10.72, 11.56, 18.81, 5.95 and 3.04% lower than average health, based on the nearest neighbour matching estimations. The bottom row in [Table 2](#) shows z-scores for Wooldridge’s double-robust estimators. These were calculated to make the estimators comparable across indicators. Coefficient sizes fell as follows: insolvency problems (−7.0), deprivation (−5.3), exclusion (−3.7), low income (−2.6) and non-owners (−2.1). Consumption-based indicators clearly had stronger associations with health than did income and ownership.

A common practice is to include socioeconomic background as a control variable when examining the relationship between health and scarcity on matched samples. We conducted ordinary least squares (OLS) regression with robust standard errors, using samples before and after propensity score matching ([Fig. 1](#)). For detailed information, see [Appendix 3, Table A.3](#). The size of the coefficient was smaller in matched samples, since matching captured selection bias and reduced

Table 2
Different estimation techniques for predicting the association between diverse indicators on self-reported health.

	Deprivation	Exclusion	Insolvency	Low income	Non-owner
Nearest neighb.	−.780 (.225)	−.841 (.204)	−1.368 (.236)	−.433 (.219)	−.221 (.257)
Kernel	−.992 (.182)	−.815 (.175)	−1.359 (.180)	−.527 (.224)	−.473 (.213)
Stratification	−.897 (.173)	−.745 (.179)	−1.294 (.183)	−.447 (.226)	−.454 (.219)
Caliper	−.729 (.225)	−.721 (.216)	−.965 (.295)	−1.099 (.360)	−.442 (.304)
IPTWRA ATT (doubly robust) [z-score]	−.897 (.170) [−5.27]	−.728 (.196) [−3.71]	−1.287 (.186) [−7.00]	−.556 (.215) [−2.59]	−.446 (.216) [−2.06]

Note. Coefficients that are not statistically significant at the 0.05-level are marked in bold.



Note. 1. Reference for education: primary and lower secondary school (10-year schooling)
 2. Reference for work: full-time employed.
 3. Reference for income: income \geq NOK 1,400,000.

Fig. 1. OLS regression on self-reported health, before and after matching. Note. 1. Reference for education: primary and lower secondary school (10-year schooling). 2. Reference for work: full-time employed. 3. Reference for income: income \geq NOK 1,400,000.

the confounding effect. As expected, several variables became non-significant due to the reduced sample size after matching. However, even when controlled for numerous important socioeconomic background variables, the association between health and deprivation, exclusion and insolvency was still strong and significant (see Models 2, 4 and 6). They predicted .55, .55 and 1.05 lower health scores, respectively, when comparing the disadvantaged with the non-disadvantaged. The coefficient size of insolvency was almost twice as large (0.238 SD) as the sizes of deprivation (0.129 SD) and exclusion (0.131 SD).

The relationship between lower income and homeownership on health were not statistically significant in Models 8 and 10. The results remained robust when using different cut-off points for household income or replacing household income with individual income (not shown). However, these insignificant results may have been due to the small sample size after matching.

In addition, health did not differ significantly among various income covariates, controlled for consumption indicators. In some pieces of extant literature, income is viewed as an intermediate variable between consumption and health (e.g., Lundberg et al., 2008). Therefore, to detect the coefficient size between consumption and health, we have also included income intervals as control variables in the weighted models – finding that the coefficients of economic scarcity did not change much with or without controls for income categories (see Appendix 4, Table A.4). Again, this might have been due to a combination of the reduced sample size after propensity score matching, as well as numerous predictors.

Other important covariates, shown in Fig. 1, were people who are unemployed or receive unemployment or other welfare benefits. These groups had significantly poorer health in all matched samples based on the five indicators.

6. Discussion

Using the latest Deprivation Survey from Norway, we estimated the correlation between economic scarcity and SRH based on five different indicators. We found a significant association between health and all consumption-based indicators, and this relationship was strongest when measuring economic scarcity using the consumption indicator of insolvency. This supported *H3* and *H4*. The income indicator was significantly associated with health (using most of the matching techniques), but the coefficients became insignificant when controlling for socioeconomic background. Homeownership also did not have a robust association with health scores.

This study has confirmed the importance of incorporating consumption into health studies. Consumption involves a substantial

material aspect in terms of living conditions, as well as a social component involving customs, norms and participation. Consumption also contains a more direct component of subjective feelings, and causes feelings of shame, lower self-confidence, stress, anxiety and mental and physical health problems (Gubrium, 2014; Hiilamo, 2018). While individual feelings correlate with psychological wellbeing, previous studies have also established a firm connection between health and social comparison, relative deprivation and shame (Buunk, Gibbons, Buunk, Gibbons, & Buunk, 2013; Tennen, Mckee, & Affleck, 2000; Yngwe, Fritzell, Lundberg, Diderichsen, & Burström, 2003). Therefore, using consumption-based indicators, economic scarcity is shown to be negatively connected to health.

We chose to use SRH instead of pathological or clinical measures of health. When an individual reports his or her own health, subjective considerations play a more important role than, for example, medical certificates. It would be interesting to test the relationship between economic scarcity and health based on different health indicators in future studies. Furthermore, although SRH highly correlates with objective health measurements, an individual's self-evaluation of his or her health may also correlate with his or her social background. For example, with the same SRH, respondents with higher education have healthier levels of biomarkers than lower educated groups (Dowd & Zajacova, 2010). Therefore, using subjective health measurements may underestimate health inequalities. However, in this research, the respondents were matched by educational attainment. By comparing people with similar education, matching potentially reduced such biases.

Moreover, the relationship between health and economic scarcity may be reciprocal (Lundberg et al., 2008; Mullainathan & Shafir, 2013). Although we constructed samples that showed a good match between treatment and control groups, it is difficult to determine causal directions based on a cross-sectional dataset. Therefore, this analysis could only draw conclusions about certain correlations between health and economic scarcity but cannot conclude on causality. Scholars have already shown uncertainties connected to the causal relationship between health and socioeconomic positions. A range of biological, psychological and social factors might act as important mediators, moderators and/or confounders, which may play important roles in the association between health and socioeconomic factors (Mackenbach, 2019; Mackenbach & de Jong, 2018).

The matching method only ensures that the control and treatment groups are equally distributed across the measured matching variables. However, it cannot remove all unobserved heterogeneities; there may still be important confounders that are not considered. In the present case, one example is medical history or poor socioeconomic conditions

during childhood. In addition, both SRH and the consumption-based indicators were subjective. Therefore, people with low socioeconomic status may have also suffered from being influenced by inclinations to negatively assess a range of life circumstances. Such covariates could have affected both the matching variables and health. Future studies may look closer at the cause and effect of economic disadvantage in relation to health.

