# Partners in health? Exploring resemblance in health between partners in married and cohabiting couples

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**Abstract**   Sociological theories on family formation and families and health suggest that married and cohabiting partners will resemble each other in health status, positively or negatively. The family is often seen as a health-enhancing agent for individuals. However, there are large health differences among families. This study aims to answer the question whether it is the case that the healthy live with the healthy and individuals with poor health have partners who are also in poor health. Moreover, it examines whether resemblance in health is a consequence of partner choice – educational homogamy in particular – behaviour or shared circumstances. Younger and older couples are compared to investigate whether health resemblance increases over the lifecourse.

Analyses of a nationally representative sample of almost 12,000 Dutch couples show that partners are indeed significantly alike with regard to several health indicators. Respondents whose partner reports poor health are almost three times more likely to report poor health than respondents whose partner is in good health. There is a strong accumulation of health problems within households. Partner selection with regard to education causes part of the partner resemblance in health. Less support is found for the hypotheses that risk behaviour, mutual influence or the effects of shared circumstances cause similarity between partners' health status. Surprisingly, partners in older couples, who have been together for a longer time, do not resemble each other significantly more than partners in younger couples. The implications of these findings for sociological theory and social inequalities in health are discussed.

**Keywords:** education, health, homogamy, inequality, partners

## Introduction

This study investigates similarity in health between married and cohabiting partners. Although the saying goes that opposites attract, a vast body of research shows that partners tend to be more similar than different. The degree of resemblance between partners in characteristics such as education, social origin, and status has often been studied because it provides important information about social cohesion and social inequality in society (Blau and Schwartz 1984, Kalmijn 1998, Merton 1941). Similarly, partner resemblance in health provides important information.

The question whether the healthy live with the healthy and the less healthy with the less healthy is especially important from the perspective of social inequalities. For married or

cohabiting people, the most important caregiver is one's partner. It is likely that the partner's health, in addition to own health, affects an individual's daily life and wellbeing. For instance, when both partners are in bad health, it is more difficult for them to perform support roles for each other. Moreover, bad health causes stress and can lead to unemployment and loss of income. So, the mutual occurrence of health problems in a couple causes an extra burden for both partners. In addition, partner resemblance in health is important because the health of parents affects children. Having parents who are ill can cause stress and can lead to reduced parental involvement and support for children. The burden and restrictions that bad health entails – or, positively formulated, the 'human capital' that good health constitutes (Mirowsky and Ross 2003) – means that studying resemblance in health between partners will give new insights into social inequality and, at the same time, improve our understanding of the social health divide. Studying health resemblance also informs us about family processes of mutual influence with regard to health (and health behaviour).

There are little to no empirical data on spouse resemblance with respect to health. This holds true for the Netherlands, on which this study focuses, as well as for most other countries. Therefore, the first question of this study is a descriptive one: To what extent are partners alike in self-reported health? Sociological theory on family formation, lifestyles and the influence of partners on health and health behaviour suggests that we may expect substantial similarities in health. The next step then is to explore possible explanations suggested by these theories. Thus, the second question of this study is: How can partner resemblance in health be explained? I employ data on almost 12,000 couples to explore the extent to which alikeness in health is a consequence of resemblance in education and lifestyles or the result of living together and shared circumstances.

## Sociological perspectives

In the sociological literature, there are three lines of research that can help us study resemblance in health between spouses. The first deals with family formation and various forms of partner resemblance – homogamy. The second line studies how the family affects individuals' health. Third, literature on social inequalities in health – or more generally, the social determinants of health – provides a link between education and health, which is necessary to understand how educational homogamy can entail the accumulation of health problems in lower-educated households.

## Health selection or indirect consequence of partner choice?

Sociology has a long tradition of studying how individual, group-level and structural factors influence who marries whom (Kalmijn 1998). Preferences, opportunities, and third parties (family, friends, social groups) determine the importance of individual, group-level and structural characteristics. First of all, marriages – or partnerships in general – are an outcome of people's preference for a spouse with certain characteristics. The assumption is that unmarried persons search for an attractive spouse in terms of socioeconomic and cultural resources. Socioeconomic resources provide economic wellbeing and status; for instance, education, income and prestigious jobs. These resources make a potential spouse more attractive. Cultural resources refer to such issues as values, opinions, knowledge and life style. People do not search for a partner with more cultural resources, but rather for

potential spouses who share similar cultural values, opinions and lifestyles (Kalmijn 1998, for an empirical study on the Netherlands, see Uunk 1996).

If we apply sociological theories on partner choice to spouse resemblance in health, two processes can be distinguished: direct and indirect partner selection. If a certain characteristic, for instance health, plays a significant role in selecting the partner (through preferences) then resemblance in health is caused by direct partner selection. It seems unlikely, however, that direct selection based on health is the most important explanation for partner resemblance in health. Other characteristics, such as age, education, social position, ethnicity and religion are assumed to play a more important role than health. Moreover, at the age when most people start serious relationships, health differences are not as salient as differences in socioeconomic and cultural characteristics.

The second process, indirect partner selection, means that people select each other based on characteristic A, which is correlated with characteristic B. Consequently, direct selection based on characteristic A leads to resemblance in characteristic B (Kalmijn 1998). Thus, if A is related to health, direct selection on A would lead to health similarity. Which forms of direct partner selection could result in partner resemblance in health? The characteristics on which direct partner selection is based have to be associated with health. Age clearly satisfies this condition and so does education. Numerous studies have shown strong educational homogamy (Blackwell 1998, Kalmijn 1998) and education is strongly related to health throughout the lifecourse (Mackenbach *et al.* 1997, Mirowsky and Ross 2003). Lifestyle may also play a role in partner selection and, as lifestyles influence health, it may cause resemblance in health. The assumption is that partners also influence each other's lifestyle during their relationship (Monden, De Graaf and Kraaykamp 2003, Turk and Kerns 1985). Lifestyle is therefore treated in the section on the effects of living together. However, it is important to note that lifestyle homogamy found in a cross-sectional study can be the result of partner selection as well as partner influence.

The second research question can now be refined: *To what extent can resemblance in health between partners be explained by educational homogamy (after taking age into account)*? There is ample evidence for a direct effect of education on partner choice (Kalmijn 1998, Smits, Ultee and Lammers 2000). Formulating an exact expectation is not possible, but I expect that *partner resemblance in health will be partly explained by educational homogamy* (hypothesis 1).

