Region Stockholm

Statistical report - Testmiljö diabetes

Version 2.0

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Contents

List of Figures

List of Tables

1 Special thanks

Testmiljö diabetes would like to give special thanks to the following healthcare providers and authorities for contributing with pseudonymised data for this research project:

- Karolinska universitetssjukhuset
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- SLSO
- Danderyds sjukhus
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- S:t Eriks ögonsjukhus
- Public Healthcare Services Committee Administration, Stockholm County Council, Stockholm (in Swedish: Hälso- och sjukvårdsförvaltningen)

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2 Project boundaries

As primary data source, this project utilizes the Stockholm Regional Healthcare data warehouse (VAL). This data source includes data on all healthcare in Stockholm financed by Region Stockholm except a small amount of data (around 6% of all outpatient physician visits) from private caregivers within the state-regulated national tariff (in Swedish “nationella taxan”).

In addition to the VAL data, we have included Electronic Health Records (EHR) data from 8 major healthcare providers in Region Stockholm. The majority of these are publicly driven healthcare providers; we only had access to very limited EHR data from private healthcare providers. Therefore, the EHR-based part of the data in this project should be interpreted with caution due to the limited coverage. As an example, the municipality Ekerö in Stockholm mainly has private primary healthcare centers, hence this project has complete VAL data but limited EHR data for patients resident at Ekerö.

3 Scientific project group

The following persons from Region Stockholm participated in the scientific project group:

- Michael Alvarsson (PI)
- Ingrid Dahlman
- Sergiu-Bogdan Catrina
- Claes-Göran Östensson
- Pia Lindborg
- Charlotte Höybye
- Björn af Ugglas
- Sven-Åke Lööv

4 Key findings

Diabetes mellitus is a serious, chronic disease and among the top ten leading causes of death in the world. More people die annually of diabetes than malaria, HIV/Aids and tuberculosis altogether. Diabetes is a heavy burden for patients. It is associated with many complications and increased mortality. The morbidity, mortality, reduced life expectancy and costs of diabetes make it also an important public health condition. The burden of diabetes is increasing in Stockholm. The prevalence of diabetes mellitus (DM) is rising, mainly for DM type II, almost 4% of the population now having DM type II, and 0.5% having DM type I. This translates into 95,000 persons with DM type II, and more than 10,000 with DM type I. More than 9,000 persons develop DM each year in Stockholm.

This project in diabetes is a collaboration project between Region Stockholm, academy and the pharmaceutical industry and aims to provide knowledge on how DM patients in Stockholm are managed and to identify areas where DM care can be improved.

The following key findings and areas for improvement were identified:

- Patients with DM type II on average had lower income and education than the general population in Stockholm, whereas DM type I prevalence was not associated with socioeconomic measures.
- In adult patients with DM type I, 50% were overweight or obese. Among those with DM type II, nearly 78% were overweight or obese.
- There was almost 12% with DM type I above 65 years of age in both sexes.
- Substantial regional differences in prevalence, incidence, risk factor burden, drug treatment, and achieved HbA1c were observed.
- Almost 20% of patients with DM type I and 12% of patients with DM type II had HbA1c >70 mmol/mol (very poor metabolic control).
- 30% of patients with DM type II have no ongoing GLD treatment (only diet-treated) and several patients had HbA1c levels >70 mmol/mol before GLD was introduced.
- More than 30% of patients with DM type II had no record of statin use, despite guidelines urging extensive use of statins.
- In patients above 45 years of age, more than 30% with DM type I and more than 35% with DM type II had systolic blood pressure in the hypertensive range (140 mmHg or above).
- The prevalence of all adverse consequences of diabetes differed substantially between patients with DM type I versus DM type II, unsurprising given the large difference in age.
- Cardiovascular events (ischemic heart disease, heart failure, atrial fibrillation, stroke, and peripheral artery disease) had occurred in 11% of patients with DM type I, and in 40% of those with DM type II.
- Among patients with DM type I, kidney function was normal (eGFR>=90) in 45%, microalbuminuria was present in 9%, and macroalbuminuria in 3%. In those with DM type II, kidney function was normal (eGFR>=90) in 16%, microalbuminuria was found in 22%, and macroalbuminuria in 9%.
- History of psychiatric disorders were high, 30% in adults with DM type I and type II (mainly due to anxiety, depression or neuropsychiatric disorder).

To summarize, this report has shown that diabetes is an increasing problem due to increasing prevalence, ageing population and, at least for DM type II, that the disease affects those with lesser resources. It also implicates that a substantial number of patients are undertreated in regard to glycemic control, systolic blood pressure and lipid levels, contributing to the high burden of cardiovascular events in patients with diabetes. Noteworthy is also the high comorbidity of psychiatric disorders further contributing to the unhealth of these patients.

5 Introduction

Diabetes mellitus (DM) is a serious, chronic disease and among the top ten leading causes of death in the world. More people die annually of diabetes than of malaria, HIV/Aids and tuberculosis altogether [1]. On a global level, the prevalence of DM has increased substantially in countries at all income levels. From 1980 to 2014, the prevalence has increased from 4.7% to 8.5% [2, 3], and this increase is expected to continue [4]. In Sweden, the prevalence of diagnosed DM is estimated between 4 and 5% [5]. In addition, up to a third of the patients with DM have been proposed to not yet have been diagnosed. DM is a heavy burden for patients. It is associated with many complications and increased mortality. In 2012, there were 1.5 million deaths worldwide directly caused by DM [3]. The main cause of death in DM patients is ischemic heart disease [6]. DM also imposes a large economic burden on healthcare systems. Costs related to DM are high and increasing, and it is estimated that the majority of countries spend between 5% to 20% of their total health expenditure on DM [7]. The morbidity, mortality, reduced life expectancy and costs of DM make it an important public health condition.

One aim of the Research and Development strategies [8, 9] for Region Stockholm is to strengthen collaborations with academy and industry. In 2013, as part of the Stockholm regional pharmaceutical strategy [10], Region Stockholm initiated a framework to enable structured collaborations between Region Stockholm, academy and the pharmaceutical industry. The overarching aims of this framework (testmiljö) are to improve patient care, to promote rational and cost-effective use of medicines, and to improve conditions for research and innovation in the pharmaceutical area. Focus for these collaborative projects has been to describe the epidemiology, healthcare utilization and drug treatment in a selected disease area, to gain knowledge about how patients are managed today and to identify areas where healthcare can be improved. This project in DM is part of the testmiljö collaboration framework and aims to provide knowledge on how DM patients in Stockholm are managed and to identify areas where DM care can be improved. Pharmaceutical and medtech companies within the therapeutic area were invited to participate in this program via the trade association for the research-based pharmaceutical industry (Läkemedelsindustriföreningen) and Swedish Medtech. For this project, Boehringer Ingelheim AB, Bayer AB, Eli Lilly Sweden AB and Novo Nordisk Scandinavia AB participated.

In this collaboration framework, a scientific project group from Region Stockholm defines scientific research questions from Region Stockholm's perspective and participating companies are further invited to submit research questions. Among all submitted research questions, the Region Stockholm project group prioritizes and decides which are to be included in the project. In this framework, Region Stockholm acts as the research authority and governs the research data (Forskning och Innovation). The principal investigator (PI) is a researcher employed by Region Stockholm. Region Stockholm further supports this project with scientific and clinical expertise through the study project group. The participating pharmaceutical companies contributes with clincial and scientific expertise. An external part is responsible for the execution of the project, including project management, study proposal, study protocol, statistical analysis plan, ethics committee application, applications to data holders, data management and statistical analysis and report. For this project, the scientific analytical company in epidemiology, Sence Research AB (Sence), is the external part.

5.1 Objective

The objective was to describe the epidemiology, patient characteristics, comorbid conditions, disease history and treatment patterns of DM in Region Stockholm.

5.2 Study design

Descriptive retrospective population-based observational cohort study.

6 Data management and data preparation

The data for this research project are governed by Region Stockholm (Forskning och Innovation). Data management and statistical analyses have been compiled by Sence Research AB (Sence). A data processing agreement, compliant with the General Data Protection Regulation [11] has been established between Region Stockholm and Sence. This agreement stipulates and gives documented instructions on how Sence shall handle the data on behalf of Region Stockholm. Data have been processed according to the international standard ISO/IEC 27001:2013 (Information Security Management System) and applicable data security regulations [11].

6.1 Data sources

6.1.1 Stockholm Regional Healthcare Data Warehouse (VAL)

The regional healthcare data warehouse of Region Stockholm (VAL) includes information on all contacts with healthcare financed by the county council. Data for primary care, secondary care and hospitalizations are available from the 1980s (inclusion of diagnoses from primary care from 2003). The International Classification of Diseases Version 10 (ICD-10) has been used since 1997. VAL also contains demographic information on patient age, sex, migration status and death. Information on prescription drugs dispensed in the ambulatory setting have been included since July 2010. The drug dispensing data come from the same source as the Swedish Prescribed Drug Register, with a population coverage of over 99% [12]. The Anatomical Therapeutic Chemical (ATC) classification system is used to code dispensed drugs.

6.1.2 Electronic Health Records (EHRs)

TakeCare is presently the most widely used EHR system in Region Stockholm [13], and the installation has over 50,000 active users across most groups of healthcare professionals. The installation handles more than 4 million patient records and covers more than 88% of inpatient care and 75% of primary care [14].

6.2 Data linkage

The figure below presents an overview of the data linkage procedure within this reserach project:

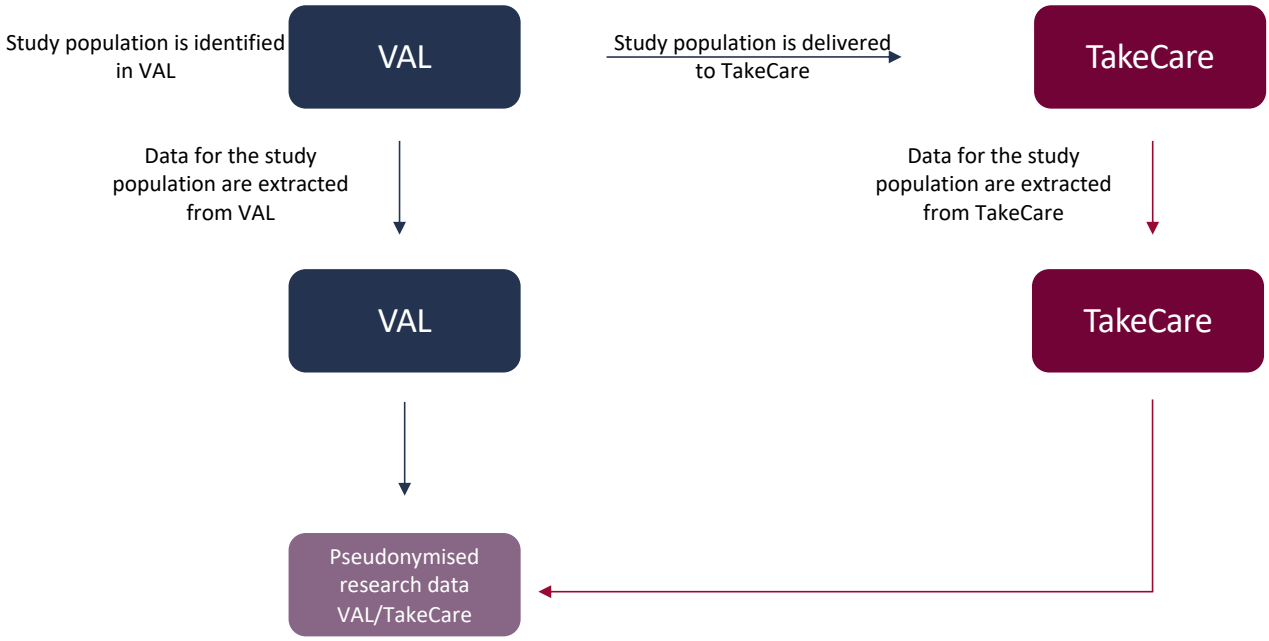


Figure 1: Data linkage procedure

6.3 Data pseudonymisation

Confidentiality of data has been maintained at all times and all data have been analysed in a pseudonymised format. The following pseudonymisation process steps have been undertaken on the data in this research project:

1. Each study participant has been assigned a pseudonym unique for this research project, i.e. the personal identity number (PIN) has never been included and exposed in the research data (PIN was deleted during the data extraction and linkage procedure).
2. No direct identifiers such as names, addresses, postcodes etc. have been included in the research data.
3. In order to minimize the risk of "back-door" identification, all potentially identifying variables such as age, sex and municipality have been renamed with randomly generated variable names, and variable values (e.g. "Male" and "Female") have been exchanged for randomly selected values. These codes have only been available to the study analyst.

7 Approvals and agreements within the research project

Before the data collection started within the research project, the following approvals and agreements were obtained:

Table 1: Approvals and agreements within the research project

Approval	Date of approval
Ethical approval	
Ethical approval (Dnr 2018/1005-31)	2018-07-04
Approvals from data holders	
VAL	2019-04-10
Södertälje sjukhus	2018-12-18
Södersjukhuset	2019-02-01
Vårdbolaget TioHundra	2019-02-11
SLSO	2019-03-11
Danderyds sjukhus	2019-03-12
Ersta sjukhus	2019-03-12
Karolinska universitetssjukhuset	2019-04-17
S:t Eriks ögonsjukhus	2019-05-03
Data processing	
Data Processing Agreement (DPA)	2018-09-21
Registration of processing PI data	2018-09-21

8 Definitions

8.1 Primary study population

The primary study population in this research project comprises all patients with DM in Stockholm still resident per 31 December 2018. To be included in the primary study population, the patient should have at least one recorded diagnosis of DM (recorded by physician) in any healthcare setting and in any diagnosis position. The figure below presents a flow chart for the primary study population:

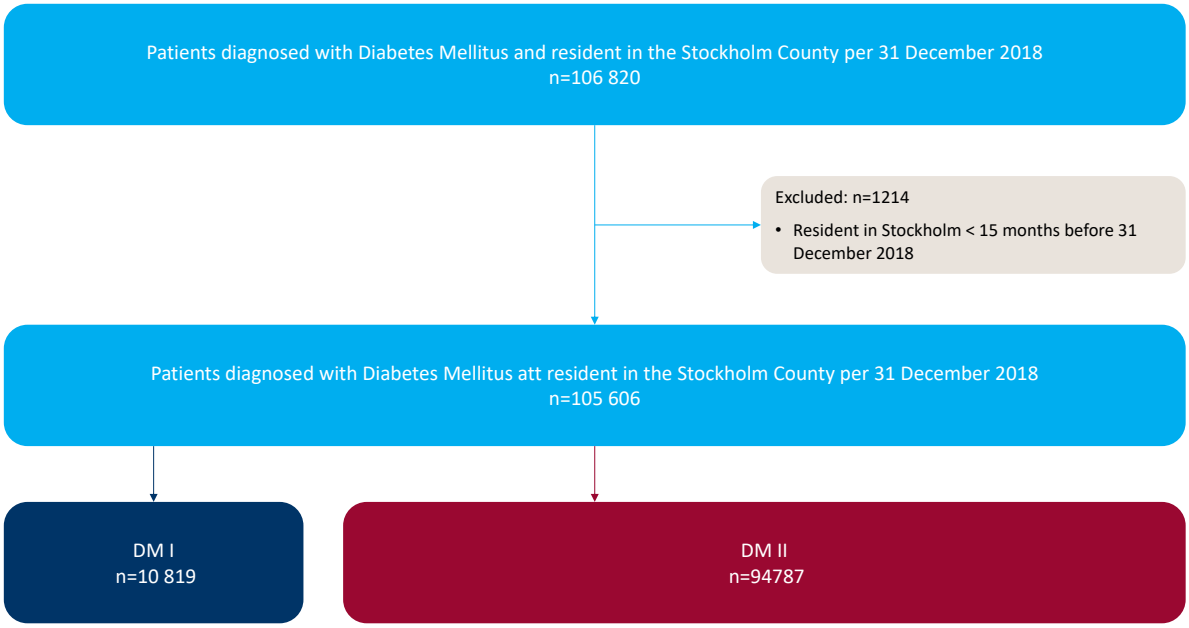


Figure 2: Primary study population

Note: There have been extensive discussions within the scientific steering committee for this research project regarding inclusion criteria. To include patients based on only one recorded diagnosis code may overestimate the true DM population in Stockholm since diagnosis codes may be recorded incorrectly. More conservative inclusion criteria, such as a mandatory rule of at least two consecutive recorded diagnosis codes in primary diagnosis position may give us a more valid DM population, but risks underestimating the true DM population in Stockholm. Since the primary obejctive of this research project was to evaluate the DM healthcare in Stockholm, the scientific steering committe chose to be more inclusive, minimizing the risk of erroneously excluding DM patients.

8.2 Categorization of diabetes type I and II

During the data management process we observed that a large proportion of patients had both DM type I and II diagnoses recorded during their history of DM. Therefore, the scientific steering comittee decided to use a previously established epidemiologic algorithm to classify patients according to DM type I and II [15]. This algorithm has been developed by the Swedish National Diabetes Register (NDR) and validated as accurate in 97% of cases. However, a few modifications to NDR's algorithm have been necessary to adjust to the prerequisites of the research data in this project.

The algorithm used in this research project is defined as follows:

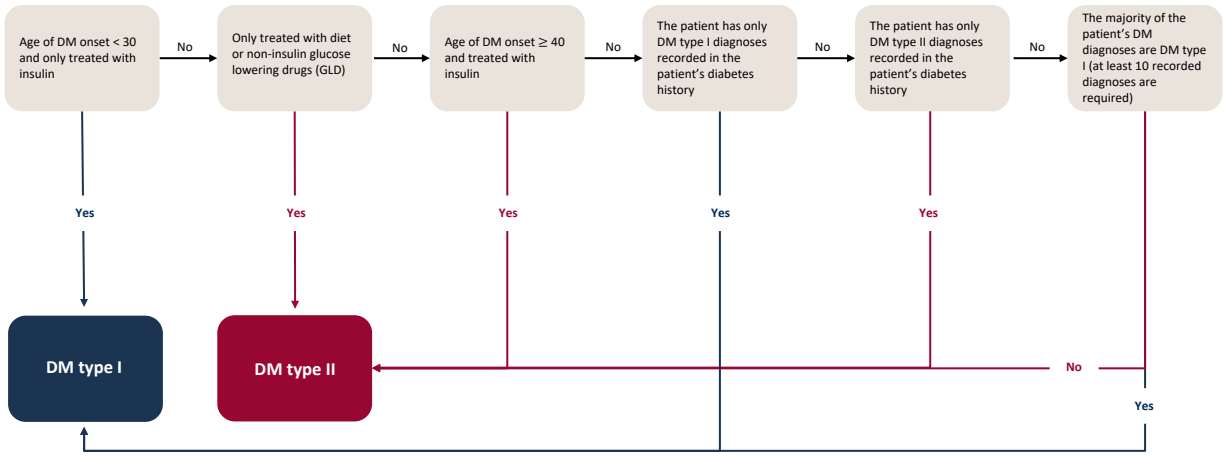


Figure 3: Epidemiological defintion of Diabetes Mellitus

Note1: The algorithm uses all historical data on diagnoses and glucose lowering drug utilization. Therefore, patients with longer duration of DM have more data collected and a higher chance to be categorized into the correct DM group than patients that have diabetes diagnosed during 2018. This possible misclassification is likely to affect a very small number of individuals.

Note2: Patients with an uncertain date of DM onset will not be categorized in the steps involving DM onset but passed through to the next step in the algorithm.

8.3 Incidence of diabetes

For each patient, the date of the first recorded DM diagnosis in the research data was selected to classify the patient as incident. Patients were categorized into DM type I or type II according to their first recorded DM diagnosis (incidence method 1), or by using the diagnostic algorithm above (incidence method 2).

8.4 Prevalence of diabetes

In this project, the following three different methods were used to estimate the prevalence of DM in Region Stockholm:

8.4.1 Prevalence (according to last DM diagnosis each year)

In method 1, we estimated prevalence from 2013 to 2018 by selecting all patients in Stockholm with at least one recorded DM diagnosis during each year. The last recorded DM diagnosis in each year categorized the patient into DM type I or type II. To be included in the analysis, the patient must have been resident in Stockholm per 31 December each year. Diagnoses from both outpatient care (including

primary care) and inpatient care were included in this estimation and also diagnoses recorded both in primary and secondary diagnosis positions.

Note 1: Method 1 will likely underestimate the true prevalence of DM in Stockholm, since not all patients are seeking care on a yearly basis and all patients with a chronic condition will not have a diagnosis recorded each year.

Note 2: Due to uncertainties in the recording of diagnoses (see section 8.2), method 1 will also likely misclassify a large proportion of patients. Therefore, we do not recommend to use method 1 for prevalence estimation of DM in Stockholm since method 1 answers the question "How many patients in Stockholm have at least one recorded DM diagnosis the current year (2013-2018) and are resident in Stockholm per 31 December that year".

8.4.2 Prevalence (according to diagnostic algorithm)

Due to the limitations of estimating DM prevalence using method 1, method 2 used historical data over all recorded diagnoses of DM. Method 2 estimates point prevalence of DM using all available data on DM diagnoses. The structure of method 2 is as follows:

1. Identify the first ever recorded diagnosis of DM for each patient
2. Analyze if the patient is still resident in Stockholm per 31 December each year
3. Categorize patient into DM type I and DM type II according to the epidemiological definiton in section 8.2.

Note 1: Migration data have been included in this research project, but these data have a few known quality issues in early years of the study. Therefore, to ensure that the patient was still resident in Stockholm per 31 December each year, each patient must have had at least one recorded healthcare visit within 2 years (730 days) before 31 December each year. The healthcare visit did not need to be related to DM.

Note 2: In method 2, the patients were included at the date of first recorded DM diagnosis. This means that the patient did not need to have a recorded DM diagnosis the current year to be included in this prevalence estimation (note that the patient needed to be resident in the Stockholm region per 31 December each year).

8.4.3 Prevalence (according to diagnostic algorithm, last 5 years)

Prevalence method 3 follows the same structure as prevalence method 2, but we truncated historical data on DM diagnoses to only include 5 years of historical data for each year. This means that each year (2013-2018) utilized 5 years of historical data for estimation of prevalence, and therefore all years were treated equally. (Definitions in 2013 utilized data between 2009 and 2013; those in 2018 utilized data between 2014 and 2018; etc.)

8.5 Duration of diabetes

We have developed two approaches to estimate the duration of DM:

1. Using only information on recorded DM diagnoses. For each patient, we identified the first DM diagnosis ever recorded in the research data. This date, for the first recorded DM diagnosis, was set as the patient's incident date (i.e. start of DM). This way to estimate the duration of DM will likely underestimate the true duration of DM, since this research project only included data on DM diagnoses recorded within Region Stockholm (i.e. if a patient had initially been diagnosed with DM in another county in Sweden before moving to Stockholm, we did not have information on that patient's first diagnosis). Also, DM type II has most likely been present already prior to its diagnosis. The term "duration of DM" should also be interpreted with some caution, as a patient may have had DM well before the patient's first recorded DM diagnosis (this applies mainly to duration of DM type II).
2. Since method 1 has its limitations, method 2 includes added data from EHRs in the analyses of DM duration. In the EHR data, the keyword "year of DM onset" was extracted. In method 2, we therefore combined data on first recorded DM diagnosis (method 1) with data on year of DM onset from EHRs. We allowed EHR data to override VAL data, i.e. if the first recorded DM diagnosis in VAL was in 2010 and information from EHRs indicated that the year of onset was 2002, the EHR information was used to determine date of DM onset.

8.6 Incidence of GLD therapy

Annual incidence of glucose lowering drugs (GLD) therapy between 01 January 2013 and 31 December 2018 has been analyzed on a drug class level.

1. Select the first ever recorded dispensation of GLD therapy (drug class) for each patient with DM. The date of first dispensation will be the index date (incidence date).
2. Patient should have been resident in Region Stockholm for 15 months to be included in the analysis.
3. Patients are categorized into DM type I or DM type II according to the epidemiologic algorithm.

8.7 Clinical characteristics

8.7.1 Body mass index

Body mass index (BMI) was calculated using data on weight and height from EHRs. The most recently recorded weight and height before 31 December 2018 was used for this calculation. To be included in this BMI calculation, weight and height should have been recorded within five (5) years from 31 December 2018. In the analysis, the following BMI categories were used:

Table 2: BMI categories

BMI category
$<$ 25 kg/m2
25-29 kg/m2
30-34 kg/m2
35-39 kg/m2
$\geqslant$ 40 kg/m2

Note: Due to uncertainties in the interpretation of BMI for patients under 18 years old, we chose to only calculate BMI for patients with an age of 18 years and above.

8.7.2 Blood pressure

Systolic and diastolic blood pressure (SBP, DBP) measurements were calculated by using extracted data from EHRs. To be included in this analysis, SBP and DBP had to be recorded within one (1) year from 31 December 2018. Since blood pressure varies considerably over time, we have, for each patient, calculated the mean value of SBP and DBP recorded within the past year. In the analysis, the following categories for SBP were used:

Table 3: SBP groups

SBP group
$<$ 130 mmHg
130-139 mmHg
140-149 mmHg
$\geqslant$ 150 mmHg

8.7.3 Estimated glomerular filtration rate (eGFR)

Information on estimated glomerular filtration rate (eGFR) measurements were extracted from EHRs. The most recently recorded eGFR before 31 December 2018 was used for this calculation. The included eGFR value is calculated based on the CKD-Epi algorithm [16]. To be included in this analysis, eGFR should have been recorded within two (2) years from 31 December 2018. eGFR was only calculated for patients $\geqslant$ 18 years of age. In the analysis, the following eGFR groups were used:

Table 4: eGFR categories

eGFR category
$<$ 15 ml/min
15-29 ml/min
30-59 ml/min
60-89 ml/min
$\geqslant$ 90 ml/min

8.7.4 Blood lipid profile

Information on cholesterol (total, HDL, LDL) and triglycerides, was extracted from EHRs. The most recently recorded value before 31 December 2018 was used for this calculation. To be included in this analysis, total cholesterol should have been recorded within two (2) years from 31 December 2018. The motivation for choosing a time period of two years was that lipids were not always expected to be measured annually, and the within-person variability of cholesterol levels is low to moderate.

8.7.5 HbA1c

Information on HbA1c was extracted from EHRs. The most recently recorded HbA1c before 31 December 2018 was used for this calculation. To be included in this analysis, HbA1c should have been recorded within two (2) years from 31 December 2018.

The motivation for choosing a time period of two years is that although guidelines recommend HbA1c to be measured annually, the sample included a mix of patients with established DM and patients diagnosed with DM during 2018, and all patients may not have had the possibility to have a HbA1c recorded during 2018. The most recent HbA1c value before 31 December 2018 was selected.

In the analysis of HbA1c, the following categories were used:

Table 5: HbA1c categories

HbA1c category
$<$ 42 mmol/mol
42-51 mmol/mol
52-70 mmol/mol
$>$ 70 mmol/mol

8.7.5.1 Initiation of GLD therapy in relation to HbA1c

HbA1c levels at initiation of GLD therapy will be analyzed by selecting the most recently recorded HbA1c value within two (2) years before initiation of GLD therapy. HbA1c levels will be analysed on a drug class level.

8.7.6 Albuminuria

8.7.6.1 Microalbuminuria

Information on microalbuminuria was extracted from structured data fields in the EHRs. Measurements on microalbuminuria inlcuded the following values: "Yes", "No", and "Normalized". We have in this analysis included the values "Yes" as having microalbuminuria. We used the most recently recorded value on microalbuminuria within two (2) years from 31 December 2018.

8.7.6.2 Macroalbuminuria

Information on macroalbuminuria was extracted from structured data fields in EHRs. Measurements on macroalbuminuria inlcuded the following values: "Yes", "No". We used the most recently recorded value on microalbuminuria within two (2) years from 31 December 2018 in the analysis.

