

**Working life expectancy in good
and poor self-perceived health
among Dutch workers aged 55–65
years with a chronic disease over the
period 1992–2016**

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Abstract

Working life expectancy in good and poor self-perceived health among Dutch workers aged 55–65 years with a chronic disease over the period 1992–2016

In the Netherlands, various policy measures were taken in recent years to encourage prolonged working. Increasingly, also workers with chronic diseases are called upon to continue working despite their health problems. The success of policies aiming at prolonged working is often judged by an increase in the average age when workers leave employment, but the question remains whether people work more years in good health, or rather in poor health. Also, it is not clear to what extent workers with a chronic disease experience poor health. This study examines working life expectancy in good and poor self-perceived health of workers with a chronic disease from age 55 onwards, and whether workers who experience poor health continued working longer during the period 1992–2016. Workers with a chronic disease extended their working lives by approximately 18 months in the period from 1992 to 2016. In the first half of this period, working life expectancy in poor health increased (with 6 months), whereas in the second half, working life expectancy in good health increased (with 13 months).

Samenvatting

Werkduurverwachting in goede en slechte ervaren gezondheid van Nederlandse werkenden met een chronische ziekte in de leeftijd 55 tot 65 jaar in de periode 1992-2016

In Nederland zijn de afgelopen decennia diverse maatregelen getroffen om langer doorwerken te bevorderen. In toenemende mate zijn ook werkenden met chronische ziekten genoodzaakt om te blijven werken ondanks hun gezondheidsproblemen. Het succes van beleid gericht op langer doorwerken wordt vaak afgemeten aan een toename in de gemiddelde leeftijd waarop mensen de arbeidsmarkt verlaten. Het blijft echter de vraag of mensen meer jaren werken in goede gezondheid, of in slechte gezondheid. Het is ook onduidelijk in welke mate werkenden met een chronische ziekte zich ongezond voelen. In deze studie onderzoeken we de werkduurverwachting in goede en slechte zelfervaren gezondheid van Nederlandse werkenden met chronische ziekten van 55 jaar en ouder, en of werkenden die zich ongezond voelen langer zijn gaan werken tussen 1992 en 2016. De studie laat zien dat werkenden met een chronische ziekte ongeveer 18 maanden langer zijn gaan werken in de periode 1992 tot 2016. In de eerste helft van deze periode nam de ongezonde werkduurverwachting toe (met 6 maanden), terwijl in de tweede helft de gezonde werkduurverwachting toenam (met 13 maanden).

Executive summary

Background

In the last several decades, successive Dutch governments have taken measures to encourage prolonged working. As there are fewer possibilities to leave the labor market early, it is likely that older adults with a chronic disease are nowadays required to work longer in poor self-perceived health (SPH) than previously. This can be examined by applying the working life expectancy (WLE) measure. This study examines to what extent WLE in good and poor SPH changed between 1992 and 2016 among workers with a chronic disease from age 55 onwards.

Methods

Three cohorts (1992, 2002, 2012) of workers with a chronic disease aged 55–65 years were selected from the Longitudinal Aging Study Amsterdam (LASA), with a three-year follow-up each ($n=705$). A three-state survival model was estimated, modeling transitions between the states 'working with good SPH', 'working with poor SPH', and 'exit from work'. WLEs were estimated using MSM and ELECT in R.

Results

Overall WLEs at age 55 were 5.2, 5.7 and 6.8 years in the 1992, 2002 and 2012 cohorts, respectively. Workers aged 55 years with initially *good* SPH had a total WLE of 5.5 years, of which 0.5 years in poor SPH, in the 1992 cohort; a total WLE of 6.0 years, of which 0.8 years in poor SPH, in the 2002 cohort; and a total WLE of 6.9 years, of which 0.6 years in poor SPH, in the 2012 cohort. Workers aged 55 years with initially *poor* SPH had a total WLE of 4.7 years, of which 2.4 years in poor SPH, in the 1992 cohort; a total WLE of 5.2 years, of which 3.3 years in poor SPH, in the 2002 cohort; and a total WLE of 6.5 years, of which 3.6 years in poor SPH, in the 2012 cohort.