**Living together and family processes**

Sociologists have long stressed the importance of family and partners for one's health. The family is seen as one of the central factors that shape and influence individuals' health behaviours, beliefs and attitudes (Danielson, Hamel-Bissell and Winstead-Fry 1993, Doherty and Campbell 1988). Family members play an important role in defining health and (the appraisal of) illness and they influence health-related behaviours such as food habits, smoking, drinking alcohol, physical exercise and consumption of medical care (Turk and Kerns 1985). Traditionally, there has been much attention paid to the positive influence that families can have on health (House, Umberson and Landis 1988, Ross, Mirowsky and Goldsteen 1990). Social support and social control within families are generally believed to stimulate health-promoting behaviour (Baranowski 1997, Umberson 1987). Families, however, do not necessarily promote good health (Gryzwacz and Marks 1999). Norms and values about health and health behaviour evolve in a family and depend on the health statuses and socioeconomic and cultural resources of the family members.

This means that some families may enhance the health of its members more than other families, while some families can even be detrimental for its members' health. Smoking provides an obvious example. On the one hand, quitting smoking is easier if a family member (especially a person's partner) has recently quit smoking or has never smoked (Monden, De Graaf and Kraaykamp 2003). On the other hand, the opposite is equally true; having a partner who smokes makes it more difficult to quit smoking. A family in which smoking is accepted can be detrimental to an individual's health because of a lower likelihood of quitting, and also because of passive smoking.

The sociological literature is clear about its assertion that partners are important for each other's health, although the mechanisms through which partners influence each other are less clear. From this literature, we should expect partners to become more similar over time with regard to health behaviour and health beliefs and, therefore, more similar in (subjective) health status. By influencing each other's behaviour, partners adapt and grow more alike. On the other hand, part of the similarity in lifestyle, especially smoking and drinking behaviour, may have already existed before the relationship started, and may be due to social homogamy. In that case, health resemblance could be a consequence of lifestyle similarity. The following hypothesis can be formulated: *partner resemblance in health is partly the result of similarities in lifestyle* (hypothesis 2). Whether lifestyle homogamy is caused by partner selection or partner influence is not addressed at this point. The influence of the partner goes beyond the effect of similarities in lifestyles. Partners' behaviour can also have direct health effects, as in the case of passive smoking. A partner's education may have direct and indirect effects on one's health, for instance, through the partner's contribution to household income, the partner's health beliefs and illness behaviour. Likewise, a person's own behaviour and educational attainment influence his or her partner's health (see also Monden *et al.* 2003). These ideas about mutual influence lead to the hypothesis that *the behaviour and characteristics of one partner influence the health of the other, and vice versa, and thus causes partner resemblance in health; this resemblance is stronger, the longer partners live together* (hypothesis 3).

Finally, there is another important explanation for health similarity between partners: shared environment. Because partners live together they share a social and physical environment and this environment influences their health. Examples of shared environment are household income, housing conditions and physical and social aspects of the neighbourhood, as well as access to and quality of healthcare facilities in the area. It is important to note that individuals may experience the same circumstances but yet react to them in different ways. In general, however, sharing the same environment is expected to lead to similarity in health; thus, I hypothesise that *shared environment partly explains partner resemblance in health* (hypothesis 4). Shared environment will also lead to higher resemblance in older than in younger couples. The environment, either physical or social, is unlikely to have instantaneous effects. Spouses who have lived together for some years will have been influenced by the shared environment for a longer time and therefore will be more similar in their health condition than couples who have been together for a shorter period of time.

**Social inequality in health**

There is an elaborate literature on the social gradient in health and health-related behaviour (for a recent introduction, see Bartley 2004). This literature focuses on how social class (in the UK), education and income (in the Netherlands and the United States) affect an

individual's health. People from higher classes, with more education and higher income, report better health throughout modern societies. A combination of material, behavioural and psychosocial factors have been proposed as explanations for the educational gradient in health (see, for instance, Stronks *et al.* 1997, Mirowsky and Ross 2003). Education is related to advantages and disadvantages throughout the lifecourse (*e.g.* Blane 1999). In the Netherlands, material circumstances, such as adverse working conditions and an uncertain financial situation, and behavioural factors, such as smoking and little physical exercise, can explain a substantial part of the poor health situation among lower-educated groups (Stronks *et al.* 1997, for other countries see: Mirowsky and Ross 2003, Sacker *et al.* 2000, Fuhrer *et al.* 2002). Most studies look at individuals instead of families. 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. By doing so, most previous studies have ignored the likelihood that social inequalities at the individual level can differ from those at the household level. The notion of partner resemblance points at the accumulation of negative or positive characteristics in households. Educational homogamy will lead to accumulation of health problems in lower-educated households. In general, health resemblance between partners entails greater social inequalities at the household level than at the individual level. It is important to assess the level of social inequality at the household level, not only because most sociological studies about health inequalities focus on individuals, but also because health policies and insurances tend to ignore the household level. Furthermore, by studying to what extent health resemblance is caused by similarity in education, lifestyles or income, we can also draw conclusions about the link between education and health. That is, the analyses can show whether education has an independent effect or whether differences in income and lifestyles among educational groups lead to differences in health.

## Prior empirical research

Although there are a large number of sociological studies on various sorts of homogamy, health is rarely addressed explicitly. In a range of disciplines other than sociology (*i.e.* medicine, epidemiology, psychology and behaviour genetics), research is available which examines spouse correlations of physical traits (including physical health), personality and psychosocial traits (including mental health). With regard to physical traits, the majority of studies concern spouse correlations for cardiovascular risk factors, such as blood pressure, cholesterol, body mass index and fatfold (Hippisley-Cox and Pringle 1998). These studies describe and try to explain prevalence of cardiovascular risks in the population. One way to do so is by studying spouse couples. Because spouses are not genetically linked any concordance in risk factors must be due either to direct partner selection or to effects of the shared environment (Knuiman *et al.* 1996: 48). Studies in this area show a positive and significant association between spouses in many cardiovascular risk factors. According to Tambs and Moum (1992), typical spouse correlation in physical traits ranges from r = 0.10 to r = 0.30. Even if age, height and weight are controlled for, these correlations are substantial.

