Does who you live with matter for your health? The influence of partners' socioeconomic characteristics on self-rated health in Norway

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Abstract

Aims: Studies of the association between self-rated health and persons' income and education have almost invariably shown that people with higher education and incomes report better health. Less is known of the influence of household members' socioeconomic characteristics on individuals' health. This study thus aims to assess the extent to which socioeconomic characteristics of partners may contribute to explain the variation in the respondents' self-rated health (SRH).

Methods: Using an observational design, we analysed cross-sectional Norwegian survey data on SRH (2015 and 2019), linked to register data on education and income for respondents (N=7,082) and their opposite-sex co-resident spouse or partner. We employed logistic regression models to assess the associations between respondents' SRH and the relative income and education of their partner. Average marginal effects were calculated to enable cross-model comparisons.

Results: Net of individual characteristics, having a higher educated partner was positively associated with SRH for both male (OR=1.56) and female (OR=1.36) respondents. Having a partner with an above median income (by age and sex) was positively associated with SRH for female (OR=1.29) respondents only. For education, the positive SRH associations were roughly similar for respondents and partners. For income, the associations were more pronounced for respondents than partners.

Conclusions: Our findings suggest that health is affected by the resources (or lack thereof) in one's immediate networks. To reduce social inequalities in health, health personnel may customize interactions to account for household resources. Such knowledge may also be used in health promoting activities to enhance participation and health competency.

Keywords: Education, family, health status*, income*, Norway, partner*, self-assessed, sex, socioeconomic

Background

Health is shown to vary by several sociodemographic characteristics, in Norway [1, 2] as in most other countries [3-6]. Some of these, like sex and age, are beyond intervention. Others, like education, income, work, lifestyle factors, social networks, and neighbourhood characteristics, may be modified by changes in individual behaviour or community level arrangements. Studies of the association between self-rated health (SRH) and persons' income and education have almost invariably shown that people with higher incomes and more years of formal training report better health [7, 8]. As people's life is affected by interests and options shaped in interaction with the close surroundings, research on income and education gradients in SRH should investigate whether differences in health may be related to household members' income and education [9]. Persons with little income or education may live affluent and enlightened lives with possible favourable implications for health, based on the income and education of other household members. Also, the health of persons with high incomes and education might be adversely affected if other household members are struggling and resources must be diverted to help them.

The importance of income and education for SRH has not been much investigated from a household perspective, albeit notable exceptions exist for education [10-15]. These studies generally find that partners' (higher) educational level is associated with better health. More specifically, an earlier, large Dutch study (N=40,000) found that taking both partners' education into account raised the social gradient in SRH more than when it was based on own or partner's education alone [10]. This aligns well with findings from a Norwegian study (N=18,000), showing that an extra year of education for either the partner (within) or on average for the couple (between) would result in better health [11]. A large US study (N=340,000) also show that accounting for spousal education reduced the association between individuals' own education and SRH (especially for married women) [12]. A similar

conclusion was reached in a more recent, smaller Spanish study (N=4,500), but the authors underscore that the associations differed between groups: Having a higher educated partner, for instance, was only found to benefit health among low-educated men [13]. In a cross-national European study including 29 countries (N=59,000), the researchers found that both partners' educational level positively affected SRH and that the associations were most pronounced in settings with greater degrees of educational homogamy [14]. A recent Norwegian study (N=21,000) showed that spousal education was positively associated with own health for both men and women, the link being somewhat stronger for men [15]. The research is much scarcer for income, and we have not been able to find studies that focus primarily on economic contributions of partners for SRH. The previously mentioned US study included total family income in relation to poverty thresholds as a control variable, but did not look at homogamy or heterogamy within couples [12]. The smaller Spanish study examined labour market participation (as a proxy for economic activity) and concluded that whereas the health of men was negatively influenced by having a working spouse, the health of women was affected positively if at least one couple member was economically active [13]. Other aspects of health, such as morbidity [16, 17], mortality [16-21], health service utilization [22] etc., show that having a partner with more education and a higher income contribute to better outcomes (with variations across outcomes, sex, and age) and the magnitudes of the estimates are generally larger than those observed for SRH. We aim to assess the extent to which self-rated health (SRH) is affected by the income and education of the respondent's co-resident partner in today's Norway. We thus contribute to the literature in two ways: We examine i) the influence of partners' income on SRH and ii) the joint influence partners' education and income on SRH, neither of which we have seen reported in the literature so far.

