The Interrelationship between Income, Health and Employment Status

K STRONKS, H VAN DE MHEEN, J VAN DEN BOS AND J P MACKENBACH

Stronks K (Department of Public Health, Erasmus University, PO Box 1738, 3000 DR Rotterdam, The Netherlands), van de Mheen H, van den Bos J and Mackenbach J P. The interrelationship between income, health and employment status. *International Journal of Epidemiology* 1997; **26**: 592–600.

Background. The aim of the study was to test the hypothesis that the relatively strong association between income and health, compared to that between education/occupation and health, can partly be interpreted in terms of an association between employment status and health.

Methods. Health indicators used were the prevalence of one or more chronic conditions, and perceived general health. Data were generated from a postal survey, part of the baseline data collection of a Dutch prospective cohort study on socioeconomic inequalities in health.

Results. After controlling for differences in other socioeconomic indicators, the association between income and health was found to be stronger than that between occupation or education and health. Most of the difference in strength was found to be due to employment status, especially among men. Controlling for employment status, and controlling for the distribution of those with a long-term work disability in particular, reduced the risks of lower income groups, whereas the risks of lower educational and occupational groups hardly changed.

Conclusions. These results suggest that the relatively strong association between income and health can for a large part be interpreted in terms of an interrelationship between employment status, income and health. More specifically, it is largely due to the concentration of the long-term disabled in lower income groups. This indicates the importance of the selection mechanism, as these groups are excluded from paid employment because of their health status, leading to a lowering of income. However, income was still found to be related to perceived general health after controlling for employment status, especially among women. This suggests that an explanation in terms of an effect of material factors on health may also be important.

Keywords: socioeconomic inequalities in health, income, employment status

It is now well recognized that people in lower socioeconomic status (SES) groups on average are less healthy than people in higher socioeconomic groups.[1,2] Socioeconomic status represents the position of an individual or household in the social stratification. It is generally assumed that social stratification comprises several components. Following Weber, a class and a status component may be distinguished. The class component reflects the material resources an individual controls, e.g. spending power and physical living conditions. The status component reflects differences in lifestyles, attitudes, knowledge etc.[3,4] Level of income is considered to be the most appropriate indicator of the material or class component, while occupational and educational level are more closely related to the status component.

Socioeconomic inequalities in health have frequently been described but an explanation of these inequalities has received less attention in empirical studies. The largest part of these inequalities seems to be caused by the effect of SES on health, through more specific determinants of health, such as material factors (e.g. working and housing conditions), and lifestyle factors (e.g. smoking and alcohol consumption).[5] To determine the relative importance of these explanations, SES, health and possible determinants of health inequalities have to be studied simultaneously. There are, however, other strategies which give an indication as to their relative importance. One strategy is to compare the strength of the association between different indicators of SES and health.[6,7]

The association between health and income—either measured directly or via indicators of material well-being—seems to be stronger than the association between health and the more frequently used indicator of occupational class. For example Goldblatt[7] showed that the rather simple variable 'household access to a car', was a more powerful (single) discriminator of mortality

Department of Public Health, Erasmus University, PO Box 1738, 3000 DR Rotterdam, The Netherlands.

than occupational class. Blaxter,[8] in an analysis on Health and Lifestyle Survey data, reported higher risks of health problems for low income groups than for low occupation groups while controlling for differences in the other socioeconomic indicators. She concluded that 'the apparently strong association of social class and health is primarily an association of income and health' (p. 72). Given the connection between income and material factors, these results may indicate that material factors are more important in the explanation of inequalities in health than e.g. lifestyle. There may, however, be another possible explanation for the relatively strong association between income and health. This concerns an explanation in terms of an effect of health on income, through employment status. That alternative explanation is explored in this paper.

The associations between SES, health and employment status are complex. Firstly, employment status is associated with health. For example, housewives and the unemployed are less healthy than those in paid employment.[9,10] In addition, employment status is related to SES. People from lower socioeconomic groups have a higher risk of losing their job.[11–14] We hypothesized that employment status is more strongly associated with income than with occupation and education, because job loss often implies a lowering of income.[15] The effect of employment status on education and occupation is presumed to be less likely. Although unemployed people might have a higher risk of experiencing downward social class mobility,[16] in most cases a person's educational and occupational level will have been achieved before the current employment status is attained. If this assumption is correct, the association between income and health is more likely to be based on the relationship between employment status and health than that between occupation or education and health.

