Life expectancy and insurability of people with chronic conditions

July 2022
Our team consists of researchers from the Department of Public and Occupational Health of the Amsterdam UMC, location AMC, and Consultants from the Analytics & Cognitive team at Deloitte.

Angela de Boer  
Associate Professor, Amsterdam UMC

Sietske Tamminga  
Assistant Professor, Amsterdam UMC

Michiel Greidanus  
Researcher, Amsterdam UMC

Astrid de Wind  
Assistant Professor, Amsterdam UMC

Martijn Ludwig  
Senior Manager, Deloitte

Maren Diether  
Senior Consultant, Deloitte

Claudia Bony  
Business Analyst, Deloitte

Isabelle Lebrocquy  
Founder, oPuce
Living with chronic disease
Chronic diseases affect a third of the Dutch population and account for more than 50% of deaths in the Netherlands\(^2\)

### Chronic diseases encompass a variety of diagnosis

- Most chronic diseases are the result of a combination of **genetic, physiological, environmental, and behavioral factors**\(^1\)
- Chronic diseases encompass a variety of diagnosis

### Chronic disease currently affects a third of the Dutch population\(^2\)

- The percentage is **expected to raise** to 40% by 2030, e.g. due to aging
- As a result, **multi-morbidity** (being diagnosed with multiple diseases) is expected to raise as well

### Chronic diseases account for 71% of all deaths globally\(^1\)

- 1/3 of these deaths are in people **aged 30–69**
- In the Netherlands, most people with chronic disease **work as many hours as people who are not chronically ill**\(^2\)

### Main diagnoses\(^1\):  

- **Cancer**
- Cardiovascular disease
- Chronic respiratory disease
- Diabetes
- Mental Disorders

### Prevalence in NL\(^3\):

<table>
<thead>
<tr>
<th>Disease</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension (1 in 6)</td>
<td></td>
</tr>
<tr>
<td>Chronic depression (1 in 12)</td>
<td></td>
</tr>
<tr>
<td>Asthma (1 in 18)</td>
<td></td>
</tr>
</tbody>
</table>

### Causes of death in NL\(^3\):

- Cancer: 32%
- Cardiovascular diseases: 28%
- Other: 41%

1. [https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases](https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases)
3. [https://www.euro.who.int/__data/assets/pdf_file/0005/355991/Health-Profile-Netherlands-Eng.pdf](https://www.euro.who.int/__data/assets/pdf_file/0005/355991/Health-Profile-Netherlands-Eng.pdf)
Datasets & limitations

The CBS microdatasets used for this study are:

- For both analyses: GBAPERSONTAB2008, GBAPERSONTAB2009
- For the survival analysis for data on the diagnoses: LMR1995-LMR2009
- For the housing market analysis and the survival analysis: GBAOVERLIJDENTAB2019
- For the housing market analysis: PROPERTY WOZBAGTAB2013-2014, EIGENDOMTAB2013-2014

The following limitations should be taken into account for this study:

- This study only included patients who were diagnosed or treated in a hospital
- In patients with multiple diagnoses, one diagnosis was randomly selected
- Diagnosis year is estimated based on the years in which a patient was not treated in a hospital
Data
Our study cohort consist of people diagnosed with a chronic disease in the Netherlands, and an age- and gender-matched reference group

- **People with chronic disease**
  - Source: Landelijke Medische Registratie (LMR), which contains all diagnoses registered during a hospital stay in NL
  - Diagnosed with chronic disease between 2000 and 2012
  - Matched to CBS microdata

- **Reference group**
  - Source: CBS microdata, which contains registrations of the population (e.g. age, gender, year of death)
  - Age and gender matched to chronic patients
  - Not diagnosed with chronic disease

**Medical Data (static, chronic patients only)**
- Diagnosis year (for each diagnosis)
- Diagnosis (for patients with multiple diagnosis one diagnosis is selected at random)

**CBS Data (static)**
- Age
- Gender

**Chronic disease in our dataset**
- Chronic diseases are identified based on their ICD-9 diagnosis code
- The exact classification was obtained from the ‘Chronic Condition Indicator’ of the AHRQ\(^1\) defined as a condition that lasts 12 months or longer and (a) places limitations on self-care, independent living, and social interactions; and /or (b) it results in the need for ongoing intervention with medical products, services, and special equipment

1: [https://hcup-us.ahrq.gov/toolsofsoftware/chronic/chronic.jsp#pubs](https://hcup-us.ahrq.gov/toolsofsoftware/chronic/chronic.jsp#pubs)
Descriptive analysis of all chronic patients
864,711 people were diagnosed with one or more chronic illness(es) in 2008 and 2009

The dataset of chronic patients can be categorized into 18 body systems

- Our study cohort consist of people diagnosed with any chronic disease in the Netherlands in 2008–2009 (up to the age of 65 years old)
- Chronic diseases can be divided into 18 body systems using the ICD-9-CM system
- The chronic patient population shows the following characteristics:
  - 54% of the patient group is female
  - Chronic disease incidence increases with age
  - 16% of chronically ill patients suffer from more than 1 chronic disease¹

Body system III (neoplasms) is the most common

The 5 main chronic diagnoses as defined by WHO are among the top 10 body systems in this dataset, with cancer and diseases of the circulatory system being the most common.

Atrial fibrillation is the most common diagnosis

The top 10 most common chronic diseases belong to only 4 body systems: Circulatory Systems, Neoplasms, Connective Tissues and Nervous System.

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Body System</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coronary atherosclerosis</td>
<td>Cardiovascular</td>
<td>427.3</td>
</tr>
<tr>
<td>Malignant neoplasm of breast (female), unspecified</td>
<td>Neoplasms</td>
<td>174.9</td>
</tr>
<tr>
<td>Antineoplastic chemotherapy and immunotherapy - VS81²</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Atrial fibrillation</td>
<td>Cardiovascular</td>
<td>414.0</td>
</tr>
<tr>
<td>Coronary atherosclerosis</td>
<td>Cardiovascular</td>
<td>174.9</td>
</tr>
<tr>
<td>Malignant neoplasm of breast (female), unspecified</td>
<td>Neoplasms</td>
<td></td>
</tr>
<tr>
<td>Other and unspecified derangement of medial meniscus</td>
<td>Connective Tissue</td>
<td>717.3</td>
</tr>
<tr>
<td>Carpal tunnel syndrome</td>
<td>Musculoskeletal</td>
<td>354.0</td>
</tr>
<tr>
<td>Senile cataract, unspecified</td>
<td>Connective Tissue</td>
<td>366.10</td>
</tr>
<tr>
<td>Other and unspecified angina pectoris</td>
<td>Connective Tissue</td>
<td>413.9</td>
</tr>
<tr>
<td>Unspecified cataract</td>
<td>Connective Tissue</td>
<td>366.9</td>
</tr>
<tr>
<td>Displacement of lumbar intervertebral disc without myelopathy</td>
<td>Connective Tissue</td>
<td>722.10</td>
</tr>
<tr>
<td>Multiple sclerosis</td>
<td>Connective Tissue</td>
<td>737.3</td>
</tr>
</tbody>
</table>

¹: The comorbidities are lower here since the people diagnosed in 1995–2007 are removed from the patients of 2008–2009;
²: Body system 18 and ICD codes VS81 are supplementary classifications of factors influencing health status and contact with health services and are in grey to show that they are not chronic diseases.

© 2022 Deloitte The Netherlands