Norway and the other Nordic countries are strong welfare states. Norway has a public education system from elementary school through college/university level and a public health

care system from primary care (GP and municipal health care services) to specialized health services. In addition, relatively generous health-related welfare compensatory mechanisms are in place for income support when health problems interfere with employment and self-provision [23]. This is in line with Esping-Andersen's concept of 'de-familialization', reflecting the fact that many modern welfare states have taken on (parts of) the welfare production previously undertaken within families, thus eroding the role of households in this sphere [24]. Government compensatory mechanisms are therefore largely directed at the affected individual, and household resources and/or obligations are to a lesser extent considered. Research on whether existing policies to reduce social inequalities in health adequately reflect the 'linked lives' perspective appears warranted [25]. Although gender equality rates high on the political agenda in Norway, the male breadwinner model is still quite common, particularly among the older generations. Norwegian women earn on average 14% less than men, but women participate in the labour force to a greater extent than in many other European countries, and more women than men partake in higher education [26]. Based on the scarcity of recent research from developed countries on this topic, the aim of this paper is to assess whether the SHR of an individual depends both on one's own personal income and education as well as the income and education of his or her co-residential partner (and discrepancies in these domains). We also assess whether the association varies by sex and age of the interview object (IO). We pose the following research questions:

- Does the SRH of an individual depend both on the IOs' personal income and education *and* on the income and education of partners?

- Is the influence of education stronger than that of income in Norway as we have a public healthcare system and income compensatory mechanisms in place than other countries in which these associations have been assessed previously?

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- Does the influence on health of partners' income and education vary by the IOs' sex and age?

Data and methods

Data on self-rated health (SRH) was obtained from the 2015 and 2019 *Health, care and social relations, survey on living conditions* from Statistics Norway [27, 28], harmonized with the European Health Interview Survey (EHIS) [29]. We opted to pool data from two survey rounds to increase the sample size and ensure that we had sufficient power to place weight also on non-significant associations in case of null findings (individual year results available on request). The Norwegian strands had overall response rates of 59 and 57% [27, 28]. Statistics Norway linked additional register data on sociodemographic characteristics to the survey: Data on IOs' household members were obtained from national registers prior to the interviews, and during the interviews this information was checked and amended. After ethical approval from the Norwegian Agency for Shared Services in Education and Research (NSD, now SIKT), we were granted access to an anonymized research file, and all research has been undertaken in accordance with the Helsinki declaration.

The outcome variable is self-rated health (SRH), based on the question '*How is your health in general?*'. The variable has five response options (very good/good/fair/bad/very bad). We dichotomized them into (1) 'good' (very good/good) or (0) 'not good' (fair/bad/very bad).

Our main explanatory variables are education and income of the IOs and their marital or cohabiting partners of opposite sex, as well as the relative difference in these measures to assess aspects of homogamy and heterogamy. For both partners, we opted to code education into either higher or lower education. Higher education comprised those with any schooling at college or university level, whereas lower education comprised those with schooling limited to a high school diploma.

The income variable encompasses *all* incomes and includes earnings from both labour market efforts and welfare benefit uptake. Incomes were first divided into quartiles (Q1-Q4), accounting for IOs' age group, year, and sex (cf. Table 1). Next, incomes were categorized as below (Q1 and Q2) or above (Q3 and Q4) the median. Thus, when described as higher or lower, the incomes are not relatively higher or lower within couples but relate to the general levels of the income of the IOs and their partners. The overall patterns show, however, that for most couples this is the case also in absolute terms (cf. Table S1).

To ensure that individuals had reached their final education level, the lower age limit of IOs was set to 30 years. This also helped ensure that the income measure reflects one's capacity, as students generally have a much lower income than full-time employees. The upper age limit of IOs was set to 67 years, which reflects the most common age to begin old age pension uptake and pensions are generally lower than earnings. Age group (30-39, 40-49, 50-59 and 60-67 years), number of children in the household (0, 1 or 2+), and survey year were included as control variables.

Eight IOs were deleted because either they or their partners were registered with 'No education'. IOs (N=165) and partners (N=272) with missing information on education were categorized in the lowest education group, whereas observations with missing income were coded zero (N=1 for IOs; N=37 for partners). The resulting data set comprised a total of 7,082 partnered IOs, aged 30-67 (Table 1).

