



Life expectancy and  
insurability of people  
with chronic conditions



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**



# Background

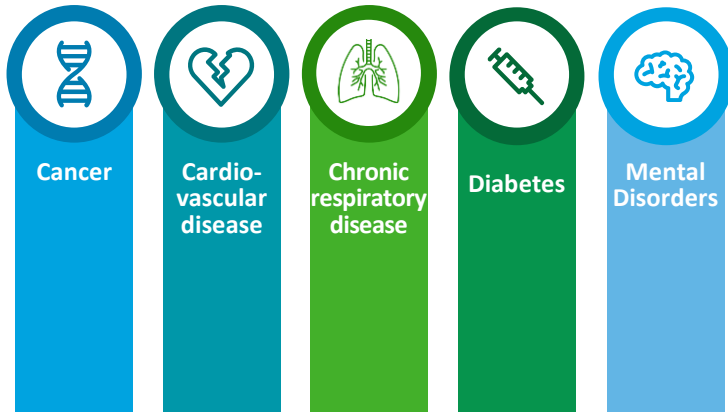
Chronic diseases affect a third of the Dutch population and account for more than 50% of deaths in the Netherlands<sup>2</sup>



## Chronic diseases encompass a variety of diagnosis

- Most chronic diseases are the result of a combination of **genetic, physiological, environmental and behavioral factors**<sup>1</sup>
- Chronic diseases encompass a variety of diagnosis

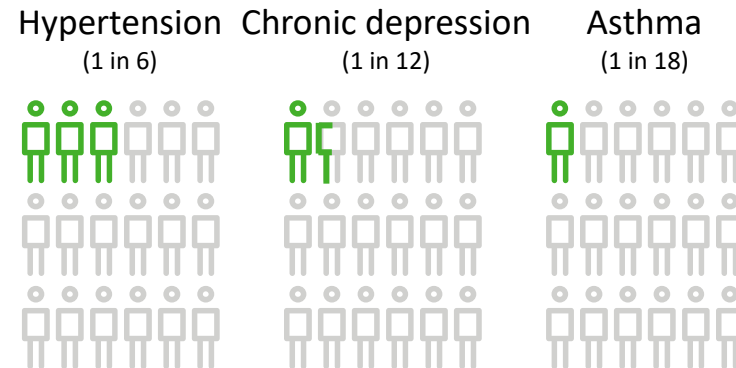
### Main diagnoses<sup>1</sup>:



## Chronic disease currently affects a third of the Dutch population<sup>2</sup>

- 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

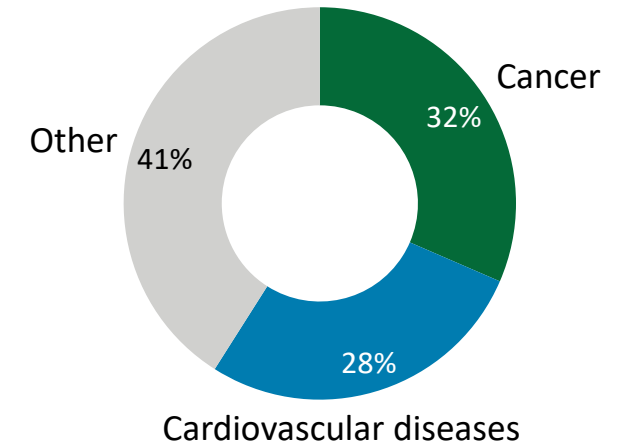
### Prevalence in NL<sup>3</sup>:



## Chronic diseases account for 71% of all deaths globally<sup>1</sup>

- **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**<sup>2</sup>

### Causes of death in NL<sup>3</sup>:



1: <https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases>

2: <https://www.rivm.nl/en/news/rivm-forecasting-study-a-healthier-netherlands-with-more-people-living-with-a-chronic-disease>

