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Partner's and own education: does who you live with matter for self-assessed health, smoking and excessive alcohol consumption?

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Abstract

This study analyses the importance of partner status and partner's education, adjusted for own education, on self-assessed health, smoking and excessive alcohol consumption. The relationship between socio-economic factors and health-related outcomes is traditionally studied from an individual perspective. Recently, applying social-ecological models that include socio-economic factors on various social levels is becoming popular. We argue that partners are an important influence on individual health and health-related behaviour at the household level. Therefore, we include partners in the analysis of educational health inequalities. Using data of almost 40,000 individuals (with almost 15,000 Dutch cohabiting couples), aged 25–74 years, who participated in the Netherlands Health Interview Survey between 1989 and 1996, we test hypotheses on the importance of own and partner's education. We apply advanced logistic regression models that are especially suitable for studying the relative influence of partners' education. Controlled for own education, partner's education is significantly associated with self-assessed health and smoking, for men and women. Accounting for both partners' education the social gradient in self-assessed health and smoking is steeper than based on own or partner's education alone. The social gradient in health is underestimated by not considering partner's education, especially for women.

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Introduction

The social gradient in self-assessed health and health-related behaviour, such as smoking and alcohol consumption, on the individual level is nowadays well established (Mackenbach et al., 1997; Pappas, Queen, Hadden, & Fisher, 1993; Marmot & Wilkinson, 1999). Education is one of the major dimensions of the social gradient in health. Lower educated people are less healthy, smoke more often and consume alcohol more

excessively than their higher educated counterparts (Cavelaars et al., 2000; Droomers, Schrijvers, Stronks, Van de Mheen, & Mackenbach, 1999; Crum, Helzer, & Anthony, 1993; Lynch, Kaplan, & Salonen, 1997). Whereas there is little need for further empirical proof of these differences, there still is much to be learned in understanding the social determinants of health and health-related behaviour, especially with regard to the role of the social context individuals live in (House, 2002; Marmot et al., 1997).

Questions and theories about the social gradient in health outcomes are usually formulated on the level of individuals and empirical research employs isolated individuals as units of analysis. The dominance of this

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individualistic approach has been noted before. Regarding health behaviour Rice and colleagues (1998, p. 971) for instance wrote: “the majority of research ... has tended to concentrate on the role of the consumer as the basic unit of analysis assuming that behaviour or lifestyle is an independent and self-determining function of individuals without regard for the environment which they inhabit”. The same holds true for other research on health and health-related outcomes. By and large, research has ignored that lifestyles are not purely individual phenomena. Ross and Huber (1985) rightly stated “it is in the household that larger social and economic order impinges on individuals, exposing them to varying degrees of hardship, frustration, and struggle”. Recently, it is acknowledged that health-related outcomes can better be understood by applying social-ecological models that include socio-economic factors over the life course and on various social levels (Berkman & Kawachi, 2000; Robert & House, 2000; Zimmer, Hermalin, & Lin, 2002). For instance, neighbourhood level socio-economic status (SES) affects health outcomes independent of own SES (Pickett & Pearl, 2001). It is likely that socio-economic factors on other levels, such as the household level, are important as well. We argue that partner’s SES is such an important factor.

Relatively little research has explicitly studied the importance of partner’s SES with regard to health and health behaviour. Previous research has shown that it matters for one’s health *whether you live with someone* (Joung, 1996; Macintyre, 1992; Ross, Mirowsky, & Goldsteen, 1990). However, the question whether it matters *who you live with* is largely left unanswered. Earlier research on partner’s SES and mortality (Bosma, Appels, Sturmans, Grabauskas, & Gostautas, 1995; Suarez & Barret-Conner, 1984; Martikainen, 1995) and health and longstanding illness (Arber, 1997) points at the relevance of partner’s socio-economic characteristics for own health-related outcomes. Indirect empirical support for the importance of spouses for health and health behaviour can also be found in the literature on SES indicators (e.g., by using household equivalent income, or the highest occupational status in the household) (Krieger, Williams, & Moss, 1997; Vågerö, 2000), social support (Seeman 2000) and smoking cessation (Monden, De Graaf, & Kraaykamp, 2003; Osler & Prescott, 1998). No previous studies however, investigated explicitly to what extent partner’s SES influences self-assessed health, smoking and excessive alcohol consumption independent of own SES.

In this paper, we will first simultaneously address the questions whether it matters if you live with someone and who you live with. Then we will focus on people who cohabit and study whether it matters who you live with, in more detail than done in previous studies. We use education as an indicator of SES. Education is a

central stratifying characteristic in modern societies (Berkel van Schaik & Tax, 1990). Moreover, educational attainment is more than a financial or economic resource. The school system affects and socializes everyone. Especially, higher education is associated with a healthier lifestyle, health knowledge and less risk behaviour. Thus, we will answer the following questions: (a) Is there an effect of partner’s education on self-assessed health, excessive smoking and alcohol consumption after controlling for own education, and if so to what extent? (b) Are the independent effects of partner’s education equal for men and for women? and (c) Are health-related outcomes more associated with the highest educational level than the lowest educational level in a household?

Theory and hypotheses

Why partner’s education matters for health and health behaviour

Previous research has shown that having a partner has positive effects on one’s health and health behaviour, especially for men (Joung, 1996; Macintyre, 1992; Ross, Mirowsky, & Goldsteen, 1990). Explanations are sought in (improved) social support, attachment and economic well-being for married people (Umberson, 1992). In this study, we need to answer the question why partner’s education matters for health and health behaviour. The explanations are rather similar to those that explain individual educational differences in health. The social causation hypothesis is generally regarded the most important explanation (Graham, 2000; Whitehead, 1988). There is an effect of health on social position as well, but the association between education and health is mainly caused by the direct and indirect effects that education has on health (Fox, Goldblatt, & Jones, 1986; Van de Mheen, Stronks, Schrijvers, & Mackenbach, 1999). The social causation hypothesis assumes that education (or SES in general) affects material, behavioural and psychosocial factors and that these in turn have effects on health. A large number of studies have shown that these three sets of factors indeed can explain substantial parts of the educational effect on health (Ross & Wu, 1995; Stronks, van de Mheen, Looman, & Mackenbach, 1996). Previous research has also exemplified that material circumstances and psychosocial factors explain some of the educational effect on health behaviour (Droomers et al., 1999; Stronks, Van de Mheen, Looman, & Mackenbach, 1997). Below, we argue why partner’s education has an (additional) effect through the same mechanism as own educational level. First, we argue how partner’s education affects material circumstances and psychosocial factors (House, 2002), which in their turn affect health and health behaviour,

and then we argue how partner's education affects health behaviour.