Multivariate logistic regression models were used to assess the association between SRH and partners' education and income. Table 2 shows results from three models: Model I is a base model, including only IO's own characteristics, Model II also includes partner characteristics, whereas Model III simultaneously accounts for IO characteristics and the relative education and income of partners (to those of other partners of IOs of the same age, year, and sex). Since existing studies show some differences depending on respondents' sex,

we ran models for both sexes combined, but also separately for male and female IOs. Marginal effects were calculated to facilitate adequate cross-model comparisons (Tables S2-S4), and to formally assess effect modification of sex, an interaction term between the main explanatory variable and sex were also included in some models (Figures 1 and 2). In an additional model, we also examined interactions between the relative education and income resources of partners (Figure 2, Table S3). Lastly, since differences according to age have been reported, we also ran Model III stratified by younger vs older age (age 50, close to the mean age) to assess possible effect modification of age (Figure 3, Table S4). The statistical significance level was set at 5%.

Results

Table 1 provides descriptive statistics of the sample. The vast majority of IOs reported good health. The sex distribution was equal (49% female IOs), and the mean IO age was 49 years. The average IO annual income was around € 40,000. The sampled female IO's incomes were 28% lower than those of male IOs. Both female IOs and female partners held a higher education than the corresponding males: Whereas those having completed high school comprised the largest share among males, those having a short college/university education comprised the largest share among females. Near 21% of male IOs resided with a more educated partner, whereas this was the case for only 10% of female IOs. The reverse pattern was observed for lower-educated partners, among both male and female IOs. In terms of income (above or below the median by age, year, and sex), the shares residing with a partner in either a higher (22%) or lower (22%) income group was similar across IOs' sex. Thus, across sex, in a relative perspective, most couples were fairly homogamous in terms of both educational level and income group.

[Table 1 about here]

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Table 2 shows the odds of reporting good health among male and female IOs. Table S2 shows corresponding marginal effects (including estimates also for the reference group) for a more thorough comparison. Model I confirms the well-established positive associations between IOs' own education, income and health, overall and across sex. Model II shows positive and statistically significant estimates for partners' higher education and incomes for the sample overall. Whereas the magnitudes of the odds ratio (OR) for education were similar for IOs and partners (OR=1.4), the magnitude of IOs' income estimate (OR=2.6) was clearly higher than that of partners (OR=1.2). Some notable differences were, however, observed across sex. For female IOs, the magnitudes of partners' higher education (OR=1.3) and above median income (OR=1.4) were both statistically significant, although the confidence intervals for own and partner's education overlap. For male IOs, only the association of partners' education was statistically significant (OR=1.6). Thus, there was no statistically significant association between men's own education and health, net of partners' education. For income, the pattern was reversed: Whereas there was a clear positive association between men's own income and health (OR=2.4), no significant association was found for partners' higher income.

Our final model, Model III (cf. Tables 2 and S2), includes the combined relative education and income of both partners and shows an advantage in terms of health overall (OR=1.4) and for male (OR=1.6) and female (OR=1.4) IOs with a higher-educated partner as compared to both partners having a low education (reference group). The respective estimates were statistically non-significant for higher-educated male IOs with lesser-educated partners, but positive for female IOs, and thus positive also overall. The estimates of both partners having a higher education was almost twice that of the reference group, overall as well as for male and female IOs (all three ORs around 1.9). In conclusion, whereas male IOs appear to

benefit in terms of health from having a higher-educated partner and this seems more important than their own educational level, female IOs' health appears to benefit from either partner having a higher education.

Model III shows that whereas male IOs' own higher income influenced their health positively (OR=2.1), no statistically significant association were seen for those with partners in a higher income group (OR=0.8). Consequently, the estimate changed only negligibly if both the male IO and his partner had an income above the median (OR=2.3). For female IOs in the lowest income group, however, there was a positive association between health and having a partner in the highest income group (OR=1.3). The association was, however, more pronounced for female IOs' own higher income (OR=2.5) when they had partners in the lowest income group. When both partners belonged to the highest income group, the positive association with health was increased fourfold (OR=4.4). The resulting estimate for both partners having a high income for both sexes combined, lies between that of male and female IOs (OR=3.2), as is also the case for IOs' lower income and partners' higher income (non-significant) and IOs' higher income and partners' lower income (OR=2.3). To summarize, whereas male IOs reap no health benefits from having a partner in a higher income group, female IOs *do* benefit (OR=1.3). One's own income nevertheless appears far more important.