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:**

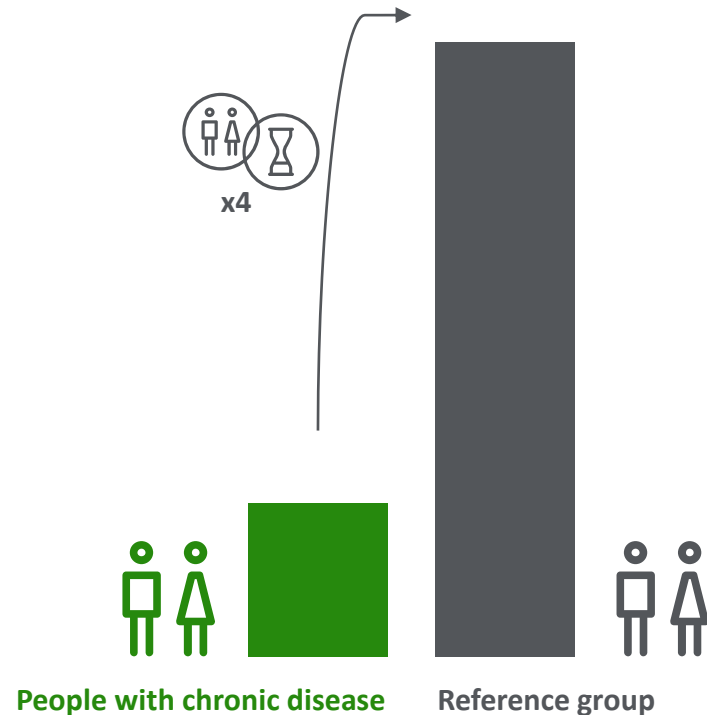
- For both analyses: GBAPERSONTAB2008, GBAPERSONTAB2009
- For the survival analysis for data on the diagnoses: LMR1995-LMR2009,
- For the housing market analysis and the survival analysis: GBAOVERLIJDENTAB2019,
- For the housing market analysis: PROPERTY WOZBAGTAB2013-2014, EIGENDOMTAB2013-2014

## **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



- 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**

- 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

1: <https://hcup-us.ahrq.gov/toolssoftware/chronic/chronic.jsp#pubs>

Dataset
<b>Medical Data (static, chronic patients only)</b> <ul style="list-style-type: none"><li>• Diagnosis year (for each diagnosis)</li><li>• Diagnosis (for patients with multiple diagnosis one diagnosis is selected at random)</li></ul>
<b>CBS Data (static)</b> <ul style="list-style-type: none"><li>• Age</li><li>• Gender</li></ul>
<b>Chronic disease in our dataset</b> <ul style="list-style-type: none"><li>• Chronic diseases are identified based on their <b>ICD-9 diagnosis code</b></li><li>• The exact <b>classification</b> was obtained from the <b>'Chronic Condition Indicator'</b> of the AHRQ<sup>1</sup> defined as a <b>condition that lasts 12 months or longer</b> and (a) <b>places limitations</b> on self-care, independent living, and social interactions; and /or (b) it results in the <b>need for ongoing intervention</b> with medical products, services, and special equipment</li></ul>

# Descriptive analysis of all chronic patients

864,711 people were diagnosed with one or more chronic illness(es) in 2008 and 2009