Conclusions

Chronically ill workers extended their working lives by approximately 18 months between 1992 and 2016 (without additional months in poor SPH in the last ten years). This could indicate that this group became well able and/or was supported to work longer. It could also mean that this group felt forced to work longer. In the 1990s, WLE in poor health increased, whereas in the subsequent decade, WLE in good health increased, both among workers in general and among workers who initially had poor SPH. This may indicate that different measures that were taken over time had different implications for WLE in good and poor health. The government measures taken in

2002 were meant to encourage rapid return to work among workers on sick leave, and this seems to have facilitated prolonged working among chronically ill workers with poor SPH. The stricter qualification criteria for disability pension that were adopted in 2006 seem to have stimulated prolonged working mainly among chronically ill workers with good SPH.

Implications

As it becomes more common for workers with health problems to work longer, it is increasingly important that employers support this group of workers in prolonging their working lives. Furthermore, healthy and unhealthy working life expectancy may be used as indicators to monitor the health of the working population. Healthy and unhealthy working life expectancy may be used as an additional criterion for the success of policies aimed at prolonging people's working lives, in addition to figures regarding the average age of leaving employment.

1. Introduction

1.1 Background

Western societies are facing demographic changes including aging of the population. This puts pressure on social security systems. To counteract negative financial consequences, several countries have implemented measures to encourage prolonged working and to discourage early exit from the workforce. One of the measures that the Dutch government has taken is to gradually increase the statutory retirement age from 65 years in 2012 to 67 years and three months by 2022¹. On top of the financial measures that are intended to stimulate prolonged working among the overall population, several measures have been taken to stimulate prolonged working among workers with health problems. Since 1966, Dutch workers with occupational limitations due to poor health were entitled to disability benefits under the Disability Insurance Scheme (WAO)². However, in 2002, the regulations were amended to support workers with health problems to continue working and to encourage early return to work from the first day of sickness absence^{2 3}. Moreover, in 2006, the WAO scheme was abolished and replaced by the Work and Income (Capacity for Work) Act (WIA), and the qualification criteria for a disability pension became more stringent^{3 4}. This implies that older workers with health problems are particularly affected as they may need to continue working despite poor health.

Poor health and exit from work were closely linked until recently. A systematic review of the literature shows that having a chronic disease increased the likelihood of early exit from work via the disability pension and unemployment⁵. As the possibilities to leave the labor market early have become fewer, it is to be expected that also older adults with a chronic disease are nowadays required to work longer in poor self-perceived health than previously. Self-perceived health is a comprehensive measure of health, meaning that it encompasses several aspects of health that are important to an individual. To illustrate, self-perceived health was associated in the past with depression^{6 7} and functional limitations⁸. Furthermore, it is a strong predictor of mortality, even when controlling for specific health indicators and other relevant factors that are known to predict mortality⁹. Hence, having a poor self-perceived health is undesirable from the perspective of the worker. As self-perceived health was associated in the past with absenteeism and presenteeism (working while sick)¹⁰, working while feeling unhealthy may also not be desirable from an employer's perspective. It is thus important to examine whether prolonged working among workers with a chronic disease is not at the expense of their self-perceived health.

The success of policies aiming at prolonged working is often illustrated by an increase in the average age of leaving employment, because that is the primary goal of such policies. As working longer in poor self-perceived health is undesirable from the perspective of both employee and employer, one may advocate that prolonged working policies are only successful if they do not lead to increased time in poor self-perceived health. The question thus arises whether people now work longer in good health or in poor health. This can be examined using the working life expectancy (WLE) measure. Working life expectancy is similar to life expectancy, except for the endpoint, which is exit from work rather than death.

In 2004, Nurminen et al. introduced the WLE measure to determine the number of years that municipal workers worked in different states of work ability¹¹. Nurminen argued that the WLE measure, which represents the period of employment in a given state of work ability, should be preferred above other measures as an indicator of population health in the context of occupational health¹¹. In 2007, Lievre et al. introduced the healthy WLE measure, which they defined as the number of years between the age of 50 and 70 years both in good health and employed, and compared healthy WLE of twelve European countries¹². By combining information on participation in paid work and on health status, both operationalizations of WLE show which part of the total WLE from a certain age are spent in good health, and which part in poor health. The Longitudinal Aging Study Amsterdam (LASA)^{13 14} provides the unique opportunity of estimating healthy and unhealthy WLE of older workers, and to compare WLE in good and poor self-perceived health over three cohorts, i.e. from 1992 to 1996, from 2002 to 2006 and from 2012 to 2016. Van der Noordt et al. used these data to examine working life expectancy with disability for a Dutch population of older workers¹⁵. To date, no studies on working life expectancy in good or poor self-perceived health have been conducted among older workers with chronic diseases.

