RESEARCH REPORT

Socioeconomic inequalities in mortality within ethnic groups in the Netherlands, 1995–2000

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Study objective: To analyse socioeconomic inequalities in mortality in Dutch, Turkish, Moroccans, Surinamese, and Antillean/Aruban men and women living in the Netherlands and to assess the contribution of specific causes of death to these inequalities.
Design: Open cohort design using data from the Municipal Population Registers and cause of death registry.
Setting: the Netherlands from 1995 through 2000.
Participants: All inhabitants of the Netherlands.
Main outcome measures: This study calculated directly standardised mortality rates by mean neighbourhood income and estimated relative mortality ratios comparing the two lowest socioeconomic groups with the two highest socioeconomic groups for all and cause specific mortality by country of origin and sex.
Main results: Socioeconomic differences in total mortality were comparatively large in Dutch, (RR = 1.49, CI = 1.46 to 1.52), Surinamese (1.32, 1.19 to 1.46), and Antillean/Aruban men (1.56, 1.29 to 1.89) and in Dutch (1.39, 135 to 1.42) and Surinamese women (1.27, 1.11 to 1.46). They were comparatively small among Turkish (1.10, 0.99 to 1.23) and Moroccan men (1.10, 0.97 to 1.26) and among Turkish (1.13, 0.97 to 1.33), Moroccan (1.12, 0.93 to 1.35) and Antillean/Aruban women (1.03, 0.80 to 1.33). The mortality differences among the Dutch were partly attributable to inequalities in mortality from cardiovascular diseases, whereas among Antillean/Aruban men external causes strongly contributed to the mortality differences. The small differences among Turkish and Moroccan men were due to a lack of inequalities for cardiovascular diseases and small inequalities for the other causes.
Conclusions: The impact of socioeconomic status on mortality differed between ethnic groups living in the Netherlands. Maintaining small socioeconomic inequalities in mortality among Turkish and Moroccans men and women and among Antillean/Aruban women could prevent future increases in overall mortality in these groups.

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Within many countries, substantial inequalities in mortality between ethnic groups exist.[1–4] The extent to which socioeconomic inequalities underlie ethnic inequalities in mortality remains contested, but many argue that ethnic inequalities in mortality are predominantly determined by socioeconomic inequalities.[5 6] If the strength of the relation between socioeconomic status and mortality would vary between ethnic groups, this would have consequences for the extent to which socioeconomic inequalities can underlie ethnic differences in mortality. Therefore, to better understand the relation between ethnicity, socioeconomic status, and mortality, it is important to assess whether socioeconomic factors affect mortality in a similar way in all ethnic groups. However, up to now, little research has been done on the size of socioeconomic inequalities in mortality within ethnic minority groups. Most of the existing evidence originates from the UK and USA and suggests that the association between socioeconomic position and mortality may not be equally strong in all ethnic groups.[1 2 7–11]

The size of socioeconomic inequalities in mortality varies between countries, age groups, sexes, periods, and rural/urban areas,[12–15] and this suggests that it may also vary between ethnic groups. Variations in the size of the gradient between ethnic groups could be related to artefacts,[5] but it may also be related to real phenomena, such as health selection effects being more pronounced in some socioeconomic strata than in others[7] or to ethnic variations in the relation between specific risk factors (such as smoking and diet) and socioeconomic status.

The situation in the Netherlands resembles that in many other continental European countries, in the sense that many important types of immigration that are common within Europe are represented. Turks and Moroccans initially came as labour migrants to the Netherlands, while the migration of Surinamese and Antilleans/Arubans is related to the colonial past. We estimated the size of socioeconomic inequalities in mortality within these minority groups by making use of information on mean neighbourhood income. We aimed to identify factors that explain possible variations between groups in the size of socioeconomic inequalities in mortality by evaluating the contribution of specific causes of death to these inequalities.