The negative effects of adverse material circumstances on health and health behaviour are empirically well established (see for instance, Droomers et al., 1999; Graham, 2000; Graham & Der, 1999; Stronks et al., 1997). The term material circumstances refers to economic wealth, housing quality, working and living conditions. Except for working conditions, material circumstances are not individual but household characteristics. They are produced through the pooled resources of all household members and they affect all household members. People who live together profit from economies of scale compared to people who live alone (Rogers, 1995). Therefore, having a partner is important. However, partners differ in the resources that they can contribute to the household. Independent of one's own education, the number of resources to improve material well-being is higher when the spouse has a higher educational level. The advantage of more resources is not restricted to the maximization of household income. A person's financial situation, the house he or she lives in, and even the labour market career are all influenced by own as well as partner's characteristics, of which education is a very important one (Bernasco, De Graaf, & Ultee, 1998; Ultee, Dessens, & Jansen, 1988; Mulder & Smits, 1999).

The second pathway from partner's education to health and health behaviour runs through psychosocial factors. Some psychosocial factors are very much individual and not strongly affected by external circumstances or other household members. Still, a number of psychosocial factors (social network, stress, social support, coping) that are associated with health and health behaviour are the 'product' of resources and lifestyles that both partners bring into the household. Low SES is associated with lower levels of social support (Ross et al., 1990). Eckenrode's (1983) study showed that poorly educated people mobilize social support less effectively than the well-educated. Thus, people with a low educated partner might experience less social support, more stress, and less effective coping behaviour and this will affect their health and health behaviour.

Health behaviour is an intermediary factor as well as an outcome in this study. Partner's education affects health through health behaviour. Above, we have argued that partner's education affects health behaviour through material circumstances and psychosocial factors. There are also more direct links between partner's education and health behaviour. Education is strongly associated with lifestyles and has enduring effects on people (Bourdieu, 1984; Hyman, Wright, & Reed, 1976). Sociologists have traditionally studied specific lifestyles such as cultural participation and attitudes, whereas epidemiologists have presented evidence that education is also associated with health lifestyles (Leclerc et al.,

1992; Kilander, Berglund, Boberg, Vessby, & Lithell, 2001). Several studies have shown that partners influence each other's lifestyle (Umberson, 1992; Van Berkel & De Graaf, 1995). For instance, smokers negatively influence their partner's diet (Osler, 1998) and smoking behaviour (Monden, De Graaf, & Kraaykamp, 2003; Osler & Prescott, 1998) and wife's attitude and fat intake predicts her husband's fat intake (Shattuck, White, & Kristal, 1992). If a lower educated person lives together with a lower educated spouse it is more likely that their lifestyles will be 'typical low class' than if the spouse was higher educated. So, one's 'individual' lifestyle is affected by own and partner's education.

Partner's education hypothesis

To sum up, people are affected by their partner's educational level largely through the same mechanisms that link their own education to their health and health behaviour. People with a higher educated partner may benefit from their partner's education through its consequences for material circumstances, psychosocial environment and lifestyle. Consequently, our expectation is: *People with low educated partners are more likely to report poor health, smoke or drink alcohol excessively than people with high educated partners, controlling for their own educational level* (hypothesis 1).

Male dominance hypothesis

We assume that both men and women are affected by their partner's educational level. However, we expect the effect of partner's education to be stronger for women than for men. Traditionally, the household's material circumstances depend more on men's educational resource than on women's. Even in 1991, two out of three Dutch women relied for more than 50 per cent of her standard of living on an income transfer of her husband (Van Berkel, 1997). Studies in sociology have shown varying levels of *male dominance* for class identification, cultural participation, voting behaviour, and fertility (Van Berkel, 1997; Van Berkel & De Graaf, 1995). Results from health studies employing husband's occupation as a measure for women's SES also suggest male dominance (Krieger et al., 1997). This literature implicitly touches upon the question of partner influences. In most cases, husband's occupation has a stronger influence on women's health outcomes than women's own occupation. Unfortunately, these studies did not estimate wife's and husband's occupation simultaneously. Following the suggestions of male dominance, our second hypothesis reads: *Women experience relatively more influence of their partner's educational attainment on health, smoking and alcohol consumption than men do (controlling for their own educational level)* (hypothesis 2).

Highest status dominance hypothesis

Is an individual in a mixed household more influenced by the highest education or by the lowest education (irrespective of whose educational level it is)? The household-level perspective gives us the unique opportunity to test whether the positive effect of higher educational attainment is stronger than the negative effect of lower educational attainment. In terms of smoking and drinking, which can be seen as components of lifestyles, the question really is about adaptation to higher or lower class lifestyles. We expect that partners with higher education more strongly influence their lower educated partners than vice versa. Individuals adjust to the lifestyle of the class of whoever has the higher level. This idea comes from sociological analysis of class (Erikson, 1984). High educated people may be more reluctant to change their behaviour than their low educated partners, because this could be interpreted as moving 'down'. The high educated lifestyle may enjoy more status. Moreover, higher educated people may be better able to influence their partners through information and arguments. Thus, we expect dominance of the highest education: *A person's health, smoking and alcohol consumption are relatively more affected by the person with the highest educational level than the person with the lowest educational level in the household* (hypothesis 3).