1.2 Aim of this study

To gain insight into the consequences of policies aimed at prolonged working for workers with a chronic disease, such as abolishment of the work disability scheme, insight into healthy and unhealthy WLE among this group is essential. Therefore, our study is intended to find out to what extent WLE in good and poor self-perceived health changed between 1992 and 2016 among workers with a chronic disease from age 55 onwards. The possible causes of changes in this period are not subject of this study, but they are discussed in order to place the results in a context.

This article proceeds as follows. Section 2 describes the design, the inclusion and exclusion criteria of the study sample, the data, and the statistical analyses. Section

3 next describes the study sample and presents the results of the empirical analyses. Section 4 discusses our findings in light of previous findings and of measures that were taken to stimulate prolonged working. The strengths and limitations of the present study, as well as the implications for workers, employers and society, are then discussed. We close with the main conclusions based on this study.

2. Methods

2.1 Design and study sample

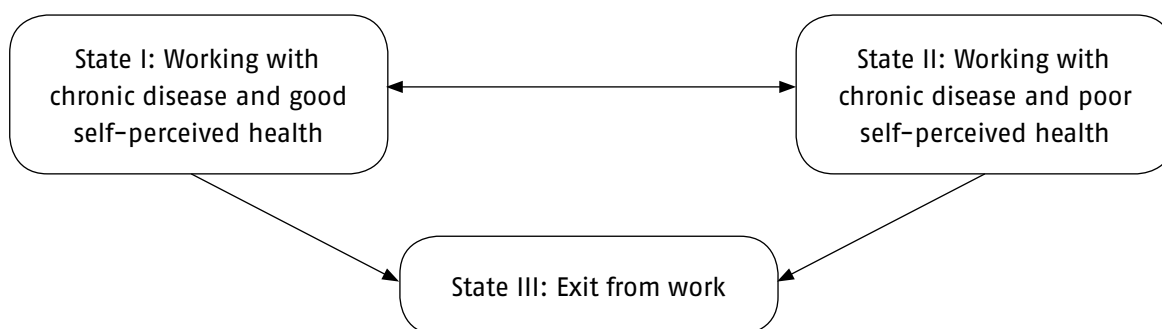
Data from the Longitudinal Aging Study Amsterdam (LASA) were used. LASA is an interdisciplinary cohort study that aims to determine predictors and consequences of changes in functioning with aging^{13 14}. The cohort is based on a nationally representative sample of adults aged 55–85 years. The initial response rate was 60% (n=3805). The study was started in 1992. Since then, measurement cycles have taken place every three years. Respondents were examined and interviewed in their homes by trained interviewers. Additional cohorts of respondents aged 55–64 years were recruited in 2002 and 2012 using the same sampling frame as for the 1992 cohort. More detailed information on the LASA study design can be found elsewhere^{13 14}.

In our study the first two measurement cycles from the three cohorts were used, i.e. the 1992 cohort (1992–1996), the 2002 cohort (2002–2006), and the 2012 cohort (2012–2016). Inclusion criteria for this study were: having an age of 55 to 65 years at baseline, having a paid job of at least one hour per week at baseline, and having one or more chronic diseases at baseline. To assess employment status, respondents were asked whether they currently had a paid job of one or more hours per week. Respondents were asked whether they currently had a chronic disease. This was covered in one question with the following answering options: 1) chronic non-specific lung disease, 2) cardiac disease, 3) peripheral arterial disease, 4) diabetes mellitus, 5) cerebrovascular accident or stroke, 6) osteoarthritis, 7) rheumatoid arthritis, 8) cancer, and 9) other. Those who indicated having a chronic disease were included in the study sample. Workers who dropped out during the follow-up, for reasons other than their death (n=81), and those who did not provide information on self-perceived health or employment status at follow-up were excluded (n=87). These inclusion and exclusion criteria resulted in a study sample of 705 persons (1992 cohort n=134, 2002 cohort n=247, 2012 cohort n=324).

2.2 Self-perceived health

Self-perceived health (SPH) was assessed using the following question: 'How is your health in general?' This question could be answered according to the following response options: 'very good', 'good', 'fair', 'sometimes good, sometimes bad', and 'poor'. Participants were classified as having good SPH if they reported having 'very good' or 'good' health. Those who reported having 'fair', 'sometimes good, sometimes bad' or 'poor' health were classified as having poor SPH.