METHODS

Data

We used data for the years 1995 through 2000 from the cause of death register and the municipal population registers (GBA), which provided data on all inhabitants of the Netherlands with a legal status. These registers were linked on personal identification number. Persons were allowed to enter the study (through birth or immigration) throughout the study period (open cohort design). Of each inhabitant, the amount of person time was calculated. The event of interest was death. Deaths of persons that are included in the population registry should be included in the cause of death registry, irrespective of whether the death occurred in the Netherlands or abroad. Only deaths of persons that officially de-registered from the population registry, for example

Table 1 Population by ethnicity, socioeconomic status, and sex

	% Of population according to socioeconomic status*				Total number of person years
	1 (high)	2	3	4 (low)	
Male					
Dutch	54	30	9	7	32127935
Turkish	14	27	17	42	874675
Moroccan	19	25	16	41	751404
Surinamese	26	23	13	38	779177
Antillean/Aruban	31	25	16	28	258979
Female					
Dutch	54	30	9	7	30973279
Turkish	14	28	17	41	789701
Moroccan	19	26	16	40	653727
Surinamese	26	24	13	36	822544
Antillean/Aruban	31	26	16	27	256524
Total	51	30	10	9	68288844

*As a measure of socioeconomic status mean household equivalent income of neighbourhoods was used.

because they (r)emigrated, are not included in the cause of death registry. The causes of death were coded according to ICD 9 in 1995, and according to ICD 10 in 1996–2000. Although deaths that took place abroad are included in the cause of death registry, the cause of death was almost never established. Usually, these deaths were categorised under ill defined conditions. Among Turkish and Moroccans, 80% of deaths within this category took place abroad, among Surinamese and Antilleans/Arubans 50%, and among Dutch 13%.

All data were tabulated according to sex, date of birth, country of origin, six digit postcode, and marital status (unmarried, married, widowed, or divorced). As a proxy of ethnicity we used the country of birth of subject and both parents. We applied the standard definition of foreigners of Statistics Netherlands and considered a person to be non-Dutch if at least one parent was born abroad.[16] In case of mixed origin, the country of birth of the mother prevailed. Because the age structure varied strongly between ethnic groups and because socioeconomic differences in mortality varied strongly with age, all analyses were restricted to the population aged 0–59 years. Five year age bands were applied, using age at mid-year. Information on sociodemographic characteristics of people who remained alive and of people who died both came from the population register.

On the basis of six digit postcode we linked information on all neighbourhoods in the Netherlands that we obtained from the regional income register (RIO) and the register on areas and neighbourhoods (WBR). Neighbourhoods contained on average about 1500 persons. This information included region (west, east, south, and north), degree of urbanisation

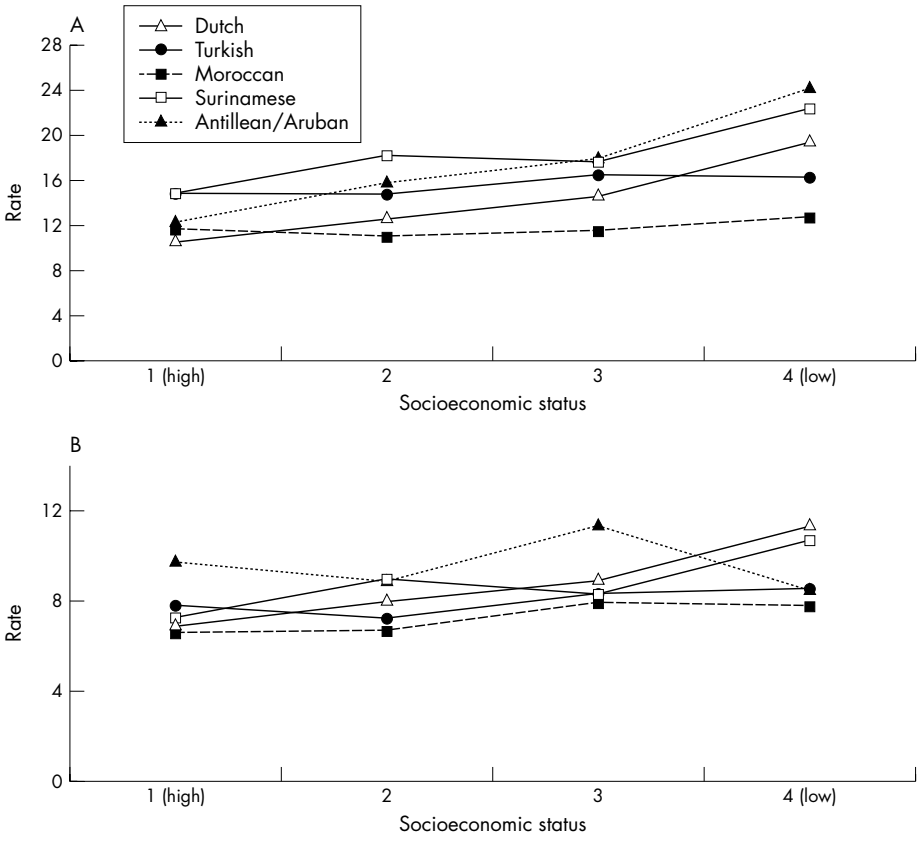

Figure 1 Directly standardised mortality rates for all cause mortality by ethnicity and SES. (A) Males; (B) females.