This research found a significant correlation between income and health, but the strength of the correlation weakened when performing OLS regression using the propensity score matching sample. This could have resulted from the matching having removed the confounding effect of income. However, as mentioned above, another reason might be the small sample size. In addition, low education and lack of work can also cause low income. When including education and employment as control variables, the effect of income may be suppressed. This added uncertainties to our attempt to draw conclusions about the non-significant relationship between income and health.

This study has also found that homeownership did not play a significant role in health, possibly because homeownership can capture regional and structural factors, such as unemployment rates, regional social policies and demographic aspects. These variables were not included in the survey. Future studies could, therefore, incorporate contextual variables when calculating propensity scores. Moreover, the significance of house tenure could be context-specific. A comparative study among ten European countries has found that homeownership was associated with better health in the UK and the Netherlands but not in other countries (Dalstra, Kunst, Mackenbach, & EU Working Group on Socioeconomic Inequalities in Health, 2006). This suggests that the importance of housing must be considered more carefully in different

countries with different housing policies. In Norway, the debt and mortgage burden is rising. The median house price-to-income ratio was 3.5 in Norway in 2014. In larger cities, the median house price is more than four times greater than income (Anundsen & Mæhlum, 2017). About 57% of homeowners have a loan-to-value ratio above 85%, and one in five have debt more than five times greater than their income (Anundsen & Mæhlum, 2017). Therefore, homeownership may no longer be a safety net but, rather, a risk factor for individuals and their families.

Although homeownership is one of the most important aspects of wealth, wealth is often more than just ownership. Unfortunately, we did not have access to other variables that could be used to construct a more comprehensive indicator for wealth. Such an indicator may be necessary for more in-depth studies of the wealth–health relationship.

7. Conclusion

This study has revealed notable health differences between people with and without consumption-based economic scarcity, measured by material deprivation, social exclusion and insolvency problems. The correlation was strong and distinguishable. In addition to income and wealth, scarcity in this study integrated consumption as a central element of economic disadvantage. At a relatively low economic level, people do not have access to a wide representation of consumer goods, are unable to fully participate in social activities and do not share the representative style of living others possess. The economically disadvantaged are excluded from common social spheres, which may negatively correlate with their health.

Appendix 1. Norwegian Deprivation Survey

The list of items related to material deprivation and social exclusion is presented in the table below:

Table A.1
Items related to deprivation and exclusion

No.	Items (material deprivation)
1	Living in an area without problems, such as crime, violence or vandalism
2	Living in an area without problems, such as dust, odour or other pollution due to traffic, industries, etc.
3	Having access to an area within 200 m of the residence that can be used for play and recreation
4	Living in a safe neighbourhood where children can play
5	Being able to keep the home warm
6	Being able to pay rent/joint expenses in co-ownership/service charge before the due date
7	Being able to visit a dentist when needed
8	Being able to eat meat, fish or vegetarian food every other day
9	Being able to replace worn clothes with new clothes
10	Having at least two pairs of shoes that fit, including a pair of winter shoes
11	Being able to replace worn furniture with new furniture
12	Having a private car at one's disposal
13	Having a washing machine
14	Having a dishwasher
15	Having access to a PC
16	Having clothes that are specially adapted to leisure activities
17	Having a bike
18	Having a coffee machine (not drip-coffee maker/kettle)
19	Having a mobile phone
20	Having a smartphone
21	Having internet
22	Having ski equipment
23	Having access to cable TV
24	Eating in a cafe or canteen at least once a week
No.	Items (social indicators)
1	Having at least one week's vacation away from home per year
2	Going to theatres, concerts, dance performances, operas, etc. at least once a year
3	Visiting museums, art exhibitions, historical monuments, archaeological sites etc. at least once a year
4	Attending sporting events at least once a year
5	Eating and/or drinking out with friends and family at least once a month

(continued on next page)

Table A.1 (continued)

No.	Items (material deprivation)
6	Using leisure time for cultural activities, such as playing an instrument, photographing, dancing, play-acting, crafts etc. as a hobby
7	Reading books, newspaper, magazines, etc.
8	Working out regularly in, for example, a gym or swimming pool.
9	Watching movies/series/YouTube/TV
10	Spending time on social media (Facebook, Instagram, etc.)
11	Being able to stream music or movies
12	Spending some money on oneself (buy a magazine, a small gift, something good to eat, etc.) at least once a week
13	Being a member of an organisation, club, association, etc.
14	Going to the hairdresser at least every other month
15	Being able to save money
16	Participating in leisure activities with friends

The deprivation and exclusion thresholds, as defined by [Bakkeli and Borgeraas \(2019\)](#), are based on percentage numbers of items people lack because they cannot afford them. The deprivation index is conditioned on the majority opinion of what is ‘essential’. If at least 50% of the respondents regarded an item as essential, the item was considered important. In this way, three material items and one social item were considered unimportant and were filtered from further analysis.

A relatively high percentage of people had access to all items, amounting to almost 70% of the population. Therefore, the vast majority of the population did not experience deprivation. However, about 30% could not afford one or more item, and 18.44% could not afford two or more items. Again, when considering items related to social activities, most people (approximately 70% of the population) had access to all social items. Furthermore, 32% of the population could not afford one or more item, and 18.73% could not afford two or more items.

The Deprivation Survey has defined the mean deprivation index based on the numbers of items lacking due to affordability, operating in the same fashion as [Saunders and Wong’s \(2010\)](#) study. When plotting the deprivation index alongside income distribution, the crossover thresholds between the deprivation index and household income levels lay at around two items for both material deprivation and social exclusion. When material and social indicators were merged, the lowest income groups missed out completely on four items (see [Figure A1](#)). It is worth mentioning that Income Category 2 corresponds to a household income level of NOK 200,000–399,999. This category was selected because it contained the officially poverty line.

In this study, we adopted a threshold of two items because we chose to separate material and social indicators.