Figure 1. Three-state survival model



Based on SPH and employment status, respondents can be assigned to one of the following states: State I. 'Working with chronic disease and good SPH', State II. 'Working with chronic disease and poor SPH', and State III. 'Exit from work' (see Figure 1. Three-state survival model). To assess the number of months that a respondent stayed in state I or state II, information on the age at which the respondent left paid employment was needed. This was assessed using the following question: 'In which month and which year did you stop doing paid work?' Based on the registered date of birth, age at exit from work was calculated. If the month and year of exit were not reported (n=15), the date halfway between the two interviews was used to calculate the age at exit from work. For respondents who died within three years after an interview in which they reported that they worked, the date of death minus six months was decided as the age of exit from work (n=15).

2.3 Demographics

Age and sex of the respondents at the time of the interviews were obtained from municipal registries. Highest level of education completed comprises three levels: low (elementary school, lower vocational education, or less), medium (general intermediate, intermediate vocational, and general high school education), and high (higher vocational education, professional education, and university). Sex and level of education were not included in the analyses but are used to describe the study population.

2.4 Statistical analyses

Descriptive statistics, i.e. means, standard deviations, frequencies, and percentages, were used to report on baseline characteristics. The analyses took place in two steps. First, transition probabilities between the states 'Working with chronic disease and good SPH' (state I), 'Working with chronic disease and poor SPH' (state II), and 'Exit from work' (state III) were modeled using a continuous-time three-state survival model (Figure 1). In the three-state survival model the times of transitions between

the first and second state are interval-censored. This means that the exact transition times between these states are assumed to lie between two observations and that transitions from state I to state II, or vice versa, may occur several times. State III is an absorbing state, meaning that this state can be entered only once. The exact transition time was obtained from the data. The model was estimated using the R-package MSM (Multi-State Modeling). Hazards were estimated for transitions between the states for age and cohort dummies¹⁶. From these hazards, hazard ratios and transition probabilities were derived. An age-dependent model was used, which assumes that state transitions increase or decrease log-linearly with age. Second, transition probabilities were used to estimate overall WLE as well as WLE in good and poor SPH. This was done using the R-package ELECT (Estimating Life Expectancies using Continuous Time). WLEs are reported by cohort and separately for groups with good and poor SPH at baseline. Differences between WLEs were considered statistically significant when the point estimate of one WLE fell outside the 95% confidence interval of the other WLE, and the other way around. WLEs are also presented graphically¹⁷. The graphs show WLEs in good and poor SPH on the y-axis for age 55 to 68 years on the x-axis, for workers with a chronic disease in general and for workers who initially have poor SPH, respectively. WLEs are shown separately for the 1992, 2002, and 2012 cohorts.

2.5 Ethical issues

The VU University Medical Center medical ethical committee approved the LASA study, and informed consent was obtained from all participants.

3. Results

3.1 Baseline characteristics

Table 1 shows baseline characteristics of all workers with a chronic disease, and of those who initially had good and poor SPH for the three cohorts separately. The average age varied between 58.8 years and 59.6 years across the three cohorts. All three cohorts included somewhat more men than women (54.6% to 61.9% men). Educational level increased over time. In cohorts 1992 and 2002, most workers had a low level of education, whereas in cohort 2012 most workers had an intermediate level. The percentage of workers with a high level of education were 17.2%, 28.7% and 35.2% for the 1992, 2002 and 2012 cohorts, respectively.

3.2 Working Life Expectancies

3.2.1 Total group of workers with a chronic disease

Among the total group of workers with a chronic disease, total WLE at age 55 was 5.2 years in the 1992 cohort, 5.7 years in the 2002 cohort, and 6.8 years in the 2012 cohort (Table 2; Figure 2). The increase in total WLE between the 1992 and 2002 cohorts was not significant, whereas the increase between the 2002 and 2012 cohorts was significant. There was no difference in healthy WLE between the 1992 and 2002 cohorts, but healthy WLE increased from 4.1 years in the 2002 cohort to 5.2 years in the 2012 cohort. Unhealthy WLE was 1.1 years in the 1992 cohort, 1.6 years in the 2002 cohort, and 1.6 years in the 2012 cohort. The increase in unhealthy WLE between the 1992 and 2002 cohorts was not significant.

3.2.2 Workers with chronic disease who initially had good self-perceived health

Among workers who initially had good SPH, the total WLE at age 55 increased from 5.5 years in the 1992 cohort to 6.0 years in the 2002 cohort and to 6.9 years in the 2012 cohort. Only the increase between the 2002 and 2012 cohorts was significant. Healthy WLE increased between the 1992 and 2002 cohorts from 4.9 to 5.2 years, which was not considered significant. There was a significant increase to 6.3 years in the 2012 cohort. Unhealthy WLE in this group increased from 0.5 to 0.8 years between the 1992 and 2002 cohorts and decreased to 0.6 in the 2012 cohort. This increase and decrease were, however, not significant.