Data and methods

Data

We employ data from nine editions (1989–1996) of the annual Netherlands' Health Interview Survey (NethHIS) from Statistics Netherlands (Centraal Bureau voor de Statistiek, 1996). The NethHIS is a combined face-to-face interview and self-administrated questionnaire among about 8000 respondents (per year) in randomly sampled households and is representative for the Dutch non-institutionalised population. The survey design is cross-sectional. Up to four members in each household were interviewed, including the head of the household and his or her partner. We only include heterosexual married or cohabiting adult partners. Each respondent filled out the self-administrated questionnaire on smoking, alcohol and some health outcomes, whereas in some cases the spouse answers the background questions and the general health questions. The response rate of approximately 56 per cent is quite standard for the Netherlands. The NethHIS is the primary and most authoritative data source for national representative statistics on health inequalities in the Netherlands (Mackenbach et al., 1997). The 1989–1996 editions are unique because they gathered information about the health status and health behaviour of both partners.

Household surveys on health are very rare in the Netherlands. Moreover, no other study has so much statistical power. All together, there are 46,134 respondents. We excluded respondents who were younger than 25 ($n = 2101$) or older than 74 ($n = 4410$) years of age. The lower limit is chosen to make sure almost everyone has finished his or her educational career. We also excluded 146 respondents living with a partner of the same sex, 112 respondents who did not provide accurate information on educational levels, and 12 respondents with missing data on health. This results in 39,353 respondents (including 16,579 couples) for the analysis on self-assessed health. Due to missing information, the number of respondents analysed for smoking and alcohol consumption is 35,749 (including 14,982 couples) and 35,575 (including 14,909 couples) respectively.

Education is considered a good indicator of SES in the Netherlands (Berkel van Schaik & Tax, 1990). Of the three core components of SES (education, income and occupation), education is available for everyone and it is the most individual characteristic of the three. Moreover, education has high reliability and validity (Liberatos, Link, & Kelsey, 1988) and is stable during adult life. Respondents were asked to report their *highest obtained diploma*. We define four categories: primary or no education, lower secondary, upper secondary and tertiary education (reference group). These levels are actual, existing school levels that have a substantial meaning in the Dutch school system. Smoking indicates whether respondents are *current smokers*. Non-smokers and former smokers are the reference category. Respondents were asked how often they drank six or more alcoholic drinks on one occasion during the last half-year. Consuming six or more alcoholic drinks on more than three days a week is defined as *excessive alcohol consumption*. In the face-to-face interview health was measured with a single item question: 'how is your health in general?' and five answer categories: 'very good, good, fair, sometimes good and sometimes bad, bad'. We dichotomised the answer into (very) good (0) and *less than good health* (1). About 21 per cent of all men and 23 per cent of the women report less than good health, whereas 43 per cent of the men and 33 per cent of the women are current smokers. The percentage of excessive alcohol consumption is 6.7 and 1.3 per cent for men and women, respectively. Age, marital status and urbanisation are used as control variables. Urbanisation is divided in three categories (highly urban, medium/low urban and rural), based on the typology by Statistics Netherlands (Centraal Bureau voor de Statistiek, 1996).

Statistical analysis

Our baseline model is a standard logistic model containing respondent's education and confounders (age, urbanisation and marital status) as independent

variables and either less than good health, smoking status or excessive alcohol as outcome variable. Adding partner status and partner's education to this model allows us to evaluate their independent contribution. By comparing the model fit of a model with and without partner's education, we evaluate the effect of partner's education on top of own education. Moreover, these logistic regression models allow us to compare the effect of having or not having a partner (i.e. whether you live with someone) to the effect of partner's education (i.e. who you live with). These models will be estimated for men and women separately.

Next, we turn to a (logistic) diagonal reference (Sobel, 1981, 1985) model that better fits both the theory and the data (Cox, 1990). A basic assumption of these models is that individuals from couples where both partners have the same education can be seen as the core ("reference") of the specific educational group defining its norms and lifestyles (De Graaf & Heath, 1992; De Graaf, Nieuwebeerta, & Heath, 1995). Therefore, if one wants to know the typical health behaviour of a low educated person, one should consider a person living with a partner with the same education. The behaviour of a low educated person married to a university graduate is likely to be affected by this (higher educated) partner. The major advantage of the diagonal reference model is that it takes the health behaviour of the educationally homogamous couples as references. On basis of these couples, the typical educational gradient is estimated. For respondents who have an educational level different from their partner's the model uses one parameter to estimate the importance of own versus partner's education. Specifications of this parameter allow us to test male dominance and high status dominance easily. Moreover, the diagonal reference

model uses less degrees of freedom than standard models.

Technically, the diagonal reference model reads: $\text{prob}(Y_{ijk} = 1) = 1/(1 + e^{-\text{lin}})$, where $\text{lin} = p\alpha_i + (1-p)\alpha_j + \beta_L \text{cov}_L$. Y_{ijk} equals 1 if respondent k in the ij th cell (i for own education, j for partner's education) reports less than good health, smoking or excessive alcohol consumption. The expected mean of the core members of each educational level is modelled by α . So, instead of coefficients for own and partner's individual education this model estimates coefficients for the outcomes of respondents who have the same educational attainment as their partners have. Subsequently, for all respondents who have an educational level different from their partner's a weight coefficient p (with restriction $0 \leq p \leq 1$) is estimated, which indicates to what extent a respondent's outcome depends on the estimated effect of his/her own educational level (the estimated population mean of the typical couples) relative to partner's educational level. If p equals unity the outcome is only influenced by the respondent's own education, if p equals zero the outcome is only influenced by the partner, whereas both partners are equally important when $p = 0.5$. Logit coefficients are estimated for L covariates, in our case age, marital status, urbanization and gender. All analyses were performed with SPSS10.