Some studies have investigated specific diseases. Hippisley-Cox *et al.* (2002) studied mutual occurrence of eight diseases in married couples from ten British general practices. According to the authors, shared environment as well as similarity in behaviours causes resemblance in specific diseases. However, Willemsen and colleagues (2003) could not replicate significant results for asthma, diabetes and cardiovascular diseases in a sample of

Dutch twins. With regard to personality traits and mental health, several studies have found significant partner resemblance (Eagles *et al.* 1987, Galbaud du Fort *et al.* 1994).

Only a few studies used a general health indicator to compare partners' health. Tambs and Moum (1992) found a spouse correlation of about r = 0.25 for self-assessed general health in a sample of over 20,000 couples in a Norwegian region.[1] This study concerned patterns of resemblance for several characteristics over the duration of the marriage. The spouse correlation of general health appeared to be quite stable over time except for the first two years. Wilson (2001, 2002) presented cross tabulations of general health and an index of functional limitations and restrictions for a sample of American husbands and wives aged 51 to 61. The accompanying kendall's $\tau_b$ ranged from 0.17 to 0.22. Chandola and colleagues (2005) assessed clustering of the sf-36 mental and physical health functioning scores within British households. Their analysis is not restricted to couples but includes all household members aged over 16 and also single-person households. Although this study did not assess spouse correlations for specific health indicators, the findings clearly suggest that there is health resemblance among British spouses as well. Considering these findings, one would expect to find partner resemblance in the Netherlands for general health in a similar range to those found in the US and Norway (correlations of 0.15 to 0.25).

**Data**

The annual Netherlands Health Interview Survey (NethHIS) by Statistics Netherlands (Central Bureau of Statistics 1996) provides self-reported health indicators and background information for both adult partners in households. The NethHIS is a representative sample of the non-institutionalised Dutch-speaking population of the Netherlands. The survey consists of a face-to-face interview and self-administered questionnaires. Response rates vary between 55 and 59 per cent. Surveys from the 1989-1996 period are employed. Before 1989 no information on behaviour was available and since 1997 the NethHIS no longer interviews both adult partners in a household. There are 11,979 heterosexual couples aged 20 to 74 with complete information on all relevant variables for the 1989–96 period.

Three general health measurements will be examined: self-assessed general health, long-standing health problems (also called chronic conditions) and health complaints. These are often-used measurements in international and Dutch public health research (Arber 1997, Dalstra *et al.* 2002, Van Baal 1997). The three measurements cover different health aspects and can be seen as complementary. Survey questions of self-reported health have over and again been shown to be good indicators of health that even predict mortality (Ferraro and Farmer 1999, Idler and Benyamini 1997). In addition to analysing these three indicators separately, I perform analyses with structural equation models in which the three indicators are used to form one health indicator: 'overall health'.

Furthermore, a number of specific health problems are studied. This provides an extra test of the hypotheses. For 13 out of 24 long-standing health problems in the survey's checklist a positive odds ratio was found; that is, partner resemblance exists. However, the absolute numbers (and risks) are very small. Therefore, seven diseases with a high prevalence are reported (at least 10 couples where both partners report the same problem). This makes the tests more conservative, reducing the chance of biased conclusions due to reporting or coding errors. Arthritis includes all forms of chronic inflammation of the joints. Diabetes refers to both type I and type II. The use of self-reports makes it difficult to distinguish between subtypes and, moreover, the prevalence would become too small.

Explanatory and confounding variables are: age, education, household income, urbanisation, body mass index, height, smoking behaviour, and alcohol consumption. Age is
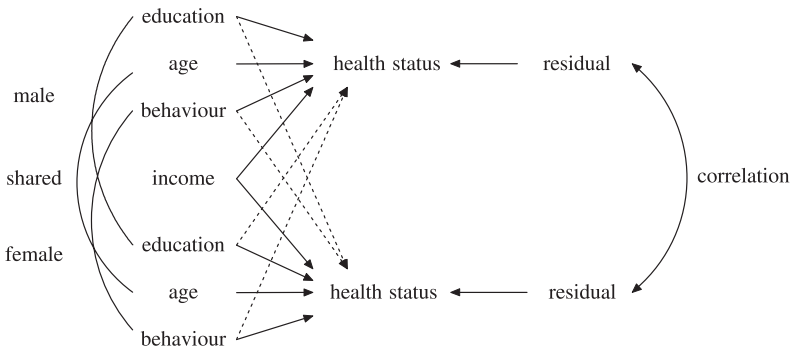
Figure 1 *Residual correlation model to examine partner resemblance in health*

measured in eleven categories of five years between 20 and 74 years of age. Education is measured in four levels: primary education or less, lower-secondary education, higher-secondary education and tertiary education (including college and university). Household income is measured in four quartiles and the highest category is the reference category. Household income is used rather than personal income, because partners benefit equally from household income in health-related aspects. Urbanisation is measured in three categories: very strongly urban, very-to-moderately urban and not urban (classification by Statistics Netherlands). Body mass index (weight in kilograms divided by height in metres squared) is often used as a measurement for obesity or food habits. A body mass index lower than 20 is classified as light, over 25 is classified as overweight, and respondents with a body mass index of 20–25 are the reference category (Kuczmarski *et al.* 1997). Height is also studied separately, in addition to its use in calculating body mass index. In various academic fields, height has a slightly different interpretation than body mass index. In social medical research the latter is usually used as an indicator for obesity and food habits, whereas in sociology (and genetics) height is interpreted as a characteristic involved in mate selection (Kalmijn 1998, Pierce 1996). With respect to smoking behaviour, I distinguish non-smokers, former smokers and current smokers. Non-smokers are the reference category. Alcohol consumption is treated in three categories: teetotallers, those who drink little to moderately and respondents with a high alcohol consumption (those drinking six or more units of alcohol on one occasion more than three times a month).