Table 1. Baseline characteristic of workers who initially had good and poor self-perceived health and the overall group of the three cohorts separately

	Good self-perceived health (n=478)			Poor self-perceived health (n=227)		
	Mean (SD) / N (%)			Mean (SD) / N (%)		
	1992 cohort	2002 cohort	2012 cohort	1992 cohort	2002 cohort	2012 cohort
Age (in years)	59.3 (2.7)	59.0 (2.7)	59.5 (2.7)	59.4 (3.0)	58.5 (2.8)	59.6 (2.7)
Sex						
Male	52 (56.5%)	96 (56.8%)	116 (53.5%)	31 (73.8%)	47 (60.3%)	61 (57.0%)
Female	40 (43.5%)	73 (43.2%)	101 (46.5%)	11 (26.2%)	31 (39.7%)	46 (43.0%)
Educational level						
Low	40 (43.5%)	57 (33.7%)	39 (18.0%)	20 (47.6%)	33 (42.3%)	28 (26.2%)
Intermediate	36 (39.1%)	58 (34.3%)	94 (43.3%)	15 (35.7%)	28 (35.9%)	49 (45.8%)
High	16 (17.4%)	54 (32.0%)	84 (38.7%)	7 (16.7%)	17 (21.8%)	30 (28.0%)

	Total (n=705)		
	Mean (SD) / N (%)		
	1992 cohort	2002 cohort	2012 cohort
Age (in years)	59.3 (2.8)	58.8 (2.7)	59.6 (2.7)
Sex			
Male	83 (61.9%)	143 (57.9%)	177 (54.6%)
Female	51 (38.1%)	104 (42.1%)	147 (45.4%)
Educational level			
Low	60 (44.8%)	90 (36.4%)	67 (20.7%)
Intermediate	51 (38.1%)	86 (34.8%)	143 (44.1%)
High	23 (17.2%)	71 (28.7%)	114 (35.2%)

Table 2. Working Life Expectancy (WLE) at age 55

	1992 cohort (n=137)		2002 cohort (n=251)		2012 cohort (n=324)	
	Years	95% CI	Years	95% CI	Years	95% CI
Workers in general						
Total WLE	5.24	4.38-5.99	5.71	5.06-6.39	6.76	6.06-7.46
Healthy WLE	4.14	3.29-4.84	4.10	3.46-4.72	5.18	4.52-5.85
Unhealthy WLE	1.10	0.73-1.60	1.61	1.21-2.10	1.59	1.18-2.05
Workers with good SPH						
Total WLE	5.46	4.48-6.34	5.98	5.19-6.74	6.89	6.11-7.67
Healthy WLE	4.93	3.99-5.73	5.20	4.49-5.92	6.26	5.51-6.96
Unhealthy WLE	0.53	0.23-1.08	0.78	0.45-1.29	0.63	0.35-1.05
Workers with poor SPH						
Total WLE	4.73	3.32-5.65	5.16	4.09-6.12	6.50	5.48-7.31
Healthy WLE	2.34	1.24-3.32	1.87	1.17-2.75	2.93	2.07-3.72
Unhealthy WLE	2.39	1.59-3.27	3.29	2.51-4.06	3.57	2.86-4.25

Figure 2. Working Life Expectancies for total group of workers with a chronic disease