In this paper, we tested the hypothesis that the relatively strong association between income and health, compared to that between education/occupation and health, can be interpreted in terms of an association between employment status and health. Moreover, the implications of these findings for the interpretation of the relationship between income and health will be discussed.

DATA AND METHODS
Population
Data were obtained from the baseline data collection of the Longitudinal Study on Socio-Economic Health Differences (LS-SEHD). This is a prospective cohort study which aims to explain socioeconomic inequalities in health in the Netherlands. The design and objective of this study have been described elsewhere in detail.[17] It is based on a cohort of 15–74 year old, non-institutionalized people with Dutch nationality in a region in the South East of the Netherlands (the city of Eindhoven and a number of surrounding municipalities). From the population registers of these municipalities, an aselect sample of approximately 27 000 people was drawn, stratified by age (45–74 year old people were overrepresented) and postcode (to overrepresent the highest and lowest socioeconomic group). In 1991, people in this sample received a postal questionnaire. The response rate was 70.1%, resulting in a study population of 18 973 people, with relatively small differences across socioeconomic groups (67% in the lowest to 73% in the highest) and other subgroups (e.g. sex, age). The analyses presented in this paper were based on respondents aged 25–64 years. People younger than 25 (mainly students, conscripts etc.) as well as conscripts/students of 25 and older were excluded because of classification problems with regard to SES. People over 64 were excluded because little variation in employment status exists within this group. People for whom information on employment status was missing (1.8%) were also excluded. This resulted in a study population of 13 391 (6506 men, 6885 women).

Indicators of Socioeconomic Position
Household income was requested only in a personal interview among a subsample. In order to estimate the level of household income for the total sample, we used proxies for income level, namely health insurance, housing tenure and car ownership. Most people in the Netherlands with an income above a certain level are privately insured, while lower income groups receive public insurance. Housing tenure and car ownership, which are considered to be indicators of material well-being, have been shown to be powerful discriminators of mortality.[6] By combining these proxies, we created five categories (from lowest to highest): publicly insured, rented house, no car; publicly insured, rented house, car; publicly insured, house owner; privately insured, rented house; privately insured, house owner. The correlation (Somer's D, dependent variable: income) between this proxy and income level as measured among the subsample is 0.54. The corresponding average net household income per month is 1900, 2633, 3010, 3427, 4402 Dutch guilders respectively. Other classifications, for example one where the most advantaged group was divided into car owners and those with no car, did not further increase the correlation between the proxy and the measurement of income level.

The second socioeconomic indicator is the educational level of the respondent, divided into four categories: primary school only; lower general and vocational

education; intermediate vocational and intermediate/ higher general education; higher vocational college and university.

Thirdly, the occupational level of the main breadwinner was determined on the basis of the current occupation, if in paid employment, or if not, the last paid employment. The occupations were classified according to five levels outlined in the Erikson, Goldthorpe and Portocarero (EGP) scheme, i.e. higher grade professionals; lower grade professionals and routine non-manual employees; self-employed; high and low skilled manual workers; unskilled manual workers.[18] People who had never been in paid employment formed the sixth category. If the respondent did not live with a partner, he or she was automatically classified as the main breadwinner. If the respondent lived with a partner, he or she was asked who the main breadwinner was.

In accordance with the results of other studies,[19,20] the socioeconomic indicators were only weakly correlated. This supports the view that each of them reflects, at least in part, a different dimension of social stratification. Occupation and education among men were the most strongly correlated (0.53), whereas we observed the weakest correlation for income and education among women (0.25).

Employment Status
People were classified according to their employment status by answering a question relating to their main activity. We distinguished five groups: (1) the paid employed; (2) the unemployed, defined as those who are officially registered as looking for a paid job; (3) people with a long-term work disability, defined as those who are dependent on some form of a social security benefit because of illness; in the Netherlands, an employee is eligible for a work disability benefit if the work disability has lasted for more than one year; the benefit equals a minimum of 70% of the least earned wage; (4) the early retired; (5) housepersons (most of them are women).

