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Regional differences in healthy life expectancy in the Netherlands

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SUMMARY

Background. Healthy life expectancy has mainly been studied at the level of healthcare systems rather than at regional level within healthcare systems. In this article, healthy life expectancy at birth and at 65 years of age for men and women in the Netherlands has been described, and factors related to these regional variations have been explored.

Methods. Ecological study of 27 healthcare regions (hospital catchment areas). Life expectancy and healthy life expectancy were calculated using 1995 mortality data and pooled health interview survey data (1992–1997) from Statistics Netherlands.

Results. Healthy life expectancy shows a regional pattern, slightly different from that found in life expectancy and self-reported health. The regional distribution of male and female healthy life expectancy is different, especially at 65 years. Healthy life expectancy of women aged 65 years is independent of their total life expectancy. Social conditions and lifestyle differences between regions are negatively associated with healthy life expectancy in Dutch regions. Healthcare supply variables show no clear relationship.

Conclusion. Although the Netherlands is a small, homogeneous country, substantial differences were found in healthy life expectancy.

INTRODUCTION

National and regional healthcare systems are supposed to contribute to the health of their inhabitants. A recent analysis concluded that medical care has been the dominant force in improving health at population level in Western countries.[1] The combination of mortality figures and subjective health experience, such as healthy life expectancy, or measures of disability, such as disability-free life expectancy, provides meaningful health indicators at population level that can be compared between countries or regions within countries.[2] In 2001, the World Health Organization described healthy life expectancy at birth as the equivalent number of years in full health that a newborn child can expect to live based on the current mortality rates and prevalence distribution of health states in the population.[3] In this article, we will give a description of regional differences in healthy life expectancy in the Netherlands, and we will compare the regional distribution of this combined mortality and subjective health measure with mortality-based life expectancy. The existence of regional differences in healthy life expectancy is an important challenge for (public) health policy. Monitoring regional differences provides information about the extent to which equity aims of the healthcare system are being reached.[4]

Until now, healthy life expectancy as a population measure of the performance of healthcare systems has mainly been used to compare social categories within countries[5] or to compare healthcare systems as a whole.[2] Regional differences have been studied less often.[6–8] Appendix 4 of the Reves Report on Health Expectations in OECD Countries gives regional data for the UK, Canada, Australia and Spain.[9] Recently, an analysis was published about regional differences in disability-free life expectancy in Spain, based on 50 provinces.[10] Disability free life expectancy turned out to be related to social conditions (illiteracy, unemployment) and life style (smoking). Weak relations were found with healthcare supply. Accordingly, in this ecological analysis of Spain, the predominance of medical care in improving the disability-free life expectancy was not confirmed.

In this article, we report a comparable regional analysis for the Netherlands. We will address the following research questions:

- How is healthy life expectancy regionally distributed in the Netherlands?
- What is the relationship between life expectancy and healthy life expectancy in Dutch regions?
- How does healthy life expectancy relate to socio-economic, life style and healthcare supply indicators?

The analysis presented in this article describes the regional differences in healthy life expectancy in the Netherlands and explores the relationships with other regional variables. It is the first step towards the analysis of performance differences between healthcare regions in one country. Section 2 briefly describes the methods and data used. We will then present information on healthy life expectancy and its correlates in the Netherlands. In the discussion, we will address the issue of the performance of health regions, in analogy to the World Health Organization's concept of the performance of health systems.

METHODS

The planning regions of the hospital sector were studied. These 27 regions have an average population of approximately 500,000 inhabitants. They are functional regions in the sense that most healthcare facilities are available in each region, and that utilization of health services across boundaries is low.