[Table 2 about here]

Formal assessments of the sex differences discussed above may be deduced from Table S2, but Figure 1 visualizes the marginal effect estimates from models including interaction terms between IOs' sex and the combined education (left) and income (right) of IOs and partners. For education, the positive SRH associations were roughly similar for respondents and partners. For income, the associations were more pronounced for respondents

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than partners. In general, Figure 1 suggests that the association between income and health appears generally stronger than that of education and health.

[Figure 1 about here]

Figure 2 and Table S3 show the combined marginal effects of both education and income for IOs and partners. Figure 2 (upper left panel) shows clear gradients in terms of both IO and partner education and income overall, with marked differences between couples where both partners have a higher education and belong to the highest income group versus those where both have lower educations and belong to the lowest income groups. The remaining panels show that although some sex differences exist, the overall patterns are quite similar.

[Figure 2 about here]

Figure 3 and Table S4 illustrate differences in the associations between IO's health and partner characteristics across age. In general, SRH was worse among the oldest respondents. Furthermore, the differences between younger and older respondents appeared largest for couples (overall and across sex) where the IO i) had a lower and the partner a higher education or ii) belonged to the lowest income group and the partner to the highest income group. Among younger male and female IOs, having a resourceful partner (either in terms of education or income) appeared to matter little, net of own resources. Among older male IOs, health was positively associated with having a better-educated partner, but the opposite was seen for having a partner in a higher income group. Among older female IOs, there appeared to be little protection in having a higher-educated partner or a partner in a higher income group.

[Figure 3 about here]

Discussion and concluding remarks

Discussion

In a nationally representative sample with a solid response rate and linked to sociodemographic register data, we confirmed the well-established finding of a strong positive association between self-rated health (SRH) and respondents' own income and education. More interestingly, we found that reports of good health were significantly more common among respondents with better-educated partners (especially among male IOs), much in line with previous findings [10-15]. This is perhaps not surprising, as Norway is a comparatively rich society where knowledge, advice and information might play an important role for health. We also found that partner's higher incomes were associated with better health among female IOs, consistent with results looking at having an economically active male spouse [13]. The results for income are also consistent with findings for other health proxies, such as health service utilization [22] and mortality [19], but to our knowledge reports of partners' income, either alone or in combination with education, has otherwise not been reported for SRH.

Although Norway in many respects is a gender egalitarian society, the mean income is markedly lower among women than men, be they IOs or partners. Our findings of the somewhat different results by sex and age might suggest that households are effective income pools in some instances, but not in others. Unfortunately, the cross-sectional design enables us to only report on associations and only in relative terms. Other data and design are needed to examine absolute differences and possible causal effects.

SRH is self-reported, but such data have been shown to predict mortality as well as many other health outcomes [30]. The problem of self-selection is an inherent issue with all

surveys in that those who opt to partake might differ from those who opt out. Although our data were balanced in terms of age and sex, persons with higher education were slightly overrepresented whereas those with only primary school were underrepresented [27, 28]. Unfortunately, no studies have examined the possible self-selection related to household members' characteristics, and this aspect warrants further study.

Income data are disposable income after tax, including all income sources. In models where the partners' incomes are combined, the measure is thus likely to accurately reflect IO's economic situation. Another strength is that we have measured differences in income according to rank, thus contribute to cross-national discussions of the importance of partners' income characteristics for health. Although we lack measures of capital income and/or homeowner information in our data, the high degree of correlation between incomes and wealth in Norway [26] makes it likely that the overall conclusions nevertheless remain valid.

The education variable may slightly underestimate length of education for younger persons, as some people continue their education after age 30. We therefore re-ran all analyses excluding those younger than 40 years with largely similar results. We also re-ran the analyses for individual survey years, and the patterns were similar (all results available on request). Unfortunately, we did not have information on partners' age, and income is strongly related to age in Norway as it increases over the life course before it drops with retirement [26]. In future studies, also partners' age ought to be accounted for, and not merely be proxied by the IOs' age.