Health Measures
Two health measures were used. The first categorized 23 chronic conditions (e.g. diabetes, low back pain, cancer, heart disease etc.). Respondents were classified according to whether they (at the time of the survey) were suffering from at least one of the conditions listed in the questionnaire. Of the male study population, 44.4% and 49.6% of the female study population reported one or more chronic conditions. The second health measure was based on the respondent's answer to the question 'How do you rate your health in general?', dichotomized as '(very) good' versus less than 'good' (fairly good; sometimes good, sometimes bad; bad). Of

the men, 27.9% and 29.0% of the women in the study population perceived their general health as less than 'good'.

Analyses
Logistic regression models were fitted, controlling for potential confounders. These are (number of categories between brackets): age (5-year age groups), marital status (4), religious affiliation (4) and degree of urbanization (5). All variables were coded as dummy-variables. Models were fitted for men and women separately because of differences in employment patterns. The analyses were carried out using the Logistic Regression module of Egret.[21] The regression coefficients and their standard errors were used to calculate odds ratios (OR) and their 95% confidence intervals (CI). The highest socioeconomic group was always used as a reference category. Given the overlap between the socioeconomic indicators, the association between a specific indicator and health was assessed when controlling for the other indicators. In addition, we compared the reduction in deviance due to the inclusion of each indicator. The higher the reduction of deviance the higher the proportion of variation in health accounted for. The reduction in deviance was also used to assess the significance of the socioeconomic gradient.

In order to test to what extent the association between each socioeconomic indicator and health was due to the relationship between health and employment status, we included that variable in the logistic regression model. Odds ratios were compared with those of the model in which differences in employment status were not controlled for.

RESULTS
In Table 1, the OR for the socioeconomic indicators are compared. All indicators caused a statistically significant reduction in deviance for both health measures, with the exception of education among women in the case of chronic conditions. Among men, the income proxy resulted in the largest reduction of deviance. The risk of the three lower income levels appeared to be increased. The size of the OR for the lowest income, educational and occupational groups is largely comparable. For women, a similar pattern was observed, but only for perceived general health. The prevalence of chronic conditions hardly varied with SES.

The results of the multivariate analyses are presented in Figures 1,2 (men) and 3,4 (women), and Table 2. When differences in the education/occupation indicators were eliminated, the income proxy now resulted in the highest reduction of deviance, except for chronic

TABLE 1 *Chronic conditions and perceived general health by education, occupation and income proxy, men and women (25–64): odds ratios and 95% confidence intervals, univariate analysis[a]*

Socioeconomic indicator		Men				Women			
		Chronic conditions (n = 6019)		Perceived general health (n = 5934)		Chronic conditions (n = 6376)		Perceived general health (n = 6274)	
Proxy household	1	1.00		1.00		1.00		1.00	
income[b]	2	0.99	0.82–1.20	1.12	0.89–1.41	0.91	0.75–1.12	1.24	0.98–1.57
	3	1.32	1.14–1.53	2.24	1.89–2.66	1.10	0.96–1.26	1.32	1.12–1.56
	4	1.56	1.35–1.81	3.11	2.63–3.68	1.26	1.09–1.45	2.35	1.99–2.78
	5	1.41	1.11–1.78	3.38	2.62–4.35	1.16	0.95–1.43	3.10	2.48–3.88
Reduction in deviance		47.6**		249.4**		14.6*		159.8**	
(Last/current)	1	1.00		1.00		1.00		1.00	
occupation main	2	1.38	1.14–1.67	1.53	1.18–1.98	1.14	0.95–1.37	1.33	1.05–1.68
breadwinner[c]	3	1.19	0.87–1.63	3.08	2.15–4.42	0.70	0.50-0.97	1.21	0.81–1.81
	4	1.51	1.23–1.86	2.73	2.09–3.55	1.25	1.03–1.53	1.99	1.55–2.55
	5	1.71	1.37–2.12	3.54	2.69–4.66	1.36	1.10–1.68	2.90	2.24–3.74
Reduction in deviance		29.0**		172.1**		24.8**		125.1**	
Education	1	1.00		1.00		1.00		1.00	
respondent[d]	2	1.34	1.15–1.56	1.68	1.39–2.04	1.00	0.83–1.21	1.23	0.96–1.57
	3	1.28	1.12–1.47	2.26	1.90–2.69	0.97	0.82–1.14	1.64	1.32–2.04
	4	1.49	1.26–1.77	3.88	3.19–4.72	1.12	0.92–1.36	3.09	2.44–3.92
Reduction in deviance		26.3**		205.7**		4.6		137.2**	

[a] Controlled for age, marital status, religious affiliation and degree of urbanization.