Mortality data from Statistics Netherlands for the year 1995 were used to construct regional life tables and to calculate life expectancy for men and women, at birth and at age 65 years for each region. The prevalence of good health has been computed on the basis of pooled data (1992–1997) from the Netherlands Health Interview Survey, which has approximately 6900 respondents per year. Pooling was necessary to obtain a sufficient number of cases, particularly in less densely populated regions. The response to the single question about self-rated health was used. The Netherlands Health Interview Survey does not include people who live in institutions (predominantly long-term care institutions, such as nursing homes and homes for the elderly). Their numbers were available at regional level from Statistics Netherlands and their health status was assumed to be less than good, as most of the institutionalized population live in long-term care institutions. These data were combined with the life table data to construct the healthy life expectancy for men and women, at birth and at age 65 years for each region, using the Sullivan method.[11] Briefly, this entails that a life table is constructed from the mortality data. A life table starts with a hypothetical cohort of 100,000 persons, and uses the mortality data to calculate how many of these are still alive at each age, and how many years will be lived in each age range. From the latter, life expectancy can be calculated by dividing the total number of years lived by the entire cohort by 100,000. To calculate healthy life expectancy, Sullivan modified the life table by dividing the number of years lived into the number of years lived in ill health and the number lived in good health. This was simply done by multiplying the years lived at each age by the prevalence of ill or good health, respectively, which can be averaged into a life expectancy in good health and in ill health (for a numerical example, see Appendix 2 in Ref. 9). The standard error of the calculated health expectancy can be calculated from the standard errors of the prevalence and mortality data.

Healthy life expectancy was related to socioeconomic indicators of the region (average income, percentage unemployed and percentage with low education; source Housing Survey, Statistics Netherlands, 1995), lifestyle indicators (percentage smokers and percentage heavy drinkers; source Netherlands Health Interview Survey, Statistics Netherlands, pooled data 1990–1997) and healthcare

supply indicators (number of hospital beds and number of general practitioners per 1000 population; source Prismant and Nivel, 1995).

RESULTS

Healthy life expectancy at birth is, averaged over 27 regions, 59.9 years for men and 60.7 years for women. However, for healthy life expectancy, the difference between men and women is almost completely removed. Healthy life expectancy at age 65 is 8.2 years for men and 9.5 for women. Variation between regions is relatively small and is largest for healthy life expectancy of women at age 65 years (Table 1).

[TABLE 1]

   Healthy life expectancy for men at age 65 years is highest in the northern part of the country (Fig. 1). The map for men at birth (not shown) shows more or less the same pattern. The regional pattern for the healthy life expectancy of women at age 65 years is much more scattered, with regions with a relatively low healthy life expectancy in all parts of the country (Fig. 2). The areas with a lower healthy life expectancy at birth for women are more concentrated in the south and south-west (not shown).

[FIGURE 1 & 2]

   The correlation between life expectancy and healthy life expectancy for each region is moderately strong for men: 0.50 at birth and 0.61 at 65 years. It is much weaker for women: 0.25 at birth and 0.11 at 65 years. Hence, for women, regional life expectancy and healthy life expectancy are nearly independent of each other.
   The correlation for healthy life expectancy at birth for men and women is moderately strong (0.68); regions with a high healthy life expectancy for one sex also tend to have a high healthy life expectancy for the other sex. However, at age 65 years, the correlation is rather weak (0.36). The total life expectancies are much more closely correlated (0.91 for life expectancy at birth and 0.84 at age 65 years; not in table).
   As a first step in the exploration of correlates of health life expectancy, correlations and regressions with socio-economic, life style and healthcare supply variables were calculated. Most correlations were weak or moderate (Table 2). Of the socioeconomic variables, average income of the region had a weak, positive relationship with healthy life expectancy; and percentage unemployed and percentage with a low education had moderately strong, negative relationships. The percentage smokers were negatively related to healthy life expectancy, particularly for men, and the percentage heavy drinkers showed a weak negative relationship with healthy life expectancy. For hospital beds per 1000 population, correlations were negative (not significant), while a positive (not significant) correlation was found between the healthy life expectancy for women at 65 years and the number of general practitioners per 1000 population.