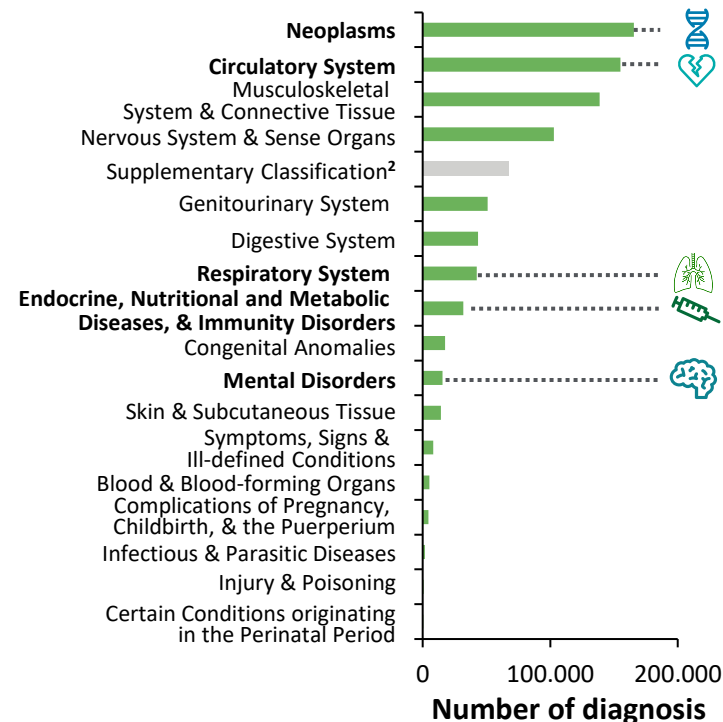
## The dataset of chronic patients can be categorized into 18 body systems

- 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 disease**<sup>1</sup>



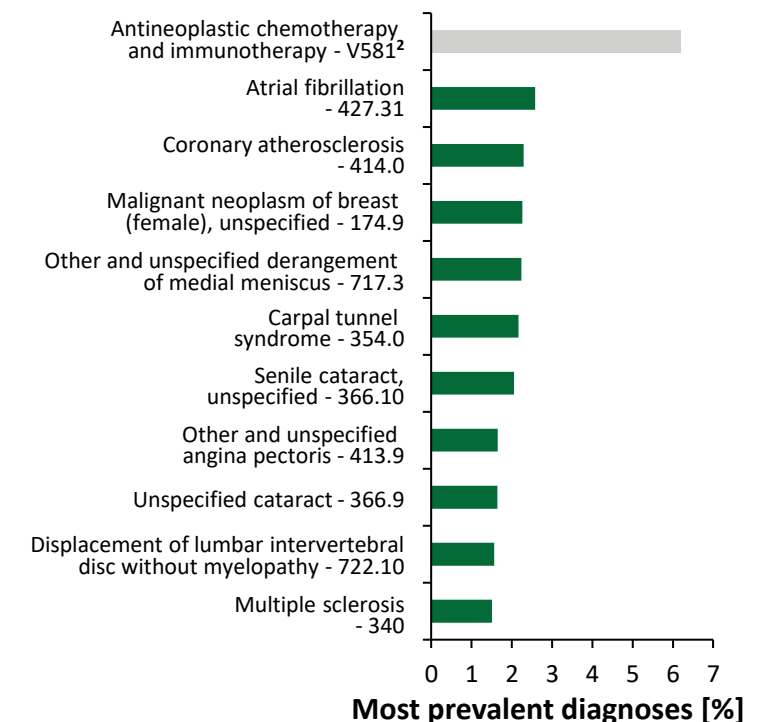
## Body system III (neoplasms) is the most common

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.



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 V581 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.



Deloitte refers to one or more of Deloitte Touche Tohmatsu Limited ("DTTL"), its global network of member firms, and their related entities. DTTL (also referred to as "Deloitte Global") and each of its member firms are legally separate and independent entities. DTTL does not provide services to clients. Please see [www.deloitte.nl/about](http://www.deloitte.nl/about) to learn more.

Deloitte is a leading global provider of audit and assurance, consulting, financial advisory, risk advisory, tax and related services. Our network of member firms in more than 150 countries serves four out of five Fortune Global 500® companies. Learn how Deloitte's approximately 264,000 people make an impact that matters at [www.deloitte.nl](http://www.deloitte.nl).

This communication contains general information only, and none of Deloitte Touche Tohmatsu Limited, its member firms, or their related entities (collectively, the "Deloitte network") is, by means of this communication, rendering professional advice or services. Before making any decision or taking any action that may affect your finances or your business, you should consult a qualified professional adviser. No entity in the Deloitte network shall be responsible for any loss whatsoever sustained by any person who relies on this communication.