8.7.7 Hypoglycaemia

We have analysed hypoglycaemia using two different data sources:

1. Using the following structured data field in the EHRs:

- Severe hypoglycaemia (within past 12 months). In Swedish: "Antalet gånger det senaste 12 månaderna som person varit i behov av hjälp från utomstående på grund av svår hypoglykemi"

2. Using diagnoses of hypoglycaemia in VAL. The following ICD10 codes were used (recorded in any diagnosis position), and we only included diagnoses recorded within the hospital setting (Definition in Swedish: Akutsomatisk vård (Sjukhusvård/Akutsjukhus)). Diagnosis codes of hypoglycaemia recorded within two (2) years from 31 December 2018 were included in the analysis.

Table 6: Included ICD10 codes to identify hypoglycaemias

ICD10 code	Name
E100C	Type 1 diabetes mellitus with hypoglycaemic coma
E106A	Type 1 diabetes mellitus with hypoglycaemia (without coma)
E110C	Type 2 diabetes mellitus with hypoglycaemic coma
E116A	Type 2 diabetes mellitus with hypoglycaemia (without coma)
E160	Drug-induced hypoglycaemia without coma
E161	Other hypoglycaemia
E161W	Other specified hypoglycaemia
E162	Hypoglycaemia, unspecified

8.7.8 Lactic acidosis

We have analysed lactic acidosis using data from VAL. The following ICD10 codes were used (recorded in any diagnosis position), and we only included diagnoses recorded within the hospital setting

(Definition in Swedish: Akutsomatisk vård (Sjukhusvård/Akutsjukhus)). Diagnosis codes of lactic acidosis recorded within two (2) years from 31 December 2018 were included in the analysis.

Table 7: Included ICD10 codes to identify lactic acidosis

ICD10 code	Name
E100D	Type 1 diabetes mellitus with lactoacidotic coma
E101D	Type 1 diabetes mellitus with lactic acidosis
E110D	Type 2 diabetes mellitus with lactoacidotic coma
E111D	Type 2 diabetes mellitus with lactic acidosis

8.7.9 Diabetic ketoacidosis

We have analysed diabetic ketoacidosis using data from VAL. The table below presents ICD10 codes (recorded both as primary and secondary diagnosis) used to select treatment episodes with ketoacidosis. Diagnosis codes of ketoacidosis recorded within two (2) years from 31 December 2018 were included in the analysis.

Table 8: Included ICD10 codes to identify diabetic ketoacidosis

ICD10 code	Name
E100A	Type 1 diabetes mellitus with ketoacidotic coma
E101A	Type 1 diabetes mellitus with ketoacidosis
E110A	Type 2 diabetes mellitus with ketoacidotic coma
E111A	Type 2 diabetes mellitus with ketoacidosis

8.7.10 Smoking habits

Information on smoking habits was extracted from EHRs. Measurements on smoking habits were categorized into “Yes”, “No” and “Former”. The most recently recorded value before 31 December 2018 was used for this calculation. Only patients 18 years and above were included in the analysis.

8.8 Diabetes eyes

8.8.1 Retinopathy

We have analysed the frequency of retinopathy using two data sources:

1. Using structured data fields in the EHRs
2. Using diagnoses of retinopathy in VAL

In this analysis, we included all available data on retinopathy recorded before 31 December 2018. The motivation for including all available data (i.e. no limitation in time period) is that retinopathy is a chronic condtion, and although retinopathy can be reversible, it is uncommon.

The following ICD10 codes, recorded in both outpatient and inpatient settings, were included:

Table 9: Included ICD10 codes to identify retinopathy

ICD10 code	Name
E10.3A/B/C	Type 1 diabetes mellitus with ophthalmic complications (background/pre-proliferative/ proliferative)
E11.3A/B/C	Type 2 diabetes mellitus with ophthalmic complications (background/pre-proliferative/ proliferative)
H36.0	Diabetic retinopathy

8.8.2 Diabetic Macular Edema (DME)

We have analysed the frequency of DME using diagnoses of DME in VAL. In this analysis, we included all available data on DME recorded before 31 December 2018.

Table 10: Included ICD10 codes to identify Diabetic Macular Edema (DME)

ICD10 code	Name
E10.3E	Type 1 diabetes mellitus with ophthalmic complications (clinically significant macular edema)
E11.3E	Type 2 diabetes mellitus with ophthalmic complications (clinically significant macular edema)

8.8.3 Treatment with drugs in the vitreous body

Data on injections of medicines were extracted from VAL using the clinical procedure code: CKD05 - Puncture of vitreous body with injection of medicine. We included all available data before 31 December 2018 in the analysis.

8.8.4 Diabetes eye examination

Data of performed fundus photography were extracted from VAL using the clinical procedure code XCK10 (In Swedish: Ögonbottenfotografering). We included all XCK10 codes recorded in VAL, but we present the data in three (3) different groups:

1. Diabetes eye examination recorded within past 12 months
2. Diabetes eye examination recorded within past 36 months
3. Diabetes eye examination, ever recorded

Note: In the extracted research data we do not have information on if the fundus photography is part of a regular screening activity or if it has been recorded at time of a visit for an eye condition.

8.9 Diabetic foot

8.9.1 Diabetic foot ulcer

The following table presents ICD10 codes to select diagnoses for the comorbidity diabetic foot ulcer. Diagnosis codes of diabetic foot ulcer recorded within two (2) years from 31 December 2018 were included in the analysis.

Table 11: Included ICD10 codes to select diabetic foot ulcer

ICD10 code	Name
E106D	Type 1 diabetes mellitus with diabetic foot ulcer
E116D	Type 2 diabetes mellitus with diabetic foot ulcer
L984	Chronic ulcer of skin, not elsewhere classified

8.9.2 Charcot foot

The following table presents ICD10 codes to select diagnoses for the comorbidity charcot foot. We included all available data before 31 December 2018 in the analysis.

Table 12: Included ICD10 codes to select charcot foot

ICD10 code	Name
M142	Diabetic arthropathy
M146	Neuropathic arthropathy
M908	Osteopathy in other diseases classified elsewhere

8.9.3 Amputation of lower limb

The following table presents procedure codes to select amputation of lower limb. We included all available data recorded before 31 December 2018 in the analysis.

Table 13: Included clinical procedure codes to select amputation of lower limb

Procedure code	Name
NGQ	Amputation and related operations of knee and lower leg
NFQ	Amputation and related operations on hip and femur
NEQ	Amputation and related operations on pelvis
NHQ	Amputation and related operations on ankle and foot

8.9.4 Revascularization of lower limb

The following table presents procedure codes to select revascularization of lower limb. We included all available data recorded before 31 December 2018 in the analysis.

Table 14: Included clinical procedure codes to select revascularization of lower limb

Procedure code	Name
PDE30	Thrombectomy or embolectomy of iliac artery
PDF30	Thrombendarterectomy of iliac artery
PDH	Bypass from infrarenal abdominal aorta and iliac arteries
PDN30	Plastic repair of iliac artery
PDP30	Percutaneous plastic repair of iliac artery
PDQ30	Insertion of stent into iliac artery
PEE	Thrombectomy or embolectomy of femoral artery and branches
PEF	Thrombendarterectomy of femoral artery and branches
PEH	Bypass from femoral artery and branches
PEN	Plastic repair of femoral artery and branches
PEP	Percutaneous plastic repair of femoral artery and branches
PEQ	Insertion of stent into femoral artery and branches
PEW	Other operations on femoral artery with branches and connection to popliteal artery
PFA	Exploration of popliteal artery and arteries of lower leg and foot
PFE	Thrombectomy or embolectomy of popliteal artery and arteries of lower leg and foot
PFH	Bypass from femoral artery to infrapopliteal arteries and from popliteal artery to arteries of lower leg and foot
PFN	Plastic repair of popliteal artery
PFP	Percutaneous plastic repair of popliteal artery or artery of lower leg
PFQ	Insertion of stent into popliteal artery or artery of lower leg
PFU	Repair after previous bypass from femoral or popliteal artery to infrapopliteal arteries and reconstruction of popliteal artery and arteries of lower leg and foot
PFW	Other connections from femoral artery to infrapopliteal arteries and operations on popliteal artery and arteries of lower leg and foot
PGH	Extra-anatomic bypass
PGU	Repair of extra-anatomic bypass
PGW	Other extra-anatomic bypass operations
DP008	Percutaneous transluminal dilatation of leg artery
DP010	Percutaneous transluminal dilatation of iliac artery

8.10 Bariatric surgery

The following table presents the procedure code to select bariatric surgery. We included all available data recorded before 31 December 2018 in the analysis.

Table 15: Included clinical procedure code to select bariatric surgery

Procedure code	Name
JDF	Bariatric surgery on stomach

8.11 Insulin pumps and glucose monitoring

8.11.1 Insulin pumps

In Stockholm, insulin pumps are distributed in two different ways: (1) via medical devices distribution channels, and (2) via pharmaceuticals channels. To be able to achieve a high coverage in data on insulin pumps this project has extracted sales data (from VAL) on insulin pumps from both distribution channels. In order not to leave out patients with insulin pumps in the analysis, we chose to include all patients with at least one note of an insulin pump or insulin pump consumables (such as reservoirs, batteries etc) within four (4) years before 31 December 2018. The motivation for choosing this time period is that the warranty of an insulin pump usually lasts for 4 years.

8.11.2 CGM/FGM

Data on continuous/flash glucose monitoring (CGM/FGM) were obtained from VAL from the medical devices data source. To be included in the sample of prevalent CGM/FGM users, the patient should have had at least one note of CGM/FGM (including consumables) within three (3) years before 31 December 2018.

8.12 Comorbidity

Data on all comorbid conditions are divided into three (3) groups with the following definitions:

1. Ever recorded – The patient should have at least one recording of a diagnosis/procedure code within that comorbidity group. The diagnosis should be recorded by a physician. The diagnosis/procedure code may be recorded in any healthcare setting and in any diagnosis position.
2. Ever recorded in inpatient care in any diagnosis position – This category will only utilize diagnosis/procedure codes recorded within inpatient care.
3. Ever recorded in inpatient care and in primary diagnosis position – This category will only utilize diagnosis/procedure codes recorded within inpatient care. The code must also be recorded in primary diagnosis position. The motivation for including this category is that extensive validations on the Swedish National Patient Registries have shown that for some clinical conditions, only diagnosis codes recorded in inpatient care and in primary position have sufficiently high validity.

8.12.1 Cardiovascular comorbidity

The following ICD10 codes were included in the definition of cardiovascular comorbidity. We have established one overall variable on cardiovascular comorbidity, but the cardiovascular diseases presented in the table have also been analysed separately:

Table 16: Included ICD10 codes to select cardiovascular comorbidity

ICD10 code	Name
I20-I25	Ischemic heart disease
I50, I110, I42 (excluding I421 and I422), I43	Heart failure
I48	Atrial fibrillation (Afib)
I60-I62	Stroke - hemorrhagic
I63-I64	Stroke - ischemic
G45	Stroke - TIA
I70-I72, I731, I739, I74, I773, I776, I778, I79	Peripheral arterial disease (PAD)
I10-I13	Hypertension

8.12.2 Psychiatric comorbidity

The following table presents the ICD10 codes to select psychiatric comorbidity:

Table 17: Included ICD10 codes to select psychiatric comorbidity

ICD10 code	Name
F00-F03	Dementia
F32-F34	Depression
F20-F29	Schizophrenia/psychotic disorder
F41	Anxiety disorder
F40, F42, F50, F60, F61, F840, F841, F845, F90	Neuropsychiatric disorders

8.12.3 Cancer

8.12.3.1 Malignancy

The following table presents ICD10 codes to select diagnoses for the comorbidity malignancy:

Table 18: Included ICD10 codes to select malign cancer

ICD10 code	Name
C00-C97	Malignant neoplasms

8.12.3.2 Breast cancer

The following table presents ICD10 codes to select diagnoses for the comorbidity breast cancer:

Table 19: Included ICD10 codes to select breast cancer

ICD10 code	Name
C50	Malignant neoplasm of breast

8.12.3.3 Prostate cancer

The following table presents ICD10 codes to select diagnoses for the comorbidity prostate cancer:

Table 20: Included ICD10 codes to select prostate cancer

ICD10 code	Name
C61	Malignant neoplasm of prostate

8.12.3.4 Pancreas cancer

The following table presents ICD10 codes to select diagnoses for the comorbidity pancreas cancer:

Table 21: Included ICD10 codes to select pancreas cancer

ICD10 code	Name
C25	Malignant neoplasm of pancreas

8.12.3.5 Bladder cancer

The following table presents ICD10 codes to select diagnoses for the comorbidity bladder cancer:

Table 22: Included ICD10 codes to select bladder cancer

ICD10 code	Name
C67	Malignant neoplasm of bladder

8.12.3.6 Liver cancer

The following table presents ICD10 codes to select diagnoses for the comorbidity liver cancer:

Table 23: Included ICD10 codes to select liver cancer

ICD10 code	Name
C22	Malignant neoplasm of liver and intrahepatic bile ducts

8.12.3.7 Colon cancer

The following table presents ICD10 codes to select diagnoses for the comorbidity colon cancer:

Table 24: Included ICD10 codes to select colon cancer

ICD10 code	Name
C18	Malignant neoplasm of colon

8.12.4 Other comorbidities

The following table presents the ICD10 codes to select other comorbidities:

Table 25: Included ICD10 codes to select other comorbidities

ICD10 code	Name
E00-E07	Disorders of the thyroid gland
K900	Celiac disease
E271	Addison's disease
L80	Vitiligo
D51.0	Pernicious anemia

8.13 Drug utilization

Drug utilization was analysed using two different methods:

1. Ever use: In this method we have identified if the patient ever have had a dispensation (filled prescripton) of the actual drug using all available data on drug dispensation (data available from 01 July 2010)
2. Ongoing treatment: As a proxy for ongoing treatment we have in this method analysed if the patient have had a dispensation within six (6) months before 31 December 2018. The motivation for choosing six months is that the Swedish reimbursement system allows for dispensation for a maximum of 3 months use, but due to less than perfect adherence, patients often delay their refills. We chose to be inclusive in our definition of ongoing treatment, and chose 6 months since we in previous work have seen that even 4 months may be a too narrow time frame for some drugs.

8.13.1 Glucose lowering drugs (GLD)

The following table presents ATC codes to select blood glucose lowering drugs (GLD):

Table 26: Included ATC codes to select glucose lowering drugs

Definition	N
A10A	Insulins
A10BA02,A10BD02,A10BD03,A10BD05,A10BD07,A10BD08,A10BD10,A10BD11,A10BD13,A10BD14,A10BD15,A10BD16,A10BD17,A10BD18,A10BD20,A10BD22,A10BD23,A10BD25	Metformin and metformin combinations
A10BB,A10BD01,A10BD02,A10BD04, A10BD06	Sulfonylureas (SU)
A10BJ,A10AE54,A10AE56,	Glucagonlike peptide-1 (GLP1) agonists
A10BH,A10BD07,A10BD08,A10BD09,A10BD10,A10BD11,A10BD13,A10BD19,A10BD21,A10BD24,A10BD25	Dipeptidyl peptidase IV (DPP4) inhibitors
A10BK,A10BD15,A10BD16,A10BD19,A10BD20,A10BD21,A10BD23,A10BD24,A10BD25	Selective sodium-glucose transporter 2 (SGLT-2) inhibitors
A10BG,A10BD03,A10BD04,A10BD05,A10BD06,A10BD09	Thiazolidinediones (TZDs)
A10BF,A10BD17	Alpha-glucosidase inhibitors
A10BX02,A10BX03,A10BX08,A10BD14	Meglitinide derivatives

Note: Products with more than one active glucose lowering compound (combinations drugs) are included in their respective group (i.e. these drugs are present in more than one group in the table above)

8.13.2 Anti-hypertensive drugs

The following table presents ATC codes to select anti-hypertensive drugs:

Table 27: Included ATC codes to select anti-hypertensive drugs

ATC code	Name
C02	Alpha blockers and centrally acting
C09A, C09B, C09C, C09D, C09X	Agents acting on the renin-angiotensin system
C03A,C09DA,C09BA,C03EA01	Thiazide diuretics
C07	Beta blocking agents
C08C	Calcium channel blockers, peripherally acting

8.13.3 Lipid lowering agents

The following table presents ATC codes to select lipid lowering drugs:

Table 28: Included ATC codes to select lipid lowering drugs

ATC code	Name
C10	Lipid modifying agents

8.13.3.1 Statins

The following table presents ATC codes to select statins:

Table 29: Included ATC codes to select statins

ATC code	Name
C10AA	HMG CoA reductase inhibitors

8.13.4 Anticoagulants

The following table presents ATC codes to select anticoagulants:

Table 30: Included ATC codes to select anticoagulants

ATC code	Name
B01AA	Vitamin K antagonists
B01AB	Heparin group
B01AE	Direct thrombin inhibitors
B01AF	Direct factor Xa inhibitors
B01AX05	Fondaparinux

8.13.5 Antiplatelet drugs

The following table presents ATC codes to select antiplatelet drugs:

Table 31: Included ATC codes to select antiplatelet drugs

ATC code	Name
B01AC	Platelet aggregation inhibitors excl. heparin

8.14 Healthcare resource utilization

8.14.1 Outpatient healthcare resource utilization

Outpatient healthcare resource utilization has been estimated using data from VAL. The calculations included all outpatient healthcare utilization, i.e not only healthcare related to DM. For each patient, we have estimated the healthcare utilization consumed during one year, 2018. However, we have only included healthcare utilization consumed during the period when the patients had DM. This means that for the few patients that are newly diagnosed during 2018, we only included healthcare utilization that is consumed after the incident DM date. We then calculated healthcare utilization per person-year: if a patient had DM for the entire 2018, that patient contributed with 1 year to the denominator; if a patient only had DM for 6 months during 2018, that patient contributed with 6 months to the denominator.

Outpatient healthcare utilization was described using the following categories:

Table 32: Categories of healthcare utilization

Group no	Category	Definition
1	All outpatient healthcare events	This category will include all recorded healthcare events both direct (i.e. physical visits) and indirect events (i.e. telephone contacts etc)
2	All primary healthcare events	This category will include all recorded primary healthcare events both direct (i.e. physical visits) and indirect contacts (i.e. telephone contacts etc). This category is included in group 1 "All outpatient healthcare events"
3	All specialised outpatient healthcare events	This category will include all recorded specialised outpatient healthcare events both direct (i.e. physical visits) and indirect contacts (telephone contacts etc). This category is included in group 1 "All outpatient healthcare events
4	All outpatient healthcare events by physicians (physical visit)	This category will include direct contacts with outpatient healthcare. After discussion with HSF, we have chosen to include the following types of healthcare visits into this category: "Nybesök enskilt", "Återbesök enskilt", "Hembesök", "Gruppbesök", "Teambesök", "Gruppteambesök", "Nybesök Vårdgaranti". Only outpatient healthcare performed by a physician
5	All primary healthcare events by physicians (physical visits)	This category will include direct contacts with primary care. After discussion with HSF, we have chosen to include the following types of healthcare visits into this category: "Nybesök enskilt", "Återbesök enskilt", "Hembesök", "Gruppbesök", "Teambesök", "Gruppteambesök", "Nybesök Vårdgaranti". Only primary healthcare performed by a physician
6	All specialised outpatient healthcare events by physicians (physical visits)	This category will include direct contacts with specialised outpatient care. After discussion with HSF, we have chosen to include the following types of healthcare visits into this category: "Nybesök enskilt", "Återbesök enskilt", "Hembesök", "Gruppbesök", "Teambesök", "Gruppteambesök", "Nybesök Vårdgaranti". Only specialized outpatient healthcare performed by a physician

Note: This way of defining outpatient healthcare utilization describes "mean healthcare utilization for DM patients prevalent at 31 December 2018". This means that the utilization is a mix of DM patients with long duration of their disease and newly diagnosed patients.

8.14.2 Inpatient healthcare resource utilization

Inpatient healthcare resource utilization was estimated using data from VAL. Only inpatient episodes with status "discharged" and inpatient healthcare utilization consumed during 2018 were included in the analyses. This means that if an inpatient episode started before 01 January 2018, only the days consumed during 2018 were included. In accordance with the Swedish national standard, inpatient bed-days have been defined as the date of discharge minus the date of admission plus 1 day [17]. The calculations of inpatient bed-days include all inpatient healthcare utilization, i.e not only that related to DM.

8.15 Healthcare costs

8.15.1 Inpatient and outpatient healthcare costs

For inpatient and outpatient healthcare utilization we estimated the costs for each patient using cost data from the VAL database. The following method was used:

In VAL, each healthcare visit or inpatient treatment episode includes a cost variable. However, this cost information has several limitations since it will not include some of the fixed costs in the agreements between Region Stockholm and the healthcare providers. An example of fixed costs is the so-called capitation in primary care where the healthcare provider is reimbursed a fixed amount for each patient listed at that primary healthcare center. Therefore, the included information on costs will likely underestimate the true costs for healthcare. To be able to analyse costs with higher validity, HSF has initiated an important work establishing different multiplier factors that are applied to each healthcare visit taking the fixed costs into account. Adding these factors will give a much better estimate of the true costs of healthcare and this is the method we have used in this project. Given that analysing healthcare cost data is challenging, and the work on establishment of multiplier factors is in an early phase, we should interpret the cost data with caution.

For each patient with DM, we estimated the costs for outpatient and inpatient healthcare and presented costs per person-year. We have applied the same strategy as in previous section, i.e. including only the healthcare utilization consumed during 2018 after DM diagnosis.

8.15.2 Drug costs

For each patient, costs for all drugs utilized during 2018 were estimated. Costs were calculated using the variable costs for the region (SLLKOST) which includes the costs for Region Stockholm (i.e the total drug cost minus the costs the patient pays (co-pay)). Costs were only calculated for drugs that were prescribed and dispensed in outpatient care (prescription drugs) and not for drugs administered in-hospital. We have applied the same strategy as in previous section, i.e. including only costs for drugs consumed during 2018 after DM diagnosis.

Note: Costs for free-of-charge drugs used for selected infectious diseases (smittskyddsläkemedel) were not included in the cost analysis.

9 Demography of the total population in Stockholm

In this section, information on the entire population in Stockholm is presented, facilitating comparisons with DM type I and II patients.

9.1 Population data in Stockholm

To estimate prevalence and incidence of DM in Stockholm, population data collected from Statistics Sweden (SCB) [18] were used. The following table presents the population in Stockholm per 31 December each year:

Table 33: Population in Stockholm 2013-2018

Municipality	Population 2012	Population 2013	Population 2014	Population 2015	Population 2016	Population 2017	Population 2018
0114 Upplands Väsby	40723	41449	41816	42661	43891	44605	45543
0115 Vallentuna	31215	31616	31969	32380	32785	33175	33432
0117 Österåker	40269	40495	41180	42130	43293	44130	44831
0120 Värmdö	39387	39784	40541	41107	42000	43444	44397
0123 Järfälla	68210	69167	70701	72429	74412	76453	78480
0125 Ekerö	26160	26355	26698	26984	27406	27753	28308
0126 Huddinge	101010	102557	104185	105311	107538	110003	111722
0127 Botkyrka	86274	87580	88901	89425	90675	91925	93106
0128 Salem	15881	16001	16140	16426	16615	16665	16786
0136 Haninge	79430	80932	82407	83866	85693	88037	89989
0138 Tyresö	43764	44281	45390	46177	47103	47304	48004
0139 Upplands-Bro	24353	24703	25287	25789	26755	27614	28756
0140 Nykvarn	9442	9523	9815	10192	10424	10660	10923
0160 Täby	65364	66292	67334	68281	69386	70405	71397
0162 Danderyd	31960	32222	32295	32421	32653	32888	33187
0163 Sollentuna	66859	68145	69325	70251	71023	71848	72528
0180 Stockholm	881235	897700	911989	923516	935619	949761	962154
0181 Södertälje	89473	91072	92235	93202	94631	96032	97381
0182 Nacka	92873	94423	96217	97986	99359	101231	103656
0183 Sundbyberg	40793	42626	44090	46110	47750	49424	50564
0184 Solna	71293	72740	74041	76158	78129	79707	80950
0186 Lidingö	44434	45178	45465	46302	46853	47185	47818
0187 Vaxholm	11126	11188	11329	11380	11621	11831	12023
0188 Norrtälje	56634	56845	57568	58669	59420	60808	61769
0191 Sigtuna	42272	43372	44085	44786	46274	47146	48130
0192 Nynäshamn	26572	26796	27041	27500	27752	28109	28290
Total	2127006	2163042	2198044	2231439	2269060	2308143	2344124

9.2 Mean age in each municipality in Stockholm

The figure below presents the mean age for each municipality in Stockholm:

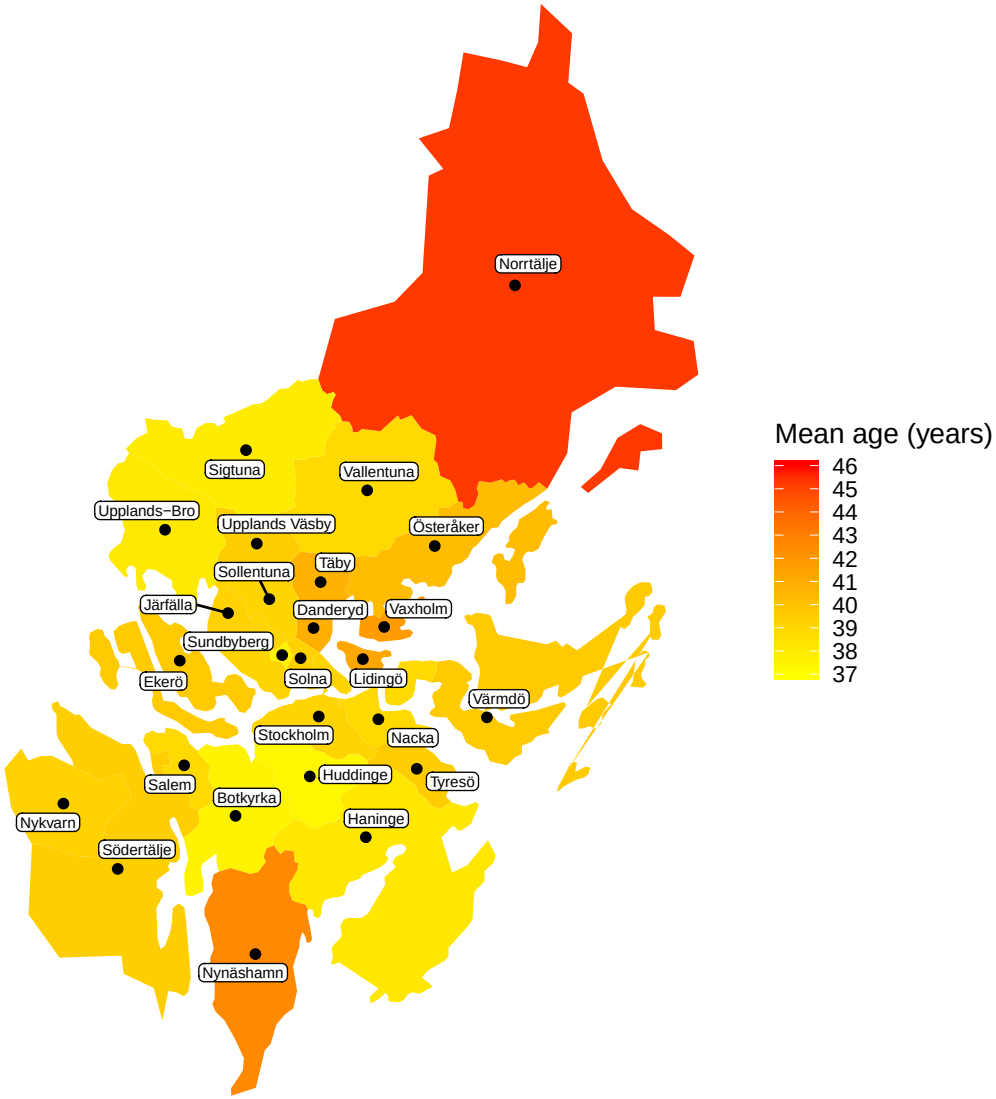


Figure 4: Mean age for each municipality in Stockholm

9.3 Mosaic areas in Stockholm

Mosaic is a system for geodemographic classification of households. It applies the principles of geodemography to consumer household and individual data collated from a number of government and commercial sources. Each patient in Stockholm was categorized into one of the following three levels:

1. Highest income/education
2. Medium income/education
3. Lowest income/education

The figure below presents the Stockholm population according to the three Mosaic classification levels. The denominator data in this analysis have been provided by Region Stockholm (HSF).