Norway is an affluent country, and neither men nor women are normally heavily dependent on their co-residential partner for their health or well-being. It may thus not be surprising that the estimates for self-rated health were somewhat weaker than those observed for morbidity and mortality as the influence of partners' characteristics might be more important in handling illness and poor health than for health promotion among healthy

individuals [19-22]. Furthermore, the influence of partners' characteristics on SRH may be stronger in settings where education levels are lower, income specialization is more common, or gender equality is less common. It may also be stronger in less 'de-familialized' societies [24].

Concluding remarks

We have shown that self-rated health is affected by the resources (or lack thereof) in our immediate networks, in line with Elder's 'linked lives' perspective [25] and the conclusions drawn by previous studies [10-14]. Health associations were generally more pronounced for income than education, and the magnitude of the various associations differed in part across individuals' own sociodemographic characteristics. To reduce social inequalities in health, health and welfare policies could benefit from reflecting the interdependence of lives to a greater extent. Health personnel may customize interactions to account for resource differences at the household level when treating sick individuals and advocating for health promotion.

Acknowledgements

References

1.	Goldblatt, P., et al., *Rapid review of inequalities in health and wellbeing in Norway since 2014*. 2023, Institute of Health Equity: London.
2.	Dahl E, Bergsli H, and van der Wel K, *Review of social inequalities in health in Norway*. 2014, Oslo and Akershus college: Oslo.
3.	Townsend, P. and N. Davidson, *Inequalities in health: The Black Report*. 1982, Harmondsworth: Penguin Books.
4.	Mackenbach, J.P., et al., *Socioeconomic inequalities in morbidity and mortality in western Europe. The EU Working Group on Socioeconomic Inequalities in Health.* Lancet, 1997. **349**(9066): p. 1655-9.
5.	Degerlund Maldi, K., et al., *Widespread and widely widening? Examining absolute socioeconomic health inequalities in northern Sweden across twelve health indicators.* International Journal for Equity in Health, 2019. **18**(1): p. 197.
6.	Jacquet, E., et al., *Social inequalities in health and mental health in France. The results of a 2010 population-based survey in Paris Metropolitan Area.* PLoS One, 2018. **13**(9): p. e0203676.
7.	Moor, I., J. Spallek, and M. Richter, *Explaining socioeconomic inequalities in self-rated health: a systematic review of the relative contribution of material, psychosocial and behavioural factors.* J Epidemiol Community Health, 2017. **71**(6): p. 565-575.
8.	Enroth, L. and S. Fors, *Trends in the Social Class Inequalities in Disability and Self-Rated Health: Repeated Cross-Sectional Surveys from Finland and Sweden 2001-2018.* Int J Public Health, 2021. **66**: p. 645513.
9.	Monden, C.W., *Do Measured and Unmeasured Family Factors Bias the Association Between Education and Self-Assessed Health?* Soc Indic Res, 2010. **98**(2): p. 321-336.
10.	Monden, C.W., et al., *Partner's and own education: does who you live with matter for self-assessed health, smoking and excessive alcohol consumption?* Soc Sci Med, 2003. **57**(10): p. 1901-12.
11.	Nilsen, S.M., et al., *Education-based health inequalities in 18,000 Norwegian couples: the Nord-Trøndelag Health Study (HUNT).* BMC Public Health, 2012. **12**: p. 998.
12.	Brown, D.C., R.A. Hummer, and M.D. Hayward, *The Importance of Spousal Education for the Self-Rated Health of Married Adults in the United States.* Popul Res Policy Rev, 2014. **33**(1): p. 127-151.
13.	Gumà, J. and J. Spijker, *Until Death Do Us Part. The Influence of Own and Partner's Socioeconomic Status on the Health of Spanish Middle-Aged Population.* Int J Environ Res Public Health, 2020. **17**(13).
14.	Huijts, T., C.W.S. Monden, and G. Kraaykamp, *Education, Educational Heterogamy, and Self-Assessed Health in Europe: A Multilevel Study of Spousal Effects in 29 European Countries.* European Sociological Review, 2010. **26**(3): p. 261-276.
15.	Lamu, A.N., G. Chen, and J.A. Olsen, *Amplified disparities: The association between spousal education and own health.* Social Science & Medicine, 2023. **323**: p. 115832.
16.	Torssander, J., et al., *Partner resources and incidence and survival in two major causes of death.* SSM Popul Health, 2018. **4**: p. 271-279.
17.	Kilpi, F., et al., *The Spillover Influence of Partner's Education on Myocardial Infarction Incidence and Survival.* Epidemiology, 2018. **29**(2): p. 237-245.
18.	Torssander, J. and R. Erikson, *Marital partner and mortality: the effects of the social positions of both spouses.* J Epidemiol Community Health, 2009. **63**(12): p. 992-8.
19.	Syse, A. and T.H. Lyngstad, *In sickness and in health: The role of marital partners in cancer survival.* SSM Popul Health, 2017. **3**: p. 99-110.
20.	Kravdal, Ø., *A broader perspective on education and mortality: are we influenced by other people's education?* Soc Sci Med, 2008. **66**(3): p. 620-36.