Table 2 Relative mortality risks for all cause mortality: the two lowest compared with the two highest socioeconomic groups after adjustment for age and, respectively, marital status, region, and degree of urbanisation

	RR (95% CI) two lowest compared with two highest SES groups adjusted for age and				
	No other	Marital status	Region	Urbanisation	All
Male					
Dutch	1.49 (1.46 to 1.52)	1.33 (1.30 to 1.35)	1.52 (1.49 to 1.55)	1.42 (1.39 to 1.45)	1.31 (1.28 to 1.34)
Turkish	1.10 (0.99 to 1.23)	1.10 (0.99 to 1.23)	1.10 (0.98 to 1.22)	1.08 (0.96 to 1.22)	1.09 (0.97 to 1.24)
Moroccan	1.10 (0.97 to 1.26)	1.10 (0.96 to 1.25)	1.10 (0.97 to 1.26)	1.08 (0.93 to 1.25)	1.07 (0.93 to 1.24)
Surinamese	1.32 (1.19 to 1.46)	1.23 (1.11 to 1.36)	1.31 (1.19 to 1.46)	1.26 (1.12 to 1.41)	1.17 (1.04 to 1.31)
Antillean/Aruban	1.56 (1.29 to 1.89)	1.46 (1.20 to 1.77)	1.54 (1.26 to 1.87)	1.41 (1.14 to 1.75)	1.32 (1.06 to 1.65)
Female					
Dutch	1.39 (1.35 to 1.42)	1.29 (1.26 to 1.32)	1.42 (1.38 to 1.46)	1.32 (1.29 to 1.36)	1.27 (1.24 to 1.31)
Turkish	1.13 (0.97 to 1.33)	1.14 (0.97 to 1.33)	1.15 (0.97 to 1.35)	1.15 (0.96 to 1.37)	1.14 (0.95 to 1.37)
Moroccan	1.12 (0.93 to 1.35)	1.13 (0.94 to 1.35)	1.11 (0.92 to 1.33)	1.12 (0.91 to 1.37)	1.17 (0.94 to 1.44)
Surinamese	1.27 (1.11 to 1.46)	1.22 (1.07 to 1.40)	1.29 (1.13 to 1.49)	1.22 (1.05 to 1.43)	1.14 (0.97 to 1.33)
Antillean/Aruban	1.03 (0.80 to 1.33)	1.02 (0.78 to 1.32)	1.01 (0.78 to 1.31)	1.04 (0.78 to 1.38)	0.97 (0.72 to 1.30)

(address density per square kilometre within neighbourhoods classified into five groups) and mean household equivalent income (classified into the 10 deciles of the total population). Mean household equivalent income of neighbourhoods was used as indicator of socioeconomic status. Although it is an ecological measure, it is able to show socioeconomic differences in mortality in the Netherlands and it is comparatively robust for confounding.[17 18] To have sufficient numbers of deaths for each ethnic group in each socioeconomic class, we recoded socioeconomic status into four groups that contained, respectively, 50%, 30%, 10%, and 10% of the total number of person years (see table 1).

Statistical analyses

The mortality level of each socioeconomic group was measured by means of directly standardised mortality rates using the total of the studied migrant populations as a standard. Absolute differences in mortality rates between the two highest and the two lowest socioeconomic groups were calculated for total and cause specific mortality.

We estimated the size of relative mortality differences between the two lowest and the two highest socioeconomic groups by means of Poisson regression analyses (using Stata version 7). We related the number of deaths to numbers of person years as offset variable, and to income group as independent variable. All relative risks were adjusted for age (five year age groups) and for all relative risks 95% confidence intervals were estimated. To test whether the size of socioeconomic inequalities in mortality did significantly differ between ethnic minority groups and Dutch, an interaction term between socioeconomic status and ethnicity was added to the regression analyses. Regression analyses were carried out with and without adjustment for differences in marital status, region, and degree of urbanisation.