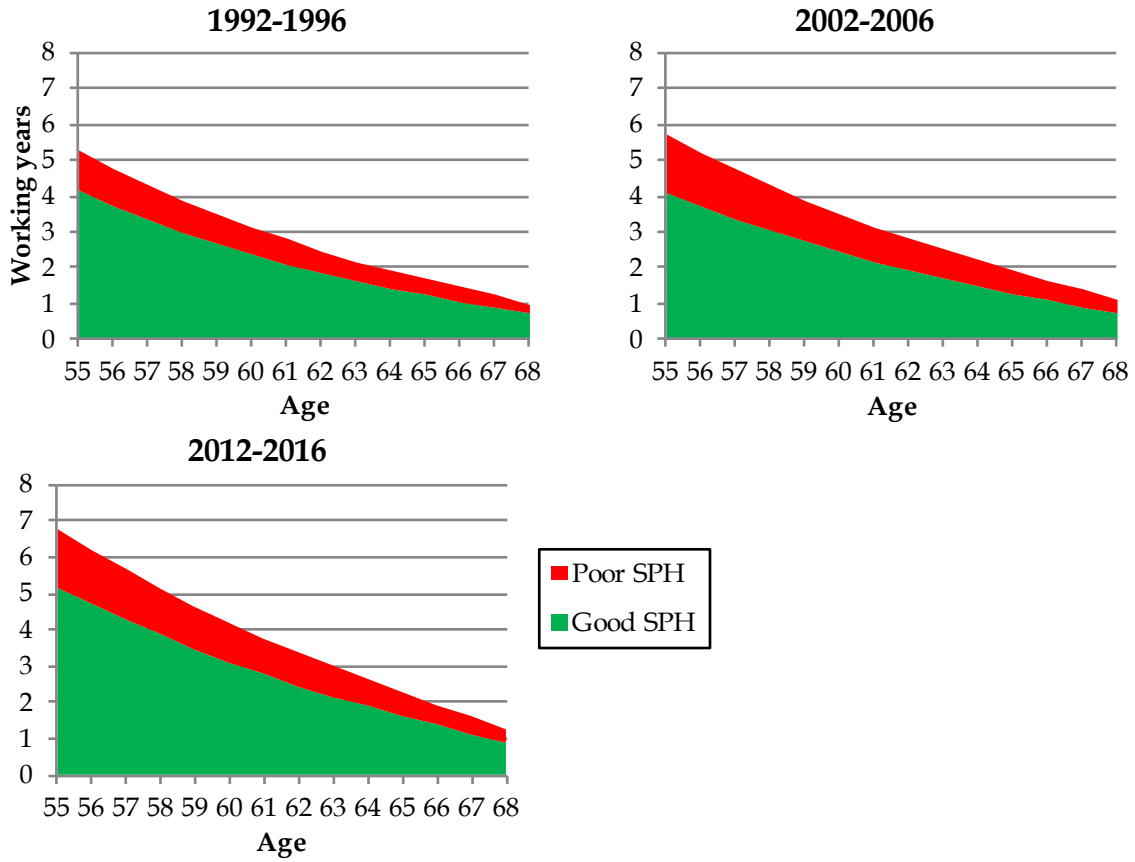
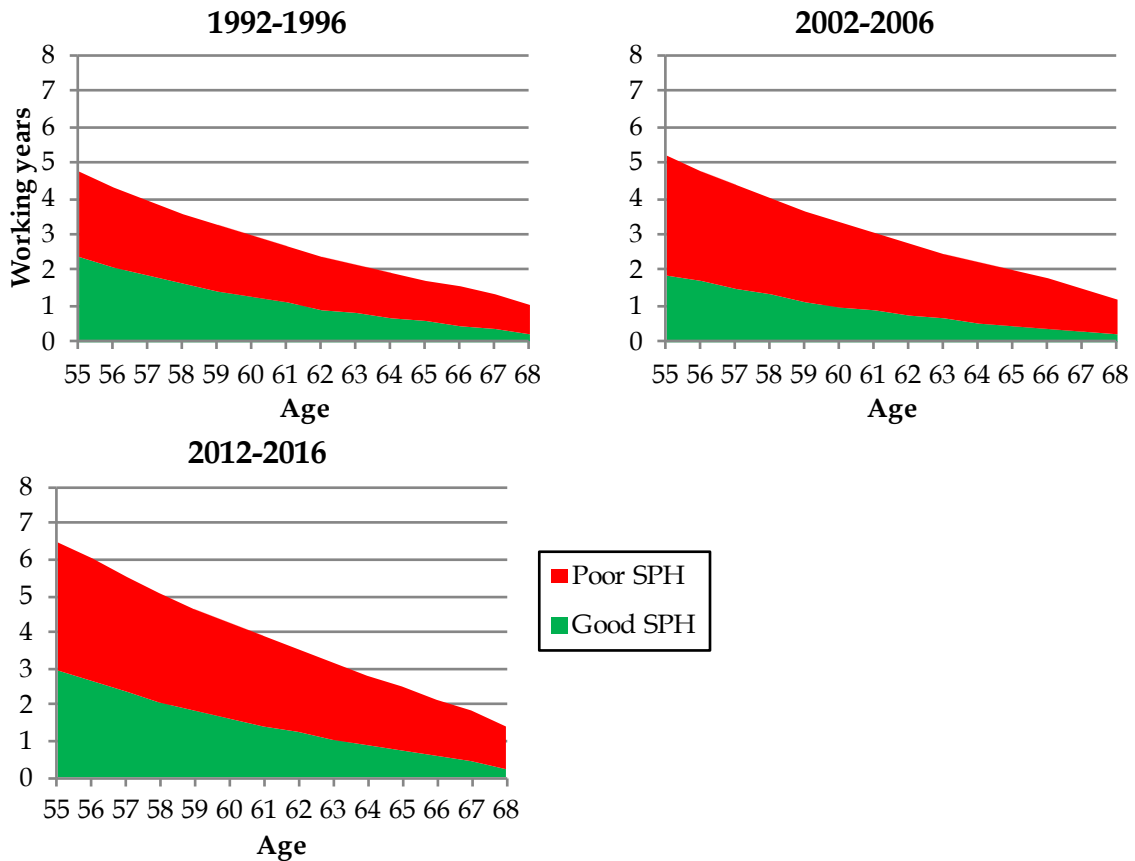