[b] Income levels: 1 privately insured, house owner; 2 privately insured, rented house; 3 publicly insured, house owner; 4 publicly insured, rented house, car; 5 publicly insured, rented house, no car.

[c] Occupational levels: 1 higher grade professionals; 2 lower grade professionals and routine non-manual; 3 self-employed; 4 high and low skilled manual; 5 unskilled manual.

[d] Educational levels:1 higher vocational/university; 2 intermediate vocational/higher and intermediate general; 3 lower general/vocational; 4 primary school.

* $P < 0.05$, ** $P < 0.001$.

conditions among women. In men, the prevalence of chronic conditions now hardly varied with occupational and educational status (Figure 1, shaded bars). For both health measures, the OR of the lower income groups were higher than those of the lower occupational/educational levels. The difference between the income proxy and education/occupation indicators was more pronounced for men than for women.

Table 3 shows the health status of the five employment status groups with those in paid employment used as a reference. The results for men and women were very similar. Not surprisingly, among people with a long-term work disability, the prevalence of health problems was particularly high. Furthermore the health of the unemployed was significantly worse. Also housewives (in women) perceived their health to be significantly worse than the paid employed.

The association between the household income proxy and employment status is summarized in Table 4. Among

men, the percentage of employed decreased with decreasing income level. Moreover, in both sexes, the proportion of the unemployed and those reporting a long-term work disability was much higher in the lower income levels. For example the proportion of the latter was more than 10 times higher in the lower income groups. For educational and occupational level the clustering of these groups in lower socioeconomic levels was less pronounced.

The figures also show the OR for the income proxy, occupation and education after differences in employment status has been controlled for (black bars). Among men, the OR for the lower educational and occupational groups only slightly changed as compared to those of the model in which employment status had not been controlled for. Instead, controlling for employment status did substantially reduce the OR for the lower income groups, and they were now smaller than for the lower educational and occupational groups. In the case of
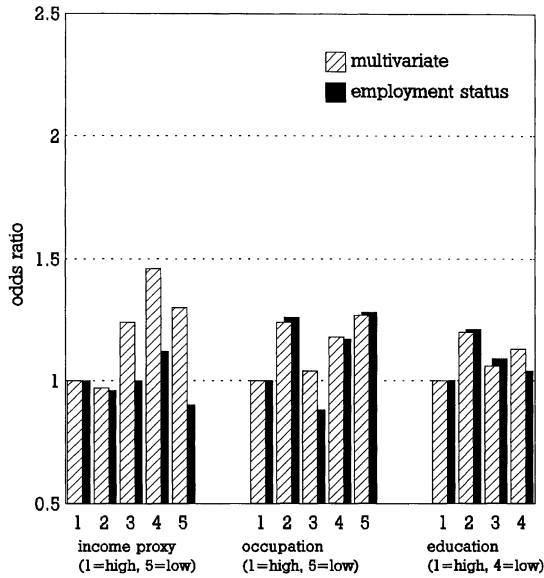
FIGURE 1 *Chronic conditions by income proxy, occupation and education, men, 25–64 years, multivariate; and controlling, in addition, for employment status[a]*

[a] Results of logistic regression models also including age, marital status, religious affiliation, degree of urbanization.
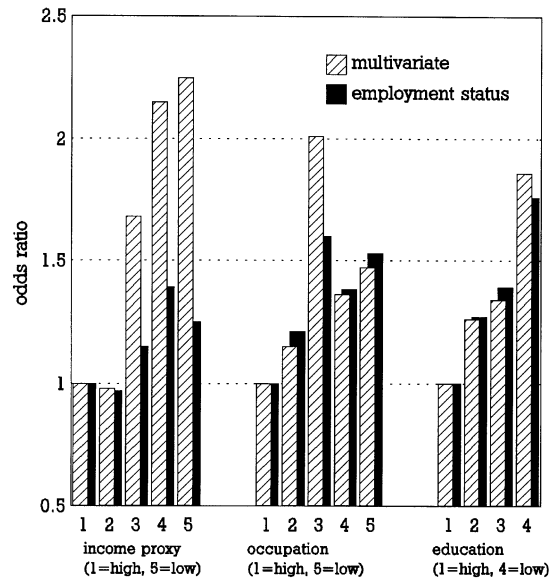
FIGURE 2 *Perceived general health by income proxy, occupation and education, men, 25–64 years, multivariate; and controlling, in addition, for employment status[a]*