RESULTS

Dutch lived more often in high income neighbourhoods than Surinamese and Antilleans/Arubans (table 1), whereas the latter lived more often in high income neighbourhoods than Turkish and Moroccans.

Directly standardised mortality rates varied between socioeconomic groups in most ethnic groups (fig 1A and 1B) but the size of differences varied between groups. Socioeconomic mortality differences were comparatively large in Dutch (RR = 1.49, CI = 1.46 to 1.52), Surinamese (1.32, 1.19 to 1.46) and Antillean/Aruban men (1.56, 1.29 to 1.89) and in Dutch (1.39, 135 to 1.42) and Surinamese women (1.27, 1.11 to 1.46) (table 2). They were comparatively small in Turkish (1.10, 0.99 to 1.23) and Moroccan (1.10, 0.97 to 1.20) men and in Turkish (1.13, 0.97 to 1.33), Moroccan (1.12, 0.93 to 1.35) and Antillean (1.03, 0.80 to 1.33) women. The variation in the size of socioeconomic differences in mortality between ethnic groups was significant in men (0.95, 0.92 to 0.97) and women (0.94, 0.91 to 0.98) (results not shown). Only mortality differences in Antillean/Aruban men and Surinamese women were not significantly different from those in Dutch (results not shown).

Comparison of relative risks of death before and after adjustment for marital status, region, and degree of urbanisation showed the extent to which socioeconomic differences in mortality were explained by these variables (table 2). The inequalities among the Dutch, the Surinamese, and among Antillean/Aruban men were partly explained by marital status. Region barely influenced the size of inequalities. Degree of urbanisation did have some effect, especially on mortality differences among Antillean/Aruban men. After adjustment for these variables, there still was a significant variation between ethnic groups in the size of socioeconomic inequalities in mortality (men: 0.95, 0.92 to 0.97; women: 0.94, 0.91 to 0.98; results not shown).

The size of socioeconomic differences in mortality varied between ethnic groups for specific causes of death as well (table 3 and 4). In males, mortality differences varied significantly between ethnic groups for cardiovascular diseases (0.87, 0.82 to 0.92) and other causes of death (0.95, 0.91 to 0.99; results not shown). In females the variations were significant for infectious (0.77, 0.63 to 0.92) and cardiovascular diseases (0.85, 0.78 to 0.92; results not shown). More specifically, socioeconomic inequalities in mortality from infectious diseases were comparatively small in Surinamese women (0.67, 0.30 to 1.47) and mortality differences from cardiovascular diseases were small in Turkish (0.92, 0.71 to 1.18), Moroccan (0.94, 0.66 to 1.34) and Surinamese (1.16, 0.94 to 1.42) men and in Surinamese (1.13, 0.84 to 1.52) and Antillean/Aruban (0.81, 0.42 to 1.56) women. Mortality differences from other causes were small in Turkish (1.11, 0.94 to 1.31) and Moroccan (1.15, 0.94 to 1.42) men and mortality differences from external causes were small in Moroccan (1.10, 0.83 to 1.44) men and Turkish (0.77, 0.49 to 1.23) women and were large in Antillean/Aruban (2.13, 1.49 to 3.03) men.

The socioeconomic differences in total mortality among the Dutch were to a comparatively large degree attributable to inequalities in mortality for cardiovascular diseases, while among Antillean/Aruban men, inequalities in mortality from external causes made a large contribution to the differences in total mortality (fig 2A and 2B). The small socioeconomic differences in total mortality among Turkish and Moroccan men were attributable to slightly inverse inequalities for

Table 3 Directly standardised mortality rates and relative mortality risks for specific causes of death by socioeconomic status and ethnicity for males