21.   Skalická, V. and A.E. Kunst, *Effects of spouses' socioeconomic characteristics on mortality among men and women in a Norwegian longitudinal study.* Social Science & Medicine, 2008. **66**(9): p. 2035-2047.

22.   Syse, A., et al., *Do characteristics of family members influence older persons' transition to long-term healthcare services?* BMC Health Serv Res, 2022. **22**(1): p. 362.

23.   Molven, O. and J. Ferkis, *Healthcare, welfare and law: Health legislation as a mirror of the Norwegian welfare state*. 2011, Oslo: Gyldendal.

24.   Esping-Andersen, G., *4. The Household Economy*, in *Social Foundations of Postindustrial Economies*. 1999, Oxford University Press. p. 47-72.

25.   Elder Jr, G.H., *The life course paradigm: Social change and individual development*, in *Examining lives in context: Perspectives on the ecology of human development.* 1995, American Psychological Association: Washington, DC, US. p. 101-139.

26.   Statistics Norway, *This is Norway 2021*, Statistics Norway, Editor. 2021, Statistics Norway,: Oslo, Norway.

27.   Statistics Norway, *Survey on Living Conditions 2019: Health, care and social relations*. 2020, Statistics Norway: Oslo, Norway.

28.   Statistics Norway, *Survey on Living Conditions 2015: Health, care and social relations*. 2016, Statistics Norway: Oslo, Norway.

29.   Eurostat. *European Health Interview Survey*. 2022 [cited 2022 09.09]; Available from: https://ec.europa.eu/eurostat/web/microdata/european-health-interview-survey.

30.   Idler, E.L. and Y. Benyamini, *Self-rated health and mortality: a review of twenty-seven community studies.* J Health Soc Behav, 1997. **38**(1): p. 21-37.