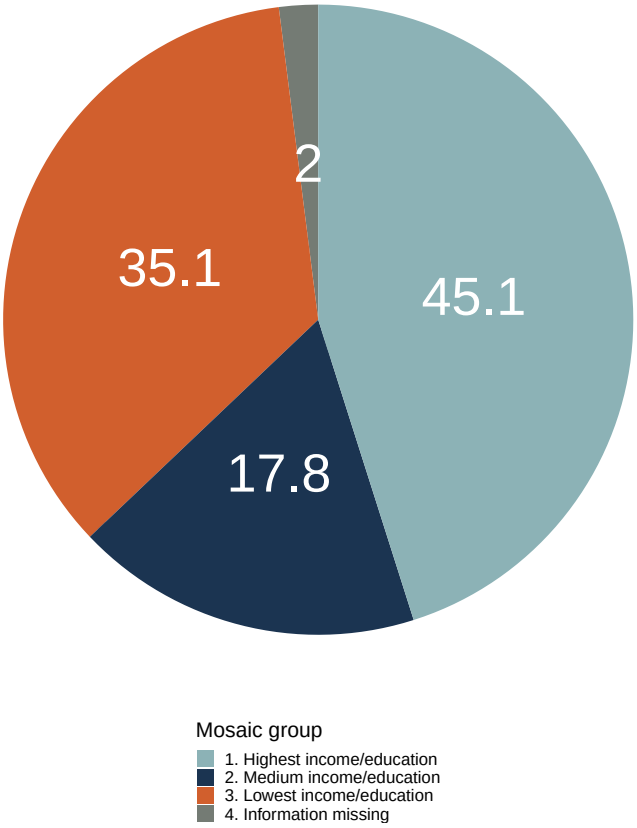


Figure 5: Mosaic grouping for the Stockholm County

Note: The Mosaic classification is not based on individual level data, hence socioeconomic and sociodemographic data may differ somewhat from e.g. individual data from SCB.

9.4 Healthcare utilization in Stockholm

To be able to compare data on healthcare resource utilization we here provide data on mean number of outpatient physician visits during 2018 for the total population in Region Stockholm (data from HSF, Region Stockholm). The visits must be direct, i.e. involve a meeting with a physician. The following type of visits have been included:

Table 34: Type of outpatient visits included in the figure below

Type of visit (outpatient)
Individual physical visit
Homecare visit
Group visit/shared medical appointment
Team based care (individual)
Team based care (shared appointment)

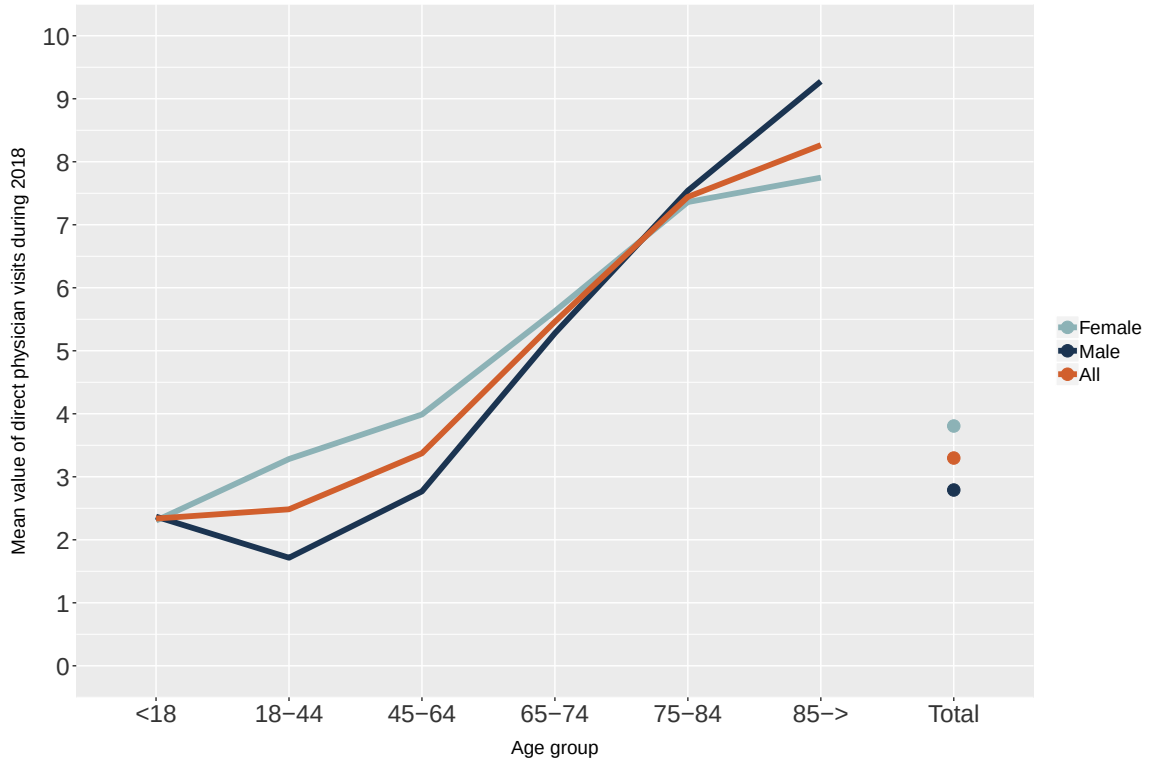


Figure 6: Mean outpatient physician visits in Stockholm for 2018

10 Results

10.1 Epidemiology of diabetes in Stockholm

10.1.1 Incidence of diabetes in Stockholm

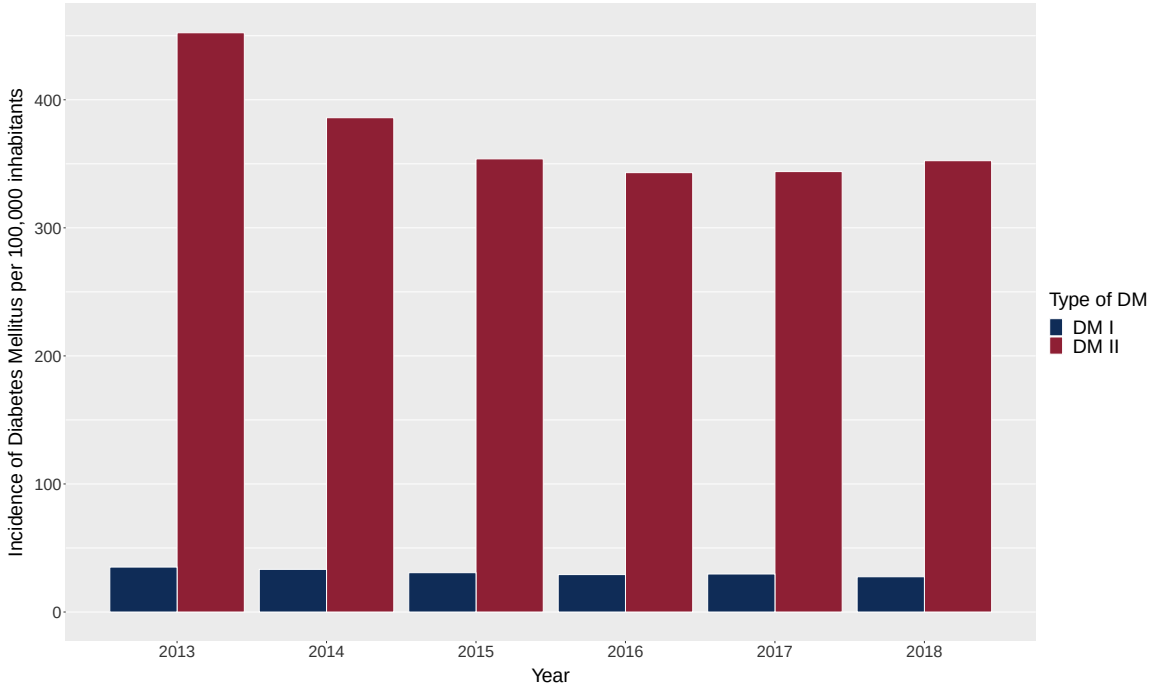


Figure 7: Incidence of DM in Stockholm according to method 1

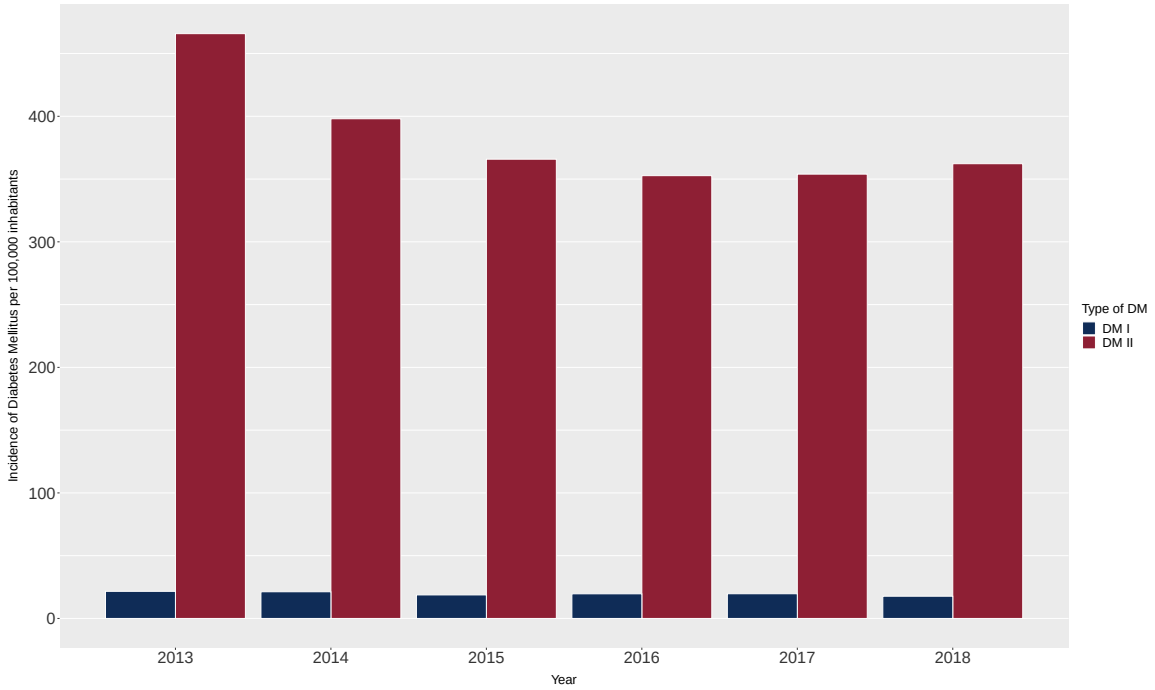


Figure 8: Incidence of DM in Stockholm according to method 2

Note 1: These methods for estimation of incidence may overestimate the true incidence since patients may have had their first recorded DM diagnosis outside the Stockholm region and are therefore not

captured in our research data. This analysis answers the question "How many new DM patients are diagnosed in Stockholm each year"

Note 2: In 2013, a new system for diagnoses code reporting was introduced within the Stockholm healthcare region. This likely explains the high incidence observed in 2013.

Note 3: Method 2, using the diagnostic algorithm gives a more precise estimate of DM type I and DM type II.

10.1.2 Prevalence of diabetes in Stockholm

10.1.2.1 Prevalence (according to last DM diagnosis each year)

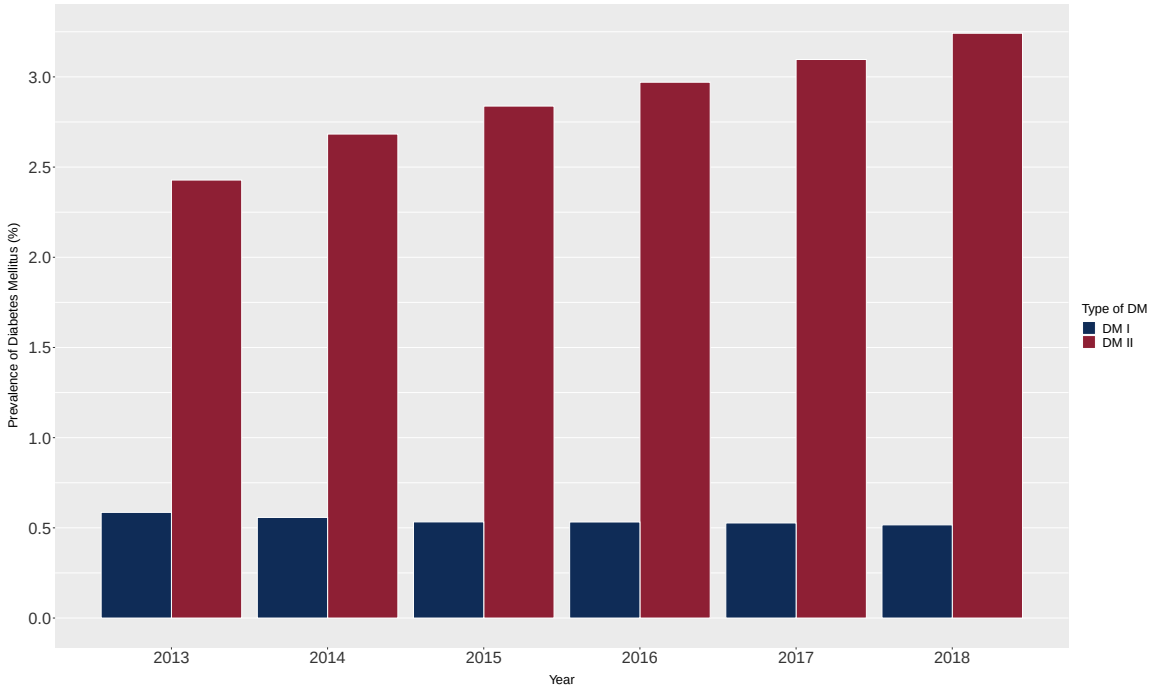


Figure 9: Prevalence of DM in Stockholm according to method 1

Note: This analysis answers the question "How many patients in Stockholm have at least one recorded DM diagnosis the current year (2013-2018) and are resident in Stockholm per 31 December each year"

10.1.2.2 Prevalence (according to diagnostic algorithm)

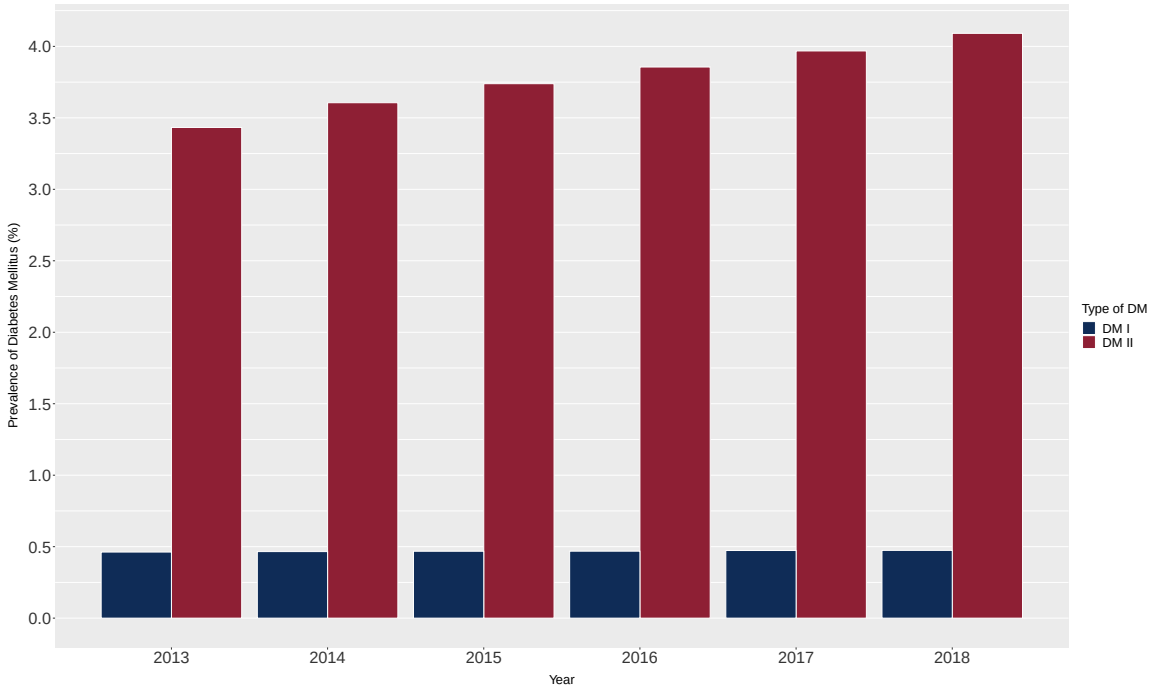


Figure 10: Prevalence of DM in Stockholm according to method 2

Note: This analysis answers the question "How many patients in Stockholm have been diagnosed with DM (using all available data) and are resident in Stockholm per 31 December each year"

10.1.2.3 Prevalence (according to diagnostic algorithm, last 5 years)

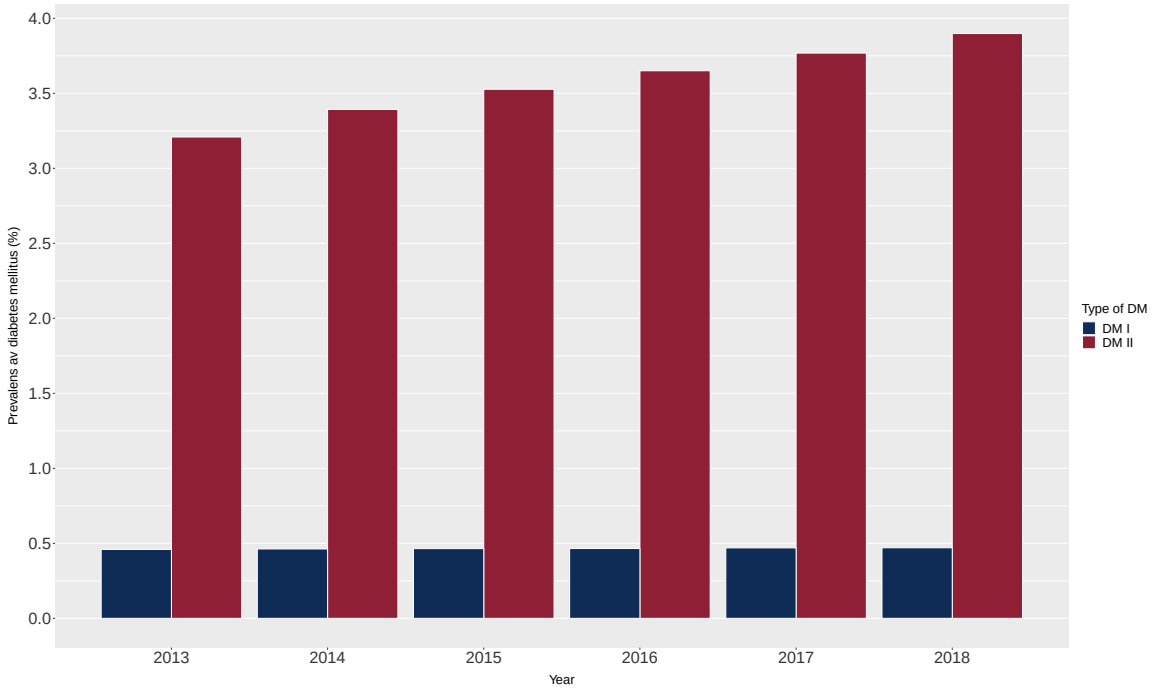


Figure 11: Prevalence of DM in Stockholm according to method 3

Note: This analysis answers the question "How many patients in Stockholm have been diagnosed with DM (using last 5 years data for each year) and are resident in Stockholm per 31 December each year"

10.2 Categorization of DM patients according to the epidemiologic algorithm

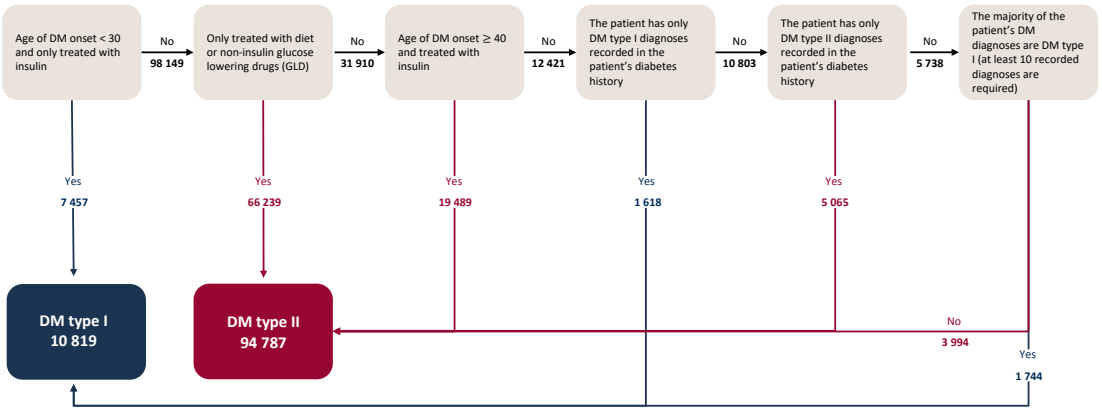


Figure 12: Classification of DM patients according to the epidemiologic algorithm

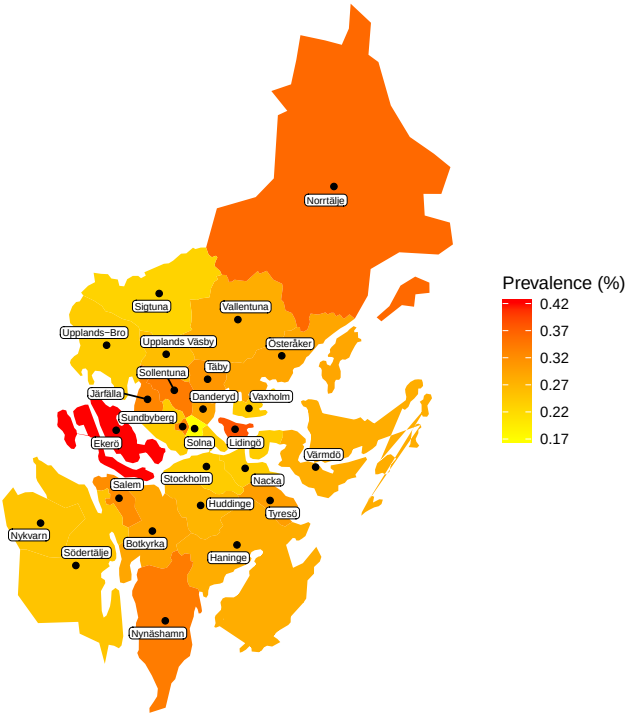
Results on Diabetes Mellitus type I

10.3 Results on diabetes type I

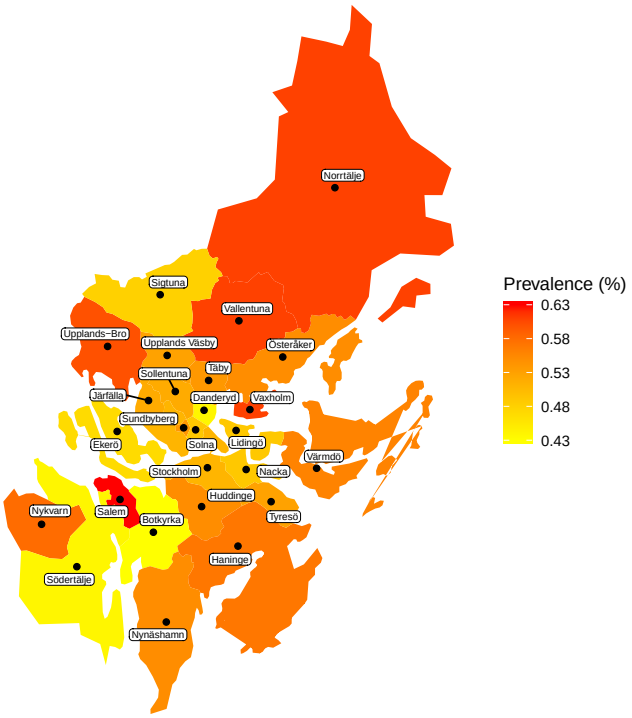
In this section we present results from analyses related to DM type I. Throughout the report, figures presenting data on DM type I are colored in dark blue. The population includes all patients in Stockholm diagnosed with DM type I according to the established algorithm. However, the majority of analyses on DM type I are performed on patients aged 18 years or older. Age groups analysed are presented in each table and figure.

10.3.1 Prevalence of diabetes typ I

The figures below present the prevalence of DM type I for each municipality in Stockholm:



(a) Prevalence of DM type I (< 18 years of age) by each municipality in Stockholm. Population data for each municipality (< 18) as denominator

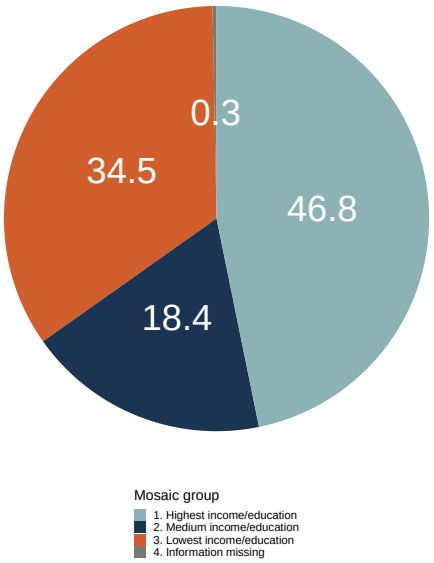


(b) Prevalence of DM type I (⩾18 years of age) by each municipality in Stockholm. Population data for each municipality (⩾ 18 years of age) as denominator

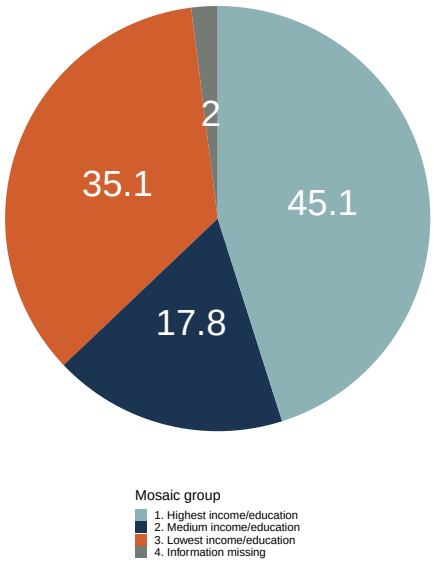
Figure 13: Prevalence of DM type I by municipality

10.3.2 Mosaic group

The figures below present the Mosaic group distribution among patients with DM type I (all ages). As comparison, the bar chart to the right presents Mosaic data in the total Stockholm population. For each patient with DM type I, the most recent Mosaic group before 31 December 2018 has been selected (if the patient has moved between different Mosaic groups within Stockholm during the study period).