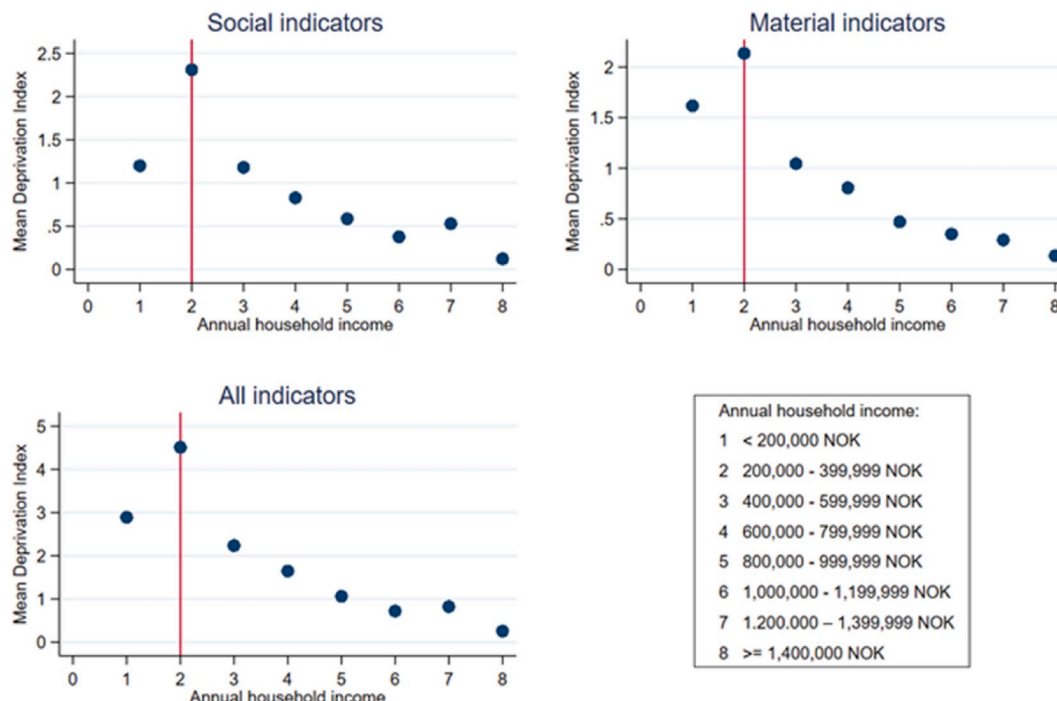


Fig. A.1. Mean deprivation and exclusion indices by annual household income ([Bakkeli & Borgeraas, 2019](#)).

Appendix 2. Constructing matching samples

Table A.2a

Covariates used to construct matching samples

	Deprivation	Exclusion	Insolvency	Low income	Non-owner
Age	x	x	x	x	x
Gender	x	x	x	x	x
Education	x	x	x	x	
Couple no child					x
Couple w. child					x
Single parent					x
Live alone		x			x
Household size			x	x	
Full-time			x		
Part-time	x	x			
Retired	x	x			
Unemployed	x	x	x	x	x
Other w.benefit	x	x	x	x	x
Student					x
Househ. income	x	x			x

Table A.2b

Reduction in standardised biases.

	Before matching	After matching
Deprivation	114.4	19.2
Exclusion	110.0	23.8
Insolvency	84.0	18.5
Low income	117.9	10.4
Non-ownership	131.7	23.8

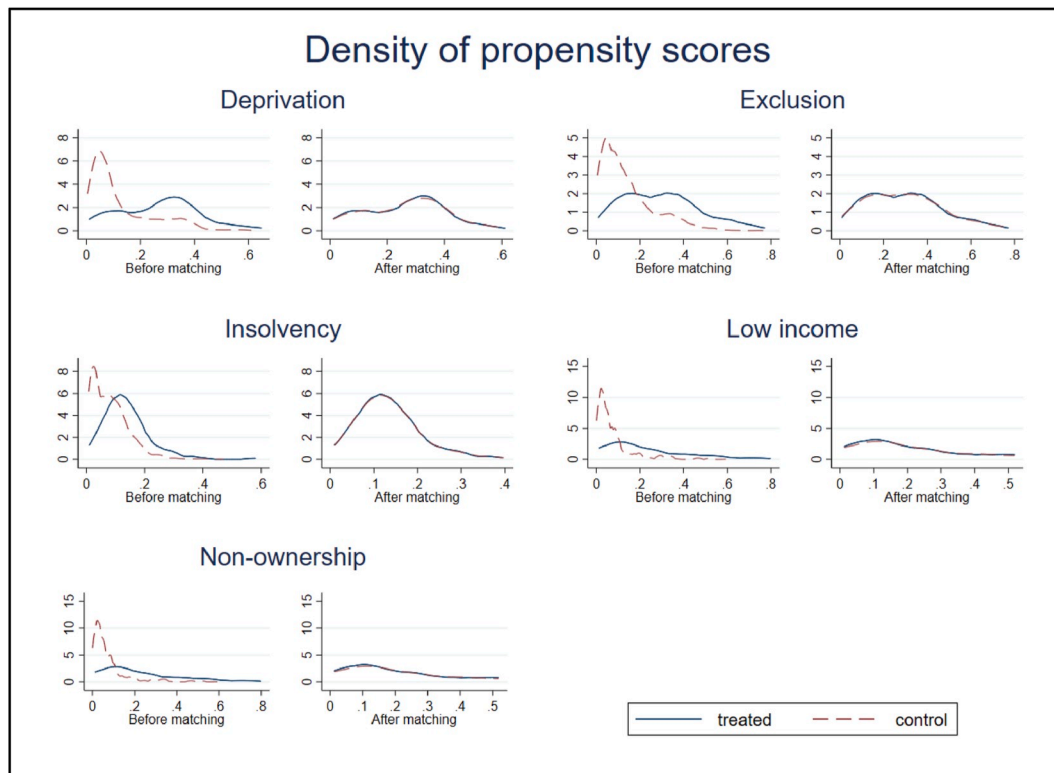


Fig. A.2a. Distribution of propensity scores before and after matching for the five indicators.