## Method

In the first step, partner resemblance in health is examined simply by correlations and odds ratios (for dichotomised measurements). The association between men's and women's health is analysed for several indicators. In the next step, residual correlation models are used. Figure 1 shows how the residual correlation represents partner resemblance in health net of other forms of homogamy (solid lines) and mutual influence (dashed lines). Assume that a person's characteristics affect his or her health and these characteristics are correlated with those of the spouse, but do not affect the spouse's health directly. In that case, the residuals of male and female health should be uncorrelated after controlling for the individual characteristics (Ultee *et al.* 1988). Each model is estimated separately for men and for women. The residual is calculated by subtracting the predicted score

on health from the observed score. These residuals are then correlated. Notice that the residual correlation of men and women in an empty (or intercept) model is equal to the correlation between men's and women's health. First, all variables are examined in a 'bi-variate' way; that is, the residual correlation is calculated while controlling for one variable at a time. Next, multivariate models are examined. LISREL 8.53 (Jöreskog and Sörbom 1993) is used to analyse one latent variable called 'overall health' that combines the three health indicators.

Logistic regression is used to obtain the odds ratio of having a specific disease of respondents whose partner has that disease, compared to respondents whose partner does not (see Table 3). This method is adapted from Hippisley-Cox *et al.* (2002). The dependent variable is the woman's disease status; men's status is the independent variable. Taking men's disease status as the dependent and women's disease status as the independent variable yields virtually the same results. Note that this model is not completely equivalent to the residual correlation model.

**Analytic strategy**

Various models are specified to examine the effects of the explanatory variables simultaneously. The order of the models is determined by theoretical arguments about the mechanisms that cause health resemblance. In the first model, residual correlation is equal to the age-adjusted spouse correlation in Table 2. Subsequent models introduce possible explanations. The second model adds urbanisation to reflect the fact that partners live in the same region and regional characteristics might influence health. Subsequently, three models are specified to test the contribution of education and income. Theoretically, as well as empirically, education precedes income and, to a somewhat lesser extent, lifestyles. A person's educational level is one of the most important determinants of later income and also strongly influences lifestyles (Mirowsky and Ross 2003, Ross and Wu 1995). It is therefore a relevant question whether education has an effect above income and lifestyles or whether the effect of education is completely due to higher income and different lifestyles among the higher educated. To assess the independent effects of educational homogamy and income, Model 2a adds education and Model 2b includes income. In Model 3, education and income are entered simultaneously. Next, resemblance in lifestyles (health-related behaviour) is introduced by adding smoking, alcohol consumption and body mass index to Model 4a and Model 4b. The former model does not include education. By comparing it to the latter, we can observe whether the effect of education runs though lifestyles or whether there is an additional effect of education. The final model takes mutual influence into account by adding partner's education and partner's behaviour. This is the last model because I suppose that a person's own educational level and own behaviour are more important for that person's health than the influence of the partner. The question is whether the additional effect of the partner's characteristics can explain part of the health resemblance after a person's own characteristics and shared circumstances (urbanisation, income) are taken into account.

**Describing partner resemblance in health**

The association between men's and women's health status is presented in Table 1. About 20 per cent of the respondents report less than good health, though women do so slightly

Table 1 *Men's self-assessed health by women's self-assessed health in married and cohabiting couples*

|  | women's health | | |
|---|---|---|---|
| men's health | good health | less-than-good health | total |
| good health | 8,111 | 1,580 | 9,691 |
|  | 84.7% | 16.3% | 80.9% |
| less-than-good health | 1,478 | 810 | 2,288 |
|  | 64.6% | 35.4% | 19.1% |
| total | 9,589 | 2,390 | 11,979 |
|  | 80.0% | 20.0% | 100% |

Table 2 *Association between partners' health status for several health indicators*

|  | unadjusted | | | age-adjusted | | |
|---|---|---|---|---|---|---|
| health indicator | correlation | odds ratio | 95% CI | correlation | odds ratio | 95% CI |
| overall health (combined) | 0.312 | | | 0.233 | | |
| self-assessed general health (1–5) | 0.246 | | | 0.207 | | |
| self-assessed less-than-good health (0-1) | 0.188 | 2.81 | 2.54–3.11 | 0.144 | 2.23 | 2.00–2.48 |
| longstanding health problems (#) | 0.210 | | | 0.157 | | |
| ≥1 longstanding health problem | 0.128 | 1.68 | 1.56–1.80 | 0.089 | 1.45 | 1.34–1.56 |
| health complaints | 0.227 | | | 0.215 | | |
| ≥4 health complaints | 0.149 | 2.18 | 1.99–2.40 | 0.139 | 2.08 | 1.89–2.29 |

*Note*: CI = confidence interval

more often than men. The odds of reporting less-than-good health is 2.81 (95% CI 2.54–3.11) times higher for respondents whose partner reports less-than-good health compared to respondents whose partner reports good health. Note that this figure is not adjusted for age. It simply gives an indication of the occurrence of two partners being in poor health in the general population. After adjusting for age, the association between partner's health status is still substantial (odds ratio = 2.23).

Table 2 reports the degree of partner resemblance in health for all general health indicators. Odds ratios are given for dichotomous indicators. The data provide strong support for the existence of health homogamy. The correlation between partners' self-assessed health is about r = 0.25. Overall, the correlation between partners' health is significant and positive. The odds ratios are substantive, especially for self-assessed less than good health. Combining the three health indicators results in a spouse correlation of r = 0.31. Compared to correlations of typically r = 0.1 to r = 0.3 between partners' personality traits (Feng and Baker 1994) and, for instance, education (typically r = 0.40 to r = 0.50) the correlations found for health are substantial.

Table 3 shows the odds ratios for specific diseases. Respondents whose partner has a long-standing health problem have an increased risk for reporting that same condition. Having a partner with diabetes (of either type) increases the respondents' risk to also suffer

Table 3 *Prevalence of specific self-reported long-standing health problems for men and women and (age-adjusted) risk of reporting a specific health problem for women whose partner reported the same problem compared to those whose partner did not*

|  | men % | women % | unadjusted odds ratio | adjusted for age odds ratio (95% CI) |
|---|---|---|---|---|
| diabetes mellitus | 2.0 | 1.9 | 4.39 | 2.07 (1.22–3.50) |
| arthritis | 8.1 | 9.9 | 2.57 | 1.57 (1.31–1.88) |
| intestinal disorders | 1.6 | 2.2 | 2.60 | 2.33 (1.21–4.49) |
| sinusitis | 6.7 | 9.5 | 2.42 | 2.31 (1.91–2.79) |
| hypertension | 8.5 | 9.4 | 1.89 | 1.09 (0.90–1.31) |
| asthma | 6.1 | 5.9 | 1.56 | 1.46 (1.11–1.92) |
| backache | 10.4 | 9.7 | 1.35 | 1.25 (1.04–1.50) |

*Note*: CI = confidence interval

that condition by more than four times. About two per cent of the respondents report having diabetes (of either type). This prevalence rate does not differ much from the estimates for the general Dutch population (Ruwaard and Kramers 1993). The smallest but still significant odds ratio is found for backache, a rather common health problem. Respondents whose partner suffers from backache are at a 35 per cent increased risk of reporting backache themselves. After controlling for age, the association for hypertension is no longer significant. This means that for six out of seven conditions one has an increased chance to report this conditions if one's partner has this condition. Whether social factors – education, income, and behaviour – are associated with this increased risk is investigated below.