[a] Results of logistic regression models also including age, marital status, religious affiliation, degree of urbanization.
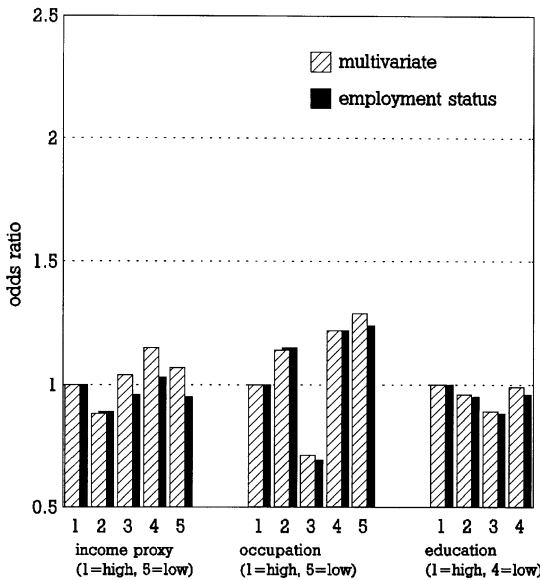
FIGURE 3 *Chronic conditions by income proxy, occupation and education, women, 25–64 years, multivariate; and controlling, in addition, for employment status[a]*

[a] Results of logistic regression models also including age, marital status, religious affiliation, degree of urbanization.
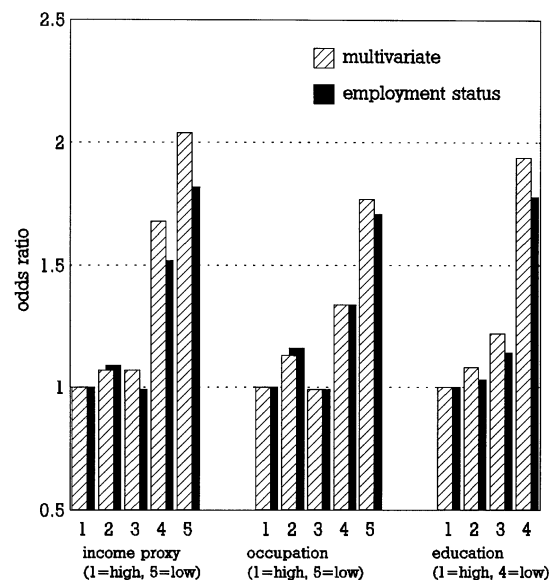
FIGURE 4 *Perceived general health by income proxy, occupation and education, women, 25–64 years, multivariate; and controlling, in addition, for employment status[a]*

[a] Results of logistic regression models also including age, marital status, religious affiliation, degree of urbanization.

(less than 'good') perceived general health, only the risk of the second lowest income level was significantly increased, whereas for occupation and especially education, a gradient was observed. As among men, in women the decrease in OR due to the inclusion of employment status in the model was the largest for level of income. The risk of the lower income levels was now only slightly higher than that of the lower educational and occupational levels.

Given the high proportion of people with a long-term work disability in low income groups in particular (Table 4) and their high risk of health problems (Table 3), the effect of controlling for employment status is probably largely an effect of controlling for the distribution of those with a long-term work disability. This was confirmed in an analysis in which we excluded this group (results not shown). The OR of lower income groups were now reduced to values which were close to those

of the model in which employment status is controlled for. For example the risk of chronic conditions for men in the lowest income level decreased from 1.30 (95% CI : 1.01–1.68) to 0.90 (95% CI : 0.68–1.18) after controlling for employment status, whereas the exclusion of the long-term disabled resulted in an OR of 1.00 (95% CI : 0.75–1.34).

DISCUSSION

In our study population, the (multivariate) association with self-reported health was found to be stronger for an income proxy than for occupation and education. Only one exception was reported, i.e. chronic conditions among women, which were hardly associated with any of the SES indicators. This is due to the fact that the chronic health measure used in the study is the sum of a list of 23 conditions, some of which appeared to be negatively related to SES while others were positively related.[22]

Although we had to use a proxy for income, our results show that these data clearly offer possibilities to study the background to the rather strong association between income and health. The aim of this paper was to explore whether the greater inequalities associated with income, compared to the inequalities in health associated with education and occupation, can be understood in terms of differences in the relationship between each socioeconomic indicator and employment status. Our results suggest that this is indeed the case.