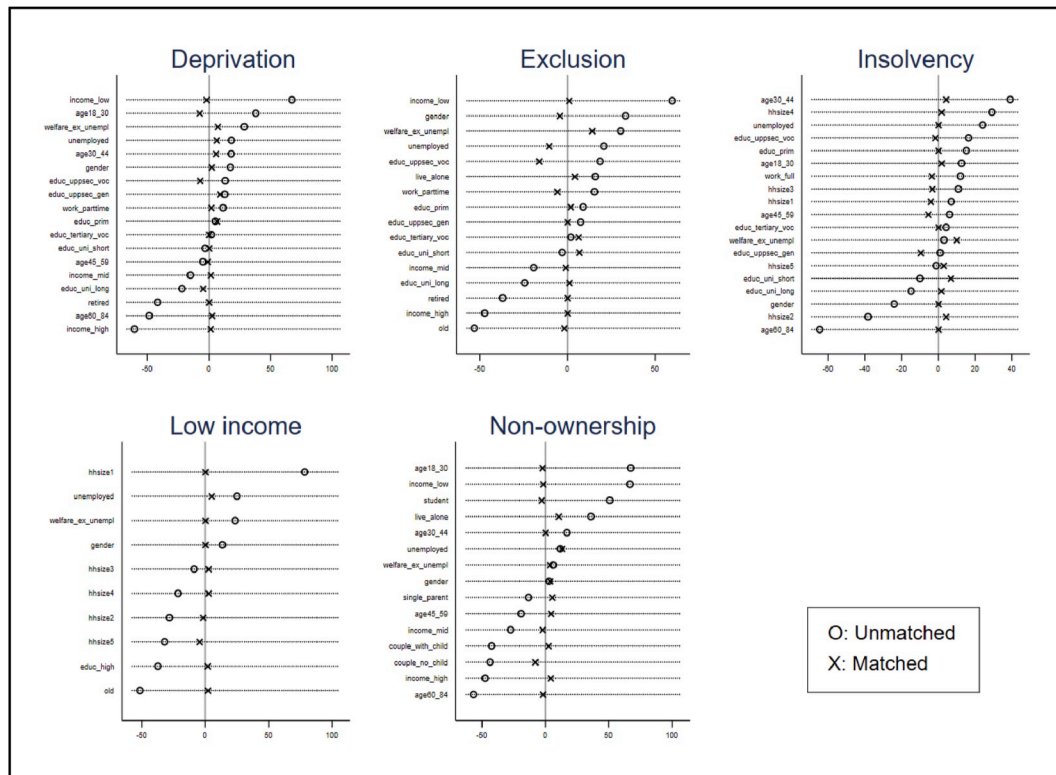


Fig. A.2b. Standardised biases before and after matching.

Appendix 3. OLS-regressions on self-reported health

Table A.3
OLS-regressions on self-reported health, before and after propensity score weighting

Weighting based on →	Deprivation		Exclusion		Insolvency		Low income		Homeownership	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Age	-.07(.03)**	-.08(.07)	-.06(.03)*	-.16(.09)	-.07(.03)*	-.01(.09)	-.08(.03)**	-.18(.08)*	-.08(.03)*	-.06(.08)
Age squared	.00(.00)*	.00(.00)	.00(.00)*	.00(.00)	.00(.00)*	-.00(.00)	.00(.00)*	.00(.00)*	.00(.00)*	-.00(.00)
Gender(male = 0)	.34(1.10)***	.09(.24)	.40(1.10)***	.34(.24)	.30(1.10)**	.14(.31)	.34(1.10)***	.88(.37)*	.45(1.1)	.26(.28)

Education(ref: pri.)										
Upper-sec (general)	.07(.29)	.81(.81)	.11(.29)	-.35(.46)	.056(.30)	-.03(.67)	.15(.29)	.23(.86)	.078(.31)	.94(.82)
Uppsec (vocational)	-.08(.29)	.70(.83)	-.02(.29)	-.08(.47)	-.07(.30)	.54(.63)	-.07(.29)	.79(.80)	-.39(.31)	.81(.89)
Tertiary vocational	.03(.29)	.87(.84)	.07(.29)	-.56(.55)	.078(.31)	.65(.67)	.04(.30)	1.77(.83)*	-.19(.31)	.78(.94)
Uni/college(≤4 years)	.20(.26)	1.25(.78)	.22(.26)	.40(.43)	.20(.27)	.62(.60)	.22(.26)	.87(.72)	-.029(.27)	1.21(.78)
Univ/colleg.(>4 years)	.22(.26)	.85(.80)	.24(.26)	-.17(.47)	.26(.27)	.38(.59)	.25(.26)	.42(.96)	.04(.28)	1.03(.79)
Work(Ref: fulltime)										
Part-time employed	-.36(.20)	-.63(.38)	-.36(.20)	-.42(.43)	-.34(.20)	-.75(.61)	-.37(.20)	-.85(.70)	-.65(.22)**	-1.01(.60)
Self- employed	.08(.29)	-.12(.55)	.16(.28)	-1.10(.38)**	.22(.27)	1.00(.42)*	.09(.28)	1.17(.96)	.13(.32)	-.45(.43)
Retired	-.41(.25)	.85(.83)	-.31(.25)	-1.16(.98)	-.35(.26)	1.32(1.09)	-.41(.25)	-1.54(1.44)	-.52(.27)	-.03(1.05)
Unemployed	-1.33(.53)*	-2.09(.72)**	-1.35(.54)*	-2.67(.61)***	-1.28(.55)*	-1.40(.92)	-1.50(.56)**	-.96(1.09)	-1.38(.70)*	-1.19(.89)
Other welfare benefit	-2.41(.23)***	-2.04(.38)***	-2.43(.23)***	-2.66(.44)***	-2.57(.23)***	-2.90(.52)***	-2.59(.23)***	-2.93(.63)***	-2.63(.24)***	-3.68(.81)***
Student	.22(.26)	.70(.49)	.21(.26)	-.061(.54)	.021(.27)	.94(.72)	.14(.26)	.36(.74)	-.40(.31)	.05(.58)
Homemaker	.93(1.12)	1.92(.77)*	1.10(1.18)	3.17(.93)***	.92(1.13)	-	.97(1.10)	-1.41(.90)	2.26(.27)***	-
Other	-.73(.57)	-1.15(.93)	-.60(.57)	-.57(.97)	-1.51(.87)	-2.93(1.05)**	-1.22(.69)	.87(1.40)	-.44(.62)	-1.72(1.16)
Hh income(≥1,400k)										
1200–1,399k	-.26(.21)	-.47(.71)	-.23(.21)	-.61(1.13)	-.24(.21)	-.77(.70)	-.28(.21)	-.75(1.55)	-.23(.23)	-.45(.82)
1000–1,199k	-.10(.18)	-.35(.65)	-.07(.18)	.66(.93)	-.13(.18)	-.76(.70)	-.14(.18)	1.71(1.53)	-.03(.20)	-1.38(.73)
800-999k	-.26(.18)	-.49(.59)	-.27(.18)	.10(.93)	-.30(.18)	-.07(.63)	-.33(.18)	2.11(1.46)	-.35(.20)	-.39(.65)