### A consequence of partner selection?

Partner selection for age, education, income, smoking, alcohol consumption, height and body mass index may entail partner resemblance in health. The spouse correlations for these characteristics are all significant ($p < 0.001$) and positive. The highest correlation is found for the age of male and female partners ($r = 0.96$). From a sociological point of view age homogamy and the age effect on health are not as interesting as the role that education, income and behaviour play. Therefore, I will concentrate on age-adjusted correlations from here on. As in other Western societies (Smits, Ultee and Lammers 2000), there is a strong correlation between spouses' educational level ($r = 0.49$) in the Dutch sample. Smoking behaviour, alcohol consumption and body mass index are less strongly correlated (Kendall's $\tau_b$ of 0.26 and 0.23, and product moment correlation of $r = 0.23$, respectively). These patterns are similar to those found in Norwegian research (Tambs and Moum 1992).

Table 4 presents spouse correlations for health adjusted for homogamy on the above-mentioned characteristics. The age-adjusted correlation between partners' health status is $r = 0.23$ if we take the three health measurements into account simultaneously. Education seems to be an important factor for the explanation of resemblance in health. This finding supports hypothesis 1. After we control for the similarity in education, partner resemblance in health is 13 per cent lower. Note that the reduction after adjusting for income is somewhat

Table 4 *Age-adjusted spouse correlations for health after controlling for several characteristics*

| | residual correlation coefficients (% reduced) | | | |
| --- | --- | --- | --- | --- |
| | overall health | self-assessed less-than-good health | long-lasting health problems | health complaints |
| total spouse correlation | 0.233 | 0.144 | 0.157 | 0.215 |
| urbanisation | 0.233 (0.0%) | 0.145 (0.0%) | 0.157 (0.0%) | 0.215 (0.0%) |
| education | 0.202 (13.3%) | 0.121 (16.0%) | 0.150 (4.5%) | 0.197 (8.4%) |
| income | 0.203 (12.9%) | 0.127 (11.8%) | 0.149 (5.1%) | 0.203 (5.6%) |
| alcohol | 0.218 (6.4%) | 0.132 (8.3%) | 0.151 (3.8%) | 0.210 (2.3%) |
| smoking | 0.227 (2.6%) | 0.140 (2.8%) | 0.156 (0.6%) | 0.211 (1.9%) |
| height | 0.229 (1.7%) | 0.141 (2.1%) | 0.156 (0.6%) | 0.212 (1.4%) |
| body mass | 0.219 (6.0%) | 0.138 (4.2%) | 0.150 (4.5%) | 0.209 (2.8%) |

overestimated, since the correlation between partners' income is artificially set to unity by using household income. Education seems to be a more important factor than income. Only for long-standing health problems, income is more important than education.

Hypothesis 2 stated that similarity in lifestyles can partly account for health resemblance. Controlling for the three lifestyle variables and height indeed reduces the residual correlations, but not as much as education does. Partners' similarity in body mass index and alcohol consumption seems to be more important than smoking behaviour. Overall, the partner correlation is reduced up to 16 per cent, depending on the health indicator. This reduction is 40 per cent if we include the reduction caused by controlling for age.

Table 5 shows substantial differences among the health indicators in the extent to which partner resemblance in health can be statistically accounted for by other factors included in the model. The spouse correlation for overall health and self-assessed less-than-good health can be explained to a much larger extent than the correlation between partners' long-standing health problems. The largest reduction is found for 'overall health', the combined measurement of the three indicators together. A quarter of the age-adjusted correlation between men's combined health indicators and women's combined health indicators can be interpreted statistically. Spouse correlation for self-assessed less-than-good health is reduced by one-fifth, whereas only about 10 per cent of partners' correlation in long-standing health problems and health complaints can be explained.

By comparing models 2a and 2b to model 3 we can conclude that education and income both contribute to the interpretation of health homogamy. Even after controlling for income, adding education to the model further reduces the spouse correlation in health. The contribution of resemblance in health-related behaviour to health resemblance is smaller than that of education. Yet, lifestyle homogamy and household income do explain part of partner resemblance in health, even in addition to educational homogamy. Comparing models 3, 4a and 4b shows that the effect of education is not simply due to differences in behaviour among education groups. Education and behaviour contribute independently to health homogamy.

Similar models are estimated for the specific long-standing health problems in Table 6. Model 5 for mutual influence cannot be estimated and is left out. All models include own and partner's characteristics and men's disease status as independent variables and women's disease status as dependent variable. Table 6 presents the age-adjusted odds ratios. After controlling for education, income and behaviour, six of the associations are

Table 5 *Age-adjusted spouse correlation in health after controlling for educational homogamy, shared circumstances and mutual influence*

| | | residual correlation coefficients (% reduced) | | | |
|---|---|---|---|---|---|
| Model | | overall health | self-assessed less-than-good health | long-lasting health problems | health complaints |
| 0 | total spouse correlation | 0.233 | 0.144 | 0.157 | 0.215 |
| 1 | urb | 0.233 (0.0%) | 0.144 (0.0%) | 0.157 (0.0%) | 0.215 (0.0%) |
| 2a | urb, edu | 0.201 (13.7%) | 0.126 (11.9%) | 0.150 (4.5%) | 0.196 (8.8%) |
| 2b | urb, inc | 0.202 (13.3%) | 0.126 (11.9%) | 0.149 (5.1%) | 0.202 (6.0%) |
| 3 | urb, inc, edu | 0.191 (18.0%) | 0.120 (16.1%) | 0.147 (6.4%) | 0.195 (9.3%) |
| 4a | urb, inc, behaviour | 0.188 (19.3%) | 0.125 (12.6%) | 0.143 (8.9%) | 0.195 (9.3%) |
| 4b | urb, inc, behaviour, edu | 0.178 (23.6%) | 0.119 (16.8%) | 0.143 (8.9%) | 0.191 (11.2%) |
| 5 | urb, inc, edu, behaviour, mutual influences | 0.177 (24.0%) | 0.115 (19.6%) | 0.143 (8.9%) | 0.191 (11.2%) |