List of figure captions

Figure 1. Marginal effects for IOs' good health and i) education (left) and ii) income (right) resources of IOs and partners, overall and interacted across IOs' sex.
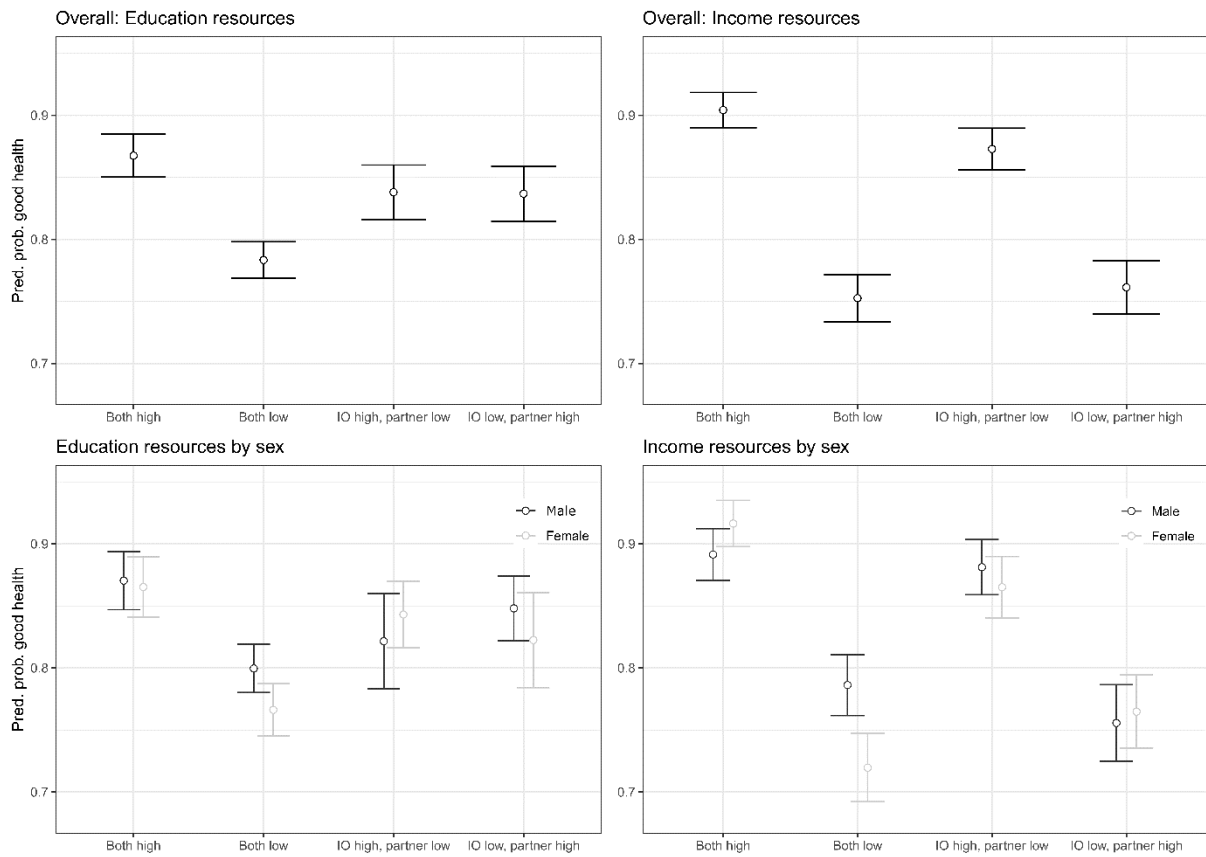
Figure 2. Marginal effects for IOs' good health and select groups of combined