		Male					
			rate				RR (1+2 *v* 3+4)
Country of origin	Cause of death	Cause as % of total	1 (high)	2	3	4 (low)	(95% CI)
Dutch	Infectious diseases	1.8	0.20	0.25	0.28	0.63	2.03 (1.77 to 2.33)
	Neoplasms	32.2	3.11	3.50	3.85	4.62	1.32 (1.27 to 1.36)
	Cardiovascular diseases	25.6	2.22	2.81	3.39	4.32	1.57 (1.51 to 1.64)
	Other diseases	24.6	3.13	3.59	4.19	6.09	1.62 (1.56 to 1.69)
	External causes	15.9	2.22	2.73	3.02	3.94	1.47 (1.40 to 1.54)
Turkish	Infectious diseases	2.6	0.15	0.25	0.61	0.46	2.39 (1.09 to 5.27)
	Neoplasms	17.4	2.91	2.32	3.00	2.82	1.11 (0.85 to 1.44)
	Cardiovascular diseases	18.0	3.00	3.22	2.54	2.86	0.92 (0.71 to 1.18)
	Other diseases	43.3	5.66	6.30	6.84	6.86	1.11 (0.94 to 1.31)
	External causes	18.7	2.27	2.52	3.34	3.13	1.33 (1.03 to 1.73)
Moroccan	Infectious diseases	3.1	0.20	0.10	0.73	0.50	3.57 (1.36 to 9.39)
	Neoplasms	17.0	1.73	1.97	1.63	2.24	1.10 (0.80 to 1.52)
	Cardiovascular diseases	13.6	1.92	1.57	1.76	1.51	0.94 (0.66 to 1.34)
	Other diseases	42.5	4.37	4.22	4.21	5.34	1.15 (0.94 to 1.42)
	External causes	23.8	2.99	2.63	2.75	3.16	1.10 (0.83 to 1.44)
Surinamese	Infectious diseases	5.3	0.67	0.73	1.22	1.11	1.66 (1.05 to 2.63)
	Neoplasms	15.0	2.01	2.57	2.37	3.47	1.43 (1.09 to 1.86)
	Cardiovascular diseases	24.3	3.82	4.31	4.56	4.50	1.16 (0.94 to 1.42)
	Other diseases	32.8	4.62	5.59	5.47	7.96	1.52 (1.27 to 1.82)
	External causes	22.6	3.15	4.17	3.37	5.19	1.29 (1.04 to 1.60)
Antillean/Aruban	Infectious diseases	7.5	0.69	1.10	1.24	1.64	1.81 (0.87 to 3.76)
	Neoplasms	17.9	2.09	4.15	2.89	4.46	1.28 (0.80 to 2.03)
	Cardiovascular diseases	15.9	2.32	2.71	2.82	3.47	1.22 (0.75 to 1.99)
	Other diseases	25.4	3.76	3.04	4.19	6.90	1.60 (1.08 to 2.37)
	External causes	33.3	2.39	2.43	6.44	7.38	2.13 (1.49 to 3.03)

cardiovascular diseases and small inequalities for most of the other observed causes.

DISCUSSION

Socioeconomic differences in total mortality were comparatively large among the Dutch, the Surinamese, and among Antillean/Aruban men. They were small among the Turkish, the Moroccans, and among Antillean/Aruban women. Among the Dutch, the mortality differences were partly attributable to inequalities in mortality from cardiovascular diseases, whereas among Antillean men external causes strongly contributed to the mortality differences. The small differences among Turkish and Moroccan men were attributable to a lack of inequalities for

Table 4 Directly standardised mortality rates and relative mortality risks for specific causes of death by socioeconomic status and ethnicity for females

		Female					
			Rate				RR (1+2 *v* 3+4)
Country of origin	Cause of death	Cause as % of total	1 (high)	2	3	4 (low)	(95% CI)
Dutch	Infectious diseases	1.3	0.12	0.14	0.18	0.30	1.84 (1.50 to 2.25)
	Neoplasms	49.5	3.02	3.31	3.59	4.17	1.23 (1.19 to 1.28)
	Cardiovascular diseases	15.6	0.88	1.18	1.35	1.85	1.67 (1.56 to 1.78)
	Other diseases	24.2	2.17	2.49	2.67	3.62	1.45 (1.38 to 1.52)
	External causes	9.3	0.83	1.00	1.17	1.65	1.55 (1.43 to 1.67)
Turkish	Infectious diseases	3.4	0.28	0.16	0.23	0.32	1.41 (0.57 to 3.50)
	Neoplasms	18.9	0.96	1.62	1.56	1.82	1.23 (0.84 to 1.79)
	Cardiovascular diseases	13.2	1.04	0.91	1.26	1.11	1.15 (0.74 to 1.80)
	Other diseases	53.0	3.61	3.29	4.27	4.55	1.32 (1.05 to 1.66)
	External causes	11.5	1.13	1.02	0.93	0.74	0.77 (0.49 to 1.23)
Moroccan	Infectious diseases	4.0	0.07	0.42	0.18	0.30	0.97 (0.38 to 2.47)
	Neoplasms	18.2	1.39	1.31	2.02	1.54	1.20 (0.77 to 1.87)
	Cardiovascular diseases	9.1	1.02	0.38	0.63	0.90	1.25 (0.67 to 2.35)
	Other diseases	55.1	2.53	3.79	3.64	3.93	1.12 (0.87 to 1.44)
	External causes	13.6	0.86	0.60	1.29	1.12	1.64 (0.96 to 2.80)
Surinamese	Infectious diseases	3.2	0.20	0.45	0.10	0.32	0.67 (0.30 to 1.47)
	Neoplasms	24.2	2.41	1.74	1.59	2.02	0.93 (0.71 to 1.24)
	Cardiovascular diseases	21.1	1.21	2.14	1.49	1.94	1.13 (0.84 to 1.52)
	Other diseases	36.2	2.65	2.97	3.54	4.40	1.58 (1.26 to 2.00)
	External causes	15.3	0.54	1.65	1.29	2.07	1.87 (1.30 to 2.70)
Antillean/Aruban	Infectious diseases	5.3	0.14	0.90	0.50	0.42	0.92 (0.29 to 2.91)
	Neoplasms	27.2	2.73	1.81	4.53	1.35	1.09 (0.66 to 1.80)
	Cardiovascular diseases	16.7	1.86	1.30	1.19	1.32	0.81 (0.42 to 1.56)
	Other diseases	35.5	2.83	3.66	3.79	3.78	1.21 (0.78 to 1.87)
	External causes	15.4	1.69	0.84	0.86	1.62	1.03 (0.53 to 2.00)