(a) Distribution of Mosaic group among patients with DM type I (all ages)



(b) Distribution of Mosaic group in the total poulation in Stockholm

Figure 14: Mosaic groups for DM type I patients

Note: This analysis has been performed for all patients (all ages) with DM type I since we did not have denominator mosaic group data for different age groups.

10.3.3 Age and sex distributions

The figure below presents the age distribution for patients with DM type I (all ages):

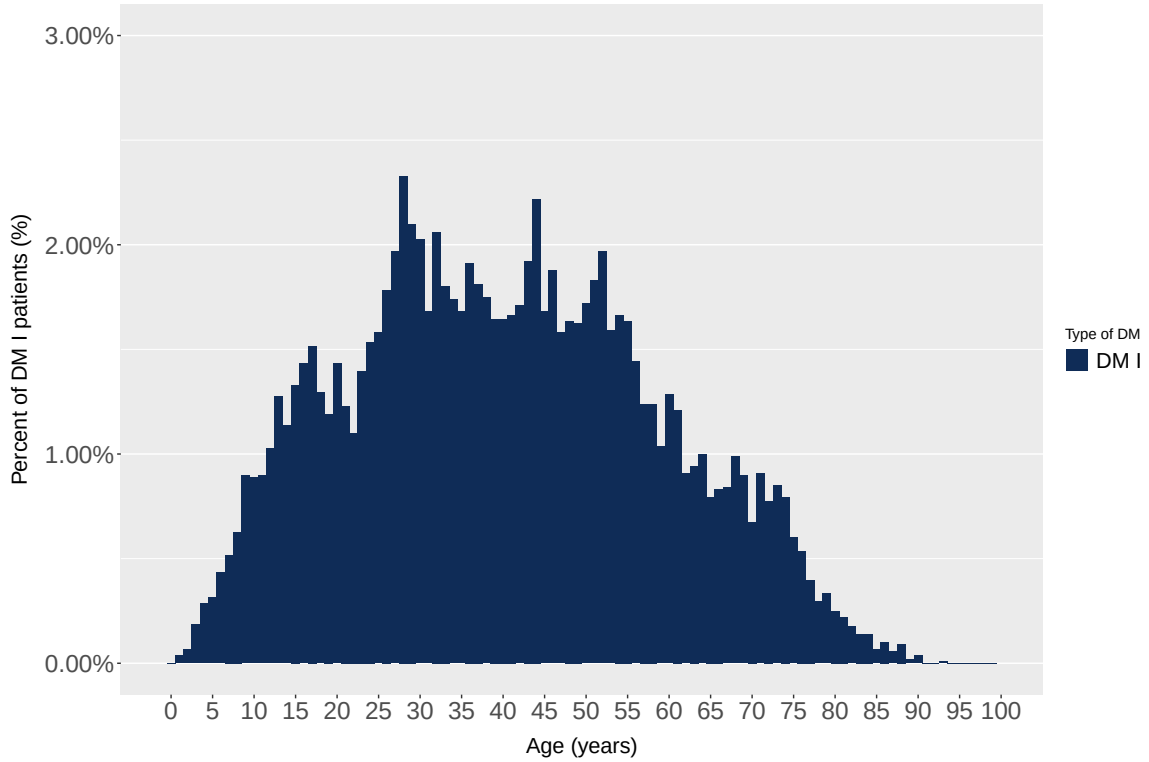
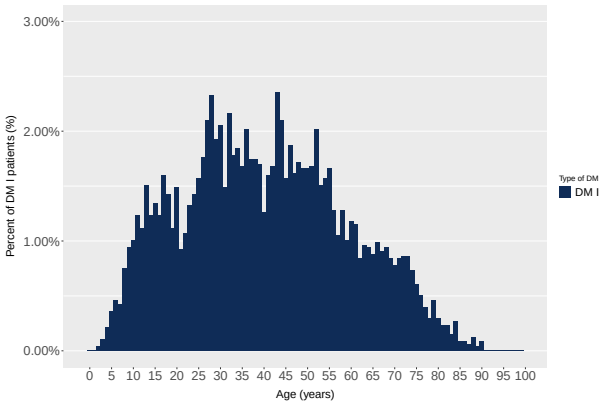
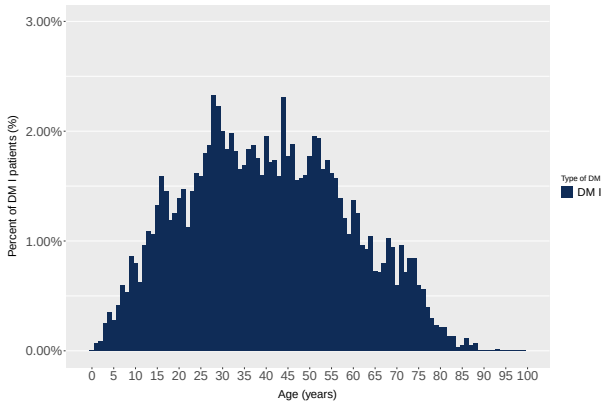


Figure 15: Age histogram for patient with DM type I (all ages)

The figures below present the age distribution for patients with DM type I (all ages) by sex strata:



(a) Age histogram for patients with DM type I (all ages) - Female



(b) Age histogram for patients with DM type I (all ages) - Male

Figure 16: Age histogram for patients with DM type I (all ages) by sex

The table below presents summary statistics on age and sex for patients with DM type I (all ages):

Table 35: Age and sex distribution for patients diagnosed with DM type I (all ages)

Variable		All DM I patients	Male	Female
N		10,819	6,053	4,766
Age	Mean (SD)	40.4 (18.6)	40.4 (18.4)	40.4 (19.0)
	Median (IQR)	40.0 (26.1, 54.0)	40.0 (26.2, 54.0)	39.1 (26.0, 54.0)
Sex	Female	4,766 (44.1%)	0 (0.0%)	4,766 (100.0%)
	Male	6,053 (55.9%)	6,053 (100.0%)	0 (0.0%)

The table below presents number of patients with DM type I by age group:

Table 36: Number of DM type I patients by age group

Variable		All	0-17	18-29	30-44	45-64	65-74	75->
N		10,819	1,393	2,048	2,951	3,148	905	374
Age	Mean (SD)	40.4 (18.6)	12.1 (3.8)	24.3 (3.5)	37.1 (4.4)	53.5 (5.5)	69.5 (2.8)	79.2 (3.8)
	Median (IQR)	40.0 (26.1, 54.0)	13.0 (9.1, 15.1)	25.0 (21.1, 27.1)	37.0 (33.1, 41.0)	53.0 (49.0, 58.0)	69.1 (67.0, 72.0)	78.0 (76.0, 81.1)
Sex	Female	4,766 (44.1%)	647 (46.4%)	880 (43.0%)	1,296 (43.9%)	1,345 (42.7%)	412 (45.5%)	186 (49.7%)
	Male	6,053 (55.9%)	746 (53.6%)	1,168 (57.0%)	1,655 (56.1%)	1,803 (57.3%)	493 (54.5%)	188 (50.3%)

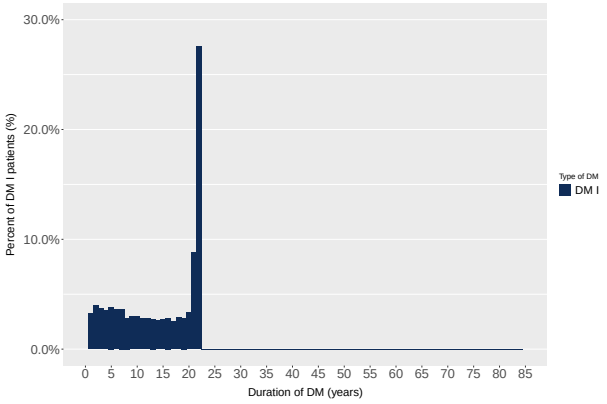
10.3.4 Duration of diabetes type I

The table below presents the duration of DM type I (all ages) for method 1 and method 2:

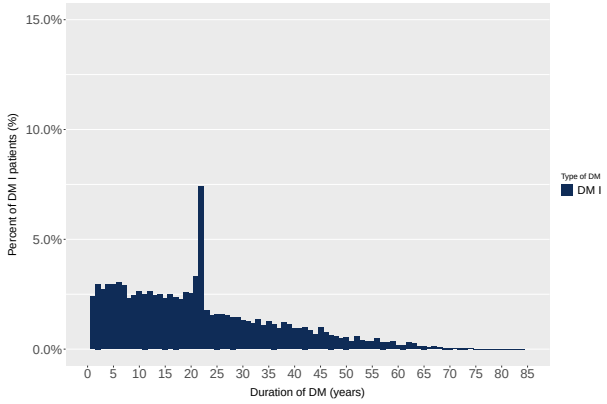
Table 37: Duration of DM diagnosed with DM type I (all ages)

	Number of patients	Mean duration	SD	Median duration	IQR
DM duration based on method 1 (first recorded DM diagnosis)	10819	14.1	7.5	15.8	14.6
DM duration based on method 2 (first recorded DM diagnosis and/or data from EHRs)	10819	21.2	15.1	19.1	21.0

Note: Of 10,819 patients categorized with DM type I, we have been able to obtain information from EHRs on year of DM onset for 7,179 (66.4%) patients. Therefore, there may still be an underestimation of the true mean and median duration of DM type I patients in Stockholm.



(a) Method 1. Duration of DM for patients with DM type 1 (all ages) based on first recorded DM diagnosis



(b) Method 2. Duration of DM for patients with DM type 1 (all ages) based on first recorded DM diagnosis or data on date of onset from EHRs

Figure 17: Duration of diabetes for DM type I patients

Note 1: The peak observed at the duration of 22 years is explained by the fact that the project only includes data on diagnoses from 01 January 1997 (i.e. a maximum of 22 years).

Note 2: The x-axes have been harmonized to be able to compare the figures (please note that the scale on the y-axis differs).

10.3.5 Clinical characteristics

10.3.5.1 Body mass index (BMI)

As described in the definition section, BMI was only estimated for patients ⩾ 18 years of age. We could calculate BMI for 7,917 (84.0%) of the 9,426 patients with DM type I and age of 18 and above using data on weight and height from EHRs.

The figure below presents BMI for patients with DM type I with an age ⩾ 18 years:

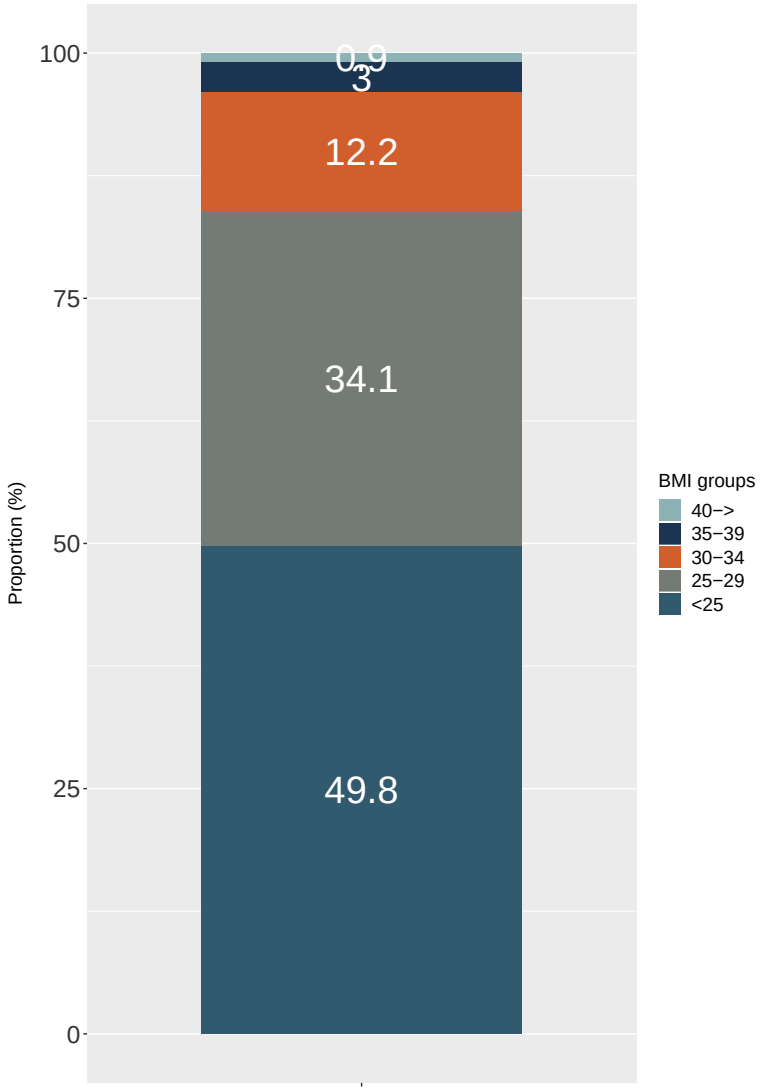


Figure 18: BMI distribution for patients with DM type I (age ⩾ 18 years)

Table 38: BMI distribution for patients diagnosed with DM type I (age ⩾ 18 years)

Age group	Number of patients	Mean BMI	SD	Median BMI	IQR
18-29	1826	24.6	4.2	24.0	5.0
30-44	2356	25.8	4.6	24.9	5.5
45-64	2627	26.6	4.5	26.0	5.8
65-74	781	26.0	4.8	25.3	5.8
75-84	293	25.0	4.4	24.3	5.0
85->	34	23.9	3.3	24.2	3.3
Total	7917	25.8	4.5	25.0	5.6

The figure below presents a violin plot for BMI for patients with DM type I with an age ⩾ 18 years:

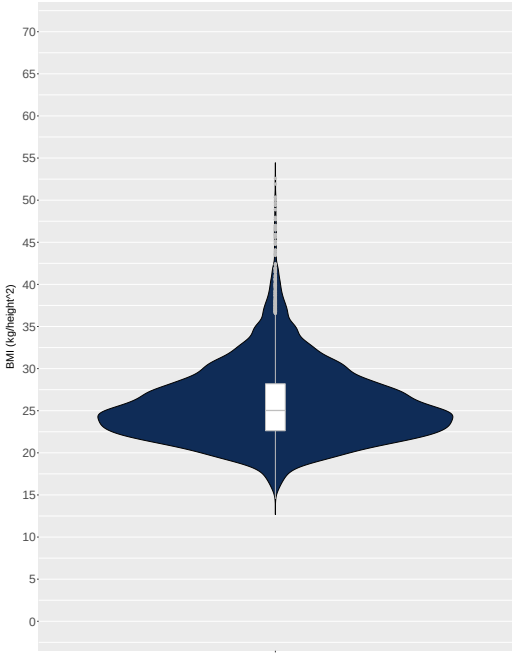


Figure 19: BMI distribution for patients with DM type I (age ⩾ 18 years)

10.3.5.2 Blood pressure

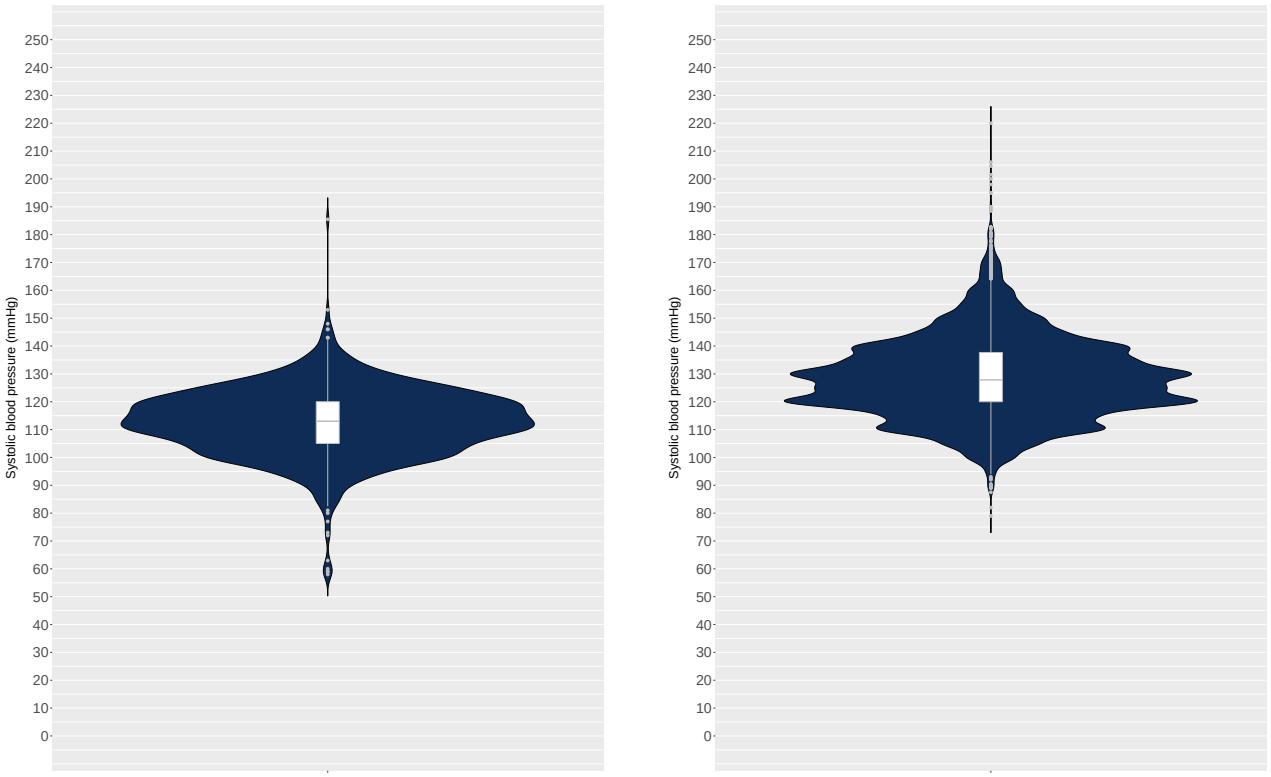
10.3.5.2.1 Systolic blood pressure (SBP)

Information on SBP was possible to obtain for 7,932 (73.3%) of 10,819 DM type I patients.

The table below presents mean SBP by age groups for DM type I patients (all ages):

Table 39: SBP distribution for patients diagnosed with DM type I

Age group	Number of patients	Mean SBP	SD	Median SBP	IQR
0-17	894	112.8	12.3	113.0	15.0
18-29	1564	120.7	11.6	120.0	16.1
30-44	2072	124.7	13.1	124.8	17.4
45-64	2385	132.8	14.5	131.5	17.3
65-74	730	137.7	14.2	136.8	16.4
75->	287	138.8	16.0	139.0	17.1
Total	7932	126.7	15.4	125.0	19.1



(a) Distribution of SBP for DM type I patients $<$ 18 years of age

(b) Distribution of SBP for DM type I patients $\geqslant$ 18 years of age

Figure 20: Distribution of SBP for DM type I patients

Note: In these violin plots (especially for patients $\geqslant$ 18 years), there was a clear digit preference for values at 110, 120, 130 and 140 mmHg.

The figure below presents SBP categories by age groups:

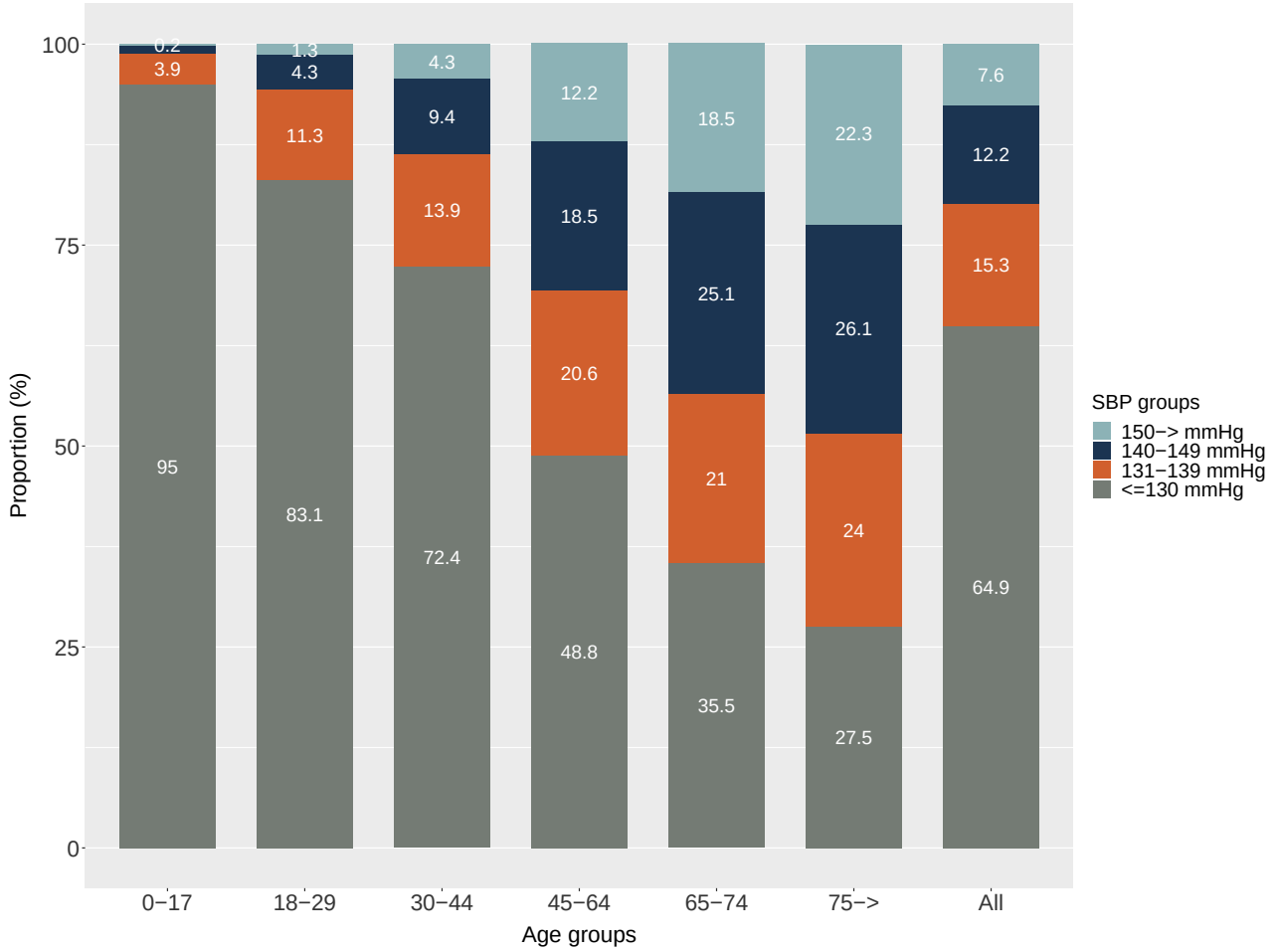


Figure 21: SBP categories by age groups

10.3.5.2.2 Diastolic blood pressure (DBP)

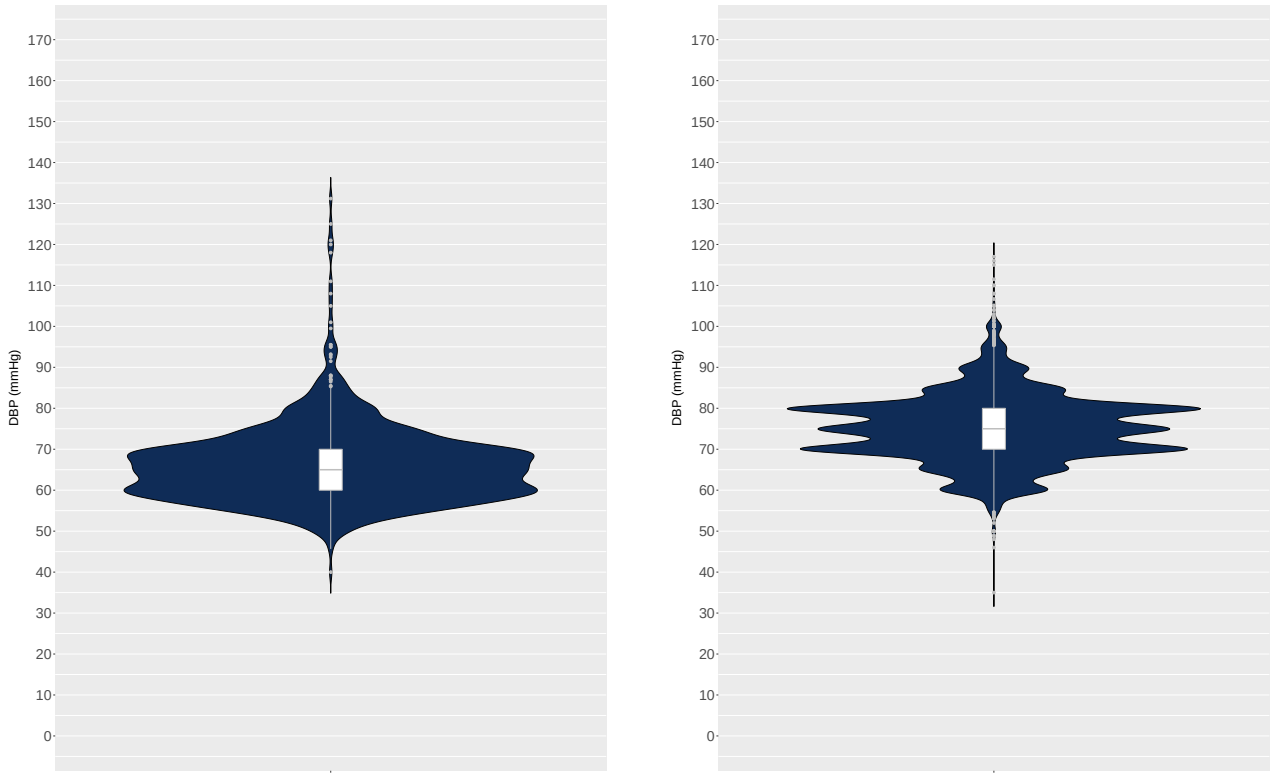
Information on DBP was possible to obtain for 7,917 (73.2%) of 10,819 DM type I patients.

Note: The number of available measurements of SBP and DBP differed minimally (7,932 vs 7,917). This is likely explained by recording errors (i.e. data outside reasonable levels in our logical checks in the data cleaning process).

The table below presents mean DBP by age groups for DM type I patients (all ages):

Table 40: DBP distribution for patients diagnosed with DM type I

Age group	Number of patients	Mean DBP	SD	Median DBP	IQR
0-17	895	66.2	9.6	65.0	10.0
18-29	1559	73.9	7.9	74.0	10.0
30-44	2066	76.6	8.1	77.0	10.0
45-64	2382	76.2	8.3	75.2	10.0
65-74	729	71.4	7.9	70.0	11.8
75->	286	70.2	7.8	70.0	9.9
Total	7917	74.1	8.9	74.7	11.0



(a) Distribution of DBP for DM type I patients < 18 years of age

(b) Distribution of DBP for DM type I patients ⩾ 18 years of age

Figure 22: Distribution of DBP for DM type I patients

10.3.5.3 Estimated glomerular filtration rate (eGFR)

Information on eGFR was possible to extract for 7,581 (80.4%) of 9,426 DM type I patients (⩾ 18 years of age).