*Note*: urb = urbanisation, edu = education, inc = income

still significant. Overall, the reductions in the odds ratios after controlling for education, income and behaviour are much smaller than they are for the general health measures. Again, the tendency to live with a partner with a similar educational background contributes more to the occurrence of health homogamy than income or behaviour do. These findings corroborate earlier studies that found that education affects health partly independently and partly through its association with income and lifestyles (Fuhrer *et al.* 2002, Lynch, Kaplan and Salonen 1997, Martikainen, Brunner and Marmot 2003, Stronks *et al.* 1997).

**Effects of living together**

The mutual influence hypothesis (hypothesis 3) is tested with Model 6 in Table 5. In this model, the educational level and lifestyle of the partner are also predictors of respondents' health. The dotted lines in Figure 1 represent this mutual influence. Mutual influence only improves the interpretation of partner resemblance in health somewhat for self-assessed less-than-good health (compare model 4b and model 5). The residual correlations do not decrease after mutual influence is added for the other health indicators. The hypothesis concerning mutual influence is thus refuted. Apparently the influence that partners have on each other's health does not increase their resemblance in health substantially.

Table 7 presents the results of an alternative test for the existence of mutual influence and the effects of living together. If partners influence each other in such a way that they become more similar with regard to health, this will not show immediately, but only after some time. Thus, we could expect that health resemblance increases with relationship duration. The same should hold, at least partly, for the influence of shared environments that was predicted in hypothesis 4. The longer partners share the same environmental influences, the more they are expected to be alike. To investigate whether partners grow more alike in health over time the sample is divided into eleven five-year age groups according to the woman's age. The NethHIS data contain no information about relationship duration but women's age is a good indicator. The correlation between women's age

Table 6 *Adjusted risk of specific self-reported long-standing health problems for women whose partner reported the same disease compared to those whose partner did not*

| | Model 1:<br>Age, urb<br>OR (95% CI) | Model 2a:<br>Age, urb, edu<br>OR (95% CI) | Model 2b:<br>Age, urb, inc<br>OR (95% CI) | Model 3:<br>Age, urb, inc, edu<br>OR (95% CI) | Model4:<br>Model 3 + behaviour<br>OR (95% CI) |
|---|---|---|---|---|---|
| diabetes | 2.07 (1.22–3.51) | 1.97 (1.16–3.35) | 2.02 (1.19–3.42) | 1.98 (1.17–3.36) | 1.97 (1.15–3.37) |
| arthritis | 1.77 (1.45–2.16) | 1.74 (1.42–2.12) | 1.73 (1.42–2.11) | 1.73 (1.41–2.11) | 1.73 (1.41–2.11) |
| intestinal disorders | 2.30 (1.19–4.44) | 2.23 (1.15–4.30) | 2.25 (1.17–4.35) | 2.22 (1.15–4.29) | 2.28 (1.17–4.41) |
| sinusitis | 2.31 (1.91–2.79) | 2.27 (1.88–2.75) | 2.30 (1.91–2.79) | 2.28 (1.88–2.75) | 2.26 (1.87–2.73) |
| hyper-tension | 1.09 (0.90–1.32) | 1.09 (0.90–1.33) | 1.11 (0.91–1.34) | 1.11 (0.91–1.34) | 1.08 (0.89–1.32) |
| asthma | 1.47 (1.12–1.93) | 1.42 (1.08–1.87) | 1.42 (1.08–1.86) | 1.40 (1.06–1.85) | 1.39 (1.05–1.83) |
| backache | 1.25 (1.04–1.50) | 1.20 (1.00–1.44) | 1.21 (1.00–1.46) | 1.19 (0.99–1.44) | 1.18 (0.98–1.42) |

*Note*: OR = odds ratio; CI = confidence interval
urb = urbanisation, edu = education, inc = income

Table 7　*Spouse correlations of health states, by age-group of the female spouse*

| | *20–24* | *25–29* | *30–34* | *35–39* | *40–44* | *45–49* | *50–54* | *55–59* | *60–64* | *65–69* | *70–74* | *trend[a]* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| overall health | 0.30 | 0.37 | 0.27 | 0.31 | 0.24 | 0.24 | 0.40 | 0.34 | 0.23 | 0.27 | 0.38 | no |
| self-assessed general health | 0.23 | 0.24 | 0.20 | 0.23 | 0.24 | 0.22 | 0.22 | 0.20 | 0.15 | 0.15 | 0.18 | no |
| self-assessed less-than-good health | 0.10 | 0.10 | 0.08 | 0.15 | 0.14 | 0.17 | 0.20 | 0.16 | 0.15 | 0.20 | 0.18 | no |
| long-lasting health problem | 0.17 | 0.18 | 0.15 | 0.16 | 0.16 | 0.13 | 0.23 | 0.16 | 0.12 | 0.13 | 0.18 | no |
| ≥1 long-lasting health problem | 0.10 | 0.12 | 0.10 | 0.06 | 0.10 | 0.10 | 0.13 | 0.11 | *0.00* | *0.06* | *0.06* | no |
| health complaints | 0.15 | 0.24 | 0.19 | 0.25 | 0.18 | 0.20 | 0.27 | 0.24 | 0.20 | 0.22 | 0.20 | no |
| N | 647 | 1,504 | 1,811 | 1,688 | 1,453 | 1,232 | 983 | 910 | 809 | 646 | 296 | |

*Note*: All correlations are significant at p < 0.01 unless printed in *italics* (*n.s.*). a. The trend indicates whether the correlation of the age group with the spouse correlation is significant (correlation over correlations)

and relationship duration in a representative survey of the Dutch population (De Graaf *et al.* 2000) was r = 0.89. In Table 7, the correlation coefficients for health in the eleven age groups are almost all significant. Only the correlation between men's and women's long-lasting health problems in the last three age groups is non-significant. Although the correlations differ across the groups, no trend is evident. Partner resemblance in health is present in all ages and for all health indicators. The trendless fluctuations confirm the lack of evidence for mutual influence found in Table 5.[2]

With regard to comparing spouse resemblance in old and young couples, selective mortality could bias the results for the oldest age groups. The most homogeneous unhealthy couples are not represented in these oldest groups because both partners have already died. The most heterogeneous couples are not present either, because one partner (the unhealthy one) has died while the other (the healthy one) is still alive. This would leave healthy homogeneous couples and homogenous and heterogeneous couples of average health in the sample, which could bias the trend. However, the age groups up to 50, for whom it is unlikely that selective mortality plays a significant role, do not show any trend pattern either. The conclusion that there is no trend seems justified.