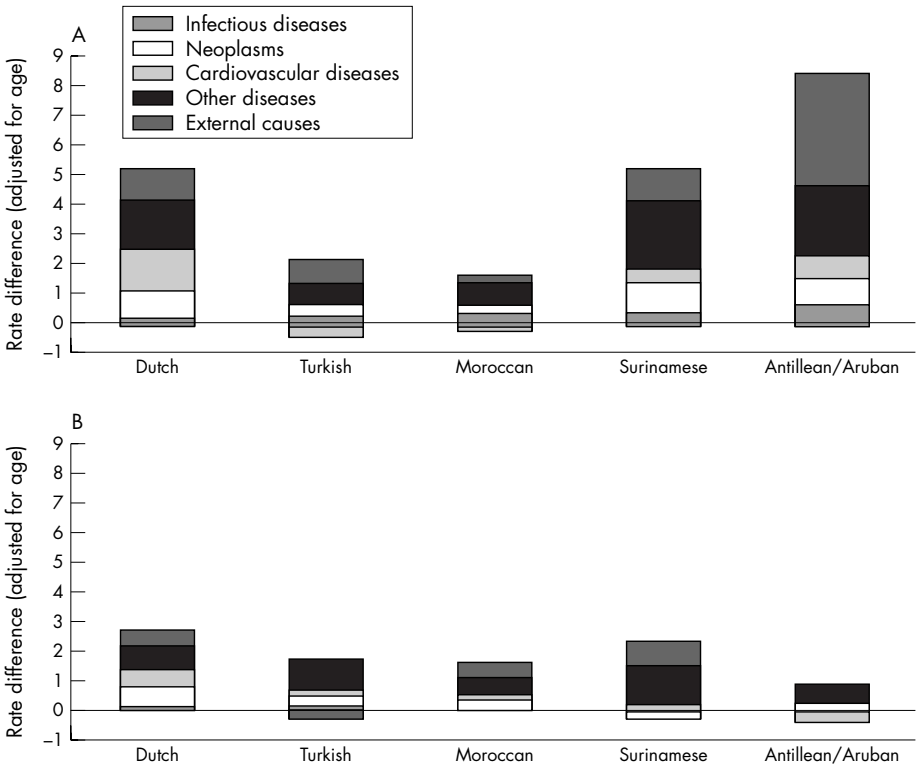

Figure 2 Absolute differences in mortality rates between the two highest and the two lowest socioeconomic groups for specific causes of death. (A) Males; (B) females.

cardiovascular diseases and small inequalities for the other observed causes.