(continued on next page)

Table A.3 (continued)

Weighting based on →	Deprivation		Exclusion		Insolvency		Low income		Homeownership	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
600-799k	-.39(.19)*	-.63(.59)	-.33(.19)	.57(.91)	-.43(.19)*	-.77(.61)	-.50(.19)**	2.22(1.68)	-.34(.21)	-.41(.56)
400-599k	-.35(.21)	-.16(.60)	-.35(.21)	.49(.92)	-.41(.21)	-.04(.64)	-.53(.21)*	1.22(1.48)	-.45(.25)	-.94(.63)
Lower inc(200-399k)	-.95(.29)**	-.79(.64)	-1.08(.30)***	-.06(1.02)	-1.08(.29)***	-1.12(.77)	-1.27(.29)***	.74(1.37)	-1.35(.36)***	-1.10(.76)
<i>SD_{βlowinc}</i>								.162		
Lower inc(<200k)	-.64(.39)	-2.61(.76)***	-.84(.40)*	-1.24(1.13)	-.53(.40)	-1.70(1.13)	-.77(.40)	1.00(1.46)	-.66(.61)	-.88(.80)
<i>SD_{βlowinc}</i>								.187		
Deprivation	-.87(.16)***	-.55(.24)*								
<i>SD_{βdeprivation}</i>		-.129*								
Exclusion			-.76(.15)***	-.56(.24)*						
<i>SD_{βexclusion}</i>				-.131*						
Insolvency					-1.25(.21)***	-1.05(.28)***				
<i>SD_{βinsolvency}</i>						-.238***				
Homerenter									-.16(.20)	-.04(.29)
<i>SD_{βhomership}</i>										-.010
Constant	9.49(.69)***	8.92(1.83)***	9.23(.70)***	10.7(2.03)***	9.44(.71)***	8.17(2.07)***	9.46(.70)***	8.52(2.50)***	9.80(.85)***	8.28(1.92)***
N	1365	297	1373	315	1318	202	1381	150	1086	162

Note. *p < .05, **p < .01, ***p < .001.

Model 1 and 2: Samples before and after PSM weighting based on deprivation. Model 3 and 4: Samples before and after PSM weighting based on exclusion. Model 5 and 6: Samples before and after PSM weighting based on insolvency. Model 7 and 8: Samples before and after PSM weighting based on low income. Model 9 and 10: Samples before and after PSM weighting based on non-ownership.

Appendix 4. OLS-models without income controls

Table A.4

OLS-models without income controls, samples are weighted by propensity scores

Weighting based on →	Deprivation		Exclusion		Insolvency		Lower income	Homeownership	
Economic scarcity	-.51 (.28)†	-.55 (.24)*	-.45 (.25)†	-.56 (.24)*	-1.20 (.29)***	-1.05 (.28)***	-.54 (.40)	-.07 (.27)	-.04 (.29)
Adjusted R-square	.28	.34	.29	.33	.30	.33	.32	.28	.31
Controlled for SES	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controlled for income categories	No	Yes	No	Yes	No	Yes	No	No	Yes
N	297		315		202		150		162

Note. †p < .10, *p < .05, **p < .01, ***p < .001.

Appendix 5. Correlation matrix between indicators for economic scarcity

	Deprivation	Exclusion	Insolvency	Low income	Non-ownership
Deprivation	1				
Exclusion	.5559	1			
Insolvency	.3130	.2896	1		
Low income	.1998	.1391	.1109	1	
Non-ownership	.2019	.1350	.1080	.2434	1

References

Ahlström, R., Edström, S., & Savemark, M. (2014). *Over-indebtedness and ill health [Överskuldssättning och ohälsa]* (No. 2014:15). Karlstad, Sweden: The Swedish Consumer Agency.

Anundsen, A. K., & Mæhlum, S. (2017). *Regionale forskjeller i boligpriser og gjeld [Regional differences in house prices and debt]* (No. 4/2017). Norges Bank (The Central Bank of Norway).

Attanasio, O. P., & Pistaferri, L. (2016). Consumption inequality. *The Journal of Economic Perspectives*, 30, 3–28. <https://doi.org/10.1257/jep.30.2.3>.

Bakkeli, N. Z., & Borgeraas, E. M. (2019). *Deprivation and social exclusion in Norway: Consumption-based indicators*. Oslo: National Institute for Consumption Studies in Norway.

Barbier, E. B. (2013). *Economics, natural-resource scarcity and development (Routledge Revivals): Conventional and alternative views*. Routledge. <https://doi.org/10.4324/9780203768907>.

Bourassa, S. C. (1996). Measuring the affordability of home-ownership. *Urban Studies*, 33, 1867–1877. <https://doi.org/10.1080/0042098966420>.

Buunk, B. P., Gibbons, F. X., Buunk, A., Gibbons, F. X., & Buunk, A. (2013). *Health, coping, and well-being: Perspectives from social comparison theory*. Psychology Press. <https://doi.org/10.4324/9780203774106>.

Case, A., & Deaton, A. (2003). *Consumption, health, gender, and poverty, policy research working papers*. The World Bank. <https://doi.org/10.1596/1813-9450-3020>.

Chapman, D. (2013). *Home & social status*. Routledge. <https://doi.org/10.4324/9781315007045>.

Chase, E., & Walker, R. (2015). The “shame” of shame. In E. Chase, & G. Bantebya-Kyomuhendo (Eds.), *Poverty and shame: Global experiences* (pp. 161–174). Oxford, United Kingdom: Oxford University Press.

Christiansen, V. (1998). Knapphet [scarcity]. In A. Rødseth, & C. Riis (Eds.), *Markeder, Ressurser Og Fordeling* (pp. 15–34). Oslo: Gyldendal.

Clayton, Maya, Liñares-Zegarra, José, & Wilson, John O. S. (2015). Does debt affect health? Cross country evidence on the debt-health nexus. *Social Science & Medicine*. <https://doi.org/10.1016/j.socscimed.2015.02.002>.

Croghan, R., Griffin, C., Hunter, J., & Phoenix, A. (2006). Style failure: Consumption, identity and social exclusion. *Journal of Youth Studies*, 9, 463–478.