The percentages of unemployed and those reporting a long-term work disability were consistently higher among the lower income levels, whereas a less pronounced pattern was observed for educational and occupational status. In multivariate analyses, controlling for employment status substantially reduced the risk

TABLE 2 *Reduction in deviance due to the inclusion of the income proxy, occupation and education (multivariate), men and women, 25–64[a]*

Socioeconomic indicator	Men		Women	
	Chronic conditions	Perceived general health	Chronic conditions	Perceived general health
Income proxy	27.8**	76.5**	7.3	59.1**
Occupation	7.7	19.5*	17.8*	28.9**
Education	5.6	24.9**	3.7	48.2**

[a] Also controlled for age, marital status, religious affiliation, degree of urbanization, and other socioeconomic indicators.
* $P < 0.05$, ** $P < 0.001$.

TABLE 3 *Chronic conditions and perceived general health by employment status, all men and women (25–64): odds ratios and 95% confidence intervals[a]*

	Men				Women			
	Chronic conditions (n = 6277)		Perceived general health (n = 6220)		Chronic conditions (n = 6616)		Perceived general health (n = 6531)	
Paid employment	1.00		1.00		1.00		1.00	
Unemployed	1.39	1.11–1.76	2.23	1.74–2.85	1.42	1.04–1.95	2.02	1.43–2.84
Work disability	4.30	3.55–5.22	10.82	8.82–13.28	5.29	4.02–6.97	11.64	8.95–15.14
Early retired	1.14	0.91–1.42	0.99	0.76–1.29	0.97	0.69–1.36	0.85	0.57–1.28
Housewives (f/m)	1.12	0.47–2.67	2.42	0.97–6.04	1.04	0.92–1.17	1.56	1.35–1.81

[a] Controlled for age, marital status, religious affiliation and degree of urbanization.

TABLE 4 *Percentage of men and women (25–64), categorized by employment status, by education, occupation and income*

Socioeconomic indicator		Men					Women				
		Employed	House-wives	Unem-ployed	Working disability	Early retired	Employed	House-wives	Unem-ployed	Working disability	Early retired
Proxy	1	84.3	0.4	0.6	2.4	12.3	23.4	72.2	0.6	1.3	2.5
household	2	73.8	0.1	1.2	4.4	20.4	23.8	69.0	0.9	2.7	3.6
income[a]	3	71.2	0.2	4.8	15.3	8.5	45.4	44.1	2.1	6.6	1.8
	4	57.0	0.4	9.8	21.9	11.0	36.2	46.5	3.4	11.3	2.7
	5	40.5	1.1	21.6	29.7	7.0	19.2	56.3	10.1	11.8	2.6
(Last/current)	1	80.5	0.2	2.4	5.3	11.6	38.2	53.7	1.7	3.8	2.6
occupation	2	72.0	0.3	4.8	9.1	13.9	46.8	37.4	4.0	7.3	4.5
main	3	68.7	0.8	6.8	20.8	3.0	41.6	50.0	0.8	5.9	1.7
breadwinner[a]	4	63.1	0.8	2.9	11.7	21.6	28.7	59.4	2.2	7.5	2.2
	5	62.3	0.1	8.2	20.3	9.1	30.0	54.7	3.2	10.0	2.2
Education	1	81.9	0.1	2.9	3.5	11.6	56.3	32.1	4.4	3.0	4.1
respondent[a]	2	75.1	0.5	4.4	8.5	11.5	49.1	42.5	1.8	4.2	2.3
	3	70.7	0.4	5.1	13.6	10.2	28.2	61.2	2.6	6.0	1.9
	4	44.6	0.6	11.1	29.8	13.9	15.6	66.9	2.6	11.5	3.4
Total		69.9	0.4	5.5	12.7	11.5	32.3	55.8	2.7	6.7	2.6

[a] For categories, see Table 1.

estimators for lower income levels, whereas those for lower educational/occupational groups hardly changed. An additional analysis in which those reporting a long-term work disability were excluded, resulted in risk estimators which were highly similar to those of the model in which differences in employment status were controlled for. This suggests that the relatively strong association between income and health, relative to that between education/occupation and health, is largely due to the concentration of those with a long-term work disability in the lower income levels. Although the re-sults were more clear-cut for men, for women too the employment status-health relationship appeared to underly the strong association between income and health.