This is the first study to report on socioeconomic differences in mortality within ethnic groups in the Netherlands. A study that used data from the 1970s from the UK showed no mortality inequalities according to occupational class in minority groups,[7] but later studies all showed socioeconomic inequalities in mortality within most ethnic groups.[8 19] In the UK, the size of the inequalities seems to vary, with strong gradients for Irish immigrants, small gradients for people born in the Indian subcontinent, and no gradients for Caribbeans.[20] In the USA, the magnitude of mortality differences was similar in blacks groups as in the white population.[8 9] A study done in New Zealand showed considerably larger social class mortality differences within Maori than non-Maori.[21] The available evidence thus suggests the association between social position and mortality is not always equally strong in all ethnic groups, which is in accordance with our results.

There are three limitations that may have affected the results of this study. Firstly, it may be that we would have obtained different results if we had used a different indicator of socioeconomic position. Unfortunately, because no other measures of socioeconomic position were available, we were unable to examine the extent to which inequalities in mortality within ethnic minority groups depended upon the socioeconomic measure that we used.

Key points

- The size of socioeconomic inequalities in mortality varied between ethnic groups.
- Socioeconomic differences in total mortality were large among Dutch and Surinamese men and women and among Antillean/Aruban men. They were small among Turkish and Moroccan men and women and among Antillean/Aruban women.
- Among the Dutch, the large mortality differences were partly attributable to large inequalities in mortality from cardiovascular diseases, whereas among Antillean/Aruban men differential mortality from external causes strongly contributed to the inequalities.
- The small mortality differences among Turkish and Moroccan men were attributable to a lack of inequalities for cardiovascular diseases and small inequalities for the other observed causes.
- These variations in socioeconomic mortality inequalities may in part be attributable to ethnic variations with respect to social support and with respect to social gradients in behavioural risk factors.

Policy implications

- Maintaining small socioeconomic inequalities in mortality among Turkish and Moroccans men and women and Antillean/Aruban women can prevent future increases in overall mortality in these groups, while the reduction of excess mortality among Surinamese men and women and Antillean/Aruban men with a low socioeconomic status can strongly reduce overall levels of excess mortality among them.
- Specific attention should be directed towards the prevention of an increase in socioeconomic differences in cardiovascular disease mortality among Turkish, Moroccan, and Surinamese men and among Surinamese and Antillean/Aruban women.

Secondly, systematic differences in income within broad income groups may have influenced the results. Dutch within the highest income category had, for example, a comparatively high income. This, however, did not explain the comparatively large socioeconomic inequality in mortality among Dutch because, upon exclusion of the Dutch population with the highest incomes (40% of the total Dutch population), the mortality differences among Dutch remained comparatively large (RRmen: 1.36, RRwomen: 1.28). It is also unlikely that heterogeneity of income within the lowest income group explained the small socioeconomic inequalities in mortality among Turks and Moroccans because, among them, mean neighbourhood income was hardly related to mortality.

Thirdly, the validity of the used indicator of socioeconomic status, a measure at the ecological level, may not be equally good for all ethnic groups. Perhaps, in some groups, the place of residence is determined by the mean socioeconomic status of a neighbourhood, whereas in others it is predominantly determined by the ethnic composition of a neighbourhood. To evaluate this, we compared the population distribution according to our measure at the neighbourhood level with a population distribution according to a measure at the individual level (household income).[22] For Antilleans, the two measures yielded the same population distributions. For Turks, Moroccans, and Surinamese, however, a somewhat larger proportion (5% to 15%) of the population belonged to the lowest income quintile according to the measure at the ecological level than according to the measure at the individual level. The place of residence of Turks, Moroccans, and Surinamese may be more strongly determined by other factors than neighbourhood income, hence, neighbourhood income may for them be a less valid indicator of socioeconomic status. As the discrepancy between the population distributions was fairly small, we think this aspect of differential validity had only limited influence on the mortality differences among Turks, Moroccans, and Surinamese.

Variations in the steepness of the socioeconomic mortality gradient could also be attributable to selection effects being more pronounced in some socioeconomic strata than in others. If the selective migration of healthy people to the Netherlands (''healthy migrant effect'') was comparatively strong among the currently poor migrants, or, if the selective remigration of a comparatively unhealthy subsample of migrants (''salmon bias'') occurred more often among the poor, this could result in comparatively small socioeconomic inequalities in mortality.

Because the Netherlands received a large part of its non-western migrants more than 25 years ago and health selection effects are reported to wear out over time,[23] the healthy migrant effect can only have affected a small proportion of the migrant population. Selective remigration of comparatively unhealthy people can only have affected a small proportion of the population, because, in the Netherlands, unregistered re-migrants remain in the cohort and registered remigration is a very rare event, especially among Surinamese and Antilleans. We therefore think it is unlikely that a differential influence of selection effects substantially influenced the size of socioeconomic inequalities in mortality.