Results

Table 1 shows that in about 57 per cent of the couples partners have mixed educational levels. Although a majority lives with a partner of a different educational level, there is a strong tendency for homogamy

Table 1
Association between own and partner's education for Dutch cohabiting men and women^a

Own education	N	Partner's education				
		Primary (%)	Lower secondary (%)	Upper secondary (%)	Tertiary (%)	
<i>Males</i>						
Primary	2898	54	31	14	2	100%
Lower secondary	3902	26	44	26	4	100%
Upper secondary	6192	17	34	39	10	100%
Tertiary	3587	5	17	38	40	100%
<i>Females</i>						
Primary	3798	41	17	8	2	100%
Lower secondary	5312	26	35	20	7	100%
Upper secondary	5239	28	39	46	27	100%
Tertiary	2230	5	11	26	64	100%

^a Overall Kendall's $\tau_B = 0.43$, $p < 0.0001$.

Table 2

Percentage of respondents reporting less than good health, current smoking and excessive alcohol consumption by own and partner's education^a

Respondent's education	Less than good health (%)	Current smoker (%)	Excessive alcohol consumption (%)
<i>Primary education</i>			
No partner	39	52	6
Partner primary education	36	47	5
Partner lower secondary education	33	48	5
Partner upper secondary education	27	44	6
Partner tertiary education	18	37	7
<i>Lower secondary education</i>			
No partner	28	51	5
Partner primary education	27	45	4
Partner lower secondary education	22	37	4
Partner upper secondary education	20	37	3
Partner tertiary education	18	37	5
<i>Upper secondary education</i>			
No partner	23	46	5
Partner primary education	23	40	3
Partner lower secondary education	18	35	3
Partner upper secondary education	17	32	3
Partner tertiary education	15	31	3
<i>Tertiary education</i>			
No partner	18	40	5
Partner primary education	15	28	3
Partner lower secondary education	12	30	2
Partner upper secondary education	12	26	2
Partner tertiary education	12	26	2

^a Adjusted for age and gender.

(a tendency to live with a partner who has an (almost) equivalent educational level).

In Table 2, we present the percentage of respondents reporting poor health, current smoking and excessive alcohol consumption for all combinations of own and partner's education to illustrate our research problem. This table suggests that partner status and partner's education affect the three outcome variables. Lower educated people without a partner report the highest smoking rate and the highest percentage of less than good health. Higher educated people living with a higher educated partner report the lowest rates, also for excessive alcohol consumption. In the next models, these relationships are quantified and tested for significance over all four educational levels.

Table 3 shows an inverse educational gradient in self-assessed health, smoking and excessive alcohol consumption. Lower educated respondents are more likely to report poor health, smoking or excessive alcohol consumption than respondents with a tertiary education. The educational differences for poor health are smaller for women than for men. Adding partner status and partner's education (combined and separately) to the base-line model improved the models for general health and current smoking. Having a partner reduces the

chance of reporting poor health for men and women. Women, but not men ($p = 0.55$) who live with a partner are also less likely to smoke. However, for both men and women we observe that having a higher educated partner is associated with lower risks of poor health and smoking. Partner's education shows the same pattern as we observe for own education. However, the gradient is less strong. The effect of partner status (whether you live with someone) is comparable in size with the difference between having a partner with primary education and a partner with a tertiary diploma.

With regard to excessive alcohol consumption, the picture is more complex. We observe an educational gradient for men, but not for women. Women with primary education whose partner has a similar diploma do have an increased risk (odds ratio = 2.08 CI = 1.01–4.32) of excessive alcohol consumption compared to women in a household where both partners have tertiary education. For women, adding partner status and partner's education to the model is not an improvement over the individual model (the change in χ^2 is not significant). The model for men improves slightly, due to the effect of partner status. What the models in Table 3 do not show is that primary educated men are more

Table 3

Logistic regression models of own education, partner's education and less than good health, being a current smoker and excessive alcohol consumption for men and women, OR (95%CI)

	Men				Women			
	Model 1		Model 2		Model 1		Model 2	
<i>Less than good health</i>								
Own education								
Primary	4.05	(3.58–4.58)	3.40	(2.98–4.03)	3.04	(2.55–3.48)	2.53	(2.20–2.91)
Lower secondary	2.41	(2.13–2.73)	2.14	(1.86–2.50)	1.87	(1.64–2.12)	1.65	(1.44–1.89)
Upper secondary	1.72	(1.53–1.94)	1.59	(1.41–1.85)	1.44	(1.27–1.64)	1.35	(1.18–1.54)
Tertiary (reference)	1.00		1.00		1.00		1.00	
Partner (1 = yes)			0.69	(0.57–0.84)			0.73	(0.61–0.87)
Partner's education								
Primary			1.59	(1.34–1.89)			1.65	(1.44–1.90)
Lower secondary			1.24	(1.05–1.46)			1.35	(1.18–1.54)
Upper secondary			1.12	(0.95–1.32)			1.18	(1.05–1.33)
Tertiary (reference)			1.00				1.00	
χ^2 (df) model improvement			60.6 (4)	$p < 0.001$			72.3 (4)	$p < 0.001$
N				18,835				20,581
<i>Being a current smoker</i>								
Own education								
Primary	2.42	(2.18–2.68)	2.20	(1.96–2.46)	2.56	(2.28–2.86)	2.17	(2.04–2.74)
Lower secondary	1.65	(1.51–1.81)	1.55	(1.40–1.72)	1.97	(1.77–2.19)	1.76	(1.60–2.09)
Upper secondary	1.33	(1.22–1.44)	1.27	(1.17–1.39)	1.53	(1.38–1.69)	1.44	(1.31–1.68)
Tertiary (reference)	1.00		1.00		1.00		1.00	
Partner (1 = yes)			0.86	(0.74–1.00)			0.87	(0.75–0.99)
Partner's education								
Primary			1.30	(1.14–1.48)			1.56	(1.37–1.76)
Lower secondary			1.12	(0.99–1.26)			1.29	(1.15–1.44)
Upper secondary			1.06	(0.95–1.19)			1.15	(1.04–1.27)
Tertiary (reference)			1.00				1.00	
χ^2 (df) model improvement			25.4 (4)	$p < 0.001$			58.1 (4)	$p < 0.001$
N				17,286				19,224
<i>Excessive alcohol consumption</i>								
Own education								
Primary	2.10	(1.72–2.56)	1.95	(1.57–2.42)	1.45	(0.95–2.21)	1.45	(0.91–2.30)
Lower secondary	1.62	(1.34–1.96)	1.55	(1.26–1.90)	0.99	(0.66–1.50)	0.99	(0.64–1.55)
Upper secondary	1.36	(1.14–1.62)	1.32	(1.10–1.59)	0.97	(0.65–1.46)	0.97	(0.64–1.48)
Tertiary (reference)	1.00		1.00		1.00		1.00	
Partner (1 = yes)			0.77	(0.56–0.94)			1.25	(0.72–2.16)
Partner's education								
Primary			1.16	(0.89–1.52)			1.03	(0.63–1.70)
Lower secondary			1.10	(0.86–1.41)			0.96	(0.61–1.51)
Upper secondary			0.95	(0.75–1.20)			1.02	(0.68–1.52)
Tertiary (reference)			1.00				1.00	
χ^2 (df) model improvement			11.7 (4)	$p < 0.05$			0.8 (4)	$p = 0.94$
N				17,253				19,156