Figure 3. Working Life Expectancies for workers with a chronic disease, who initially have poor self-perceived health



3.2.3 Workers with chronic disease who initially had poor self-perceived health

Among workers who initially had poor SPH, the total WLE at age 55 was 4.7 years, 5.2 years and 6.5 years in the 1992, 2002 and 2012 cohorts, respectively (Table 2; Figure 3). The increase in total WLE between the 1992 and 2002 cohorts was not significant, whereas that between the 2002 and 2012 cohorts was significant. Healthy WLE decreased from 2.3 in the 1992 cohort to 1.9 years in the 2002 cohort, but this decrease was not significant. This decrease was followed by an increase to 2.9 years in the 2012 cohort. Unhealthy WLE increased from 2.4 years in the 1992 cohort to 3.3 years in the 2002 cohort and to 3.6 years in the 2012 cohort, but these increases were not significant.

4. Discussion

This study has shown that successive generations of older workers with a chronic disease extended their working lives by about 18 months between 1992–1996 and 2012–2016. Workers who initially had poor SPH extended their working lives by 21 months. In the first ten-year period it was unhealthy working life expectancy that increased, whereas in the second decade it was healthy working life expectancy that increased.

4.1 Placing the results in context

The increase in overall WLE is in line with the increasing average age of leaving employment in the general population in the Netherlands, i.e. from 60 years and ten months in 2000 to 64 years and five months in 2016 (figures before the year 2000 on average age of leaving employment are not available)¹⁸. We have not found any other research that investigates WLE in good and poor SPH among workers with a chronic disease, which the results of this study might be compared with. However, Van der Noordt et al.¹⁵ recently published a study based on the same data on WLE with disability. This study showed that successive generations of older workers with disability extended their working lives.

Our finding that successive generations of workers with a chronic disease extended their working lives by about 18 months between 1992–1996 and 2012–2016 may be explained by the fact that during this period several government measures were taken to encourage prolonged working and to discourage early exit from the workforce¹. These measures limited the financial possibilities to leave the labor market early, or an early exit became financially less attractive. Also, measures that especially pertain to workers with health problems may explain the increasing WLEs of successive generations of workers^{3 4}. However, also other developments may have contributed to this development. Better treatment of chronic diseases may have contributed to a general increase in the number of people with a chronic disease¹⁹, which may consequently have resulted in prolonged working among this group. Furthermore, in the Netherlands there is a general increase in educational level²⁰, which enables people to reach a higher occupational class. Higher occupational class is associated with less hazardous physical working conditions and higher job control²¹. This may have enabled workers with health problems to continue working longer. Policies aimed at prolonged working indeed seem to have influenced the total WLE of chronically ill workers who initially have good as well as those with poor SPH. Our findings challenge the prevailing belief that workers with chronic diseases would not be able to prolong their working lives. It should, however, be noted that the study sample

of workers with a chronic disease came from the healthy part of the total population with chronic diseases. In other words, the sample may involve a healthy worker effect²². The workers in our study sample had succeeded in extending their working careers to the age of 55 years and beyond, whereas the more vulnerable workers with a chronic disease may already have left employment before reaching this age.