As the data presented here are cross-sectional, they do not provide an insight in the direction of the asso-ciation between long-term work disability and health. It is plausible however, that this association is largely due to a selection effect, as people are in this group because of health problems. This effect, which is closely related to the so-called 'healthy worker effect', has been the subject of many studies. These show that the entrance to the labour market and exit from the labour market is health-related.[16,23,24] As a result, people in paid employ-ment, in general, show lower morbidity and mortality rates than those out of paid employment.

The health-related selection will in its turn lead to a lowering of income, while not affecting educational or occupational status. As a consequence, it is likely to have a larger effect on the size of inequalities in health between income groups than on inequalities associated with educational and occupational level. We therefore interpret our findings as indicating the importance of a selection effect, i.e. an effect of health on income, through employment status.

The difference in the results for men and women might be explained by the fact that in the Netherlands a rather low proportion of women participate in the labour market.[25] In most households the woman's partner is the main breadwinner. This implies that the effect of employment status on income is more direct for men, yielding a larger reduction of the risks of lower income groups in this sex.

Our results could have been biased by the fact that we had to rely on a proxy for income. Additional ana-lyses suggest that this is not the case however. Firstly, we repeated the analyses reported here among a sub-sample for which data on net household income were available. Because of the small numbers, we could only fit a model for men and women together. As for the proxy for income, we found that controlling for employment status hardly affected the risks of the lower educational/occupational groups, whereas the risks of the lower income groups were substantially reduced. Secondly, the results reported here are in accordance with the results of another analysis, also based on a subsample which aimed to explain the lower average income of

the chronically ill compared to that of the non-chronically ill. The results showed that almost 50% of that difference in income could be attributed to differences in health, through employment status.[26]

Thus these results indicate that the strong association between income and health does not necessarily imply the relative importance of material factors in the explanation of socioeconomic inequalities in health. It, at least for some part, also reflects an association between employment status and health, which should largely be interpreted in terms of a selection effect, i.e. an effect of health on income through employment status. In addition, these results suggest that the explanation of inequalities in health associated with income differs from the explanation of inequalities in health between educational or occupational groups. Whereas previous studies indicate a rather minor role for selection processes in the generation of the latter,[23,27] on the basis of our results we expect health-related selection to be more important in the case of health inequalities associated with income. This explanation might probably even be more important for countries with a less generous social security system, in which the lowering of income following selection out of the labour market might be more pronounced.

However, the present study also observed an independent association between income and health. After controlling for employment status, the risks of negatively perceived health among the lower income levels were still increased. Thus part of the association between income and health is probably also due to an effect of material factors on health, via a material or psychological link.[28,29] Further research is necessary to gain more insight into the contribution of this explanation by simultaneously analysing indicators of material factors with other determinants of health. The results of our study indicate that any further research studying the causal effect of income on health should at least try to separate out a selection effect through employment status.

REFERENCES
1 Fox J (ed.). *Health Inequalities in European Countries*. Aldershot: Gower Publishing Company Limited, 1989.

2 Illsley R, Svensson P G (eds). Health inequities in Europe. *Soc Sci Med* 1990; **31(special issue):** 223–420.

3 Susser M, Watson W, Hopper K. Theories and indices of social class. In: Susser M, Watson W, Hopper K (eds). *Sociology in Medicine*. New York/Oxford: Oxford University Press, 1985, pp. 188–212.

4 Liberatos P, Link B G, Kelsey J L. The measurement of social class in epidemiology. *Epidemiol Rev* 1988; **10:** 87–121.

5 Davey Smith G, Blane D, Bartley M. Explanations for socio-economic differentials in mortality. Evidence from Britain and elsewhere. *Eur J Public Health* 1994; **4:** 131–44.

6 Goldblatt P. Mortality and alternative social classifications. In: Goldblatt P (ed.). *Longitudinal Study. Mortality and Social Organization*. OPCS, Series LS, no. 6. London: HMSO, 1990.

7 Dahl E. Social inequalities in ill-health: the significance of occupational status, education and income—results from a Norwegian survey. *Sociol Health Illness* 1994; **16:** 644–67.