Note. OR = odds ratio; CI = confidence interval. Results from logistic regression. Model 1: baseline model including age (5-year groups), urbanization and marital status. Model 2: Model 1 adjusted for partner's education. Model improvement of Model 2 compared to Model 1.

Table 4

Logistic diagonal reference models of own and partner's education, male dominance, high status dominance and less than good health, being a current smoker and excessive alcohol consumption

	Own and partner's education		Male dominance		High status dominance	
<i>Less than good health</i>						
Own-partner's education ^a						
Primary–primary	4.70	(3.84–5.75)	4.64	(3.79–5.67)	4.66	(3.81–5.69)
Lower secondary–lower secondary	2.45	(2.00–3.00)	2.43	(1.98–2.97)	2.42	(1.97–2.97)
Upper secondary–upper secondary	1.72	(1.39–2.12)	1.71	(1.40–2.10)	1.68	(1.36–2.08)
Tertiary–tertiary (reference)	1.00		1.00		1.00	
Relative importance of ^b						
Own education	0.66	(0.60–0.72)	0.59	(0.50–0.68)		
Partner's education	0.34		0.41			
Interaction						
Own education × male			0.14	(0.01–0.27)		
Relative importance of ^b						
Highest education					0.50	(0.39–0.62)
Lowest education					0.50	
<i>N</i> = 33,158						
<i>Being a current smoker</i>						
Own-partner's education ^a						
Primary–primary	3.14	(2.67–3.70)	3.13	(2.66–3.68)	3.10	(2.62–3.33)
Lower secondary–lower secondary	2.01	(1.73–2.33)	1.99	(1.71–2.32)	1.98	(1.69–2.32)
Upper secondary–upper secondary	1.51	(1.30–1.75)	1.50	(1.30–1.74)	1.48	(1.25–1.74)
Tertiary–tertiary (reference)	1.00		1.00		1.00	
Relative importance of ^b						
Own education	0.64	(0.55–0.73)	0.61	(0.48–0.73)		
Partner's education	0.36		0.39			
Interaction						
Own education × male			0.07	(–0.11–0.25)		
Relative importance of ^b						
Highest education					0.33	(0.16–0.50)
Lowest education					0.67	
<i>N</i> = 29,964						
<i>Excessive alcohol consumption</i>						
Own-partner's education ^a						
Primary–primary	2.19	(1.44–3.33)	2.19	(1.44–3.33)		
Lower secondary–lower secondary	1.66	(1.13–2.43)	1.66	(1.13–2.43)		
Upper secondary–upper secondary	1.34	(0.93–1.94)	1.34	(0.93–1.94)		
Tertiary–tertiary (reference)	1.00		1.00			
Relative importance of ^b						
Own education	0.83	(0.65–1.01)	0.84	(0.45–1.22)		
Partner's education	0.17		0.16			
Interaction						
Own education × male			–0.01	(–43–0.41)		
<i>N</i> = 29,818						

Note. Results from logistic diagonal reference models including age (5-year groups), urbanisation and marital status.

^aOdds ratio and 95% confidence interval.

^bWeight coefficient (ranging from 0 to 1) and its 95% confidence interval.

likely to drink alcohol excessively the higher educated their partner is. Lower educated women living with men who obtained a tertiary diploma and women with a tertiary diploma living with lower educated men also have significantly increased rates of excessive alcohol

consumption (odds ratios of 3.19 CI = 1.01–10.11 and 4.93 CI = 1.06–22.88, respectively).

Next, we turn to the logistic diagonal reference models in Table 4. Only respondents with a partner are included in these analyses. The educational gradient is now based

on respondents from couples where both partners have a similar educational level. Individuals from couples where both partners are higher educated are the reference group. We call the gradient obtained by contrasting the outcomes and behaviour of respondents from primary–primary couples to those of respondents from tertiary–tertiary couples the typical educational gradient. The outcomes for these respondents are not biased by the education of their partner. The typical gradients for all three outcomes are stronger than the individual gradients for men and women in Table 3. A typical lower educated person is 4.7 times more likely to report less than good health than a typical higher educated person is. In the individual model, we found odds ratios for men and women of 4.20 and 2.98, respectively.

We observe that the influence of own education is more important than partner's education for health and smoking (weight factor p is larger than 0.5 and smaller than 1). This confirms the finding in Table 3 that partner's education matters for health outcomes in addition to own education. Quantifying the relative importance, we observe that own education is almost twice as important as partner's education for self-assessed health (0.66/0.34), and 1.8 times as important concerning smoking. As the confidence intervals for the importance of own education include unity for alcohol consumption, we conclude that partner's education does not have the expected effect.

The interaction of the importance of own versus partner's education with sex shows that there is evidence of male dominance for less than good health (middle panel of Table 4). For self-assessed health, own education is relatively more important for men than for women, or stated differently, women experience stronger influence of their partner's education than men do. However, women's own education still is more important than their partner's is and thus there is weak (and not complete) male dominance. We observe no male dominance at all for smoking or alcohol consumption.

