

The Contribution of Six Chronic Conditions to the Total Burden of Mobility Disability in the Dutch Population

ABSTRACT

Objectives. This study assessed the proportions of the burden of mobility disability in the Dutch population that are attributable to musculoskeletal diseases, lung diseases, neurological disorders, heart diseases, diabetes, and cancer.

Methods. National survey data were analyzed with an elimination technique that combines the results of logistic regression analysis and the disease prevalence.

Results. Of the total prevalence of disability (20.5%), 33.7% can be attributed to these six chronic conditions. Musculoskeletal disorders account for the major part, whereas the contribution of cancer is very small.

Conclusions. The potential benefits of effective curative or preventive treatments for chronic conditions, in terms of reduction of the disability burden in the population, are limited. (*Am J Public Health*. 1997;87:1680-1682)

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Introduction

The burden of disability represents an important public health problem because of the aging of the population¹ and because of the associations between burden of disability and increasing health care demand,²⁻⁶ ensuing costs,⁷ and increasing mortality.⁸ The most important determinants of disability are chronic conditions, which are highly prevalent in today's Western societies, especially in old age.¹

Many studies have shown the high association between specific chronic conditions and disability, using both cross-sectional⁹⁻¹⁷ and longitudinal¹⁸⁻²¹ designs. Only a few studies have analyzed the impact of individual chronic conditions on the total burden of disability, which is determined not only by the strength of the association of each chronic condition with disability but also by the prevalence of the condition.^{6,12,16} These few studies have shown that musculoskeletal diseases (including arthritis) are the leading cause of disability for both men and women, for both the total population⁶ and the elderly.^{12,16}

In this study we assessed the proportion of the total burden of disability in the Dutch population that can be attributed to six main groups of chronic conditions.

Methods

Data were derived from the continuous Netherlands Health Interview Survey,²² which provides information on a two-stage probability sample of Dutch households. For the present study we used data on persons aged 16 years and older, because no data on disability are collected for younger persons. Data from 4 years (1989 through 1992) were aggregated to provide a substantial recent database (n = 26 288). In those years the nonresponse rate was about 40%, mainly because people refused to participate, were not at home (in spite of revisits), or were "unable to participate." In spite of this nonresponse rate, the sample appears to be a fairly accurate representation of the

Dutch population on the basis of figures on age, sex, marital status, and region.²²

Mobility disability was defined as the presence of at least minor difficulty with walking, carrying, and bending, based on questions derived from the Organization for Economic Cooperation and Development long-term disability indicator.²³

Respondents were asked whether they had had each of 24 conditions in the 12 months prior to interview. For this report we selected six major clusters of chronic conditions: musculoskeletal diseases, lung diseases, neurological disorders, heart diseases, diabetes, and cancer. These conditions have been given priority in research by the Dutch Advisory Council on Health Research.²⁴

Multiple logistic regression was used to assess the association of the separate chronic conditions and age with disability. Age was included as a continuous variable representing seven (almost equal) age groups. The coefficients of the logistic model and the actual presence of the individual conditions among respondents were then used to recalculate the prevalence of disability by averaging the predicted probability of having a disability for all respondents, by the formula

$$p_{\text{tot}} = \frac{1}{n_{\text{tot}}} \sum_{i=1}^{i=n} \frac{1}{(1 + e^{-z_i})},$$

with

$$z_i = c + \beta_1 d_{1,i} + \beta_2 d_{2,i} + \beta_3 d_{3,i} + \beta_4 d_{4,i} + \beta_5 d_{5,i} + \beta_6 d_{6,i} + \beta_{\text{age}} j,$$

where

p_{tot} = predicted proportion of the population aged 16 years and over with disability

n_{tot} = total number of respondents (24 191)

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- i* = respondent *I* (1 to 24 191)
j = age group (1 to 7)
e = 2.71828...
c = constant of the logistic model
 $\beta_1 \dots \beta_6$ = the estimated logistic coefficients for disease 1 to disease 6
 $d_{1,i} \dots d_{6,i}$ = the actual presence of disease 1 to disease 6 (yes = 1 or no = 0) in respondent *i*.

(Note: If the coefficients of the logistic model are estimated by the method of maximum likelihood, there is no need to actually calculate p_{tot} as indicated, because in that case p_{tot} is simply the observed proportion of disability. Thus $p_{tot} = .205$ from Table 1. The formula must be used for eliminated-condition estimates, or for p_{tot} when other methods of parameter estimation are used.)

This procedure was repeated after eliminating one disease at a time by setting the presence of the disease to 0 among all respondents. The difference between the resulting prevalence and the calculated total prevalence is a measure of the contribution of the individual chronic condition to the total prevalence of disability. The method we used is very similar to the method of calculating the attributable fraction or population attributable risk.²⁵ We were reluctant to follow Guccione et al.¹² in using the odds ratio to estimate the relative risk (RR) in the formula $p_c(RR - 1)/RR$, because our data violate the rare-disease assumption in the outcome variable, that is, disability, the prevalence of which is over 20%. Assuming a relative risk of 2 and a prevalence of 20% gives an odds ratio of 2.7. Using this odds ratio as an estimation of the relative risk results in an overestimation of the population attributable risk.

Results

Reflecting the Dutch noninstitutionalized population aged 16 years and older, our sample shows a slightly higher proportion of women than men and decreasing numbers of respondents with increasing age (Table 1). Almost 80% of the population had intact mobile function. Of the selected chronic conditions the musculoskeletal disorders were most frequent, reported by 17.5% of all persons aged 16 years and older. Lung diseases were second at almost 6%.