- Dalstra, J. A. A., Kunst, A. E., Mackenbach, J. P., & EU Working Group on Socioeconomic Inequalities in Health. (2006). A comparative appraisal of the relationship of education, income and housing tenure with less than good health among the elderly in Europe. *Social Science & Medicine*, 62, 2046–2060. <https://doi.org/10.1016/j.socscimed.2005.09.001>, 1982.
- Deaton, A. (1992). *Understanding consumption*. Oxford University Press.
- Deaton, A. (2008). Income, health, and well-being around the world: Evidence from the Gallup world poll. *The Journal of Economic Perspectives*, 22, 53–72. <https://doi.org/10.1257/jep.22.2.53>.
- Dewilde, C., & Raeymaeckers, P. (2008). The trade-off between home-ownership and pensions: Individual and institutional determinants of old-age poverty. *Ageing and Society*, 28, 805–830. <https://doi.org/10.1017/S0144686X08007277>.
- Doling, J., & Ronald, R. (2010). Home ownership and asset-based welfare. *Journal of Housing and the Built Environment*, 25, 165–173. <https://doi.org/10.1007/s10901-009-9177-6>.
- Dowd, J. B., & Zajacova, A. (2010). Does self-rated health mean the same thing across socioeconomic groups? Evidence from biomarker data. *Annals of Epidemiology*, 20, 743–749. <https://doi.org/10.1016/j.annepidem.2010.06.007>.
- Dreentea, P., & Reynolds, J. R. (2012). Neither a borrower nor a lender Be: The relative importance of debt and SES for mental health among older adults. *Journal of Aging and Health*, 24, 673–695. <https://doi.org/10.1177/0898264311431304>.
- Dreentea, Patricia, & Lavrakas, Paul J. (2000). Over the limit: the association among health, race and debt. *Social Science & Medicine*. [https://doi.org/10.1016/S0277-9536\(99\)00298-1](https://doi.org/10.1016/S0277-9536(99)00298-1).
- Easterlin, R. A., Angelescu McVey, L., Switek, M., Sawangfa, O., & Zweig, J. S. (2011). *The happiness-income paradox revisited (IZA discussion paper No. 5799)*. Institute for the Study of Labor (IZA).
- Eggleston, J., & Munk, R. (2015). *Net worth of households: 2015 (No. P70BR-164), current population reports*. Washington, D: U.S. Census Bureau.
- Ellaway, A., Macdonald, L., & Kearns, A. (2016). Are housing tenure and car access still associated with health? A repeat cross-sectional study of UK adults over a 13-year period. *BMJ Open*, 6, e012268. <https://doi.org/10.1136/bmjopen-2016-012268>.
- Elsinga, M. (2008). *Home ownership beyond asset and security: Perceptions of housing related security and insecurity in eight European countries*. IOS Press.
- Elstad, J. I. (2011). Does the socioeconomic context explain both mortality and income inequality? Prospective register-based study of Norwegian regions. *International Journal of Equity in Health*, 10, 7. <https://doi.org/10.1186/1475-9276-10-7>.
- Elstad, J. I., & Pedersen, A. W. (2012). The impact of relative poverty on Norwegian adolescents' subjective health: A causal analysis with propensity score matching. *International Journal of Environmental Research and Public Health*, 9, 4715–4731. <https://doi.org/10.3390/ijerph9124715>.
- Feinstein, J. S. (1993). The relationship between socioeconomic status and health: A review of the literature. *The Milbank Quarterly*, 71, 279–322. <https://doi.org/10.2307/3350401>.
- Fløtten, T., Hansen, I. L. S., Grødem, A. S., Grønningseter, A. B., & Nielse, R. A. (2011). *Knowledge about poverty in Norway (Fafo-rapport No. Fafo-rapport 2011:21)*. Oslo: Fafo.
- Franks, P., Gold, M. R., & Fiscella, K. (2003). Sociodemographics, self-rated health, and mortality in the US. *Social Science & Medicine*, 56, 2505–2514. [https://doi.org/10.1016/S0277-9536\(02\)00281-2](https://doi.org/10.1016/S0277-9536(02)00281-2).
- Gholami, A., Jahromi, L. M., Zarei, E., & Dehghan, A. (2013). Application of WHOQOL-BREF in measuring quality of life in health-care staff. *International Journal of Preventive Medicine*, 4, 809–817.
- Gravelle, H. (1998). How much of the relation between population mortality and unequal distribution of income is a statistical artefact? *BMJ*, 316, 382–385.
- Grindaker, M. H. (2018). *House prices and household consumption*. No. 11/2017.
- Gubrium, E. K. (2014). Poverty, shame, and the class journey in public imagination. *Distinktion J. Soc. Theory*, 15, 105–122. <https://doi.org/10.1080/1600910X.2013.809370>.
- Gubrium, E. (2015). No one should be poor. In E. Chase, & G. Bantebya-Kyomuhendo (Eds.), *Poverty and shame: Global experiences* (pp. 270–282). Oxford, United Kingdom: Oxford University Press.
- Haddock, C. K., Poston, W. S., Pyle, S. A., Klesges, R. C., Vander Weg, M. W., Peterson, A., et al. (2006). The validity of self-rated health as a measure of health status among young military personnel: Evidence from a cross-sectional survey. *Health and Quality of Life Outcomes*, 4, 57. <https://doi.org/10.1186/1477-7525-4-57>.
- Hays, R. D., Sherbourne, C. D., & Mazel, R. M. (1993). The RAND 36-item health survey 1.0. *Health Economics*, 2, 217–227. <https://doi.org/10.1002/hec.4730020305>.
- Hiilamo, H. (2018). *Household debt and economic crises: Causes, consequences and remedies*. Cheltenham, Glos, UK ; Northampton, Massachusetts, USA: Edward Elgar Pub.
- Hintikka, J., Kontula, O., Saarinen, P., Tanskanen, A., Koskela, K., & Viinamäki, H. (1998). Debt and suicidal behaviour in the Finnish general population. *Acta Psychiatrica Scandinavica*, 98, 493–496. <https://doi.org/10.1111/j.1600-0447.1998.tb10125.x>.
- Hohm, C. F. (1983). On the importance of homeownership: Correlates of differential attitudes. *Housing and Society*, 10, 61–71. <https://doi.org/10.1080/08882746.1983.11429927>.
- Holmgren, R., Sundström, E. N., Levinsson, H., & Ahlström, R. (2019). Coping and financial strain as predictors of mental illness in over-indebted individuals in Sweden. *Scandinavian Journal of Psychology*, 60, 50–58. <https://doi.org/10.1111/sjop.12511>.
- Howe, C. W. (1979). *Natural resource economics: Issues, analysis, and policy*. Wiley.
- Jenkins, R., Bhugra, D., Bebbington, P., Brugha, T., Farrell, M., Coid, J., et al. (2008). Debt, income and mental disorder in the general population. *Psychological Medicine*, 38, 1485–1493. <https://doi.org/10.1017/S0033291707002516>.