Socioeconomic inequalities in mortality can also be associated with levels of social support.[24] A strong social network can both attenuate and increase the socioeconomic inequalities within some ethnic groups. Among Turks and Moroccans, family ties are generally very close. Our results on the influence of marital status suggest that this has to some extent buffered against the adverse effects of a low socioeconomic status. Among Turks in the Netherlands, the group cohesion is very strong[25] and this too may have contributed to the comparatively small mortality differences among them. The small socioeconomic inequalities among Moroccans are somewhat less likely to be attributable to the protective effect of a social network, because within this group there is considerable disunity and suspicion.[25] Among Antilleans/Arubans there is a disintegration of the own network,[25] which is probably related to the economic recession in the Dutch Antilles and Aruba. A marginalised minority is now involved in the trafficking of drugs and other crimes,[26] which has resulted in a large number of casualties from homicide among Antillean/Aruban men.[3] This occurs more often among those with a lower SES, and hence strongly contributes to the large socioeconomic differences in mortality within this group.

Variations in the steepness of socioeconomic differences in mortality may also be attributable to variations in the relation between behavioural risk factors and socioeconomic status. In southern European countries smoking and an unhealthy diet was for a long time more common among those in higher socioeconomic strata than among those in lower strata.[27] Within Europe, this has resulted in a north-south gradient, with larger socioeconomic inequalities in cardiovascular mortality in the north than in the south and even some inverse inequalities for ischaemic heart disease in some parts of southern Europe.[28 29] Among Turkish and Moroccan men living in the Netherlands, we observed slightly inverse inequalities in mortality from cardiovascular diseases. There are no studies that report on socioeconomic differences in mortality in Morocco and there is only one study on Turkey. It found that family income was not predictive of overall mortality, but was predictive of future CHD events, with an excess mortality in the lowest income groups.[30] Yet, we think that the pattern among Turkish and Moroccan men living in the Netherlands may be an extension of the north-south gradient that is observed within Europe. For the Netherlands, many studies report on differences in health related behaviours between ethnic groups,[31] but in none of them was information on socioeconomic gradients included. Based on what is known about the relation between socioeconomic status and risk factors in countries that are less advanced in the epidemiological transition, we expect that the observed inverse gradient in mortality from cardiovascular diseases is related to less smoking, to a less sedentary way of life, and/or to a more traditional food pattern with more Mediterranean products among Turkish and Moroccan men with a lower SES.

Because minority groups within the Netherlands resemble groups in other countries in many ways, we expect that these results may to some extent apply to other countries with similar minority groups. This study has shown that the size of socioeconomic inequalities in mortality varies between ethnic groups. Studies that aim to assess the effect of socioeconomic status on ethnic differences in mortality should take into account these variations by, for example, studying the interaction between socioeconomic status and ethnicity in the regression model. Information about such interactions adds to our understanding of ethnic differences in mortality. Compared with native Dutch men, Moroccan men have, for example, a low level of overall mortality,[3] which is partly related to the weak association between socioeconomic status and mortality within this group. Antillean men, in contrast, have high overall mortality,[3] which is partly related to the high mortality within the lowest socioeconomic group. This knowledge can also serve the development of policies aimed at the prevention or reduction of ethnic inequalities in mortality. Maintaining small socioeconomic inequalities in mortality among Turkish and Moroccan men and women and Antillean/Aruban women can prevent future increases in

overall mortality in these groups, while the reduction of excess mortality among Surinamese men and women and Antillean/Aruban men with a low socioeconomic status can strongly reduce overall levels of excess mortality in these groups.

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APPENDIX

Table A1 Percentage of the population according to background characteristics and ethnicity

	Marital status: % single (aged 30–49)	Region: % living in West	Degree of urbanisation: % living in highly urbanised area
Male			
Dutch	25.5	30.5	17.6
Turkish	6.7	35.4	21.1
Moroccan	13.2	39.9	21.4
Surinamese	36.5	42.5	22.9
Antillean/ Aruban	53.1	38.7	21.4
Female			
Dutch	16.8	30.3	17.3
Turkish	3.3	36.4	21.1
Moroccan	3.9	40.8	20.6
Surinamese	30.8	44.0	22.5
Antillean/ Aruban	44.5	40.5	21.0

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