All chronic conditions show significant association with disability (see odds ratios in Table 2), with musculoskeletal

disorders and neurological disorders the most important ones (with odds ratios of 5.8 and 3.5, respectively).

When both the association with disability and the prevalence of the chronic condition are taken into account, the most important disease group is musculoskeletal diseases. Almost 26% of the disability in the population can be attributed to musculoskeletal diseases, 4% to neurological disorders, 2.4% to lung diseases, 1.6% to heart diseases, 1.1% to diabetes, and 0.2% to cancer.

Although heart diseases are more strongly associated with disability than lung diseases, the contribution of lung diseases to the total burden of disability—which takes both odds ratios and the disease prevalence into account—is higher. The six selected chronic conditions account for 33.7% of the total prevalence of disability.

Discussion

The proportion of disability in the population that can be attributed to a chronic condition is a function of both the prevalence and the strength of its association with disability. A substantial proportion of disability in mobility was found to be associated with the selected chronic conditions, musculoskeletal diseases being the most important.

Several studies have investigated the contribution of chronic conditions to the total burden of disability in the population. The comparability of our results with those of other studies is, however, limited, owing to differences in population, in the kind, number, and measurement of chronic conditions and disability, and in analytical strategies.

Our results are limited to disability in mobility, including a rather mild severity level. Further research could take different disability cutoff points into account. The contribution of chronic conditions to other forms of disability—disability in activities of daily living, social disability, mental disability—will also be different and needs further study.

One limitation of our study is that the data on chronic conditions were based on self-report. We do not know whether the reported condition was diagnosed by a physician or whether undiagnosed or latent diseases were present. The association of a chronic condition with disability is also dependent on duration and severity of the condition, for which no information was available in our sample. Another

TABLE 1—Age and Sex Distribution of the Sample (n = 24 191)^a and Prevalence of Disability and Chronic Conditions: Netherlands Health Interview Survey, 1989 through 1992

	%
Sex	
Male	49.0
Female	51.0
Age, y	
16–34	40.8
35–54	32.4
55–74	20.5
75+	6.3
Disability in mobility^b	
No disability	79.5
Disability	20.5
Chronic conditions^c	
Musculoskeletal diseases	17.5
Lung diseases	5.9
Neurological disorders	3.3
Heart diseases	2.3
Diabetes	2.3
Cancer	0.8
One or more conditions	26.1
Comorbidity (two or more conditions)	4.9

^aThis n represents those for whom all data on disability and chronic conditions are available; it is smaller than the total survey n (26 288) because of item nonresponse.

^bDisability is defined as the presence of at least minor difficulty with walking, carrying, or bending.

^cMusculoskeletal diseases are defined as "severe back problems, longer than 3 months, or slipped disc"; "osteoarthritis of knees, hips, or hands"; "arthritis, rheumatoid arthritis of hands or feet"; and "other chronic arthritis of joints." Lung diseases are defined as "asthma," "chronic bronchitis," and "chronic obstructive pulmonary disease." Neurological diseases are defined as "epilepsy," "dizziness with "falling," and "stroke." Heart diseases are defined as "severe heart problem" and "myocardial infarction."

limitation of our study is the exclusion of the institutionalized population. This implies, at least, an underestimation of the total prevalence of disability and chronic conditions, especially within the older age groups for whom institutionalization is relatively high (in the Dutch population the percentage of institutionalization among those aged 55 years and older is around 7%; for those aged 80 years and older, around 33%). Whether the associations found between chronic conditions

TABLE 2—Proportions of Disability Attributable to Six Chronic Conditions in the Dutch Population: Netherlands Health Interview Survey, 1989 through 1992

	Adjusted Odds Ratio ^a (95% Confidence Interval) for Mobility Disability	Prevalence of Disability Given Elimination of Specified Disease, % ^b	Population Attributable Risk, % ^c
Musculoskeletal diseases	5.8 (5.4, 6.3)	15.3	25.6
Lung diseases	1.7 (1.5, 2.0)	20.0	2.4
Neurological disorders	3.5 (3.0, 4.2)	19.7	3.9
Heart diseases	1.9 (1.5, 2.3)	20.2	1.6
Diabetes	1.6 (1.3, 1.9)	20.3	1.1
Cancer	1.3 (1.1, 1.6)	20.5	0.2
All chronic conditions		13.6	33.7

^aMultiple logistic regression results with age controlled as a continuous variable representing seven age groups (16–24, 25–34, 35–44, 45–54, 55–64, 65–74, and 75+ years).

^bSee Methods for formula used.

^cRepresents the percentage reduction in the prevalence of mobility disability resulting from elimination of the specified chronic conditions.

and disability are affected by this selection bias is not known.

The analyses described here provide insight into the potential health benefits of eliminating chronic conditions. The highest reduction in the disability burden in the population could be achieved if effective curative or preventive treatments or both for musculoskeletal diseases could be developed. However, even if we could eliminate the consequences of all the selected disease groups, the total burden of disability in the population would be only moderately reduced. Two thirds of the burden of disability in mobility is due to other diseases or medical conditions or to old age. However, we should keep in mind the effect on life expectancy, because when we are really able to eliminate certain chronic conditions, postponement of death is likely to occur. However, this has no implications for our findings with regard to nonfatal diseases (e.g., musculoskeletal diseases), because these diseases do not affect life expectancy.²⁶ Eliminating fatal diseases such as cancer is even less promising with regard to the burden of disability, because the elimination of such diseases would lead to an increase in life expectancy with disability.²⁶ □

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