Age distribution of patients with available eGFR measurements:

Table 41: Age distribution of the extracted measurements on eGFR

Age group	Number of patients
18-29	1545
30-44	2326
45-64	2618
65-74	777
75->	315
All	7581

The figure below presents eGFR categories by age groups:

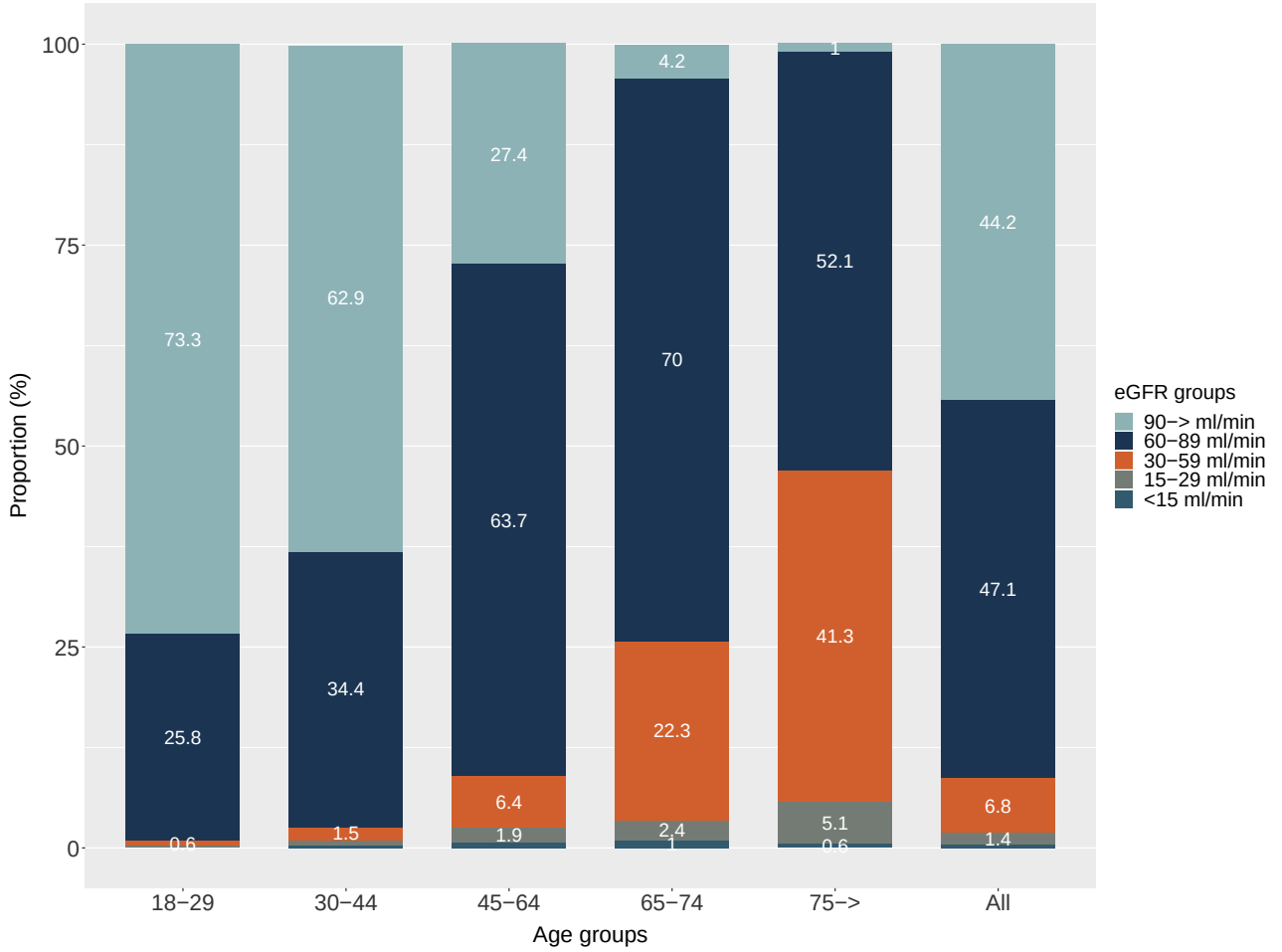


Figure 23: eGFR categories by age groups (DM type I)

10.3.5.4 Microalbuminuria

Information on microalbuminuria (Yes/No) was possible to extract for 6,542 (60.5%) of 10,819 DM type I patients.

The table below shows the age distribution of patients with available microalbuminuria measurements:

Table 42: Age distribution of the extracted measurements on microalbuminuria

Age group	Number of patients
0-17	747
18-29	1312
30-44	1748
45-64	1971
65-74	565
75->	199
All	6542

The figure below presents microalbuminuria by age groups:

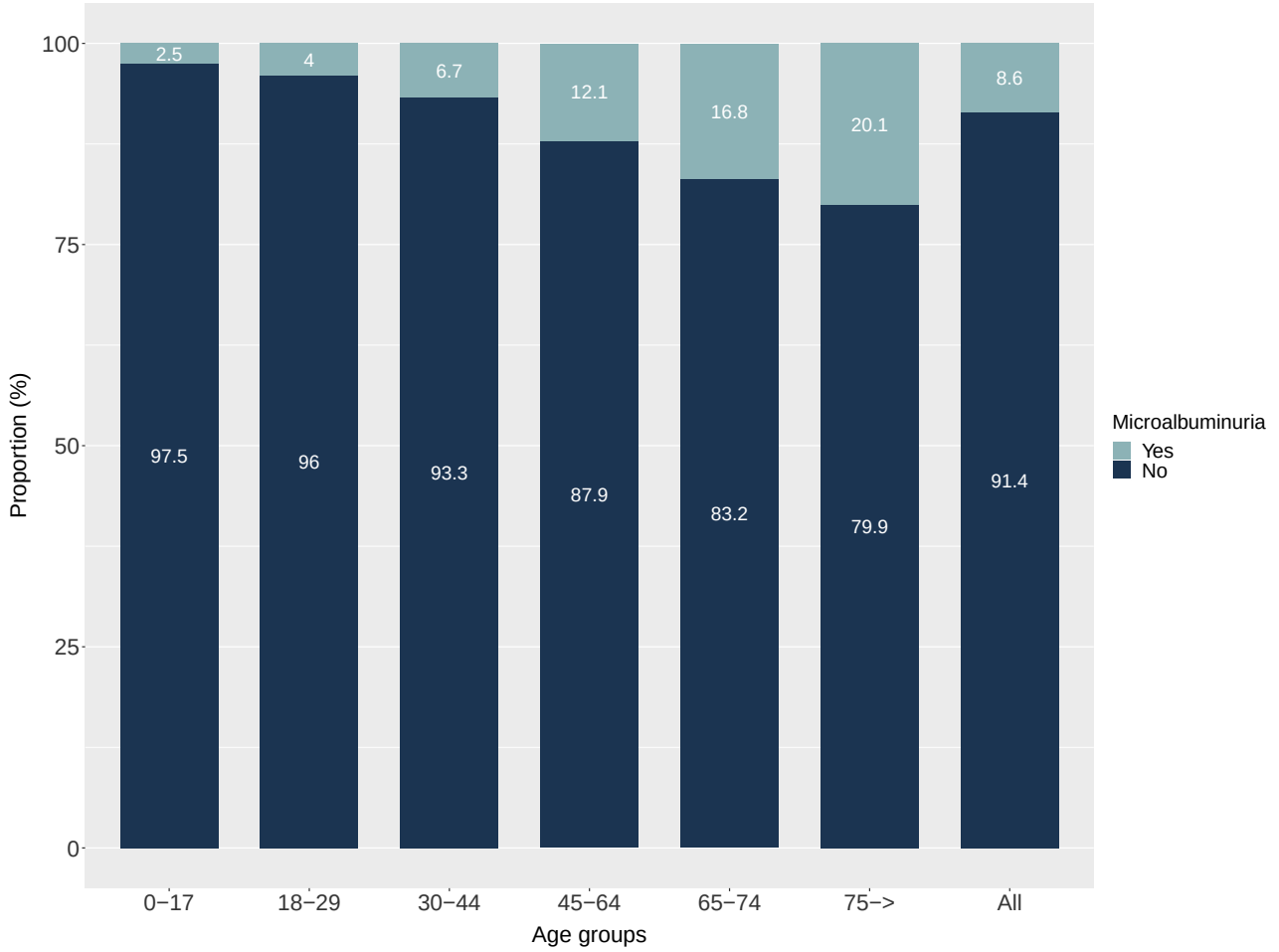


Figure 24: Microalbuminuria by age group (DM type I)

10.3.5.5 Macroalbuminuria

Information on macroalbuminuria (Yes/No) was possible to extract for 4,824 (51.2%) of 9,426 DM type I patients ($\geqslant$ 18 years of age).

The table below shows the age distribution of patients with available macroalbuminuria measurements:

Table 43: Age distribution of the extracted measurements on macroalbuminuria

Age group	Number of patients
18-29	1072
30-44	1466
45-64	1639
65-74	475
75->	172
All	4824

The figure below presents macroalbuminuria by age groups:

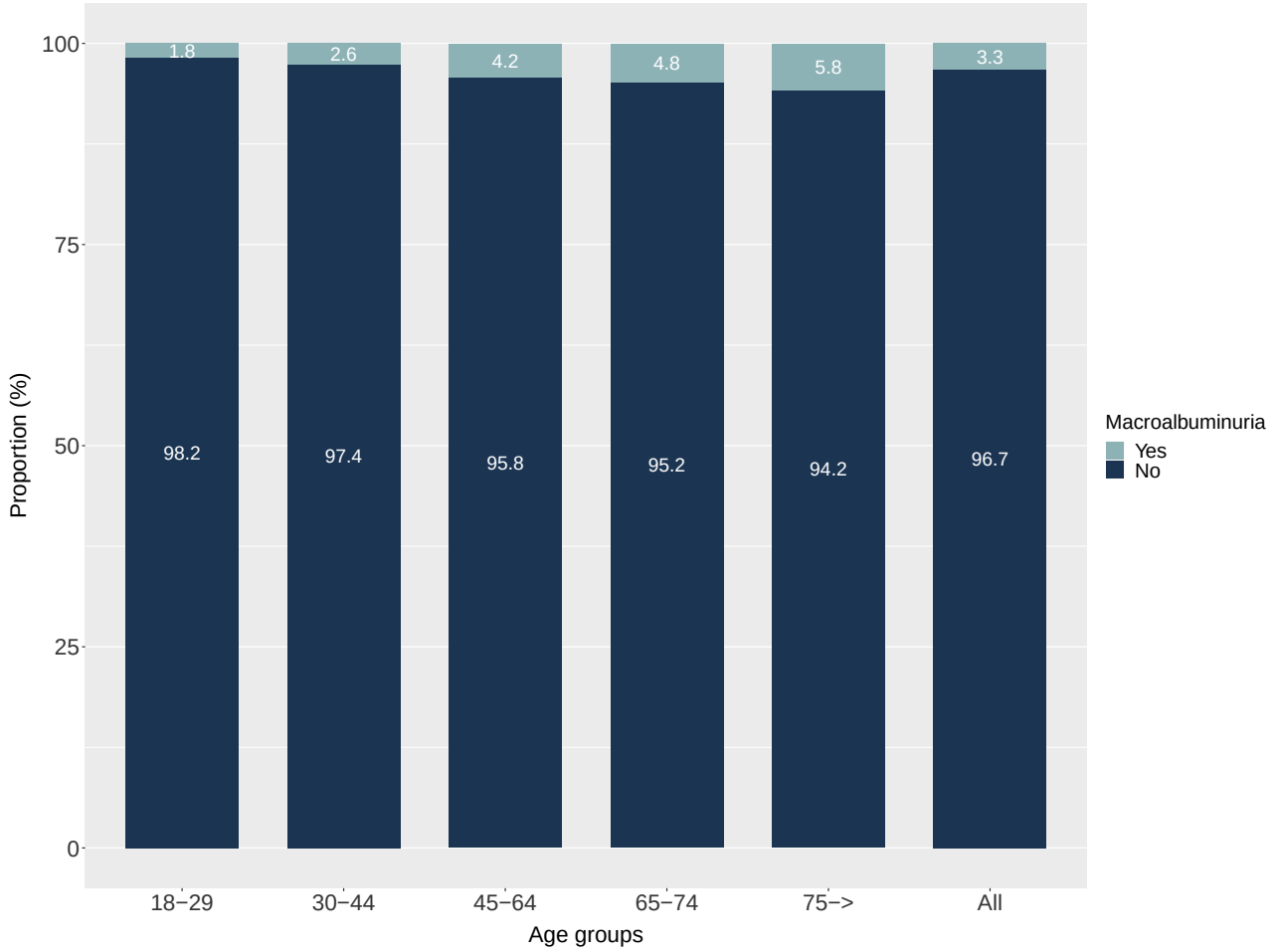


Figure 25: Macroalbuminuria by age groups (DM type I)

10.3.5.6 Smoking habits

Information on smoking habits was possible to extract for 7,732 (82.0%) of 9,426 DM type I patients ($\geqslant$ 18 years of age).

The table below shows the age distribution of patients with available information on smoking habits:

Table 44: Age distribution of the extracted information on smoking habits

Age group	Number of patients
18-29	1675
30-44	2338
45-64	2631
65-74	774
75->	314
All	7732

The figure below presents smoking habits by age groups:

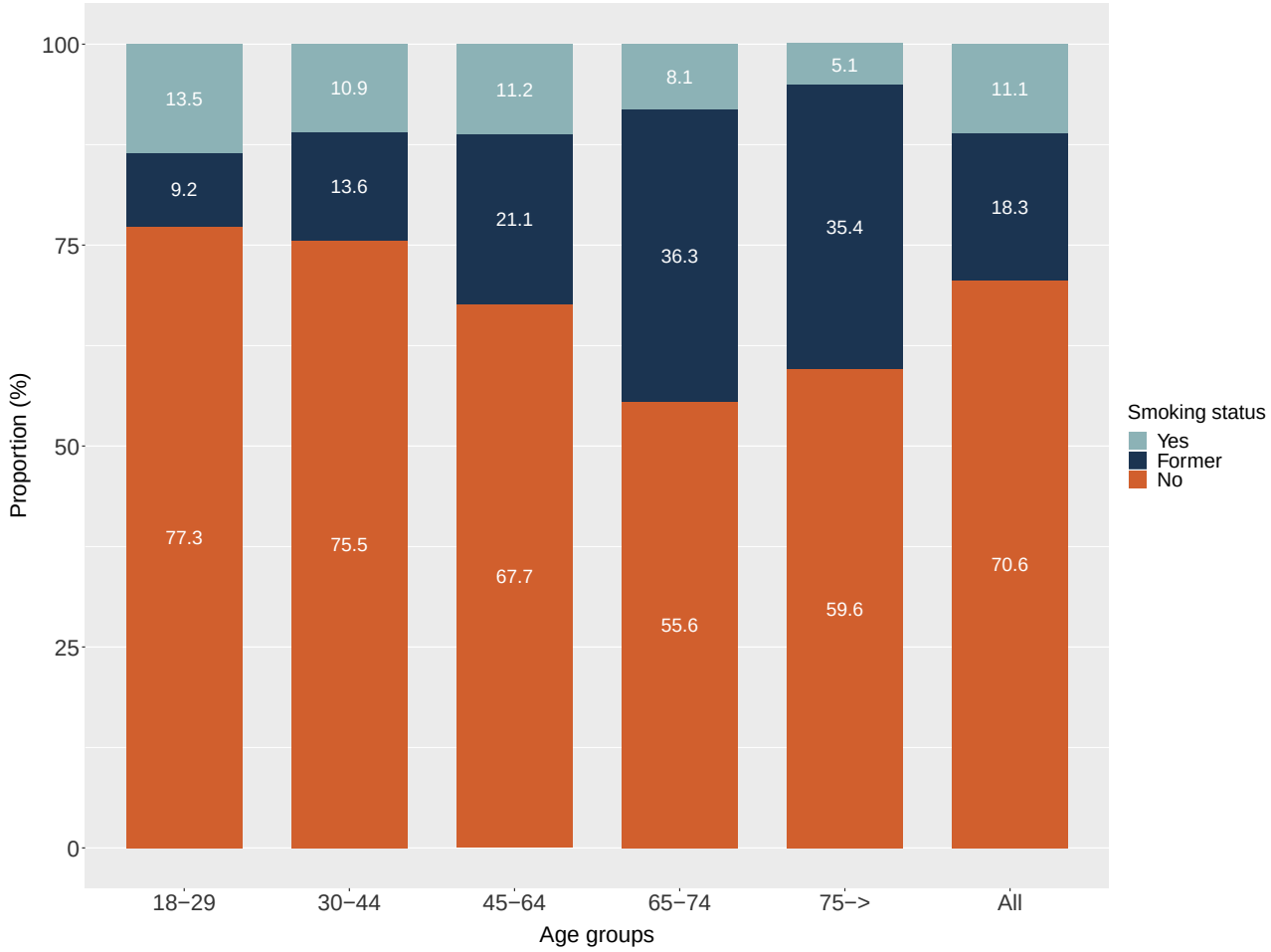


Figure 26: Smoking habits by age groups (DM type I)

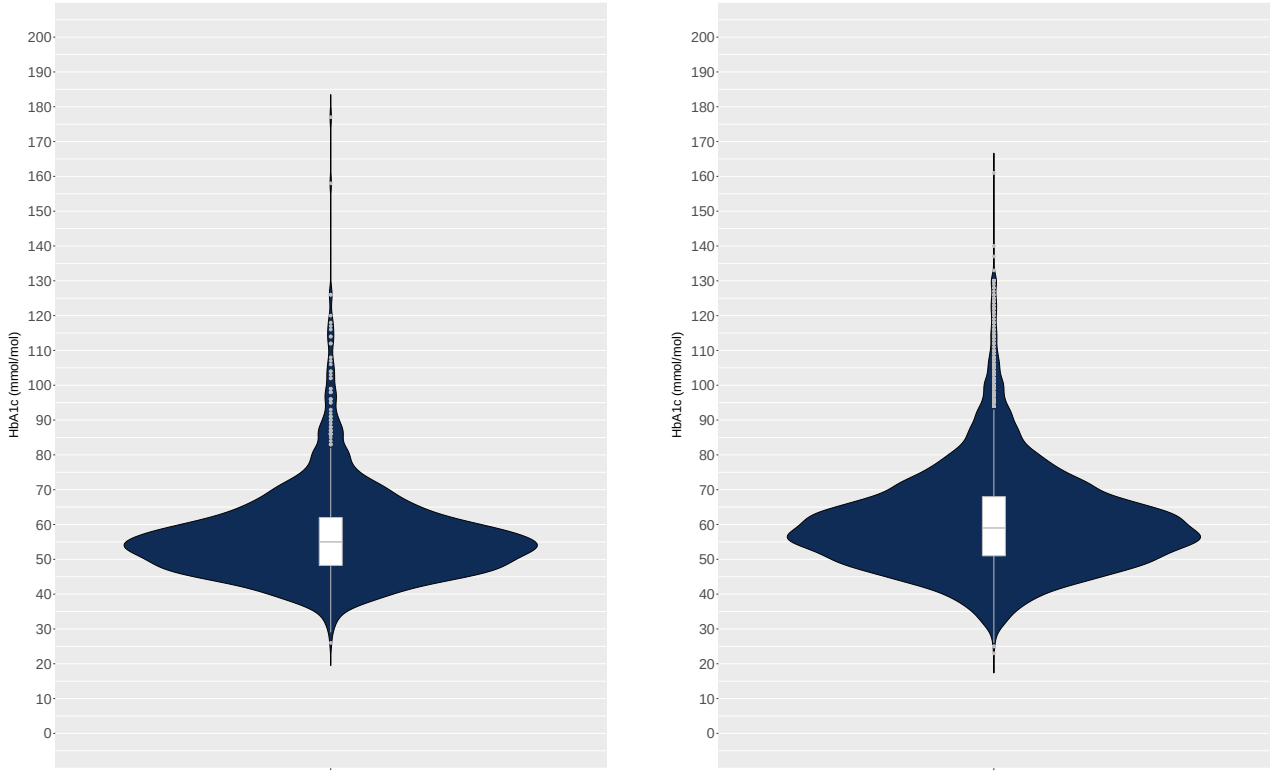
10.3.5.7 HbA1c

Information on HbA1c was possible to extract for 9,446 (87.3%) of 10,819 DM type I patients.

Table 45: HbA1c distribution for patients diagnosed with DM type I

Age group	Number of patients	Mean HbA1c	SD	Median HbA1c	IQR
0-17	1382	56.9	13.5	55	13.8
18-29	1849	61.7	16.9	59	17.0
30-44	2458	59.3	14.8	57	17.0
45-64	2690	61.7	13.6	60	16.0
65-74	771	60.6	12.3	59	15.0
75->	296	60.8	11.9	59	13.2
Total	9446	60.3	14.5	58	16.0

The figures below present violin plots for HbA1c:



(a) Distribution of HbA1c for DM type I patients $<$ 18 years of age

(b) Distribution of HbA1c for DM type I patients $\geqslant$ 18 years of age

Figure 27: Distribution of HbA1c for DM type I patients

10.3.5.7.1 HbA1c categories

This chart presents proportion of DM type I patients in each HbA1c strata by age groups:

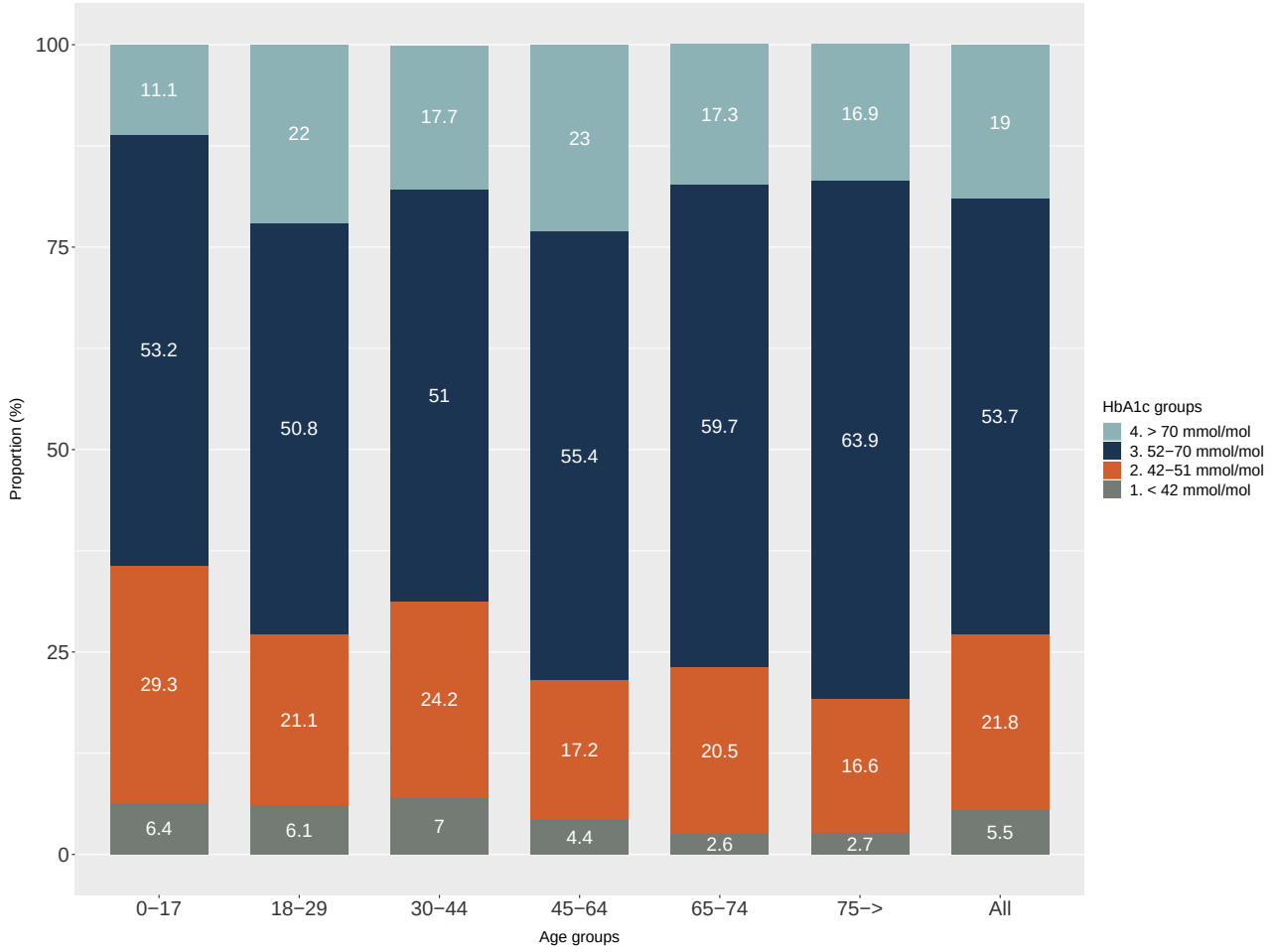


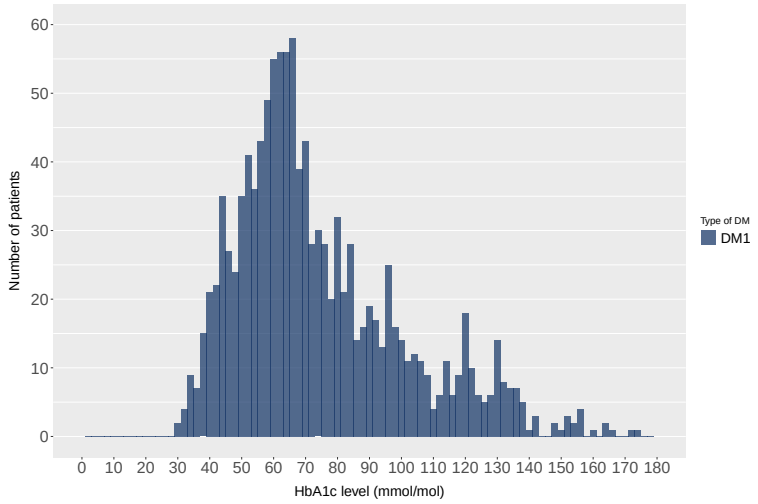
Figure 28: HbA1c strata by age groups for patients with DM type I

10.3.5.7.2 HbA1c levels at initiation of GLD therapy

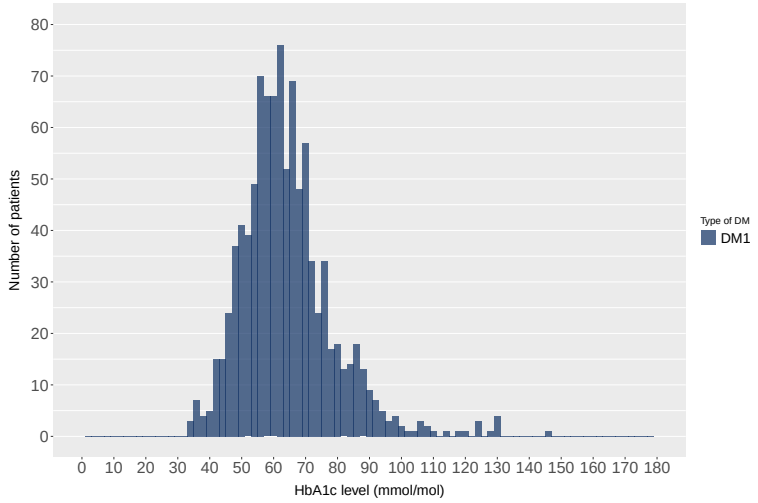
In this section, HbA1c levels at initiation of different GLD classes have been analysed according to the following procedure:

1. Select the patients' first recorded dispensation within each drug class
2. Select all patients having their first dispensation between 01 January 2012 and 31 December 2018
3. Categorize all patients into DM type I and type II according to the defined epidemiologic algorithm
4. Select the most recent HbA1c level before initiation of the drug (the HbA1c level must have been recorded within two years before initiation of the drug)

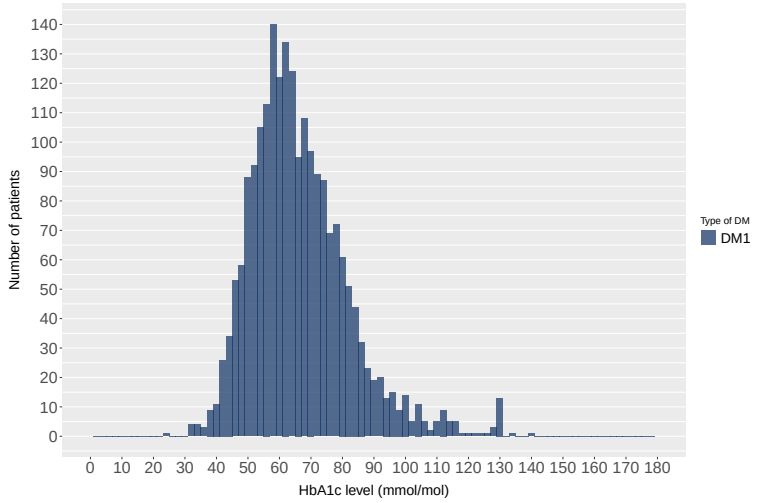
The histogram below presents HbA1c levels at initiation of the long acting insulins; insulin glargin 100, insulin glargin 300 and insulin degludec:



(a) Last recorded HbA1c value before initiation of insulin glargin 100 ⩾ 18 years of age



(b) Last recorded HbA1c value before initiation of insulin glargin 300 ⩾ 18 years of age



(c) Last recorded HbA1c value before initiation of insulin degludec ⩾ 18 years of age

Figure 29: HbA1c levels at initiation of long acting insulins for DM type I patients

10.3.5.8 Lipid profile

Blood lipid profile (total cholesterol, LDL, HDL and triglycerides) were analysed for DM type I patients $\geqslant$ 18 years of age.