[TABLE 2]

   Regression analyses (backward selection) show relationships with socio-economic and lifestyle indicators (Table 3). For men, healthy life expectancy at birth is negatively related to the percentage smokers and the percentage low educated in the region. Healthy life expectancy at age 65 years for men is negatively related to the percentage heavy drinkers and unemployment. For women, healthy life expectancy at birth is negatively related to average income, unemployment and low education. Finally, healthy life expectancy of women at age 65 years is negatively related to low education. Except for one, these relationships, although ecological, are as might be expected on the basis of epidemiologic knowledge. The exception is the negative relationship between average income of the population and the healthy life expectancy at birth for women.

[TABLE 3]

CONCLUSION AND DISCUSSION

In conclusion, although the Netherlands is a small, homogeneous country, substantial regional differences in healthy life expectancy were found, exceeding the variance expected on the basis of the sampling error in the data.

This study shows that healthy life expectancy adds something new compared with total life expectancy. Healthy life expectancy shows a regional pattern, slightly different from that of total life expectancy. Furthermore, it is important to distinguish between male and female healthy life expectancy, especially at 65 years. Healthy life expectancy of women at age 65 years is independent of their total life expectancy. Women experience ill health more often than men, but are less likely to die of it. In particular, the healthy life expectancy at age 65 years might be related to aspects of regional health care.

As in the study in Spain,[10] the correlations with social conditions and lifestyle indicators are negative, and the correlations with healthcare supply indicators were low and not significant.

This study has some shortcomings. The calculation of number of years in ill health was based on the single question about self-rated health. This question has been used in other studies of healthy life expectancy,[12] as well as in epidemiological studies.[13] An alternative to healthy life expectancy would have been disability-free life expectancy.[14,15] We prefer the former, because it is related to the prevalence of a range of chronic conditions that can be influenced by health care and prevention, while disability-free life expectancy is primarily related to disorders of the musculoskeletal system.[16]

Regarding relationships with other regional variables, a note of caution is necessary. Firstly, the relationships between socio-economic, life style and healthcare supply variables, and healthy life expectancy are ecological relations and cannot be interpreted directly in terms of a mechanism at individual level. Secondly, time lags between healthy life expectancy and its correlates were not used in this study. As suggested by Bunker,[1] lifestyle interventions may have effects but only in the very long term. However, it remains to be seen whether regional differences in healthy life expectancy can be explained by more detailed information relating to the medical care system. Finally, the number of regions studied was rather small. However, a larger number of regions also implies that each region is smaller, and that the basis for the calculation of healthy life expectancy becomes weaker. The small number of regions may have been the reason for the unexpected sign of the regression coefficient for average income of the population on healthy life expectancy at birth; the bivariate correlation is small and positive.

The background of this regional analysis of healthy life expectancy is that healthcare regions might differ in how well they perform. The debate about performance of healthcare systems has evolved from defining indicators for management information for health authorities[17] to attempts at measuring performance in a broader sense. The World Health Organization's World Health Report 2000 is an important step in this.[15] It defines health system performance in terms of disability-adjusted life expectancy and additional subjective indicators of the responsiveness and fairness of healthcare systems in relation to monetary inputs and the level of schooling of the population. A similar approach can be used for defining the performance of health regions. In doing so, a number of problems can be avoided that occur when whole healthcare systems are compared.[18] Regions within a healthcare system are much more homogeneous in terms of their history, culture, and health system and political institutions.

In order to study these differences in a performance framework, further steps have to be taken. These are the definition of relevant inputs of health care, modelling the transformation of a set of inputs in outputs, and finally the explanation of differences in performance between regions. One of the reasons for differences in performance between regions could be the extent to which different parts of the healthcare system are tuned to each other. It could be hypothesized that the performance of regional health care is positively related to regional integration of care.

The first steps to take from here are to define relevant aspects of regional health (care) systems that produce a long and healthy life, and to find reliable measurements of these with appropriate time lags. The role of preventive care and of non-healthcare inputs deserve particular attention.

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TABLES AND FIGURES

Table 1 Life expectancy (LE) and healthy life expectancy (HLE) in Dutch regions.