- Kempson, E., & Poppe, C. (2018). *Assessing the levels of financial capability and financial well-being in Norway. A summary report (No. 19–2018). Consumption research Norway (SIFO)*. Oslo: Oslo Metropolitan University.
- Kessler, R. C., & Neighbors, H. W. (1986). A new perspective on the relationships among race, social class, and psychological distress. *Journal of Health and Social Behavior*, 27, 107–115. <https://doi.org/10.2307/2136310>.
- Kinge, J. M., Modalsli, J. H., Øverland, S., Gjessing, H. K., Tollånes, M. C., Knudsen, A. K., et al. (2019). Association of household income with life expectancy and cause-specific mortality in Norway, 2005–2015. *Journal of the American Medical Association*, 321, 1916–1925. <https://doi.org/10.1001/jama.2019.4329>.
- Kuhn, R., Rahman, O., & Menken, J. (2006). Survey measures of health: How well do self-reported and observed indicators measure health and predict mortality? In B. Cohen, & J. Menken (Eds.), *Aging in Sub-Saharan Africa: Recommendation for furthering research*. Washington DC: National Academies Press (US).
- Introduction: Social stratification, welfare regimes and access to homeownership. In Kurz, K., & Blossfeld, H.-P. (Eds.), *Home ownership and social inequality in comparative perspective, studies in social inequality*, (pp. 1–20). (2004) (pp. 1–20). Stanford University Press.
- Kus, B., Nolan, B., & Whelan, C. T. (2016). Material deprivation and consumption. In *Oxf. Handb. Soc. Sci. Poverty*. <https://doi.org/10.1093/oxfordhb/9780199914050.013.26>.
- Laaksonen, M., Martikainen, P., Nihtilä, E., Rahkonen, O., & Lahelma, E. (2008). Home ownership and mortality: A register-based follow-up study of 300 000 Finns. *Journal of Epidemiology & Community Health*, 62, 293–297. <https://doi.org/10.1136/jech.2007.061309>.
- Langeland, S., Furuberg, J., & Lima, I. A.Å. (2017). *Poverty and living conditions in Norway: Condition and trends - 2017 (No. Nav-rapport 2017:4)*. NAV- Directorate of Labour.
- Livingstone, S. M., & Lunt, P. K. (1992). Predicting personal debt and debt repayment: Psychological, social and economic determinants. *Journal of Economic Psychology*, 13, 111–134. [https://doi.org/10.1016/0167-4870\(92\)90055-C](https://doi.org/10.1016/0167-4870(92)90055-C).
- Lundberg, O., Åberg Yngwe, M., Kölegård Stjärne, M., Björk, L., & Fritzell, J. (2008). *The nordic experience: Welfare states and public health (NEWS)*. Stockholm: Center for Health Equity Studies (CHESS) and Karolinska Institutet.
- Lundberg, O., & Manderbacka, K. (1996). Assessing reliability of a measure of self-rated health. *Scandinavian Journal of Social Medicine*. <https://doi.org/10.1177/140349489602400314>.
- Lynch, J., Smith, G. D., Harper, S., Hillemeier, M., Ross, N., Kaplan, G. A., et al. (2004). Is income inequality a determinant of population health? Part 1. A systematic review. *The Milbank Quarterly*, 82, 5–99. <https://doi.org/10.1111/j.0887-378X.2004.00302.x>.
- Mackenbach, J. P. (2019). *Health Inequalities: Persistence and change in European welfare states*. Oxford, New York: Oxford University Press.
- Mackenbach, J., & de Jong, J. P. (2018). Health inequalities. *An interdisciplinary exploration of socioeconomic position, health and causality (FEAM/ALLEA committee on health inequalities)*. Amsterdam: The Royal Netherlands Academy of Arts and Science.
- Marmot, M. (2002). The influence of income on health: Views of an epidemiologist. *Health Affairs*, 21, 31–46. <https://doi.org/10.1377/hlthaff.21.2.31>.
- Marmot, M., & Wilkinson, R. G. (2001). Psychosocial and material pathways in the relation between income and health: A response to Lynch et al. *BMJ*, 322, 1233–1236. <https://doi.org/10.1136/bmj.322.7296.1233>.
- Mathä, T. Y., Porpiglia, A., & Ziegelmeyer, M. (2017). Household wealth in the euro area: The importance of intergenerational transfers, homeownership and house price dynamics. *Journal of Housing Economics*, 35, 1–12. <https://doi.org/10.1016/j.jhe.2016.12.001>.
- Meng, Q., Xie, Z., & Zhang, T. (2014). A single-item self-rated health measure correlates with objective health status in the elderly: A survey in suburban Beijing. *Frontiers in Public Health*, 2. <https://doi.org/10.3389/fpubh.2014.00027>.
- Meyer, B. D., & Sullivan, J. X. (2003). Measuring the well-being of the poor using income and consumption. *Journal of Human Resources*, 38, 1180–1220. <https://doi.org/10.2307/3558985>.
- Morgan, S. L., & Winship, C. (2007). *Counterfactuals and causal inference: Methods and principles for social research (1 edition)*. New York: Cambridge University Press.
- Mortensen, L. H., Rehnberg, J., Dahl, E., Diderichsen, F., Elstad, J. I., Martikainen, P., et al. (2016). Shape of the association between income and mortality: A cohort study of Denmark, Finland, Norway and Sweden in 1995 and 2003. *BMJ Open*, 6, e010974. <https://doi.org/10.1136/bmjopen-2015-010974>.
- Mullainathan, S., & Shafir, E. (2013). *Scarcity: Why having too little means so much*. Times Books.
- Munford, L. A., Fichera, E., & Sutton, M. (2017). *Is owning your home good for your health? Evidence from exogenous variations in subsidies in England (No. 17/28), health, econometrics and data group (HEDG) working papers*. HEDG, c/o Department of Economics, University of York.
- Nettleton, S., & Burrows, R. (1998). Mortgage debt, insecure home ownership and health: An exploratory analysis. *Sociology of Health & Illness*, 20, 731–753. <https://doi.org/10.1111/1467-9566.00127>.
- Norgaard, R. B. (1990). Economic indicators of resource scarcity: A critical essay. *Journal of Environmental Economics and Management*, 19, 19–25. [https://doi.org/10.1016/0095-0696\(90\)90057-6](https://doi.org/10.1016/0095-0696(90)90057-6).
- Öst, C. E. (2012). Parental wealth and first-time homeownership: A cohort study of family background and young adults' housing situation in Sweden. *Urban Studies*, 49, 2137–2152. <https://doi.org/10.1177/0042098011427185>.
- O'Donnell, O., van Doorslaer, E., & van Ourti, T. (2013). *Health and inequality (No. TI 2013-170/V)*. Tinbergen Institute Discussion Paper.