Blood lipids were possible to obtain for the following number of patients:

Table 46: Number of patients with data on total cholesterol

Age group	Number of patients
18-29	1579
30-44	2177
45-64	2556
65-74	745
75->	286
All	7343

Table 47: Number of patients with data on LDL cholesterol

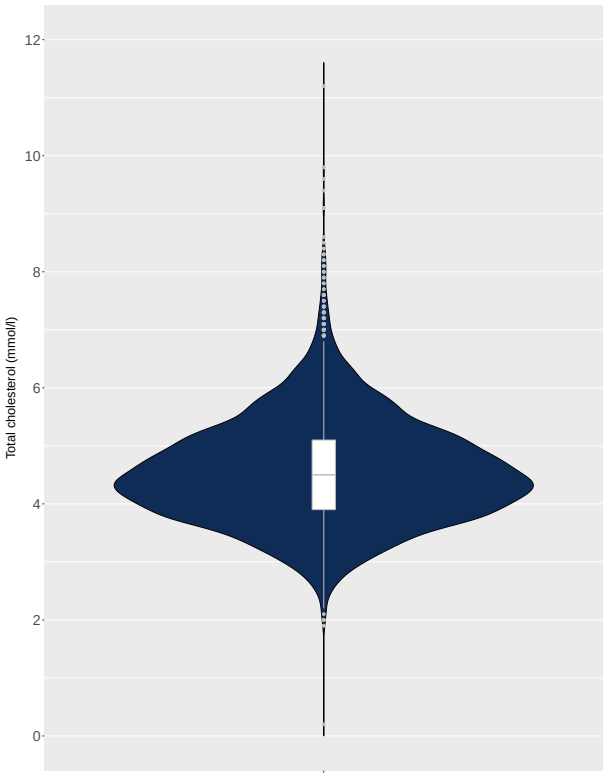
Age group	Number of patients
18-29	1482
30-44	2067
45-64	2427
65-74	716
75->	273
All	6965

Table 48: Number of patients with data on HDL cholesterol

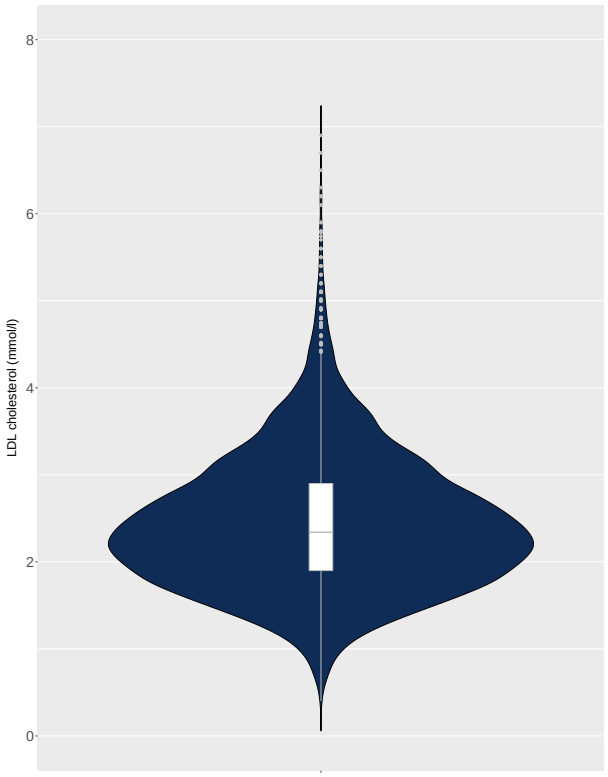
Age group	Number of patients
18-29	1576
30-44	2175
45-64	2549
65-74	746
75->	285
All	7331

Table 49: Number of patients with data on triglycerides

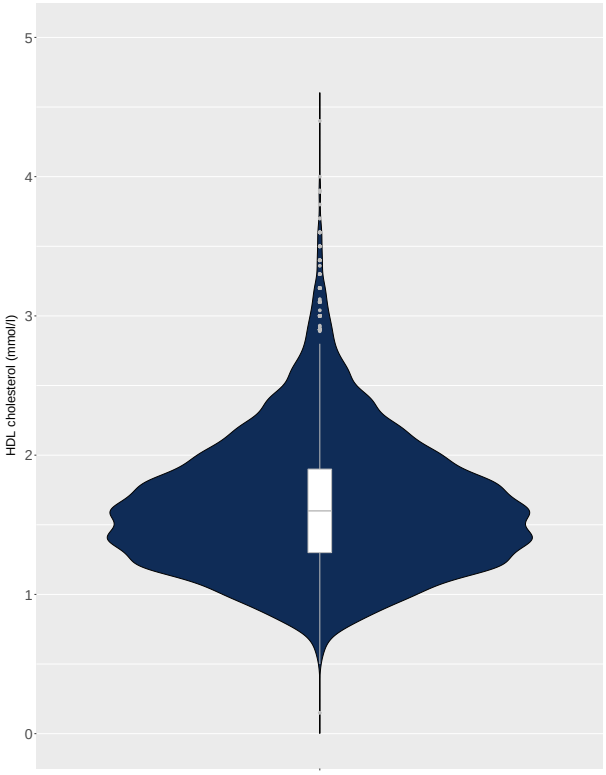
Age group	Number of patients
18-29	1524
30-44	2137
45-64	2519
65-74	737
75->	282
All	7199



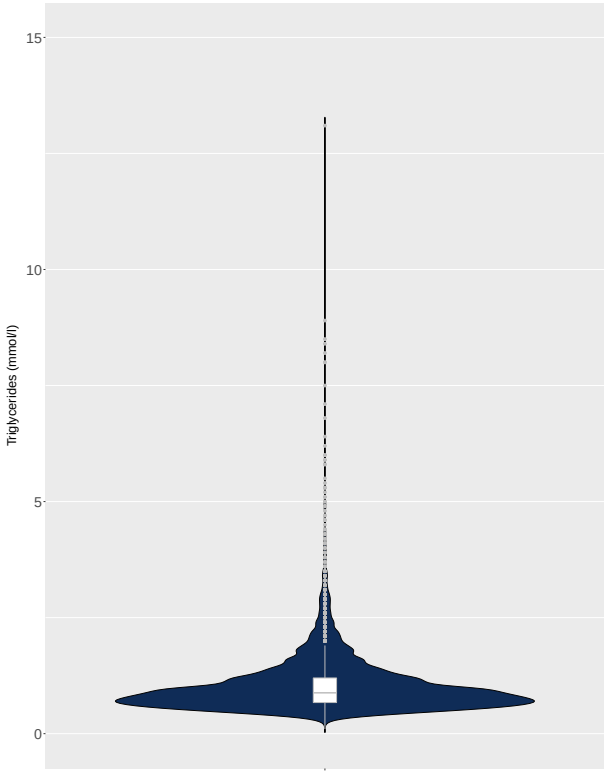
(a) Distribution of total cholesterol for DM type I patients (⩾ 18 years of age)



(b) Distribution of LDL cholesterol for DM type I patients (⩾ 18 years of age)



(c) Distribution of HDL cholesterol for DM type I patients (⩾ 18 years of age)



(d) Distribution of triglycerides for DM type I patients (⩾ 18 years of age)

Figure 30: Blood lipid profile for DM type I patients (⩾ 18 years of age)

10.3.5.9 Hypoglycaemias

10.3.5.9.1 Information on severe hypoglycaemias based on EHR data

Information on severe hypoglycaemias (past 12 months) was possible to obatin from EHRs for the following number of patients:

Table 50: Number of patients with data recorded on severe hypoglycaemia

Variable	Age group	Number of patients with recording	All patients with DM type I	Proportion of patients with a recording of hypoglycaemia
Information on severe hypoglycemia (past 12 months)	18-29	1455	2048	71.0
	30-44	2091	2951	70.9
	45-64	2309	3148	73.3
	65-74	653	905	72.2
	75->	235	374	62.8
	All	6743	9426	71.5

Note: This table only presents if information on severe hypoglycaemia has been recorded in the EHR and **not** if the patient has had a severe hypoglycaemia.

The figure below presents the frequency of severe hypoglycaemias (past 12 months) by age groups using data from EHRs:

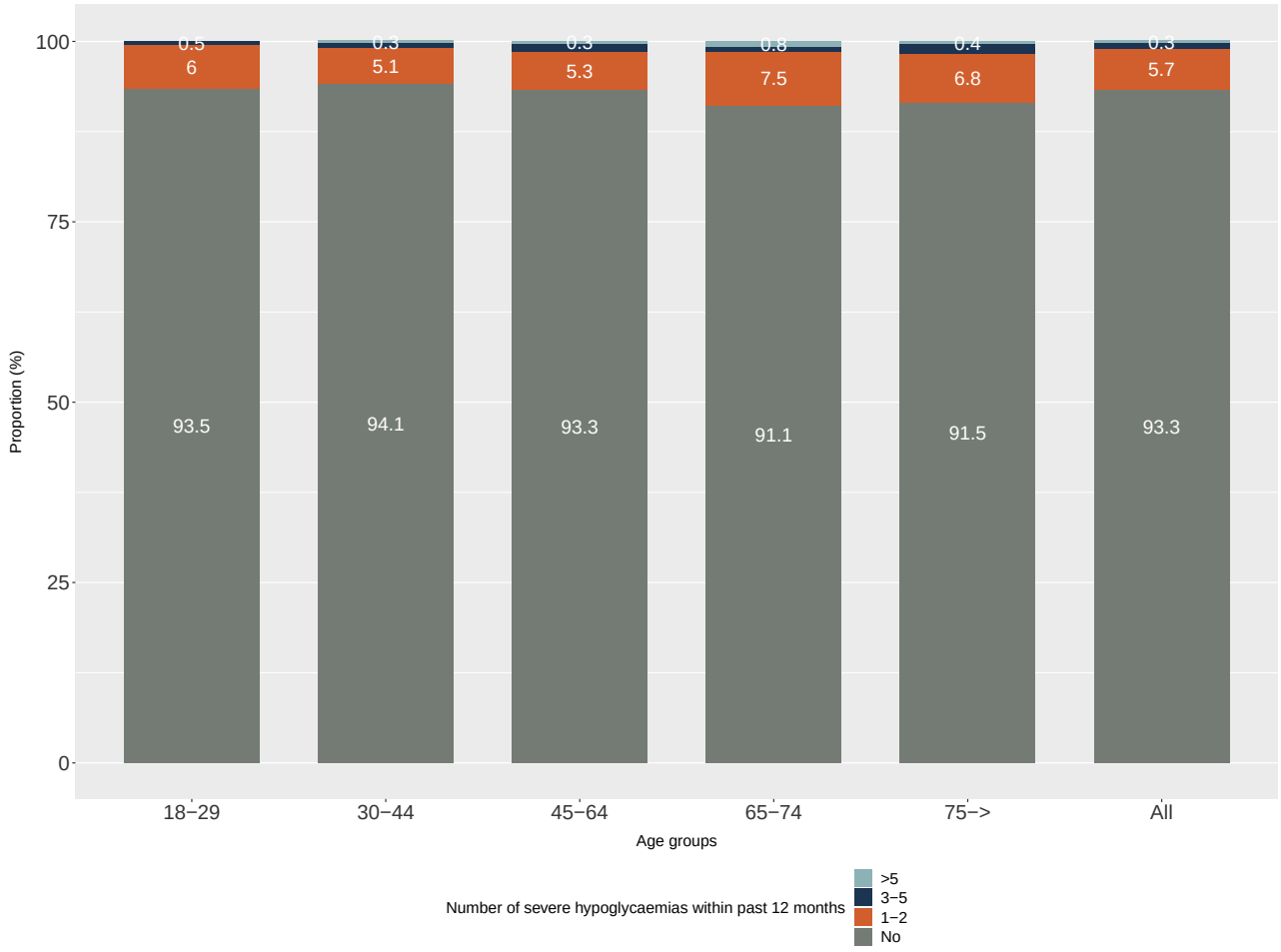


Figure 31: Recording of severe hypoglycaemia (past 12 months) for patients with DM type I

10.3.5.9.2 Information on hypoglycaemias based on diagnosis data

Table 51: Number of patients with a recorded diagnosis of hypoglycaemia within the past two years (based on diagnosis data)

	Age group	Patients (n) with hypoglycaemia	All DM I patients	Proportion of DM I patients with hypoglycaemia
Hypoglycemia (according to diagnosis)	0-17	60	1393	4.3
	18-29	71	2048	3.5
	30-44	83	2951	2.8
	45-64	118	3148	3.7
	65-74	44	905	4.9
	75->	23	374	6.1
	All	399	10819	3.7

10.3.5.10 Lactic acidosis

Table 52: Number of patients with a recorded diagnosis of lactic acidosis within the past two years (based on diagnosis data)

	Age group	Patients (n) with lactic acidosis	All DM I patients	Proportion of DM I patients with lactic acidosis
Lactic acidosis (according to diagnosis)	All	5	10819	0.05

10.3.5.11 Diabetic ketoacidosis

Table 53: Number of patients with a recorded diagnosis of ketoacidosis within the past two years (based on diagnosis data)

	Age group	Patients (n) with ketoacidosis	All DM I patients	Proportion of DM I patients with ketoacidosis
Ketoacidosis (according to diagnosis)	0-17	73	1393	5.24
	18-29	52	2048	2.54
	30-44	36	2951	1.22
	45-64	28	3148	0.89
	65-74	14	905	1.55
	75->	7	374	1.87
	All	210	10819	1.94

10.3.5.12 Diabetes eyes

10.3.5.12.1 Fundus photography

The table presents data on performed fundus photography for patients with DM type I.

Table 54: Number of patients with a recorded clinical procedure code for fundus photography

	Age group	Patients (n) with fundus photography	All DM I patients	Proportion of DM I patients with fundus photography
Fundus photography within past 12 months	0-17	519	1393	37.3
	18-29	1153	2048	56.3
	30-44	1739	2951	58.9
	45-64	1637	3148	52.0
	65-74	408	905	45.1
	75->	144	374	38.5
	All	5600	10819	51.8
Fundus photography within past 36 months	0-17	898	1393	64.5
	18-29	1808	2048	88.3
	30-44	2540	2951	86.1
	45-64	2487	3148	79.0
	65-74	617	905	68.2
	75->	232	374	62.0
	All	8582	10819	79.3
Fundus photography (ever)	0-17	912	1393	65.5
	18-29	1956	2048	95.5
	30-44	2801	2951	94.9
	45-64	2913	3148	92.5
	65-74	776	905	85.7
	75->	314	374	84.0
	All	9672	10819	89.4

10.3.5.12.2 Retinopathy

The following table presents the number of DM type I patients (all ages) with information on retinopathy from EHRs:

Table 55: Number of patients with information on retinopathy (EHR data)

	Age group	Patients (n) with information on retinopathy	All DM I patients	Proportion of DM I patients with information on retinopathy
Recording of retinopathy	0-17	787	1393	56.5
	18-29	1805	2048	88.1
	30-44	2626	2951	89.0
	45-64	2729	3148	86.7
	65-74	733	905	81.0
	75->	283	374	75.7
	All	8963	10819	82.8

Note: This table only presents if information on retinopathy has been recorded in the EHR and **not** if the patient has retinopathy.

The figures below present frequency of retinopathy among patients with DM type I:

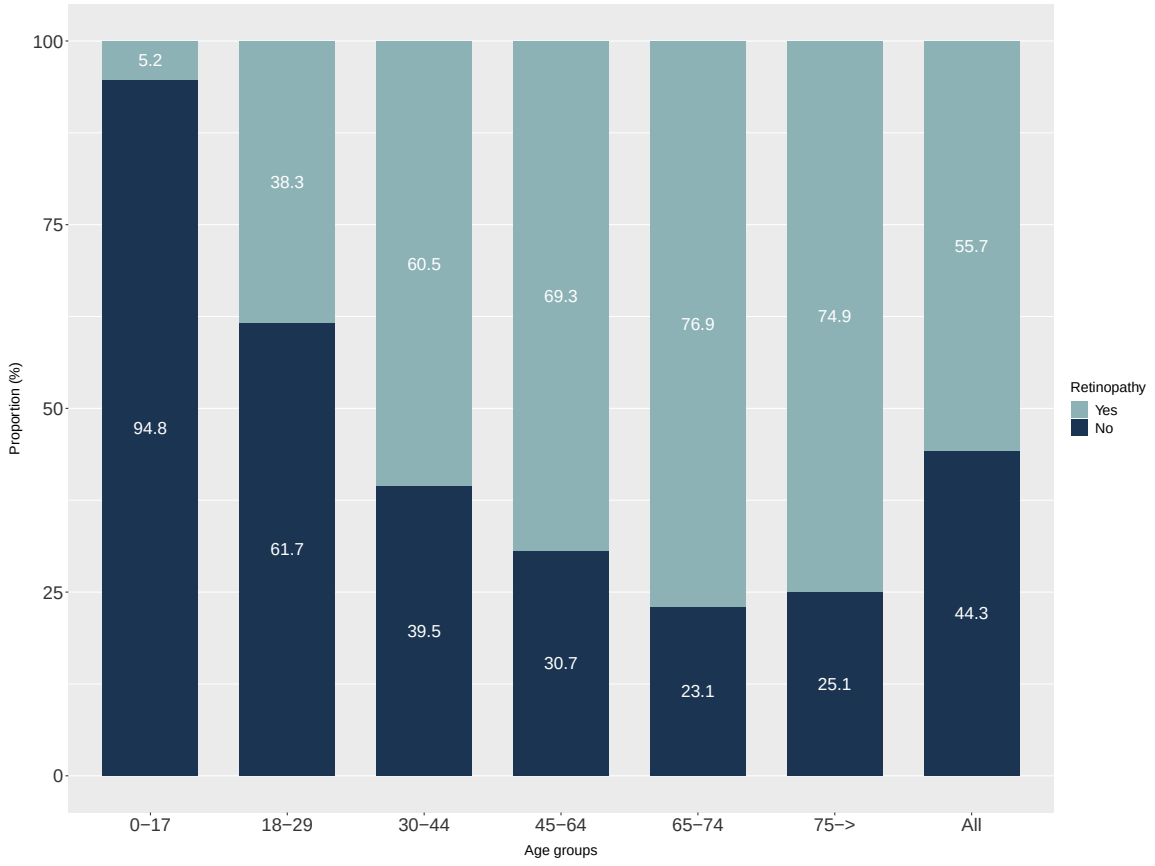


Figure 32: Retinopathy among patients with DM type I (EHR data)

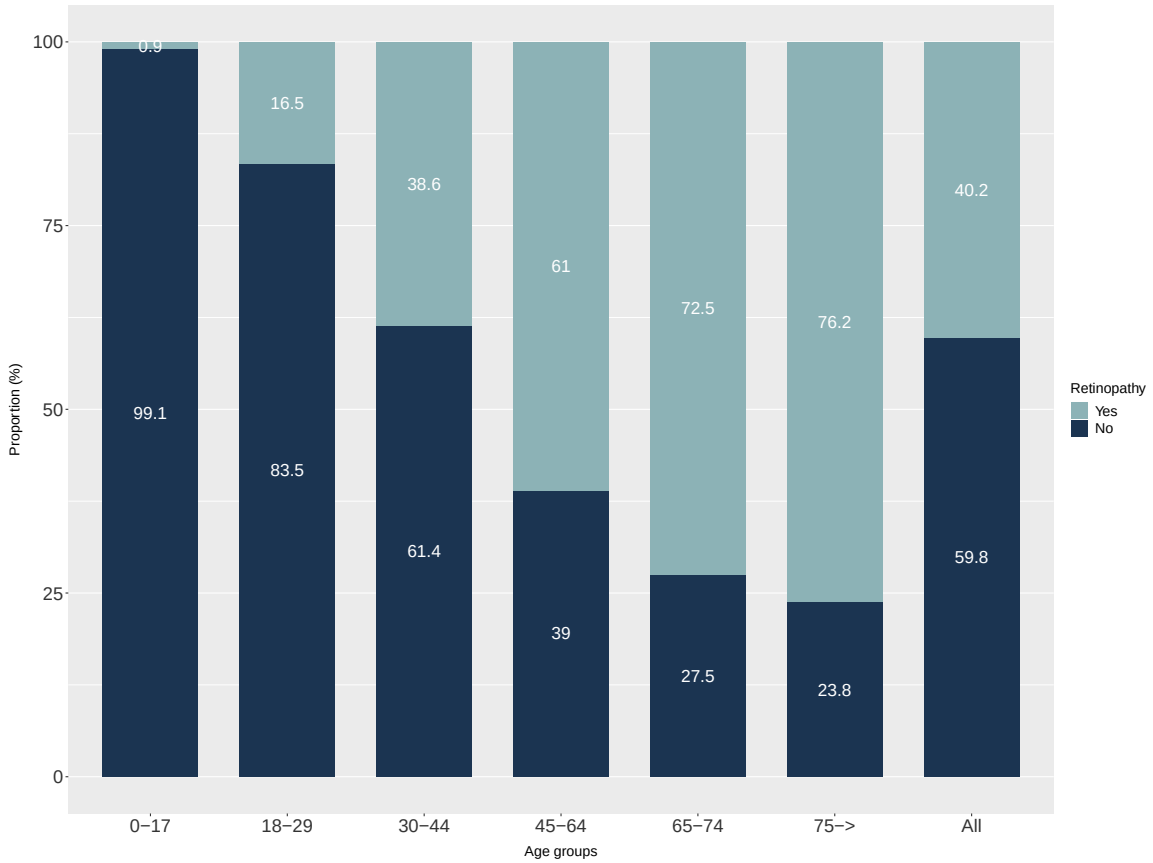


Figure 33: Retinopathy among patients with DM type I (diagnosis)

10.3.5.12.3 DME

The following table presents data on DME for patients with DM type I:

Table 56: Number of patients with a recorded ICD10 diagnosis of DME

	Age group	Patients (n) with DME	All DM I patients	Proportion of DM I patients with DME
DME (ever recorded)	0-17	0	1393	0.0
	18-29	8	2048	0.4
	30-44	53	2951	1.8
	45-64	98	3148	3.1
	65-74	44	905	4.9
	75->	21	374	5.6
	All	224	10819	2.1

Note: Since the selection of DME was only based on recorded ICD10 diagnoses, we expect an underestimation of DME in this analysis. It is likely that DME patients are also present among patients with retinopathy above.

10.3.5.12.4 Vitreous body treatment

The following table presents data on patients with a recorded procedure code for drug therapy in the vitreous body.

Table 57: Patients treated with drugs in the vitreous body

	Age group	Patients (n) treated	All DM I patients	Proportion of patients treated (%)
Drug therapy in the vitreous body (ever recorded)	0-17	0	1393	0.0
	18-29	14	2048	0.7
	30-44	69	2951	2.3
	45-64	113	3148	3.6
	65-74	56	905	6.2
	75->	34	374	9.1
	All	286	10819	2.6

10.3.5.13 Bariatric surgery

The following table presents data on the frequency of bariatric surgery for patients with DM type I:

Table 58: Bariatric surgery among patients with DM type I

	Age group	Patients (n) with bariatric surgery	All DM I patients	Proportion of patients with bariatric surgery
Bariatric surgery (according to procedure codes)	0-17	0	1393	0
	18-29	<5	2048	n/a
	30-44	36	2951	1.2
	45-64	49	3148	1.6
	65-74	7	905	0.8
	75->	0	374	0
	All	96	10819	0.9

10.3.5.14 Diabetes foot

10.3.5.14.1 Diabetic foot ulcer

The following table presents data on the frequency of diabetic foot ulcer for patients with DM type I:

Table 59: Diabetic foot ulcer among patient with DM type I

	Age group	Patients (n) with foot ulcer	All DM I patients	Proportion of patients with foot ulcer
Diabetic foot ulcer (according to diagnosis)	0-17	8	1393	0.6
	18-29	21	2048	1.0
	30-44	63	2951	2.1
	45-64	173	3148	5.5
	65-74	81	905	9.0
	75->	45	374	12.0
	All	391	10819	3.6

10.3.5.14.2 Charcot foot

The following table presents data on the frequency of Charcot foot for patients with DM type I:

Table 60: Charcot foot among patients with DM type I

	Age group	Patients (n) with Charcot foot	All DM I patients	Proportion of patients with Charcot foot
Charcot foot (according to diagnosis)	0-17	0	1393	0
	18-29	<5	2048	n/a
	30-44	21	2951	0.7
	45-64	85	3148	2.7
	65-74	47	905	5.2
	75->	13	374	3.5
	All	168	10819	1.6

10.3.5.14.3 Amputation of lower limb

The following table presents data on the frequency of amputation of lower limb for patients with DM type I:

Table 61: Amputation of lower limb among patients with DM type I

	Age group	Patients (n) with an amputation	All DM I patients	Proportion of patients with an amputation
Amputation of lower limb (according to procedure codes)	0-17	0	1393	0.0
	18-29	0	2048	0.0
	30-44	12	2951	0.4
	45-64	60	3148	1.9
	65-74	35	905	3.9
	75->	23	374	6.1
	All	130	10819	1.2

10.3.5.14.4 Revascularization of lower limb

The following table presents data on the frequency of revascularization of lower limb for patients with DM type I:

Table 62: Revascularization of lower limb among patients with DM type I

	Age group	Patients (n) with a revascularization	All DM I patients	Proportion of patients with a revascularization
Revascularization of lower limb (according to procedure codes)	0-17	0	1393	0
	18-29	0	2048	0
	30-44	<5	2951	n/a
	45-64	43	3148	1.4
	65-74	53	905	5.9
	75->	30	374	8
	All	127	10819	1.2

10.3.5.15 Insulin pumps and glucose monitoring

10.3.5.15.1 Insulin pumps

The following table presents data on insulin pumps for patients with DM type I:

Table 63: DM type I patients with insulin pumps

	Age group	Patients (n) with insulin pumps	All DM I patients	Proportion of DM I patients with insulin pump
Insulin pump use	0-17	1041	1393	74.7
	18-29	639	2048	31.2
	30-44	610	2951	20.7
	45-64	544	3148	17.3
	65-74	74	905	8.2
	75->	17	374	4.5
	All	2925	10819	27.0

10.3.5.15.2 CGM/FGM

The following table presents data on CGM/FGM for patients with DM type I:

Table 64: DM type I patients with CGM/FGM

	Age group	Patients (n) with CGM/FGM	All DM I patients	Proportion of DM I patients with CGM/FGM
CGM/FGM use	0-17	1080	1393	77.5
	18-29	1652	2048	80.7
	30-44	2225	2951	75.4
	45-64	2187	3148	69.5
	65-74	559	905	61.8
	75->	178	374	47.6
	All	7881	10819	72.8

10.3.6 Comorbidity

This section presents comorbid conditions among patients with DM type I.