Finally, the right-hand panel of Table 4 answers the question whether the highest educational level in a household is more important for a person's health and smoking behaviour than the lowest educational level (irrespective of whose education it is). The contribution of the highest versus the lowest education in the household is estimated in this model instead of own versus partner's education. We analysed this only for less than good health and smoking since partners seem to be relevant for alcohol consumption only in specific combinations. Our results do not show evidence for higher status dominance. Both the highest and lowest education in the household affect self-assessed health and do so equally strong. Interestingly, for smoking the lowest education seems to be almost twice as important as the highest education. However, this finding is not

significant as the confidence interval of the weight coefficient includes 0.5. We tested the high status dominance models for gender differences, but found no differences between men and women (results not shown).

Discussion and conclusion

In this study, we showed that partner's education is significantly associated with reporting less than good health and smoking, even after controlling for one's own education. Having a partner with low educational attainment increases health risks for both men and women, whereas having a higher educated partner decreases them. The effect of partner's education is comparable in size to that of having or not having a partner (partner status). There was no significant association of partner's education with excessive alcohol consumption. However, partners who differ strongly in their educational level experience increased risks for excessive consumption. Furthermore, we showed that comparing respondents from households with two low educated partners to respondents from high educated households reveals stronger social gradients in health-related outcomes than comparing low educated individuals to high educated individuals. This is especially true for women. By ignoring the importance of partner's education, standard individualistic models underestimate social inequalities in health and health behaviour.

We found weak associations between education and alcohol consumption. This may be due to the high cut-off point. Analyses on moderate and high alcohol consumption (drinking six or more units on at least one occasion per week) yielded results comparable to our findings on smoking (results obtainable from the authors). Moderate and high alcohol consumption reflects a lifestyle like smoking does, whereas excessive alcohol consumption probably has very important determinants operating on the biological and psychological level.

We also found evidence for weak male dominance in health. Women are more affected by their partner's educational level than men are. There appears to be no male dominance in smoking; both partners are equally important in explaining smoking behaviour. Moreover, our results suggest that higher educated partners might be more likely to adapt to the typical lower educated smoking behaviour than lower educated partners are to adapt to the (healthier) higher educated smoking styles. With regard to health, however, the lowest and highest education in the household are equally important.

We have to consider some limitations of our study as well. We had to rely on self-reported data. For smoking and alcohol consumption, there are no real alternatives. The single item question that we applied for health is

found to be a good predictor of mortality as well as other dimensions of health (Idler & Benyamini, 1997; Ferraro & Farmer, 2000). Female partners often reported data on age, education and general health of their male partners. Spouses seem to be able to report their partner's physical health accurately (Epstein et al., 1989; Van Sonsbeek, 1996). Statistics Netherlands applies both proxy and non-proxy respondents in their reports and trend figures. We analysed the sample without the proxy cases and this did not change our conclusions substantially. Moreover, using only non-proxy respondents would result in a strong overrepresentation of retired, disabled and unemployed men. The comparatively high non-response in the Netherlands may have led to an underestimation of educational differences. Non-response is somewhat higher for the lower educated. This does not affect our logistic regression models as the odds ratios are insensitive to group size. The broader confidence intervals would make it more difficult to find support for our hypotheses. Complex non-random selectivity patterns could lead to biases in our results. However, it is very unlikely that non-response is systematically linked to both specific combinations of education in couples and health-related outcomes at the same time. Moreover, those more plausible complex non-response patterns, such as a lower educated couple in good health being more likely to participate than a lower educated couple in bad health, work contra our hypotheses. Therefore, we have no clear indications that non-response has seriously biased our conclusions on the effect of partner's education. And if there were a bias, it would imply that our tests are conservative.

Only a few earlier studies have dealt with partner's characteristics, health, and health behaviour explicitly. They addressed status incongruity and fatal ischemic heart disease (Bosma et al., 1995; Suarez & Barret-Conner, 1984) and mortality and spouse's SES (Martikainen, 1995). Others have pointed at partner's SES as a measurement problem of social status (Krieger et al., 1997; Vågerö, 2000). Only one study, investigating British couples, found that husband's class and employment status are relevant for self-assessed health and limiting long-standing illness of women (Arber, 1997). These studies have concluded that partner's characteristics are relevant, but most of them did not have explicit theory about partner's influence and did not move away from the conventional methodological approach. In this article, we have advanced the analyses of partner effects and the social gradient in health outcomes in general. Especially with regard to women, there has been ongoing debate about whether to assign women their own, husband's or household SES (which has several variants). We have shown that one should take into account the effects of both own and partner's SES. For women in particular the typical social gradient (compar-

ing respondents from primary–primary households to respondents from tertiary–tertiary households) turns out to be much stronger than the social gradient in the individualistic model. It is important to note that including own and partner's SES in analysis is not the same as applying household SES. Household SES is the sum of own and partner's SES. However, we showed that own and partner's education cannot simply be added up. Own education has a stronger effect than partner's education and their weights are different for men and women. Moreover, we found little support for the highest status dominance approach, which often is the rationale behind assigning male or household level SES to women.

Our findings suggest that interventions in public health should pay attention to the social context in which individuals live. Our analyses have shown how important partner's educational level is for health and health behaviour. Educational inequalities appear to be larger when couples are studied than when respondents' partners are not taken into account. Therefore, interventions at the family level need more attention. In the recent interest for community level factors and interventions, processes that take place within households should not be ignored. A British multilevel study showed that the household influence on the number of alcohol drinks a week far outweighed the influence of place of residence (Rice, Carr-Hill, & Dixon, 2000). Since individuals belong to households with a certain lifestyle, policies aimed only at the individual may not be successful in influencing people's behaviour. Furthermore, the concentration of bad health in households (Wilson, 2001) combined with adverse material circumstances and unhealthy lifestyles in households where both partners have low SES may lead to an accumulation of social and medical problems. Interventions aimed at reducing inequalities might be more effective if they more explicitly take into account that the most disadvantaged are not simply people with low education, but those who live in families where both partners are lower educated. Another suggestion for future research is to examine to what extent partner's education influences one's health directly or indirectly through behaviour or material circumstances.