education and income of IOs and partners, overall and interacted cross IOs' sex.
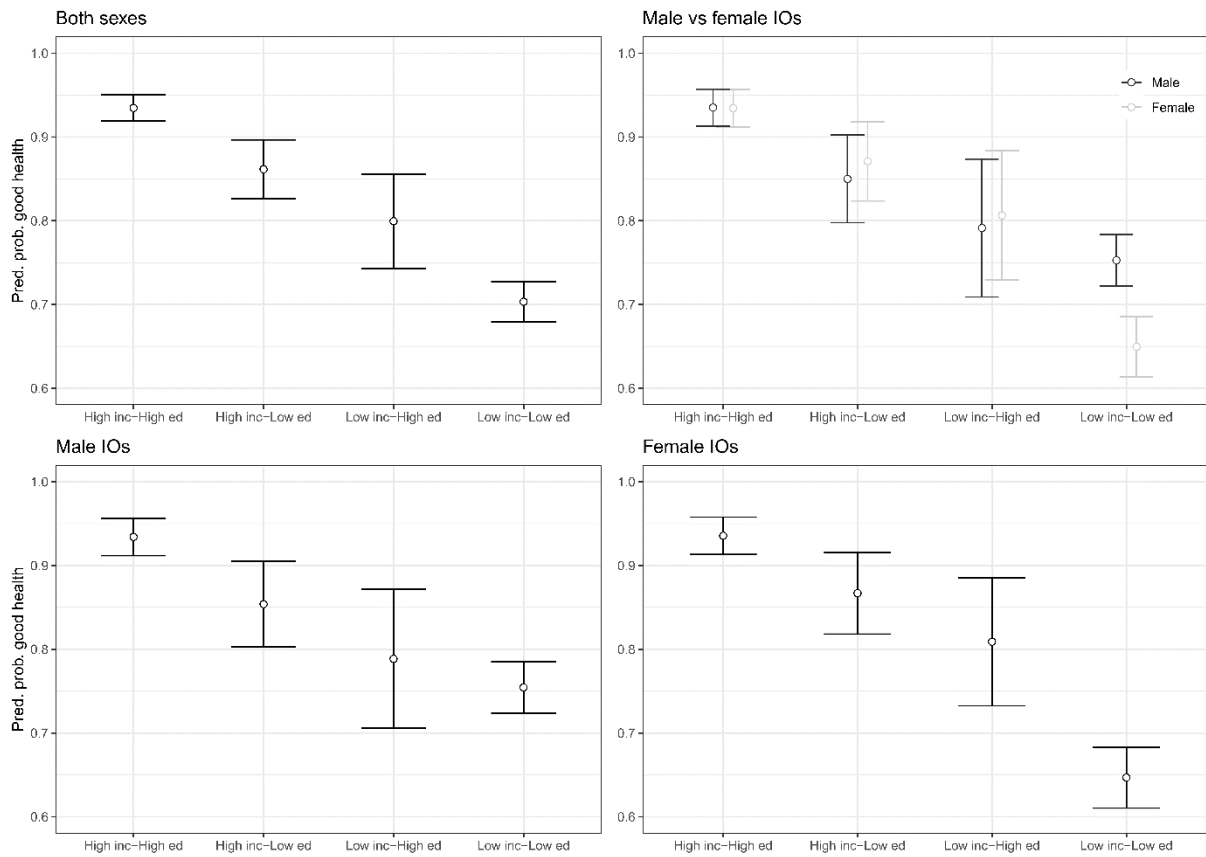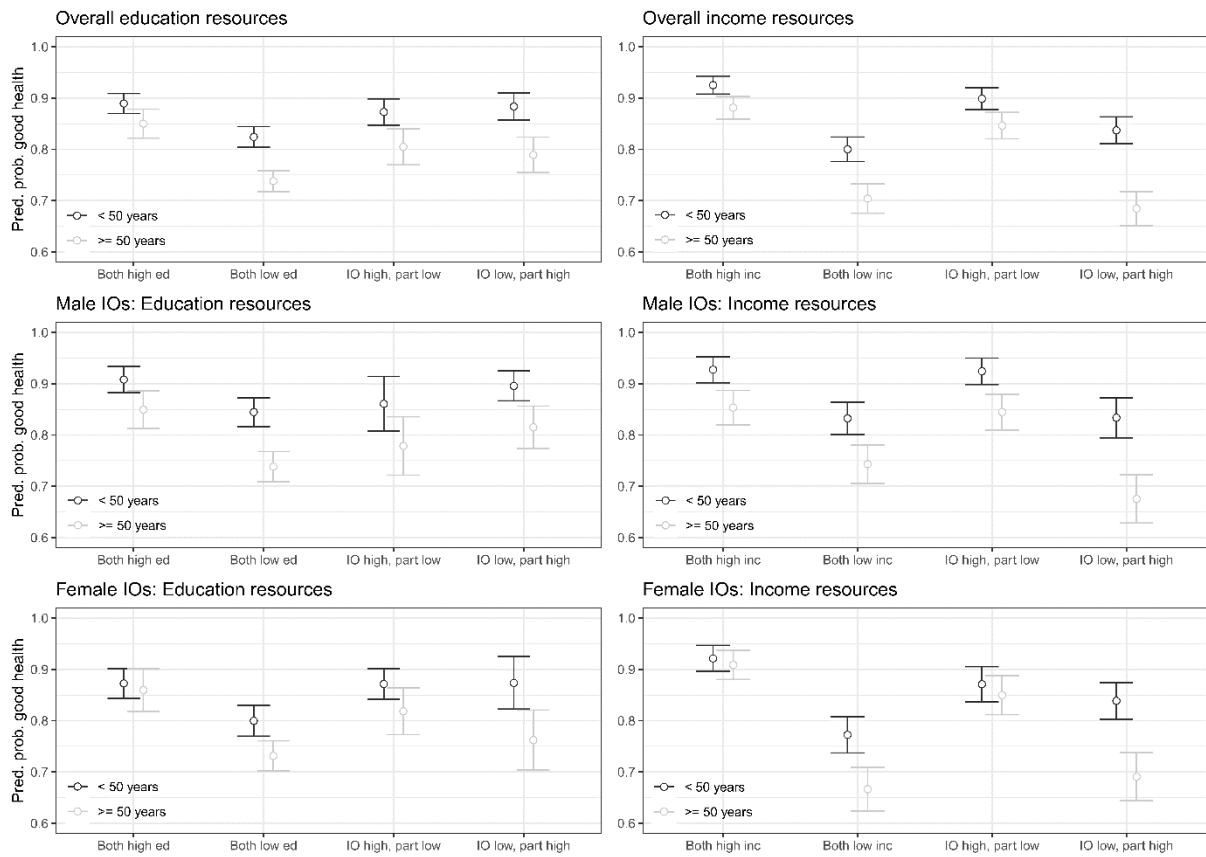
Figure 3. Marginal effects for IOs' good health and education (left) and income (right) of IOs and partners across age, overall and by IOs' sex.