10.3.6.1 Cardiovascular comorbidity

The following table presents data on cardiovascular comorbidity for patients with DM type I:

Table 65: Cardiovascular comorbidity among patients with DM type I

Comorbidity		All	DM type I patients (>=18)
N		10,819	9,426
Age	Mean (SD)	40.4 (18.6)	44.6 (16.2)
	Median (IQR)	40.0 (26.1, 54.0)	43.1 (31.0, 56.0)
Sex	Female	4,766 (44.1%)	4,119 (43.7%)
	Male	6,053 (55.9%)	5,307 (56.3%)
Cardiovascular comorbidity (IHD, CHF, AFIB, STROKE/TIA, PAD) - all healthcare levels	Yes	1,224 (11.3%)	1,218 (12.9%)
	No	9,595 (88.7%)	8,208 (87.1%)
Cardiovascular comorbidity (IHD, CHF, AFIB, STROKE/TIA, PAD) - inpatient care (all diagnosis positions)	Yes	949 (8.8%)	946 (10.0%)
	No	9,870 (91.2%)	8,480 (90.0%)
Cardiovascular comorbidity (IHD, CHF, AFIB, STROKE/TIA, PAD) - inpatient care (primary diagnosis position)	Yes	846 (7.8%)	846 (9.0%)
	No	9,973 (92.2%)	8,580 (91.0%)
Cardiovascular comorbidity (excl AFIB) - all healthcare levels	Yes	1,144 (10.6%)	1,138 (12.1%)
	No	9,675 (89.4%)	8,288 (87.9%)
Cardiovascular comorbidity (excl AFIB) - inpatient care (all diagnosis positions)	Yes	884 (8.2%)	881 (9.3%)
	No	9,935 (91.8%)	8,545 (90.7%)
Cardiovascular comorbidity (excl AFIB) - inpatient care (primary diagnosis position)	Yes	806 (7.4%)	806 (8.6%)
	No	10,013 (92.6%)	8,620 (91.4%)
AMI - all healthcare levels	Yes	266 (2.5%)	266 (2.8%)
	No	10,553 (97.5%)	9,160 (97.2%)
AMI - inpatient care (all diagnosis positions)	Yes	249 (2.3%)	249 (2.6%)
	No	10,570 (97.7%)	9,177 (97.4%)
AMI - inpatient care (primary diagnosis position)	Yes	234 (2.2%)	234 (2.5%)
	No	10,585 (97.8%)	9,192 (97.5%)
CHF - all healthcare levels	Yes	287 (2.7%)	286 (3.0%)
	No	10,532 (97.3%)	9,140 (97.0%)
CHF - inpatient care (all diagnosis positions)	Yes	195 (1.8%)	194 (2.1%)
	No	10,624 (98.2%)	9,232 (97.9%)
CHF - inpatient care (primary diagnosis position)	Yes	99 (0.9%)	99 (1.1%)
	No	10,720 (99.1%)	9,327 (98.9%)
STROKE/TIA - all healthcare levels	Yes	388 (3.6%)	387 (4.1%)
	No	10,431 (96.4%)	9,039 (95.9%)
STROKE/TIA - inpatient care (all diagnosis positions)	Yes	318 (2.9%)	318 (3.4%)
	No	10,501 (97.1%)	9,108 (96.6%)
STROKE/TIA - inpatient care (primary diagnosis position)	Yes	299 (2.8%)	299 (3.2%)
	No	10,520 (97.2%)	9,127 (96.8%)
PAD - all healthcare levels	Yes	357 (3.3%)	353 (3.7%)
	No	10,462 (96.7%)	9,073 (96.3%)
PAD - inpatient care (all diagnosis positions)	Yes	202 (1.9%)	200 (2.1%)
	No	10,617 (98.1%)	9,226 (97.9%)
PAD - inpatient care (primary diagnosis position)	Yes	167 (1.5%)	167 (1.8%)
	No	10,652 (98.5%)	9,259 (98.2%)
AFIB - all healthcare levels	Yes	229 (2.1%)	229 (2.4%)
	No	10,590 (97.9%)	9,197 (97.6%)
AFIB - inpatient care (all diagnosis positions)	Yes	177 (1.6%)	177 (1.9%)
	No	10,642 (98.4%)	9,249 (98.1%)
AFIB - inpatient care (primary diagnosis position)	Yes	81 (0.7%)	81 (0.9%)
	No	10,738 (99.3%)	9,345 (99.1%)
IHD - all healthcare levels	Yes	619 (5.7%)	619 (6.6%)
	No	10,200 (94.3%)	8,807 (93.4%)
IHD - inpatient care (all diagnosis positions)	Yes	512 (4.7%)	512 (5.4%)
	No	10,307 (95.3%)	8,914 (94.6%)
IHD - inpatient care (primary diagnosis position)	Yes	460 (4.3%)	460 (4.9%)
	No	10,359 (95.7%)	8,966 (95.1%)
Hypertension - all healthcare levels	Yes	3,139 (29.0%)	3,137 (33.3%)
	No	7,680 (71.0%)	6,289 (66.7%)
Hypertension - inpatient care (all diagnosis positions)	Yes	1,455 (13.4%)	1,455 (15.4%)
	No	9,364 (86.6%)	7,971 (84.6%)
Hypertension - inpatient care (primary diagnosis position)	Yes	44 (0.4%)	44 (0.5%)
	No	10,775 (99.6%)	9,382 (99.5%)

10.3.6.2 Psychiatric comorbidity

The following table presents data on psychiatric comorbid conditions for patients with DM type I:

Table 66: Psychiatric comorbidity among patients with DM type I

Comorbidity		All	DM type I patients (>=18)
N		10,819	9,426
Age	Mean (SD)	40.4 (18.6)	44.6 (16.2)
	Median (IQR)	40.0 (26.1, 54.0)	43.1 (31.0, 56.0)
Sex	Female	4,766 (44.1%)	4,119 (43.7%)
	Male	6,053 (55.9%)	5,307 (56.3%)
Psychiatric comorbidity - all healthcare levels	Yes	2,927 (27.1%)	2,723 (28.9%)
	No	7,892 (72.9%)	6,703 (71.1%)
Psychiatric comorbidity- inpatient care (all diagnosis positions)	Yes	656 (6.1%)	617 (6.5%)
	No	10,163 (93.9%)	8,809 (93.5%)
Psychiatric comorbidity - inpatient care (primary diagnosis position)	Yes	312 (2.9%)	303 (3.2%)
	No	10,507 (97.1%)	9,123 (96.8%)
Anxiety - all healthcare levels	Yes	1,525 (14.1%)	1,467 (15.6%)
	No	9,294 (85.9%)	7,959 (84.4%)
Anxiety - inpatient care (all diagnosis positions)	Yes	187 (1.7%)	185 (2.0%)
	No	10,632 (98.3%)	9,241 (98.0%)
Anxiety - inpatient care (primary diagnosis position)	Yes	80 (0.7%)	78 (0.8%)
	No	10,739 (99.3%)	9,348 (99.2%)
Depression - all healthcare levels	Yes	1,825 (16.9%)	1,787 (19.0%)
	No	8,994 (83.1%)	7,639 (81.0%)
Depression - inpatient care (all diagnosis positions)	Yes	308 (2.8%)	304 (3.2%)
	No	10,511 (97.2%)	9,122 (96.8%)
Depression - inpatient care (primary diagnosis position)	Yes	159 (1.5%)	156 (1.7%)
	No	10,660 (98.5%)	9,270 (98.3%)
Dementia - all healthcare levels	Yes	57 (0.5%)	57 (0.6%)
	No	10,762 (99.5%)	9,369 (99.4%)
Dementia - inpatient care (all diagnosis positions)	Yes	30 (0.3%)	30 (0.3%)
	No	10,789 (99.7%)	9,396 (99.7%)
Dementia - inpatient care (primary diagnosis position)	Yes	9 (0.1%)	9 (0.1%)
	No	10,810 (99.9%)	9,417 (99.9%)
Psychosis - all healthcare levels	Yes	96 (0.9%)	95 (1.0%)
	No	10,723 (99.1%)	9,331 (99.0%)
Psychosis - inpatient care (all diagnosis positions)	Yes	70 (0.6%)	69 (0.7%)
	No	10,749 (99.4%)	9,357 (99.3%)
Psychosis - inpatient care (primary diagnosis position)	Yes	54 (0.5%)	54 (0.6%)
	No	10,765 (99.5%)	9,372 (99.4%)
Neuropsychiatric disorder - all healthcare levels	Yes	982 (9.1%)	824 (8.7%)
	No	9,837 (90.9%)	8,602 (91.3%)
Neuropsychiatric disorder - inpatient care (all diagnosis positions)	Yes	261 (2.4%)	226 (2.4%)
	No	10,558 (97.6%)	9,200 (97.6%)
Neuropsychiatric disorder - inpatient care (primary diagnosis position)	Yes	82 (0.8%)	77 (0.8%)
	No	10,737 (99.2%)	9,349 (99.2%)

10.3.6.3 Cancer

The following table presents data on cancer for patients with DM type I:

Table 67: Cancer among patients with DM type I

Comorbidity		All	DM type I patients (>=18)
N		10,819	9,426
Age	Mean (SD)	40.4 (18.6)	44.6 (16.2)
	Median (IQR)	40.0 (26.1, 54.0)	43.1 (31.0, 56.0)
Sex	Female	4,766 (44.1%)	4,119 (43.7%)
	Male	6,053 (55.9%)	5,307 (56.3%)
Cancer (malignancy) - all healthcare levels	Yes	599 (5.5%)	593 (6.3%)
	No	10,220 (94.5%)	8,833 (93.7%)
Cancer (malignancy) inpatient care (all diagnosis positions)	Yes	296 (2.7%)	293 (3.1%)
	No	10,523 (97.3%)	9,133 (96.9%)
Cancer (malignancy) - inpatient care (primary diagnosis position)	Yes	241 (2.2%)	238 (2.5%)
	No	10,578 (97.8%)	9,188 (97.5%)
Breast cancer - all healthcare levels	Yes	88 (0.8%)	88 (0.9%)
	No	10,731 (99.2%)	9,338 (99.1%)
Breast cancer - inpatient care (all diagnosis positions)	Yes	63 (0.6%)	63 (0.7%)
	No	10,756 (99.4%)	9,363 (99.3%)
Breast cancer - inpatient care (primary diagnosis position)	Yes	62 (0.6%)	62 (0.7%)
	No	10,757 (99.4%)	9,364 (99.3%)
Prostate cancer - all healthcare levels	Yes	73 (0.7%)	73 (0.8%)
	No	10,746 (99.3%)	9,353 (99.2%)
Prostate cancer - inpatient care (all diagnosis positions)	Yes	49 (0.5%)	49 (0.5%)
	No	10,770 (99.5%)	9,377 (99.5%)
Prostate cancer - inpatient care (primary diagnosis position)	Yes	36 (0.3%)	36 (0.4%)
	No	10,783 (99.7%)	9,390 (99.6%)
Pancreas cancer - all healthcare levels	Yes	7 (0.1%)	7 (0.1%)
	No	10,812 (99.9%)	9,419 (99.9%)
Pancreas cancer - inpatient care (all diagnosis positions)	Yes	5 (0.0%)	5 (0.1%)
	No	10,814 (100.0%)	9,421 (99.9%)
Pancreas cancer - inpatient care (primary diagnosis position)	Yes	5 (0.0%)	5 (0.1%)
	No	10,814 (100.0%)	9,421 (99.9%)
Bladder cancer - all healthcare levels	Yes	23 (0.2%)	23 (0.2%)
	No	10,796 (99.8%)	9,403 (99.8%)
Bladder cancer - inpatient care (all diagnosis positions)	Yes	16 (0.1%)	16 (0.2%)
	No	10,803 (99.9%)	9,410 (99.8%)
Bladder cancer - inpatient care (primary diagnosis position)	Yes	15 (0.1%)	15 (0.2%)
	No	10,804 (99.9%)	9,411 (99.8%)
Colon cancer cancer - all healthcare levels	Yes	30 (0.3%)	29 (0.3%)
	No	10,789 (99.7%)	9,397 (99.7%)
Colon cancer - inpatient care (all diagnosis positions)	Yes	21 (0.2%)	21 (0.2%)
	No	10,798 (99.8%)	9,405 (99.8%)
Colon cancer - inpatient care (primary diagnosis position)	Yes	21 (0.2%)	21 (0.2%)
	No	10,798 (99.8%)	9,405 (99.8%)

10.3.6.4 Other comorbidity

The following table presents data on other comorbidity for patients with DM type I:

Table 68: Other comorbidities among patients with DM type I

Comorbidity		All	DM type I patients (>=18)
N		10,819	9,426
Age	Mean (SD)	40.4 (18.6)	44.6 (16.2)
	Median (IQR)	40.0 (26.1, 54.0)	43.1 (31.0, 56.0)
Sex	Female	4,766 (44.1%)	4,119 (43.7%)
	Male	6,053 (55.9%)	5,307 (56.3%)
Addisons disease - all healthcare levels	Yes	55 (0.5%)	54 (0.6%)
	No	10,764 (99.5%)	9,372 (99.4%)
Addisons disease- inpatient care (all diagnosis positions)	Yes	45 (0.4%)	44 (0.5%)
	No	10,774 (99.6%)	9,382 (99.5%)
Addisons disease - inpatient care (primary diagnosis position)	Yes	28 (0.3%)	28 (0.3%)
	No	10,791 (99.7%)	9,398 (99.7%)
Thyroid disease - all healthcare levels	Yes	1,771 (16.4%)	1,701 (18.0%)
	No	9,048 (83.6%)	7,725 (82.0%)
Thyroid disease - inpatient care (all diagnosis positions)	Yes	812 (7.5%)	788 (8.4%)
	No	10,007 (92.5%)	8,638 (91.6%)
Thyroid disease - inpatient care (primary diagnosis position)	Yes	68 (0.6%)	65 (0.7%)
	No	10,751 (99.4%)	9,361 (99.3%)
Celiac disease - all healthcare levels	Yes	513 (4.7%)	354 (3.8%)
	No	10,306 (95.3%)	9,072 (96.2%)
Celiac disease - inpatient care (all diagnosis positions)	Yes	165 (1.5%)	106 (1.1%)
	No	10,654 (98.5%)	9,320 (98.9%)
Celiac disease - inpatient care (primary diagnosis position)	Yes	38 (0.4%)	25 (0.3%)
	No	10,781 (99.6%)	9,401 (99.7%)
Pernicious anemia - all healthcare levels	Yes	21 (0.2%)	21 (0.2%)
	No	10,798 (99.8%)	9,405 (99.8%)
Pernicious anemia - inpatient care (all diagnosis positions)	Yes	8 (0.1%)	8 (0.1%)
	No	10,811 (99.9%)	9,418 (99.9%)
Pernicious anemia - inpatient care (primary diagnosis position)	Yes	0 (0.0%)	0 (0.0%)
	No	10,819 (100.0%)	9,426 (100.0%)
Vitiligo - all healthcare levels	Yes	132 (1.2%)	124 (1.3%)
	No	10,687 (98.8%)	9,302 (98.7%)
Vitiligo - inpatient care (all diagnosis positions)	Yes	7 (0.1%)	6 (0.1%)
	No	10,812 (99.9%)	9,420 (99.9%)
Vitiligo - inpatient care (primary diagnosis position)	Yes	0 (0.0%)	0 (0.0%)
	No	10,819 (100.0%)	9,426 (100.0%)

10.3.7 Drug utilization

Drug utilization among patients with DM type I is only presented for patients ⩾ 18 years of age.

10.3.7.1 Glucose lowering drug use

The following table presents data on blood glucose lowering drugs for patients with DM type I:

Table 69: GLD drug use among patients with DM type I (age ⩾ 18 years)

GLD drug class		All	DM type I (>= 18 years)
N		10,819	9,426
Age	Mean (SD)	40.4 (18.6)	44.6 (16.2)
	Median (IQR)	40.0 (26.1, 54.0)	43.1 (31.0, 56.0)
Sex	Female	4,766 (44.1%)	4,119 (43.7%)
	Male	6,053 (55.9%)	5,307 (56.3%)
Treatment with any type of GLD drug - ever recorded	Yes	10,819 (100.0%)	9,426 (100.0%)
	No	0 (0.0%)	0 (0.0%)
Treatment with any type of GLD drug - recorded within past 6 months	Yes	10,405 (96.2%)	9,051 (96.0%)
	No	414 (3.8%)	375 (4.0%)
Insulin - ever recorded	Yes	10,819 (100.0%)	9,426 (100.0%)
	No	0 (0.0%)	0 (0.0%)
Insulin - recorded within past 6 months	Yes	10,382 (96.0%)	9,031 (95.8%)
	No	437 (4.0%)	395 (4.2%)
Metformin - ever recorded	Yes	703 (6.5%)	695 (7.4%)
	No	10,116 (93.5%)	8,731 (92.6%)
Metformin - recorded within past 6 months	Yes	304 (2.8%)	297 (3.2%)
	No	10,515 (97.2%)	9,129 (96.8%)
SGLT2-inhibitors - ever recorded	Yes	46 (0.4%)	46 (0.5%)
	No	10,773 (99.6%)	9,380 (99.5%)
SGLT2-inhibitors - recorded within past 6 months	Yes	25 (0.2%)	25 (0.3%)
	No	10,794 (99.8%)	9,401 (99.7%)
GLP-1 receptor agonists - ever recorded	Yes	204 (1.9%)	204 (2.2%)
	No	10,615 (98.1%)	9,222 (97.8%)
GLP-1 receptor agonists - recorded within past 6 months	Yes	114 (1.1%)	114 (1.2%)
	No	10,705 (98.9%)	9,312 (98.8%)
DPP-4 inhibitors - ever recorded	Yes	76 (0.7%)	76 (0.8%)
	No	10,743 (99.3%)	9,350 (99.2%)
DPP-4 inhibitors - recorded within past 6 months	Yes	23 (0.2%)	23 (0.2%)
	No	10,796 (99.8%)	9,403 (99.8%)
Sulfonylureas - ever recorded	Yes	51 (0.5%)	50 (0.5%)
	No	10,768 (99.5%)	9,376 (99.5%)
Sulfonylureas - recorded within past 6 months	Yes	13 (0.1%)	12 (0.1%)
	No	10,806 (99.9%)	9,414 (99.9%)
Alpha-glucosidase inhibitor - ever recorded	Yes	6 (0.1%)	6 (0.1%)
	No	10,813 (99.9%)	9,420 (99.9%)
Alpha-glucosidase inhibitor - recorded within past 6 months	Yes	0 (0.0%)	0 (0.0%)
	No	10,819 (100.0%)	9,426 (100.0%)
Glitazones - ever recorded	Yes	5 (0.0%)	5 (0.1%)
	No	10,814 (100.0%)	9,421 (99.9%)
Glitazones - recorded within past 6 months	Yes	0 (0.0%)	0 (0.0%)
	No	10,819 (100.0%)	9,426 (100.0%)

Note: In the table above we have included all GLD treatments in the ATC code chapter *A10- drugs used in diabetes* and some of those drugs are solely indicated for DM type II. Here we propose some explanations that some of those GLD treatments are present in this table describing patients with DM type I: (1) some patients have been misclassified according to the epidemiological algorithm, (2) patients were initially diagnosed with DM type II but retained the oral GLD therapy after insulin insertion (probably LADA) and (3) off-label use.

10.3.7.2 Insulin use

The following table presents data on insulin use for patients with DM type I:

Table 70: Insulin use among patients with DM type I (age ⩾ 18 years)

GLD drug class		All	DM type I (>= 18 years)
N		10,819	9,426
Age	Mean (SD)	40.4 (18.6)	44.6 (16.2)
	Median (IQR)	40.0 (26.1, 54.0)	43.1 (31.0, 56.0)
Sex	Female	4,766 (44.1%)	4,119 (43.7%)
	Male	6,053 (55.9%)	5,307 (56.3%)
Insulin - Ever recorded	Yes	10,819 (100.0%)	9,426 (100.0%)
	No	0 (0.0%)	0 (0.0%)
Insulin - recorded within past 6 months	Yes	10,382 (96.0%)	9,031 (95.8%)
	No	437 (4.0%)	395 (4.2%)
Insulin glargin 100 - Ever recorded	Yes	8,216 (75.9%)	7,368 (78.2%)
	No	2,603 (24.1%)	2,058 (21.8%)
Insulin glargin 100 - recorded within past 6 months	Yes	3,973 (36.7%)	3,653 (38.8%)
	No	6,846 (63.3%)	5,773 (61.2%)
Insulin glargin 300 - Ever recorded	Yes	1,124 (10.4%)	1,123 (11.9%)
	No	9,695 (89.6%)	8,303 (88.1%)
Insulin glargin 300 - recorded within past 6 months	Yes	840 (7.8%)	839 (8.9%)
	No	9,979 (92.2%)	8,587 (91.1%)
Insulin degludek - Ever recorded	Yes	2,571 (23.8%)	2,440 (25.9%)
	No	8,248 (76.2%)	6,986 (74.1%)
Insulin degludek - recorded within past 6 months	Yes	2,038 (18.8%)	1,946 (20.6%)
	No	8,781 (81.2%)	7,480 (79.4%)
NPH Insulin - Ever recorded	Yes	1,683 (15.6%)	1,674 (17.8%)
	No	9,136 (84.4%)	7,752 (82.2%)
NPH Insulin - recorded within past 6 months	Yes	385 (3.6%)	385 (4.1%)
	No	10,434 (96.4%)	9,041 (95.9%)
Mix insulin - Ever recorded	Yes	264 (2.4%)	261 (2.8%)
	No	10,555 (97.6%)	9,165 (97.2%)
Mix insulin - recorded within past 6 months	Yes	98 (0.9%)	97 (1.0%)
	No	10,721 (99.1%)	9,329 (99.0%)

10.3.7.3 Cardiovascular drug use

The following table presents data on cardiovascular drug use for patients with DM type I:

Table 71: Cardiovascular drug use among patients with DM type I (age ⩾ 18 years)

Drug class		All	DM type I (>= 18 years)
N		10,819	9,426
Age	Mean (SD)	40.4 (18.6)	44.6 (16.2)
	Median (IQR)	40.0 (26.1, 54.0)	43.1 (31.0, 56.0)
Sex	Female	4,766 (44.1%)	4,119 (43.7%)
	Male	6,053 (55.9%)	5,307 (56.3%)
RAAS (ACE-I/ARB/Renin-inhibitors) - ever recorded	Yes	3,534 (32.7%)	3,532 (37.5%)
	No	7,285 (67.3%)	5,894 (62.5%)
RAAS (ACE-I/ARB/Renin-inhibitors) - recorded within past 6 months	Yes	2,809 (26.0%)	2,807 (29.8%)
	No	8,010 (74.0%)	6,619 (70.2%)
Calcium channel blocker- ever recorded	Yes	1,674 (15.5%)	1,673 (17.7%)
	No	9,145 (84.5%)	7,753 (82.3%)
Calcium channel blocker - recorded within past 6 months	Yes	1,139 (10.5%)	1,138 (12.1%)
	No	9,680 (89.5%)	8,288 (87.9%)
Beta blockers- ever recorded	Yes	1,841 (17.0%)	1,832 (19.4%)
	No	8,978 (83.0%)	7,594 (80.6%)
Beta blockers - recorded within past 6 months	Yes	1,132 (10.5%)	1,130 (12.0%)
	No	9,687 (89.5%)	8,296 (88.0%)
Alpha blockers- ever recorded	Yes	259 (2.4%)	259 (2.7%)
	No	10,560 (97.6%)	9,167 (97.3%)
Alpha blockers - recorded within past 6 months	Yes	129 (1.2%)	129 (1.4%)
	No	10,690 (98.8%)	9,297 (98.6%)
Thiazide diuretics- ever recorded	Yes	1,178 (10.9%)	1,178 (12.5%)
	No	9,641 (89.1%)	8,248 (87.5%)
Thiazide diuretics - recorded within past 6 months	Yes	790 (7.3%)	790 (8.4%)
	No	10,029 (92.7%)	8,636 (91.6%)
Statin- ever recorded	Yes	3,806 (35.2%)	3,805 (40.4%)
	No	7,013 (64.8%)	5,621 (59.6%)
Statin - recorded within past 6 months	Yes	2,825 (26.1%)	2,824 (30.0%)
	No	7,994 (73.9%)	6,602 (70.0%)
Platelet inhibitors- ever recorded	Yes	1,659 (15.3%)	1,659 (17.6%)
	No	9,160 (84.7%)	7,767 (82.4%)
Platelet inhibitors - recorded within past 6 months	Yes	1,100 (10.2%)	1,100 (11.7%)
	No	9,719 (89.8%)	8,326 (88.3%)
Anticoagulants- ever recorded	Yes	1,150 (10.6%)	1,140 (12.1%)
	No	9,669 (89.4%)	8,286 (87.9%)
Anticoagulants - recorded within past 6 months	Yes	305 (2.8%)	302 (3.2%)
	No	10,514 (97.2%)	9,124 (96.8%)
Antihypertensives (any type)- ever recorded	Yes	4,048 (37.4%)	4,026 (42.7%)
	No	6,771 (62.6%)	5,400 (57.3%)
Antihypertensives (any type) - recorded within past 6 months	Yes	3,195 (29.5%)	3,182 (33.8%)
	No	7,624 (70.5%)	6,244 (66.2%)

10.3.8 Healthcare resource utilization and costs

10.3.8.1 Outpatient

The following tables present the annual (2018) outpatient healthcare utilization and costs for patients with DM type I:

Table 72: Outpatient healthcare utilization and costs for patients with DM type I

Type of healthcare		All	0-17	18-29	30-44	45-64	65-74	75->
N		10819	1393	2048	2951	3148	905	374
All outpatient healthcare events	visits/person-year	19.1	12.6	13.0	14.2	19.7	34.9	71.1
All primary healthcare events	visits/person-year	7.9	1.8	2.7	3.4	8.1	21.1	58.7
All specialised outpatient healthcare events	visits/person-year	11.1	10.7	10.2	10.7	11.4	13.5	12.2
All outpatient healthcare events by physicians (physical visits)	visits/person-year	5.8	4.9	4.4	5.3	6.3	8.5	9.8
All primary healthcare events by physicians (physical visits)	visits/person-year	1.6	1.0	1.1	1.3	1.9	2.5	4.0
All specialised outpatient healthcare events by physicians (physical visits)	visits/person-year	4.2	3.9	3.3	3.9	4.4	6.0	5.8
Outpatient healthcare costs (SEK)	costs (SEK)/person-year	31556.2	30694.9	24476.8	26728.9	33056.5	46398.0	62209.2

10.3.8.2 Inpatient

The following tables present the annual (2018) inpatient healthcare utilization and costs for patients with DM type I:

Table 73: Inpatient healthcare utilization and costs for patients with DM type I

Type of healthcare		All	0-17	18-29	30-44	45-64	65-74	75->
N		10819	1393	2048	2951	3148	905	374
Inpatient bed-days	bed-days/person-year	1.6	1.3	0.8	1.1	1.6	3.3	6.1
Inpatient bed-days in acute somatic care	bed-days/person-year	1.1	1.3	0.5	0.8	1.2	2.2	3.3
Inpatient bed-days in psychiatric care	bed-days/person-year	0.2	0.0	0.3	0.2	0.2	0.1	0.0
Inpatient bed-days in geriatric care	bed-days/person-year	0.2	0.0	0.0	0.0	0.1	0.8	2.7
Inpatient bed-days in other care	bed-days/person-year	0.1	0.0	0.0	0.1	0.1	0.2	0.1
Inpatient healthcare costs (SEK)	costs (SEK)/person-year	18815.4	14334.7	9837.2	15909.2	19489.7	36477.9	57637.0

10.3.9 Drug costs

Table 74: Drug costs for patients with DM type I

Drug class		All	0-17	18-29	30-44	45-64	65-74	75->
N		10819	1393	2048	2951	3148	905	374
Total drug costs (ATC chaptes: A-V)	costs (SEK)/person-year	10576.4	10093.1	9128.3	9960.5	11059.7	14090.0	12385.6
Costs for drugs used in diabetes (ATC: A10) -also inlcuded in the A-chapter below	costs (SEK)/person-year	6629.7	7402.8	6938.2	6488.7	6568.7	6138.8	5025.5
Drug costs for ATC chapter A: ALIMENTARY TRACT AND METABOLISM (includes diabetes drugs, A10)	costs (SEK)/person-year	6891.5	7700.3	7102.1	6662.7	6855.6	6583.6	5725.5
Drug costs for ATC chapter B: BLOOD AND BLOOD FORMING ORGANS	costs (SEK)/person-year	374.2	17.0	39.7	152.3	569.2	1355.8	1174.2
Drug costs for ATC chapter C: CARDIOVASCULAR SYSTEM	costs (SEK)/person-year	221.0	73.3	19.0	67.1	306.8	809.5	899.1
Drug costs for ATC chapter D: DERMATOLOGICALS	costs (SEK)/person-year	90.8	135.3	42.8	54.7	114.8	134.9	166.8
Drug costs for ATC chapter G: GENITO URINARY SYSTEM AND SEX HORMONES	costs (SEK)/person-year	113.4	21.9	61.6	149.8	114.7	173.6	275.5
Drug costs for ATC chapter H: SYSTEMIC HORMONAL PREPARATIONS, EXCL. SEX HORMONES AND INSULINS	costs (SEK)/person-year	131.3	175.9	74.2	54.0	173.6	128.9	539.6
Drug costs for ATC chapter J: ANTIINFECTIVES FOR SYSTEMIC USE	costs (SEK)/person-year	356.6	291.4	496.4	434.1	286.1	184.9	233.5
Drug costs for ATC chapter L: ANTINEOPLASTIC AND IMMUNOMODULATING AGENTS	costs (SEK)/person-year	1287.8	46.7	494.7	1526.3	1532.6	3045.5	1796.3
Drug costs for ATC chapter M: MUSCULO-SKELETAL SYSTEM	costs (SEK)/person-year	40.9	4.0	16.4	38.5	52.7	89.3	108.0
Drug costs for ATC chapter N: NERVOUS SYSTEM	costs (SEK)/person-year	722.7	848.5	593.2	694.1	724.8	915.6	717.9
Drug costs for ATC chapter P: ANTIPARASITIC PRODUCTS, INSECTICIDES AND REPELLENTS	costs (SEK)/person-year	1.4	1.8	0.9	0.7	1.7	3.5	2.2
Drug costs for ATC chapter R: RESPIRATORY SYSTEM	costs (SEK)/person-year	237.5	745.8	126.9	81.8	198.6	347.0	315.6
Drug costs for ATC chapter S: SENSORY ORGANS	costs (SEK)/person-year	82.0	15.9	5.1	32.0	105.9	290.4	419.0
Drug costs for ATC chapter V: VARIOUS	costs (SEK)/person-year	25.2	15.4	55.3	12.5	22.6	27.6	12.3

Results on Diabetes Mellitus type II

10.4 Results on diabetes type II

In this section we present results from analyses related to DM type II. Throughout the report, figures presenting data on DM type II are colored in dark red. The population includes all patients in Stockholm diagnosed with DM type II according to the established algorithm. Analyses of diabetes type II were performed only for patients ⩾18 years of age unless otherwise stated.