Remarkably, the *unhealthy* working life expectancy increased in the first ten years (among workers who initially had poor self-perceived health), whereas the *healthy* working life expectancy increased in the second ten-year period (both among workers who initially had good self-perceived health and those with poor self-perceived health). This may indicate that the different measures to encourage prolonged working that were taken over time had different effects on healthy and unhealthy WLE. The measures that were taken in 2002 were meant to encourage rapid return to work among workers on sick leave^{3 23}. Considering our results, these new regulations seem to have facilitated prolonged working among workers with a chronic disease who perceive their health as poor. Subsequently, the stricter qualification criteria for entitlement to disability pay that were adopted in 2006 seem to have stimulated prolonged working mainly among workers with a chronic disease who actually felt healthy^{3 4}. It might also indicate that in the 1990s, there was still potential for growth in unhealthy WLE, which was no longer present in the subsequent decade. Further research among future generations of older workers with a chronic disease is thus necessary. Another explanation may be the increase in educational level across the three cohorts. It may be hypothesized that workers with a higher level of education are less likely to continue working while feeling unhealthy than workers with a lower level of education, as the first group is more likely to have the financial possibility to quit working because of higher earnings before and after retirement. The financial possibility of retiring early indeed has been shown to contribute to early retirement²⁴. A final explanation might be that subsequent generations of workers with a chronic disease may over time attach less importance to the presence of their chronic disease in their assessment of SPH. This is supported by a previous study, which showed that between 1992 and 2009 poor self-perceived health is determined less by chronic diseases and more by severe disability²⁵.

4.2 Strengths and limitations

In this study we applied an innovative method among older workers with a chronic disease. The LASA sample is based on a representative sample of the Dutch older population, including one of the older working population. A limitation of our study is the small sample size. However, the attrition rate was low. Because of the

small sample size, we were unable to correct for confounders or to compare subgroups based on, for example, type of chronic disease, sex and educational level. Distinguishing between type of chronic disease is interesting since chronic diseases with different prognosis and course of disease (i.e. progressive versus stable) may influence healthy and unhealthy WLE differently. Workers with a higher educational level often have less hazardous physical working conditions, which in case of health problems may enable them to work until a higher age than workers with a lower educational level. On the other hand, workers with a higher educational level more often have the financial possibility to quit working in case of health problems. However, comparing subgroups based on more characteristics than those which we considered would have led to statistical power issues. Another issue is the temporal resolution of assessing self-perceived health, which is different from the temporal resolution of assessing exit from work, i.e. once every three years and monthly, respectively. However, since self-perceived health has been shown to be a relatively stable health measure²⁶, we do not expect bias because of this differential temporal resolution.

4.3 Implications for workers, employers and society

The overall increase in total WLE of workers with a chronic disease in the past ten years, without an increase in years that they work in poor self-perceived health, may imply that these workers became able and gained support to prolong their working lives. On the other hand, it could also imply that this group feels forced to work longer, with potentially negative consequences for their productivity¹⁰. Now that working with health problems (also longer) becomes more common, it is increasingly important that employers support this group of workers in prolonging their working lives. It is likely that they have specific needs with regards to prolonged working. To illustrate, a study comparing older workers with and without chronic diseases showed that workers with chronic diseases benefited more from psychosocial resources at work, such as social support and autonomy, than workers without chronic diseases²⁷.

Furthermore, healthy and unhealthy WLE may be used as an indicator to monitor the health of the working population. Healthy and unhealthy WLE may be used as an additional criterion for success of policies aimed at prolonging people's working lives, in addition to figures regarding the average age of at which a worker leaves employment. By doing so, a connection is created between policies aimed at prolonged working and ambitions related to successful aging. After all, successful aging not only leads to sustained engagement in social and productive activities, but also to avoidance of disease and disabling conditions^{28 29}. Governments may commit

themselves to promoting the health of older workers by introducing the healthy and unhealthy WLE indicator, setting targets, and collecting data to monitor these targets. Future research could focus on healthy and unhealthy WLE of vulnerable groups in the labor market, for example workers with a low socioeconomic position and workers in flexible jobs, as well as on developments over time. In that way it is possible to monitor the consequences of social policies for the healthy and unhealthy WLEs of different groups in the labor market.

4.4 Conclusion

Total working life expectancy of successive generations of workers with a chronic disease increased by approximately 18 months between 1992 and 2016. Remarkably, in the 1990s, *unhealthy* working life expectancy increased, whereas in subsequent decade, *healthy* working life expectancy increased. Now that working longer with health problems becomes more common, it is increasingly important to enable workers with a chronic disease to continue working sustainably. Healthy and unhealthy WLE may be valuable information in the future debate on prolonged working of vulnerable groups in the labor market.

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