	Mean	Range	Range SE	Coefficient of variation
LE at birth, men	74.4	72.5-76.1		0.010
HLE at birth, men	59.9	56.8-63.5	0.53-1.34	0.026
LE at birth, women	80.2	78.9-81.9		0.010
HLE at birth, women	60.7	56.2-64.8	0.61-1.58	0.028
LE at 65, men	14.4	12.9-15.4		0.036
HLE at 65, men	8.2	6.9-9.4	0.37-1.08	0.065
LE at 65, women	18.8	17.7-19.8		0.028
HLE at 65, women	9.5	7.2-12.1	0.40-1.11	0.102

Healthy life expectancy
- < 8,0
- 8,0 - 8,5
- > 8,5
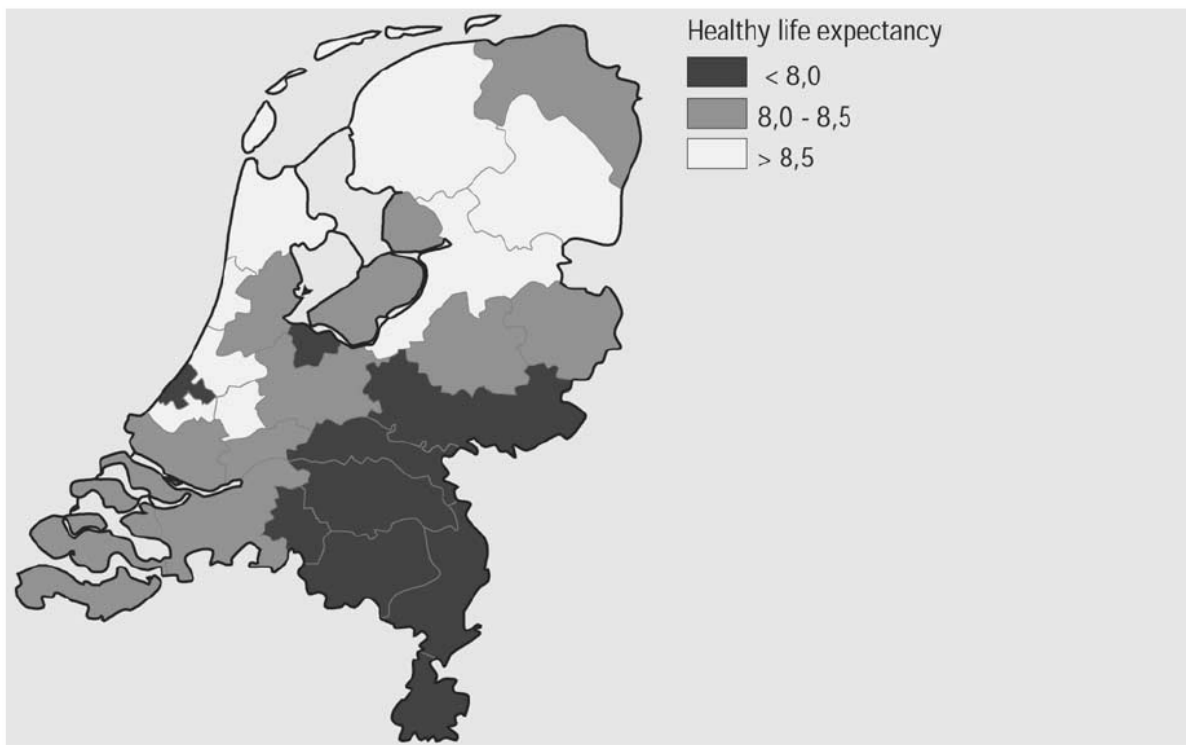
Figure 1 Healthy life expectancy in the Netherlands at age 65, men (1995).