- O'mahony, L. F., & Overton, L. (2015). Asset-based welfare, equity release and the meaning of the owned home. *Housing Studies*, 30, 392–412. <https://doi.org/10.1080/02673037.2014.963523>.
- Pickett, K. E., & Wilkinson, R. G. (2015). Income inequality and health: A causal review. *Social Science & Medicine*, 128, 316–326. <https://doi.org/10.1016/j.socscimed.2014.12.031>.
- Pollack, C. E., Chideya, S., Cubbin, C., Williams, B., Dekker, M., & Braveman, P. (2007). Should health studies measure wealth?: A systematic review. *American Journal of Preventive Medicine*, 33, 250–264. <https://doi.org/10.1016/j.amepre.2007.04.033>.
- Ravallion, M. (1998). *Poverty lines in theory and practice (No. LSM133)*. The World Bank.
- Ravallion, M. (2016). *The economics of poverty: History, measurement, and policy*. Oxford, New York: Oxford University Press.
- Revol, M. K. (2019). Under half of low-income households own their own housing. *Stat. Nor* [WWW Document] <https://www.ssb.no/bygg-bolig-og-eiendom/artikler-og-publikasjoner/under-halvparten-av-husholdninger-med-lav-inntekt-eier-sin-egen-bolig> accessed 9.5.19.
- Rodgers, G. B. (2002). Income and inequality as determinants of mortality: An international cross-section analysis. *International Journal of Epidemiology*, 31, 533–538. <https://doi.org/10.1093/ije/31.3.533>.
- Rosenbaum, P. R., & Rubin, D. B. (1985). Constructing a control group using multivariate matched sampling methods that incorporate the propensity score. *The American Statistician*, 39, 33–38. <https://doi.org/10.2307/2683903>.
- Rubin, D. B. (2001). Using propensity scores to help design observational studies: Application to the tobacco litigation. *Health Services & Outcomes Research Methodology*, 2, 169–188. <https://doi.org/10.1023/A:1020363010465>.
- Saunders, P., Naidoo, Y., & Griffiths, M. (2008). Towards new indicators of disadvantage: Deprivation and social exclusion in Australia. *Australian Journal of Social Issues*, 43, 175–194. <https://doi.org/10.1002/j.1839-4655.2008.tb00097.x>.
- Saunders, P., & Wong, M. (2010). *Measurement and change in deprivation and exclusion in Australia; A report on research in progress (ESRC grant RES-060-25-0052 No. Working paper methods series No. 11), economic, science and research council (ESRC). Social policy research centre*. Australia: University of New South Wales.
- Shapiro, T. M. (2006). Race, homeownership and wealth. *Washington University Journal of Law & Policy*, 20, 53.
- Statistics Norway. (2017). *Economic analysis [Økonomiske analyser] (No. 1/2017)*. Oslo: Statistics Norway.
- Subramanian, S., Huijts, T., & Avendano, M. (2010). Self-reported health assessments in the 2002 world health survey: How do they correlate with education? *Bulletin of the World Health Organization*, 88.
- Subramanian, S. V., & Kawachi, I. (2004). Income inequality and health: What have we learned so far? *Epidemiological Review*, 26, 78–91. <https://doi.org/10.1093/epirev/mxh003>.
- Subramanian, S. V., & Kawachi, I. (2006). Being well and doing well: On the importance of income for health. *International Journal of Social Welfare*, 15. <https://doi.org/10.1111/j.1468-2397.2006.00440.x>. S13–S22.
- Tennen, H., McKeel, T. E., & Affleck, G. (2000). Social comparison processes in health and illness. In J. Suls, & L. Wheeler (Eds.), *Handbook of social comparison: Theory and research, the Springer Series in social clinical psychology* (pp. 443–483). Boston, MA: Springer US. https://doi.org/10.1007/978-1-4615-4237-7_21.
- Townsend, P. (1979). *Poverty in the United Kingdom*. London: Allen Lane and Penguin Books.
- Vlot-van Anrooij, K., Tobi, H., Hilgenkamp, T. I. M., Leusink, G. L., & Naaldenberg, J. (2018). Self-reported measures in health research for people with intellectual disabilities: An inclusive pilot study on suitability and reliability. *BMC Medical Research Methodology*, 18, 80. <https://doi.org/10.1186/s12874-018-0539-1>.
- Wilkinson, R. G. (2006). *The impact of inequality: How to make sick societies healthier*. The New Press.
- Wilkinson, R. G., & Pickett, K. E. (2017). The enemy between us: The psychological and social costs of inequality. *European Journal of Social Psychology*, 47, 11–24. <https://doi.org/10.1002/ejsp.2275>.
- With, M. L. (2017). Health: Life quality and living condition. *Stat. Nor*. <https://www.ssb.no/sosiale-forhold-og-kriminalitet/artikler-og-publikasjoner/helse> accessed 9.5.19.
- Wong, H., Saunders, P., Ping Wong, W., Chan, M., & Chua, H. (2012). *Deprivation and social exclusion in Hong Kong*.
- Wu, S., Wang, R., Zhao, Y., Ma, X., Wu, M., Yan, X., et al. (2013). The relationship between self-rated health and objective health status: A population-based study. *BMC Public Health*, 13, 320. <https://doi.org/10.1186/1471-2458-13-320>.
- Yngwe, M. Å., Fritzell, J., Lundberg, O., Diderichsen, F., & Burström, B. (2003). Exploring relative deprivation: Is social comparison a mechanism in the relation between income and health? *Social Science & Medicine*, 57, 1463–1473. [https://doi.org/10.1016/S0277-9536\(02\)00541-5](https://doi.org/10.1016/S0277-9536(02)00541-5).