### Accumulation of health problems and social inequality

Finally, the accumulation of health problems in households by education and income is addressed. The above-discussed analyses showed that educational homogamy and, to a lesser extent, household income are important explanations for partner resemblance in health. This suggests that there is accumulation of disadvantageous factors (low education, low income, poor health) within households. Table 8 presents co-occurrence of less-than-good health by educational level and income. The results show a clear pattern of accumulation of negative characteristics. The figures are age-adjusted and separate analyses for younger and older couples yielded similar results. The likelihood of both partners reporting less-than-good health is almost seven times higher (odds ratio = 6.81) in a low educated household than in a household where both partners have tertiary education. If we compare this to individuals without taking their partner into account, the odds ratio for reporting poor health is at least a third lower (odds ratio = 4.5 and odds ratio = 2.9 for men and women respectively; not shown in table). Twenty-two per cent of all couples with joint less-than-good health can be found in the category of lowest educated households, which contains only eight per cent of all households. Similar results are found for income. The likelihood of co-occurrence of less-than-good health is four times higher in the lowest income households compared to households in the highest income quartile. Forty-three per cent of the couples with joint less-than-good health come from the lowest income quartile. The interpretation of these results can be straightforward: there is considerable accumulation of adverse characteristics in households and this leads to a steeper social gradient in health at the household level than at the individual level.

### Conclusion and discussion

The aim of this study was to describe partner resemblance in health in the Netherlands and to explore a number of explanations. The empirical analysis, based on a sample of almost 12,000 married and cohabiting couples, showed five important patterns. First, there is substantial health resemblance between partners. The correlation of spouses' self-assessed

Table 8 *Individual and joint prevalence of less-than-good health by education and household income*

| | less-than-good health (%) | | both partners less-than-good health (%) | | joint prevalence of less-than-good health | |
|---|---|---|---|---|---|---|
| | men | women | expected | observed | OR | 95% CI |
| *education of both partners* | | | | | | |
| both primary | 32.2 | 30.2 | 9.7 | 11.3 | 6.81 | 4.26–10.89 |
| highest secondary low | 28.8 | 26.5 | 7.6 | 9.6 | 5.91 | 3.71–9.41 |
| both secondary low | 18.8 | 19.3 | 3.6 | 5.8 | 3.31 | 2.03–5.42 |
| highest secondary high | 17.9 | 20.1 | 3.6 | 5.4 | 3.07 | 1.94–4.84 |
| both secondary high | 14.7 | 16.5 | 2.4 | 4.0 | 2.23 | 1.36–3.67 |
| highest tertiary | 11.3 | 14.0 | 1.6 | 2.7 | 1.49 | 0.91–2.44 |
| both tertiary | 8.1 | 11.2 | 0.9 | 1.8 | 1.00 | |
| *household income* | | | | | | |
| lowest quartile | 30.8 | 25.2 | 7.8 | 10.0 | 4.08 | 3.21–5.17 |
| 2nd quartile | 19.0 | 21.1 | 4.0 | 6.0 | 2.32 | 1.82–2.96 |
| 3rd quartile | 14.4 | 17.0 | 2.5 | 4.1 | 1.56 | 1.19–2.04 |
| highest quartile | 10.0 | 14.0 | 1.4 | 2.7 | 1.00 | |

*Note*: adjusted for age; OR = odds ratio; CI = confidence interval

health varies between r = 0.14 and r = 0.23 for separate health indicators, whereas the (age-adjusted) likelihood of reporting less-than-good health was more than twice as high for respondents whose partner also reported less-than-good health than for respondents with a partner in good health. Also for a number of common and important long-standing health problems significant associations between partners were found. Second, the tendency to marry a partner with similar educational attainment is an important explanation for health resemblance. Third, health behaviour and shared environment appear to be much less important. Fourth, spouse correlations for health do not seem to increase or decrease over the lifecourse. Fifth, as a consequence of health homogamy, health inequalities at the household level are bigger than at the individual level. There is a serious accumulation of health problems in a small group of households.

There are few international figures with which to compare these findings for the Netherlands. The spouse correlations in general health found by Tambs and Moum (1992) in Norway and by Wilson (2002) among elderly couples in the United States are comparable to the results in this study (see hypothesis 5).[3] It is likely that these results will hold true for other (Western) countries as well, at least in as far as partner resemblance in health is a consequence of age and educational homogamy. A lack of convergence between partners has also been reported for other countries (Tambs & Moum 1992).

Before elaborating on implications of the findings for sociological theories about families and health, some limitations of the analysis need to be discussed. The cross-sectional nature of the data could lead to biased results if couples that divorce are more heterogeneous with regard to health than couples who stay married. In that case, we would find health homogamy because the heterogeneous couples split up and are not included in the sample on which homogamy is calculated. Two considerations are relevant here. First, among the couples in this study, some will experience divorce later in their lives. This means that heterogeneous couples are actually observed, especially among younger couples. In the older part of the sample, we might observe homogamy simply because of attrition of

heterogeneous couples. However, this study found partner resemblance in health in older as well as younger couples. Second, it is not clear whether heterogeneous couples indeed have a higher chance of divorce. Poor health increases the risk of divorce (Joung *et al.* 1998), but I am not aware of studies that test whether this is also true for health heterogamy. Therefore, I assume that divorce cannot account for health homogamy in the current study. Another possible limitation is that, in some cases, proxy interviews were held. Previous research has shown that partners provide valid data on each other's health status (Epstein *et al.* 1989). Moreover, excluding the proxy interviews yields the same conclusions as those presented here.