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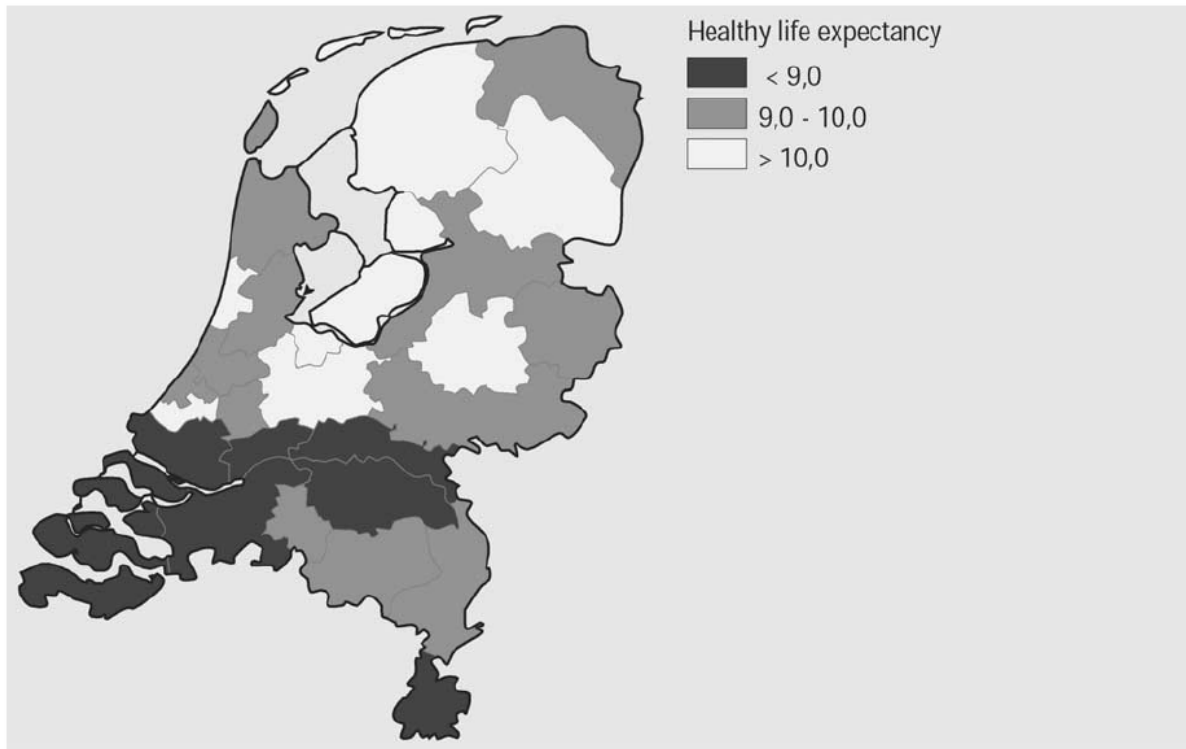**Public Health: 117, 2003, nr. 6, p. 424-429**

Figure 2 Healthy life expectancy in the Netherlands at age 65, women (1995).

Table 2 Correlates of healthy life expectancy (HLE) at birth and at age 65 years for males and females (Pearson's r).

	HLE, birth, m	HLE, birth, f	HLE, 65, m	HLE, 65, f
Smokers (%)	-0.50^a	-0.35^b	-0.47^a	-0.29
Heavy drinkers (%)	-0.14	0.10	-0.38^b	-0.06
Mean income	0.36^a	0.17	0.02	0.23
Unemployed (%)	-0.50^a	-0.42^a	-0.43^a	-0.32^b
Low education (%)	-0.41^a	-0.40^a	0.02	-0.50^a
Hospital beds (‰)	-0.27	-0.15	-0.24	-0.19
GPs (‰)	0.07	-0.05	-0.10	0.25

[a] $P < 0.05$.
[b] $P < 0.10$.

Table 3 Regression of lifestyle and socio-economic variables on healthy life expectancy (HLE) (backward selection; standardized regression coefficients).

	HLE, birth, m	HLE, birth, f	HLE, 65, m	HLE, 65, f
Smokers (%)	-0.45^a			
Heavy drinkers (%)			-0.31^b	
Mean income		-0.47^b		
Unemployed (%)		-0.46^a	0.37^b	
Low education (%)	-0.35^a	-0.62^a		-0.50^a
R^2 (adjusted)	0.32	0.27	0.22	0.21

[a] $P < 0.05$.
[b] $P < 0.10$.

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