8 Blaxter M. *Health and Lifestyles*. London: Tavistock/Routledge, 1990.

9 Bartley M, Popay J, Plewis I. Domestic conditions, paid employment and women's experience of ill health. *Sociol Health Illness* 1992; **14:** 313–43.

10 Moser K, Goldblatt P, Fox J, Jones D. Unemployment and mortality. A comparison of the 1971 and 1981 longitudinal study census samples. *Br Med J* 1987; **294:** 86–90.

11 Arber S. Social class, non-employment, chronic illness: continuing the inequalities in health debate. *Br Med J* 1987; **294:** 1069–73.

12 Bartley M. Unemployment and health: selection or causation—a false antithesis? *Sociol Health Illness* 1988; **10:** 41–67.

13 Klein Hesselink D J, Spruit I P. The contribution of unemployment to socio-economic health differences. *Int J Epidemiol* 1992; **21:** 329–37.

14 Bloemhoff A, De Winter C R. De invloed van sociaal-economische status op arbeidsongeschiktheid; een longitudinale analyse [in Dutch]. In: Mackenbach J P (ed.). *Sociaal-economische Gezondheidsverschillen Onderzocht, Deel 3*. Rijswijk: Ministerie van WVC, 1991, pp. 21–34.

15 Hay D I. Socioeconomic status and health status: a study of males in the Canada health survey. *Soc Sci Med* 1988; **27:** 1317–25.

16 Fox A J, Shewry M. New longitudinal insights into relationships between unemployment and mortality. *Stress Med* 1988; **4:** 11–19.

17 Mackenbach J P, Mheen H van de, Stronks K. A prospective cohort study investigating the explanation of socio-economic inequalities in health in the Netherlands. *Soc Sci Med* 1994; **38:** 299–308.

18 Erikson R, Goldthorpe J H, Portocarero L. Intergenerational class mobility and the convergence thesis: England, France and Sweden. *Br J Sociol* 1983; **34:** 303–43.

[19] Abramson J H, Gofin R, Habib J *et al.* Indicators of social class. A comparative appraisal of measures for use in epidemiological studies. *Soc Sci Med* 1982; **16:** 1739–46.

[20] Winkleby M A, Jatulis D E, Frank E, Fortmann S P. Socioeconomic status and health: How education, income, and occupation contribute to risk factors for cardiovascular disease. *Am J Public Health* 1992; **82:** 816–20.

[21] Statistics and Epidemiology Research Corporation. *Egret Reference Manual*. Seattle: 1990.

[22] Mheen H van de, Stronks K, Bos J van den, Mackenbach J P. De relatie tussen sociaal-economische status en verschillende indicatoren voor gezondheid. Resultaten uit de Longitudinale Studie naar Sociaal-Economische Gezondheidsverschillen [in Dutch]. In: Mackenbach J P (ed.). *De Longitudinale Studie naar Sociaal-economische Gezondheidsverschillen (LS-SEGV)*. Rijswijk: Ministerie van WVC, 1994, pp. 41–57.

[23] Fox A J, Goldblatt P O, Adelstein A M. Selection and mortality differentials. *J Epidemiol Community Health* 1982; **36:** 69–79.

[24] Dahl E. Social inequality in health—the role of the healthy worker effect. *Soc Sci Med* 1993; **36:** 1077–86.

[25] Hooghiemstra B T J, Niphuis-Nell M. *Sociale Atlas van de Vrouw. Deel 2* (Arbeid, inkomen en faciliteiten om werken en de zorg voor kinderen te combineren) [in Dutch]. Rijswijk: Sociaal en Cultureel Planbureau, 1993.

[26] Agt H M E van, Stronks K, Mackenbach J P. De financiële situatie van chronisch zieken. Interimrapport van de Longitudinale Studie naar de financiële situatie van chronisch zieken [in Dutch]. Rotterdam: Inst. Maatschappelijke Gezondheidszorg, Erasmus Universiteit Rotterdam 1994.

[27] Power C, Matthews S, Manor O. Inequalities in self rated health in the 1958 birth cohort: lifetime social circumstances or social mobility. *Br Med J* 1996; **313:** 449–53.

[28] Wilkinson R G. National mortality rates: The impact of inequality? *Am J Public Health* 1992; **82:** 1082–84.

[29] Quick A, Wilkinson R. *Income and Health*. London: Socialist Health Association, 1991.