What are the implications of the empirical results for sociological theories about families and health? The first implication is that partner selection is an important mechanism causing health homogamy. The role of education in partner choice is especially important. Both educational homogamy (Smits, Ultee and Lammers 2000) and educational differences in health (Mackenbach *et al.* 1997) are found in all modern societies and there is a large empirical and theoretical body of literature on these subjects. However, relatively little attention has been paid to the role of health in partner choice and its consequences. A substantial part of health resemblance found in this study is left unexplained. Probably, at least a part of the remaining correlation can be explained by variables that were not available in the data, and another part of the unexplained partner resemblance reflects measurement errors in health and explanatory characteristics. More important, however, is that a small part of the unexplained correlation might represent direct partner selection based on health. Unfortunately, little is known about the role of health in partner choice (*cf.* Kalmijn 1998, Noack 2000, Goldman 1993). This mechanism might be important, especially for people with severe health problems. For these people it might be more difficult to find a partner, because of social acceptance, lower mobility and fewer opportunities to meet other people. As a result, they may be more likely to marry other people with health problems or stay single. People with severe health problems might have a preference for each other, for instance, because they can relate to each other better as they understand each other's problems and needs. A negative interpretation would be that less healthy people are left to one another, despite their preferences for healthy partners, because healthy people are the first to marry, leaving very few (or no) healthy candidates available for less healthy people. In general population samples, which are used in the current study, people with severe health problems are under-represented and people who are institutionalised are not included. Moreover, many people with severe health problems may never marry. Therefore, I assume that direct health selection only explains a small part of health homogamy in the current sample. Still, given the lack of convergence over the lifecourse, initial partner choice seems to be very important and here sociological theory can add to biological theories on assortative mating to better understand the role health plays in this process.

Does the rather stable partner correlation over the lifecourse imply that partners do not influence each other's health at all? Such a strong conclusion would not be justified. There is no evidence of convergence of behaviour over the lifecourse. This implies that the influence of partners is not uniform, uni-directional or uni-dimensional. Several studies, using both quantitative (*e.g.* Monden *et al.* 2003) and qualitative approaches (*e.g.* Backett 1992), have found examples of how partners influence each others' health and health behaviour. Grzywacz and Marks (1997) show that a uni-dimensional theory of family influence is not tenable. They found that 'some dimensions of family solidarity have positive effects on some health behaviours and negative effects on others'. Backett (1992) gives an example of such a complex family process. She describes how '. . . on an everyday basis trade-offs were the most regular way in which respondents coped with tensions arising

from the effects of one person's supposedly 'healthy' behaviour on other family members'. In addition, Backett (1992) asserts: 'a concern for good health was simply one amongst many competing sets of priorities which affect daily behaviours'. Sociological studies should pay more attention to these complex processes within families. Too often the family is presented as a positive health-enhancing system or agent without explicit formulation of mechanisms that take place within the family. As a consequence, few testable hypotheses have been put forward and evaluated. Currently, sociological theories about health and the family mostly focus on parents and children, whereas the cited studies call for research on how various kinds of risk behaviour change over time within households. The simple hypothesis about convergence of behaviours in households was not supported by this study.

Another topic that needs attention is the role of healthcare consumption and illness behaviour in the explanation of health resemblance. There might be a shared attitude in families towards preventive medical care or a 'family culture' related to illness appraisal. Perhaps, some families are more prone to complain than others because of a common culture. For instance, resemblance in neuroticism could be one of the mechanisms leading to partner resemblance in health. Neuroticism is statistically significantly related to general health (Stronks *et al.* 1997; see also Elstad 1998). Previous research found spouse correlations for neuroticism to be low ($r = 0.14$) to moderate (about $r = 0.25$) or not to exist at all (Feng and Baker 1994). In an additional sample of 650 Dutch couples (De Graaf *et al.* 2000), the spouse correlation for general self-reported health ($r = 0.19$) is not affected by adjusting for neuroticism (results not shown, obtainable from the author). Still, other forms of a shared health culture might contribute to health resemblance.

Finally, the existence of health homogamy has some important implications. The most important one is that sociological studies should focus more explicitly on vulnerable families rather than vulnerable individuals. This also holds for fields of public health and social policy. Health inequalities are bigger at the household level than at the individual level. When studying the health status of a person, sociologists, but also health professionals, should consider the health status and health behaviour of that person's household members. Makers of social policies aimed at lifting levels of deprivation should be aware of the fact that the accumulation of adverse socio-economic characteristics is accompanied by accumulation of health problems, while at the same time the socio-economic disadvantage reinforces and is reinforced by the accumulation of health problems. Interventions aimed at reducing inequalities might be more effective if they were more explicitly aimed at the most disadvantaged households instead of the most disadvantaged at the individual level. The simultaneous occurrence of socio-economic disadvantages and health problems may affect all household members including children. For instance, the high divorce rates and high levels of school-dropout in lower-educated and low-income groups might partly be a result of the accumulation of socio-economic problems and health problems.

In sum, this study found substantial resemblance in health among married and cohabiting partners in the Netherlands. This alikeness in health seems to be primarily the result of partner choice and much less the result of mutual behavioural influences. This finding poses sociologists the challenge to study how individuals within families influence each other's health and health behaviour over the lifecourse. How can we explain the paradox that, on the one hand, partners do influence each other's health and health behaviours, while, on the other hand, the lack of convergence between partners' health statuses over the lifecourse seems to suggest that mutual influence and shared circumstances play only a small role at most. Sociological studies on families, health and health behaviours should, therefore, pay more attention to dynamic processes. Finally, the accumulation of negative characteristics in households concerning health warrants further sociological and public health research.

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## Notes

1  Tambs and Moum (1992) do not report overall correlations. This coefficient is the arithmetic mean of the coefficients per age group from their Table 1 on page 961.
2  The number of cases for specific long-standing health problems is too small to perform similar analyses.
3  Tambs and Moum (1992) found a correlation coefficient of 0.25, which is slightly higher than that found here. They used polychoric correlations, which in general render somewhat higher coefficients than Kendall's $\tau_b$ or Pearson's correlation do. Wilson's results only pertain to a selective age group (51–61).

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