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References

- Arber, S. (1997). Comparing inequalities in women's and men's health: Britain in the 1990s. *Social Science & Medicine*, *44*, 773–787.
- Berkel van Schaik, A. B., & Tax, B. (1990). *Naar een standaardoperationalisatie van sociaal-economische status voor epidemiologisch en sociaal-medisch onderzoek (in Dutch)*. Rijswijk: Ministerie van VWC.
- Berkman, L. F., & Kawachi, I. (2000). *Social epidemiology*. New York: Oxford University Press.
- Bernasco, W., De Graaf, P. M., & Ultee, W. C. (1998). Coupled careers: Effects of spouse's resources on occupational attainment in the Netherlands. *European Sociological Review*, *14*, 15–31.
- Bosma, H., Appels, A., Sturmans, F., Grabauskas, V., & Gostautas, A. (1995). Educational level of spouses and risk of mortality: The WHO Kaunas–Rotterdam Intervention Study (KRIS). *International Journal of Epidemiology*, *1*, 119–126.
- Bourdieu, P. (1984). *Distinction: A social critique of the judgement of taste*. London: Routledge.
- Cavalaars, A. E., Kunst, A. E., Geurts, J. J., Crialesi, R., Grotvedt, L., Helmert, U., Lahelma, E., Lundberg, O., Matheson, J., Mielck, A., Rasmussen, N. K., Regidor, E., Do Rosario-Giraldes, M., Spuhler, T., & Mackenbach, J. P. (2000). Educational differences in smoking: International comparison. *British Medical Journal*, *320*, 1102–1107.
- Central Bureau voor de Statistiek (Statistics Netherlands), (1996). Netherlands Health Interview Survey 1981–1995. 's-Gravenhage: Staatsuitgeverij.
- Cox, D. R. (1990). Role of models in statistical analysis. *Statistical Science*, *5*, 169–174.
- Crum, R. M., Helzer, J. E., & Anthony, J. C. (1993). Level of education and alcohol abuse and dependence in adulthood: A further inquiry. *American Journal of Public Health*, *83*, 830–837.
- De Graaf, N. D., & Heath, A. (1992). Husbands' and wives' voting behaviour in Britain: Class-dependent mutual influence of spouses. *Acta Sociologica*, *35*, 311–322.
- De Graaf, N. D., Nieuwbeerta, P., & Heath, A. (1995). Class mobility and political preferences: Individual and contextual effects. *American Journal of Sociology*, *100*, 997–1027.
- Droomers, M., Schrijvers, C. T. M., Stronks, K., Van de Mheen, M., & Mackenbach, J. P. (1999). Educational differences in excessive alcohol consumption: The role of psychosocial and material stressors. *Preventive Medicine*, *29*, 1–10.
- Eckenrode, J. (1983). The mobilization of social supports: Some individual constraints. *American Journal of Psychology*, *11*, 509–528.
- Epstein, A. M., Hall, J. A., Tognetti, J., Son, L. H., & Conant Jr., L. (1989). Using proxies to evaluate quality of life. Can they provide valid information about patients' health status and satisfaction with medical care? *Medical Care*, *27*, S91–98.
- Erikson, R. (1984). Social class of men, women and families. *Sociology*, *18*, 500–514.
- Ferraro, K. F., & Farmer, M. M. (2000). Utility of health data from social surveys: Is there a gold standard for measuring morbidity? *American Sociological Review*, *64*, 303–315.
- Fox, A. J., Goldblatt, P. O., & Jones, D. R. (1985). Social class mortality differentials: Artifact, selection or life circumstances? *Journal of Epidemiology and Community Health*, *39*, 1–8.
- Graham, H. (Ed.) (2000). *Understanding health inequalities*. Buckingham: Open University Press.
- Graham, H., & Der, G. (1999). Influences on women's smoking status: The contribution of socio-economic status in adolescence and adulthood. *European Journal of Public Health*, *9*, 137–141.
- House, J. S. (2002). Understanding social factors and inequalities in health: 20th century progress and 21st century prospects. *Journal of Health and Social Behavior*, *43*, 125–142.
- Hyman, H. H., Wright, C. R., & Reed, J. S. (1976). *The enduring effects of education*. Chicago: University of Chicago Press.
- Idler, E. L., & Benyamini, Y. (1997). Self-rated health and mortality: A review of twenty-seven community studies. *Journal of Health and Social Behaviour*, *38*, 21–37.
- Joung, I. M. A. (1996). Marital status and health. Descriptive and explanatory studies. Erasmus University Rotterdam (dissertation).
- Kilander, L., Berglund, L., Boberg, M., Vessby, B., & Lithell, H. (2001). Education, lifestyle factors and mortality from cardiovascular diseases and cancer. A 25-year follow-up of Swedish 50-year-old men. *International Journal of Epidemiology*, *30*, 1126–1128.
- Krieger, N., Williams, D. R., & Moss, N. E. (1997). Measuring social class in US public health research: Concepts, methodologies, and guidelines. *Annual Review of Public Health*, *18*, 341–378.
- Leclerc, A., Pietri, F., Boitel, L., Chastang, J. F., Carval, P., & Blondet, M. (1992). Level of education, lifestyle, and morbidity in two groups of white collar workers. *Journal of Epidemiology and Community Health*, *46*, 403–408.
- Liberatos, P., Link, B. G., & Kelsey, J. L. (1988). The measurement of social class in epidemiology. *Epidemiology Review*, *10*, 87–121.
- Lynch, J. W., Kaplan, G. A., & Salonen, J. T. (1997). Why do the poor behave poorly? Variation in adult health behaviours and psychosocial characteristics by stages of the socio-economic lifecourse. *Social Science & Medicine*, *44*, 809–819.
- Macintyre, S. (1992). The effects of family position and status on health. *Social Science & Medicine*, *35*, 453–464.
- Mackenbach, J. P., Kunst, A. E., Cavalaars, A. E., Groenhouf, F., & Geurts, J. J., EU Working Group on Socio-economic Inequalities in Health (1997). Socio-economic inequalities in morbidity and mortality in western Europe. *Lancet*, *349*, 1655–1659.
- Martikainen, P. (1995). Socio-economic mortality differentials in men and women according to own and spouse's characteristics in Finland. *Sociology of Health and Illness*, *17*, 353–375.

- Marmot, M., & Wilkinson, R. G. (Eds.). (1999). *The social determinants of health*. Oxford: Oxford University Press.
- Marmot, M., Ryff, C. D., Bumpass, L. L., Shipley, M., & Marks, N. F. (1997). Social inequalities in health: next questions and converging evidence. *Social Science and Medicine*, 44(6), 901–910.
- Monden, C. W. S., De Graaf, N. D., & Kraaykamp, G. (2003). How important are parents and partners for smoking cessation? An event history analysis. *Preventive Medicine*, 36, 197–203.
- Mulder, C. H., & Smits, J. (1999). First-time home-ownership of couples: The effect of inter-generational transmission. *European Sociological Review*, 13, 323–337.
- Osler, M., & Prescott, E. (1998). Psychosocial, behavioural, and health determinants of successful smoking cessation: A longitudinal study of Danish adults. *Tobacco Control*, 7, 262–267.
- Osler, M. (1998). The food intake of smokers and nonsmokers: The role of partner's smoking behavior. *Preventive Medicine*, 27, 438–443.
- Pappas, G., Queen, S., Hadden, W., & Fisher, G. (1993). The increasing disparity in mortality between socio-economic groups in the United States, 1960 and 1986. *New England Journal of Medicine*, 329, 103–109.
- Pickett, K. E., & Pearl, M. (2001). Multilevel analyses of neighbourhood socio-economic context and health outcomes: A critical review. *Journal of Epidemiology and Community Health*, 55, 111–122.
- Rice, N., Carr-Hill, R., Dixon, P., & Suttons M., . (2000). The influence of households on drinking behaviour: A multilevel analysis. *Social Science & Medicine*, 46, 971–979.
- Robert, S. A., & House, J. S. (2000). Socioeconomic inequalities in health: Integrating individual-community and societal-level theory and research. In: G. L. Albrecht, R. Fitzpatrick, & S. C. Scrimshaw (Eds.), *Handbook of social studies in health and medicine*. London: Sage Publications.
- Rogers, R. G. (1995). Marriage, sex, and mortality. *Journal of Marriage and the Family*, 57, 515–526.
- Ross, C. E., & Huber, J. (1985). Hardship and depression. *Journal of Health and Social Behavior*, 26, 312–327.
- Ross, C. E., Mirowsky, J., & Goldstein, K. (1990). The impact of the family on health: The decade in review. *Journal of Marriage and the Family*, 52, 1059–1078.
- Ross, C. E., & Wu, C. L. (1995). The links between education and health. *American Sociological Review*, 60, 719–745.
- Seeman, T. E. (2000). Health promoting effect of friends and family on health outcomes in older adults. *American Journal of Health Promotion*, 14, 362–370.
- Shattuck, A. L., White, E., & Kristal, A. R. (1992). How women's adopted low-fat diets affect their husbands. *American Journal of Public Health*, 82, 1244–1250.
- Sobel, M. E. (1981). Diagonal mobility models: A substantively motivated class of designs for the analysis of mobility effects. *American Sociology Review*, 46, 893–906.
- Sobel, M. E. (1985). Social mobility and fertility revisited: Some new models for the analysis of the mobility effects hypothesis. *American Sociological Review*, 50, 699–712.
- Stronks, K., van de Mheen, H., Looman, C. W. N., & Mackenbach, J. P. (1996). Behavioural and structural factors in the explanation of socio-economic inequalities in health: An empirical analysis. *Sociology of Health and Illness*, 18, 653–674.
- Stronks, K., Van de Mheen, H. D., Looman, C. W. N., & Mackenbach, J. P. (1997). Cultural, material and psychosocial correlates of the socio-economic gradient in smoking behaviour in adults. *Preventive Medicine*, 26, 754–766.
- Suarez, L., & Barret-Conner, E. (1984). Is an educated wife hazardous to your health? *American Journal of Epidemiology*, 119, 244–249.
- Ultee, W. C., Dessens, J., & Jansen, W. (1988). Why does unemployment come in couples? *European Sociological Review*, 4, 111–122.
- Umberson, D. (1992). Gender, marital status and the social control of health behavior. *Social Science & Medicine*, 34, 907–917.
- Vågerö, D. (2000). Health inequalities in women and men. *British Medical Journal*, 320, 1286–1287.
- Van Berkel, M. (1997). *Who dominates when: Asymmetrical patterns of influence among Dutch husbands and wives*. Nijmegen: Mediagroep (dissertation).
- Van Berkel, M., & De Graaf, N. D. (1995). Husband's and wife's culture participation and their levels of education: A case of male dominance? *Acta Sociologica*, 38, 131–150.
- Van de Mheen, H., Stronks, K., Schrijvers, C. T. M., & Mackenbach, J. P. (1999). The influence of adult ill health on occupational class mobility and mobility out of and into employment in the Netherlands. *Social Science & Medicine*, 49, 509–518.
- Van Sonsbeek, J. L. A. (1996). Vertel me wat er aan scheelt. Betekenis en methodische aspecten van enquetevragen naar de gezondheid. Voorburg/Heerlen: Centraal Bureau voor de Statistiek (dissertation).
- Whitehead, M. (1988). The health divide. In: P. Townsend, N. Davidson, & M. Whitehead, (Eds.), *Inequalities in health*. London: Penguin.
- Wilson, S. E. (2001). Socio-economic status and the prevalence of health problems among married couples in late midlife. *American Journal of Public Health*, 91, 131–135.
- Zimmer, Z., Hermalin, A. I., & Lin, H. S. (2002). Whose education counts? The added impact of adult-child education on physical functioning of older Taiwanese. *Journals of Gerontology: Social Sciences*, 57B, S23–32.