10.4.1 Prevalence of diabetes type II

The figure below presents the prevalence of DM type II for each municipality in Stockholm:

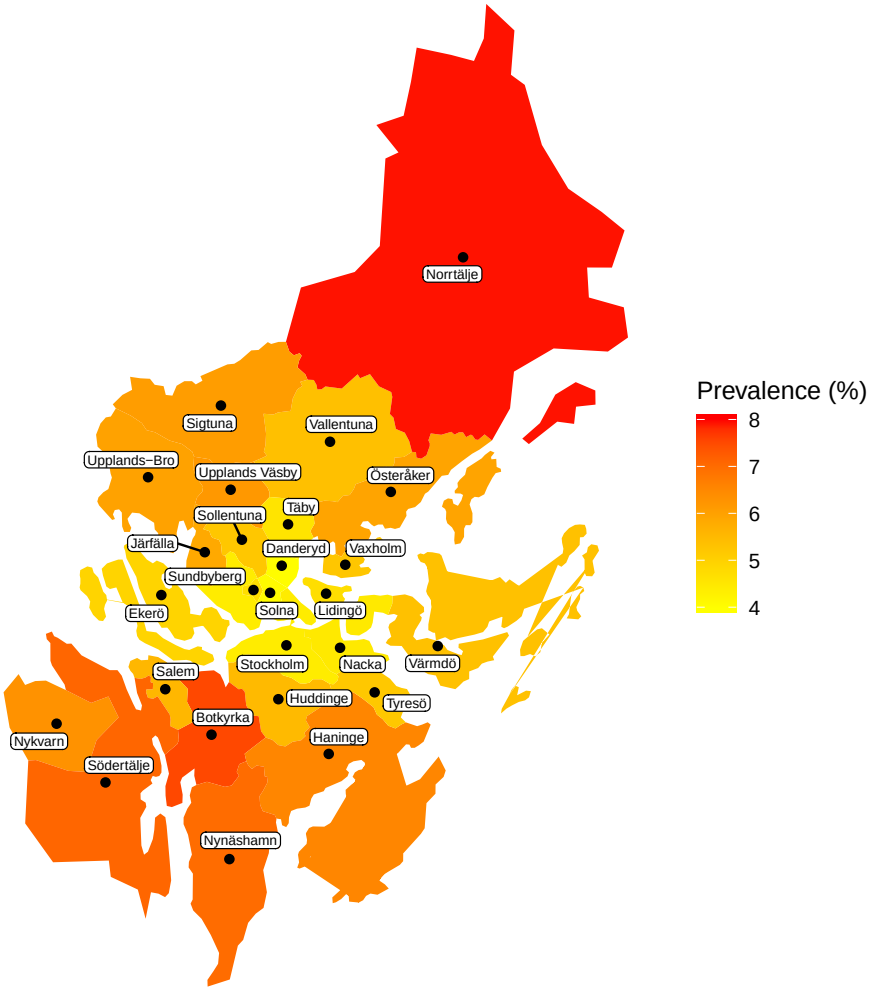
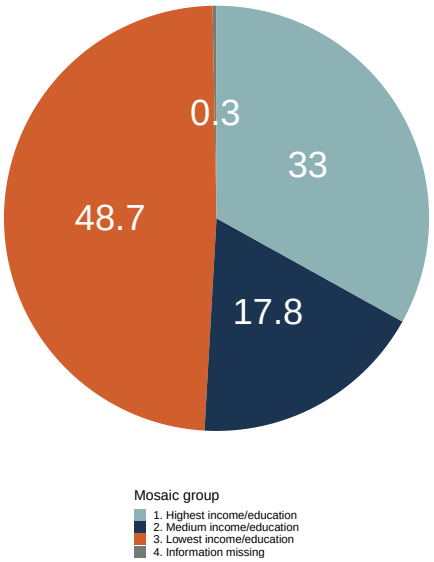


Figure 34: Prevalence of DM type II (⩾ 18 years) by municipality (Population ⩾ 18 years in each municipality as denominator)

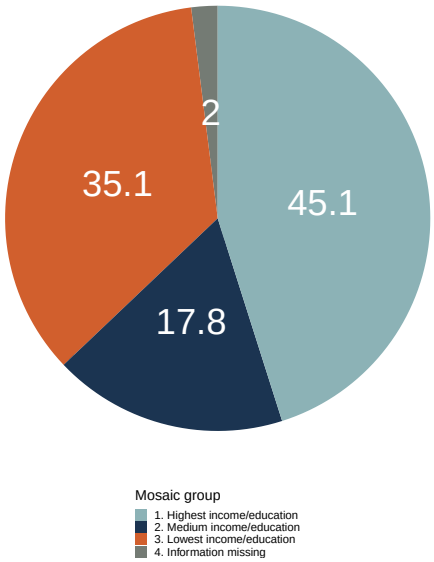
10.4.2 Mosaic group

The figures below present the Mosaic group distribution among patients with DM type II. As comparison, the bar chart to the right presents Mosaic data in the total Stockholm population. For each patient with DM type II, the most recent Mosaic group before 31 December 2018 has been selected (if the patient has moved between different Mosaic groups within Stockholm during the study period).

Note: This analysis has been performed for all patients (all ages) with DM type II since we did not have denominator data on mosaic grouping for different age groups.



(a) Distribution of Mosaic group among patients with DM type II



(b) Distribution of Mosaic group in the total population in Stockholm

Figure 35: Mosaic groups for DM type II patients

10.4.3 Age and sex distributions

The following figure presents the age distribution for patients with DM type II (all ages):

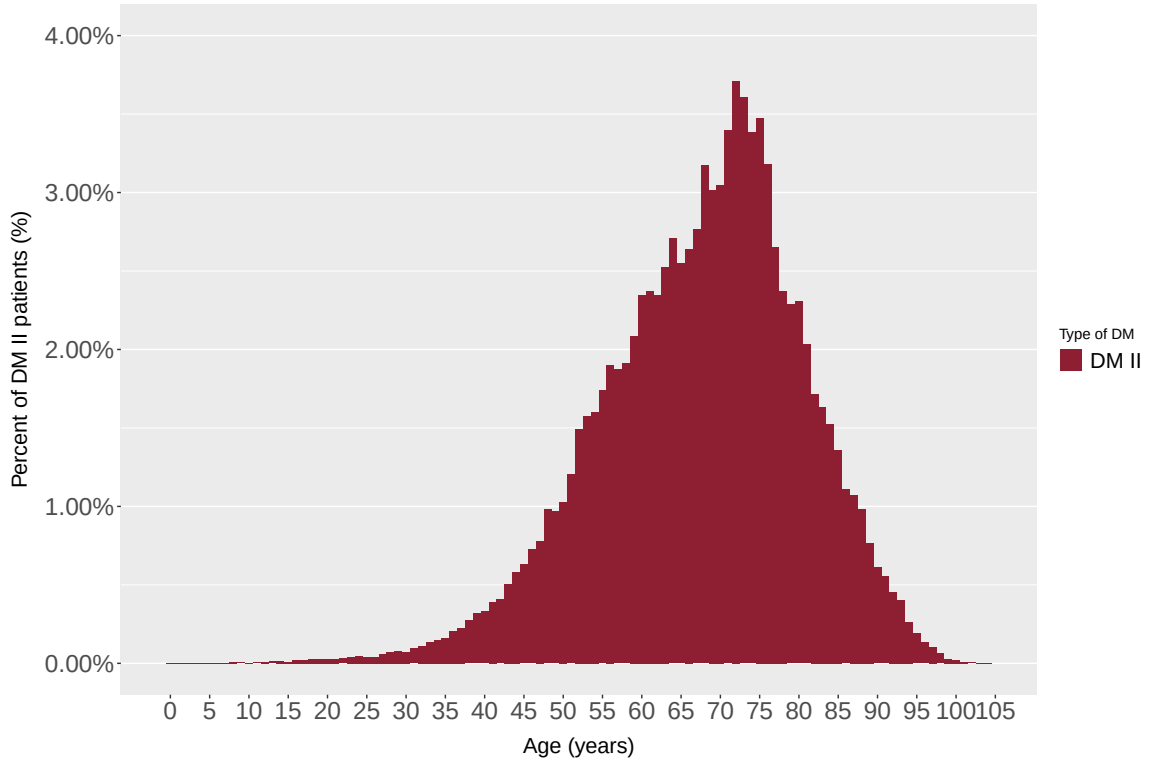
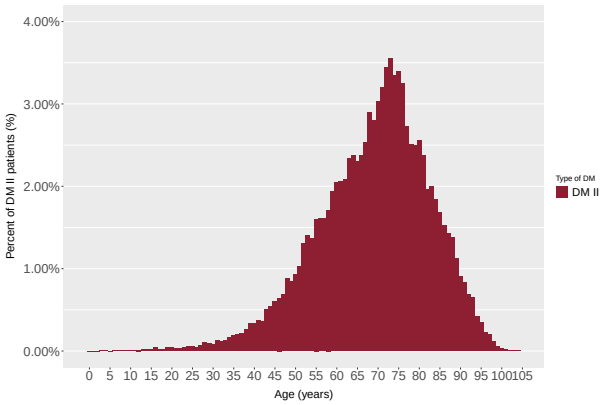
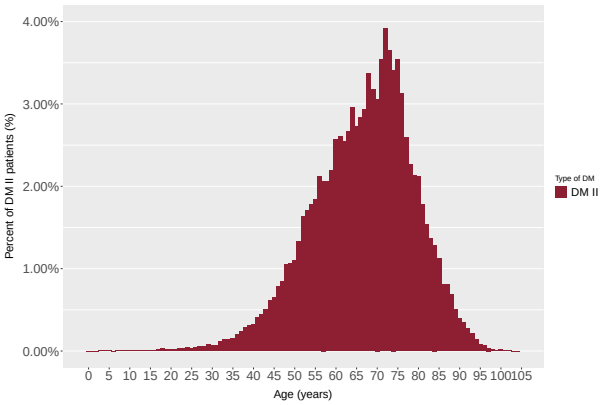


Figure 36: Age histogram for patients with DM type II (all ages)

The following figures present the age distribution for patients with DM type II (all ages) by sex strata:



(a) Age histogram for patients with DM type II (all ages) - Female



(b) Age histogram for patients with DM type II (all ages) - Male

Figure 37: Age histogram for patients with DM type II (all ages) by sex

The following table presents summary statistics on age and sex for patients with DM type II (all ages):

Table 75: Age and sex distribution for patients diagnosed with DM type II (all ages)

Variable		All DM II patients	Male	Female
N		94,787	54,544	40,243
Age	Mean (SD)	67.7 (12.9)	66.7 (12.3)	69.0 (13.5)
	Median (IQR)	69.0 (59.2, 76.1)	68.0 (59.0, 75.1)	71.0 (61.0, 78.1)
Sex	Female	40,243 (42.5%)	0 (0.0%)	40,243 (100.0%)
	Male	54,544 (57.5%)	54,544 (100.0%)	0 (0.0%)

The following table presents number of patients with DM type II by age group:

Table 76: Number of DM type II patients by age group

Variable		All	0-17	18-29	30-44	45-64	65-74	75-84	85->
N		94,787	127	494	3,772	31,096	29,645	21,954	7,699
Age	Mean (SD)	67.7 (12.9)	12.9 (3.8)	24.9 (3.4)	39.5 (3.9)	56.8 (5.3)	69.9 (2.8)	78.8 (2.8)	88.8 (3.3)
	Median (IQR)	69.0 (59.2, 76.1)	14.0 (10.9, 16.1)	25.1 (22.1, 28.0)	40.1 (37.0, 43.0)	57.2 (53.0, 61.1)	70.0 (67.2, 72.1)	78.2 (76.1, 81.0)	88.0 (86.0, 91.0)
Sex	Female	40,243 (42.5%)	68 (53.5%)	250 (50.6%)	1,582 (41.9%)	11,700 (37.6%)	11,858 (40.0%)	10,101 (46.0%)	4,684 (60.8%)
	Male	54,544 (57.5%)	59 (46.5%)	244 (49.4%)	2,190 (58.1%)	19,396 (62.4%)	17,787 (60.0%)	11,853 (54.0%)	3,015 (39.2%)

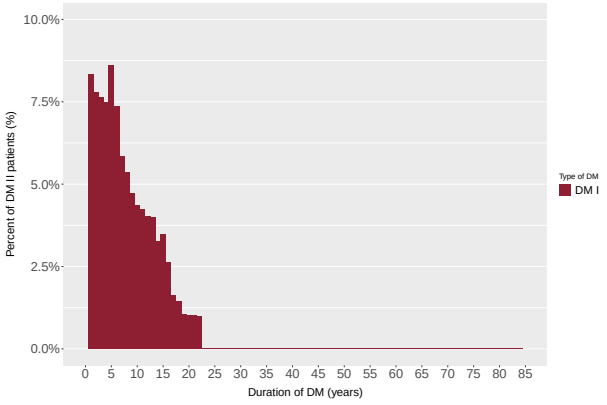
10.4.4 Duration of diabetes type II

The following table presents the duration of DM type II ($\geqslant$ 18 years) for method 1 and method 2:

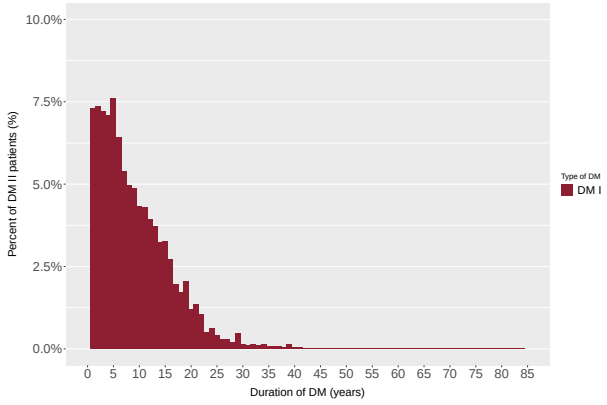
Table 77: Duration of DM for patients diagnosed with DM type II

	Number of patients	Mean duration	SD	Median duration	IQR
DM duration based on method 1 (first recorded DM diagnosis)	94660	7.5	5.4	6.3	8.2
DM duration based on method 2 (first recorded DM diagnosis and/or data from EHRs)	94660	8.9	7.1	7.1	9.4

Note: We have been able to obtain information from EHRs on year of DM onset for 38.9% of the DM type II patients. Therefore, there may still be an underestimation of the true mean and median duration of DM type II patients in Stockholm.



(a) Method 1. Duration of DM for patients with DM type II (all ages) based on first recorded DM diagnosis



(b) Method 2. Duration of DM for patients with DM type II (all ages) based on first recorded DM diagnosis or data on date of onset from EHRs

Figure 38: Duration of diabetes for DM type II patients

Note: The x-axes have been harmonized to be able to compare the figures.

10.4.5 Clinical characteristics

10.4.5.1 Body mass index (BMI)

As described in the methods section, BMI was only estimated for patients ⩾ 18 years of age. We could calculate BMI for 67,031 (70.8%) of the 94,660 patients with DM type II and age of 18 and above using data on weight and height from EHRs.

The figure below presents BMI for patients with DM type II with an age ⩾ 18 years:

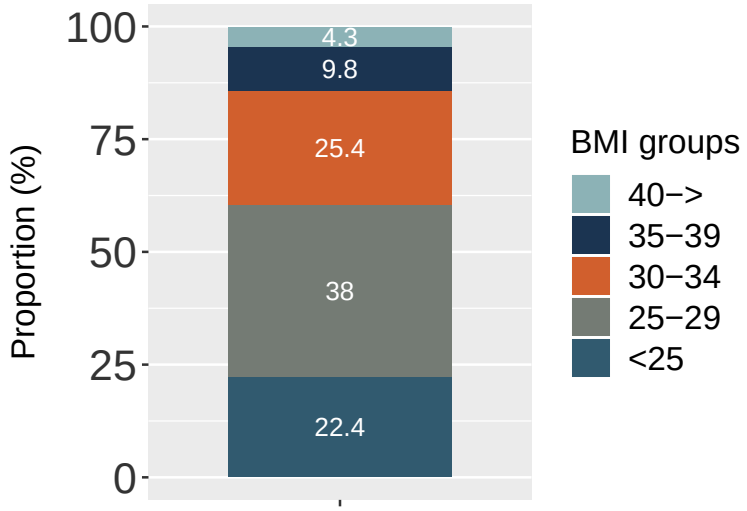


Figure 39: BMI distribution for patients with DM type II (age ⩾ 18 years)

Table 78: BMI distribution for patients diagnosed with DM type II (⩾ 18)

Age group	Number of patients	Mean BMI	SD	Median BMI	IQR
18-29	358	31.8	9.3	30.9	13.2
30-44	2643	31.4	6.9	30.6	8.5
45-64	21282	30.6	5.8	29.8	7.2
65-74	20701	29.4	5.3	28.7	6.6
75-84	16101	28.1	5.1	27.6	6.2
85->	5946	26.3	4.7	25.7	5.9
Total	67031	29.3	5.7	28.6	7.0

The following figure presents a violin plot for BMI for patients with DM type II with an age ⩾ 18 years:

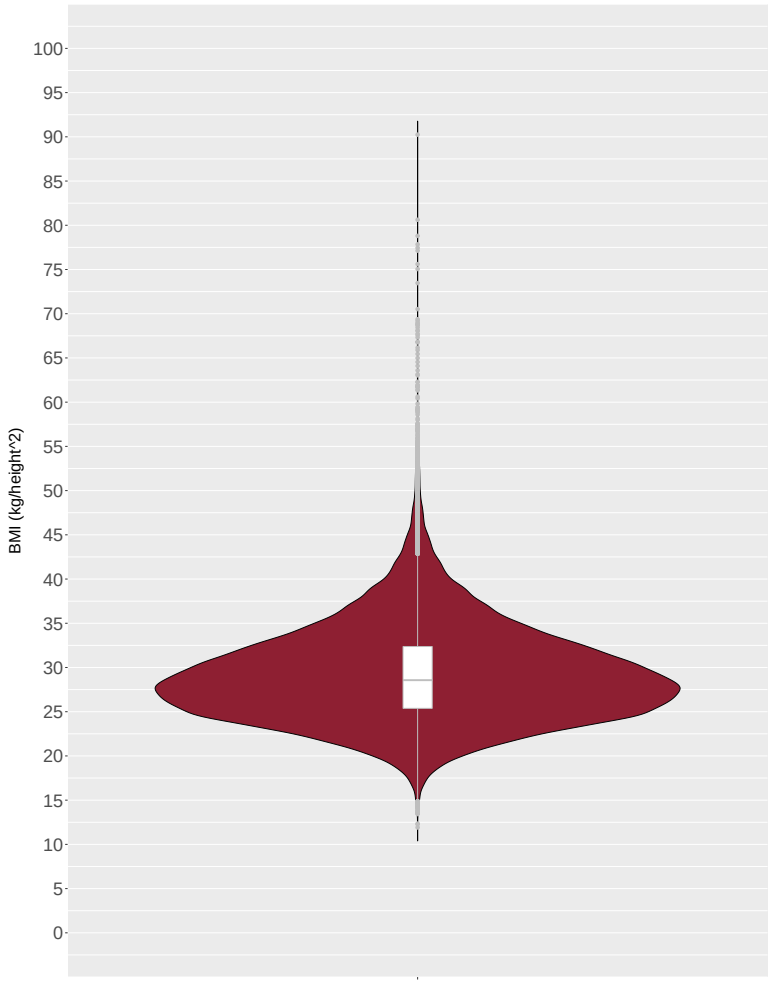


Figure 40: BMI distribution for patients with DM type II (age ⩾ 18 years)

10.4.5.2 Blood pressure

10.4.5.2.1 Systolic blood pressure (SBP)

Information on SBP was possible to obtain for 53,692 (56.8%) of 94,660 DM type II patients (⩾ 18 years).

The following table presents mean SBP by age groups for DM type II patients (⩾ 18 years):

Table 79: SBP distribution for patients diagnosed with DM type II

Age group	Number of patients	Mean SBP	SD	Median SBP	IQR
18-29	244	124.9	14.4	123.9	19.0
30-44	2046	129.4	15.6	128.0	18.5
45-64	16873	135.7	15.9	134.8	19.5
65-74	16521	138.0	15.8	136.7	18.7
75-84	13252	139.0	16.5	137.9	19.7
85->	4756	140.4	17.6	138.8	21.3
Total	53692	137.4	16.3	136.0	19.5

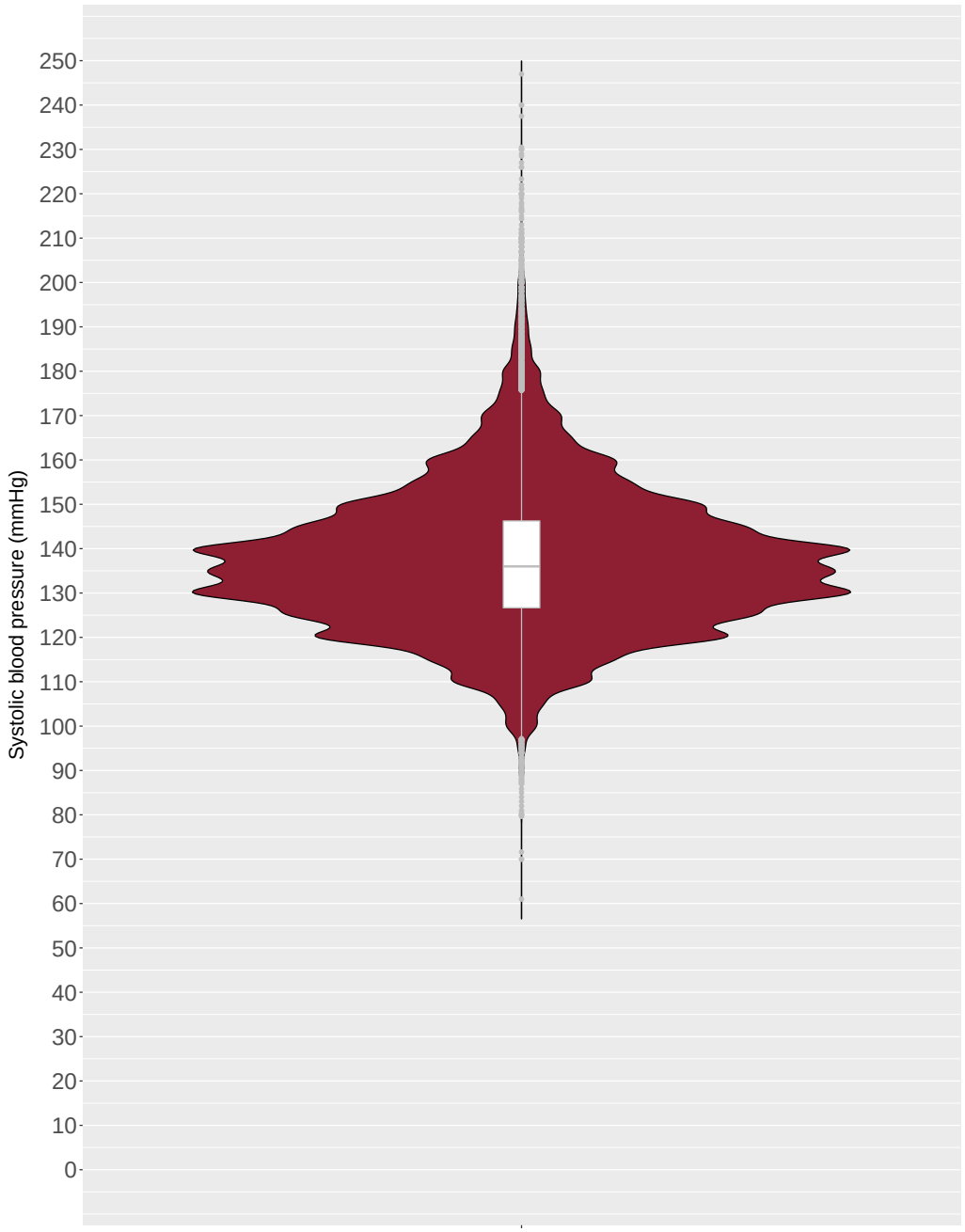


Figure 41: Distribution of SBP for DM type II patients $\geqslant$ 18 years of age

Note: In these violin plots, there was a clear digit preference for values at 110, 120, 130 and 140 mmHg.

The following figure presents SBP categories by age groups:

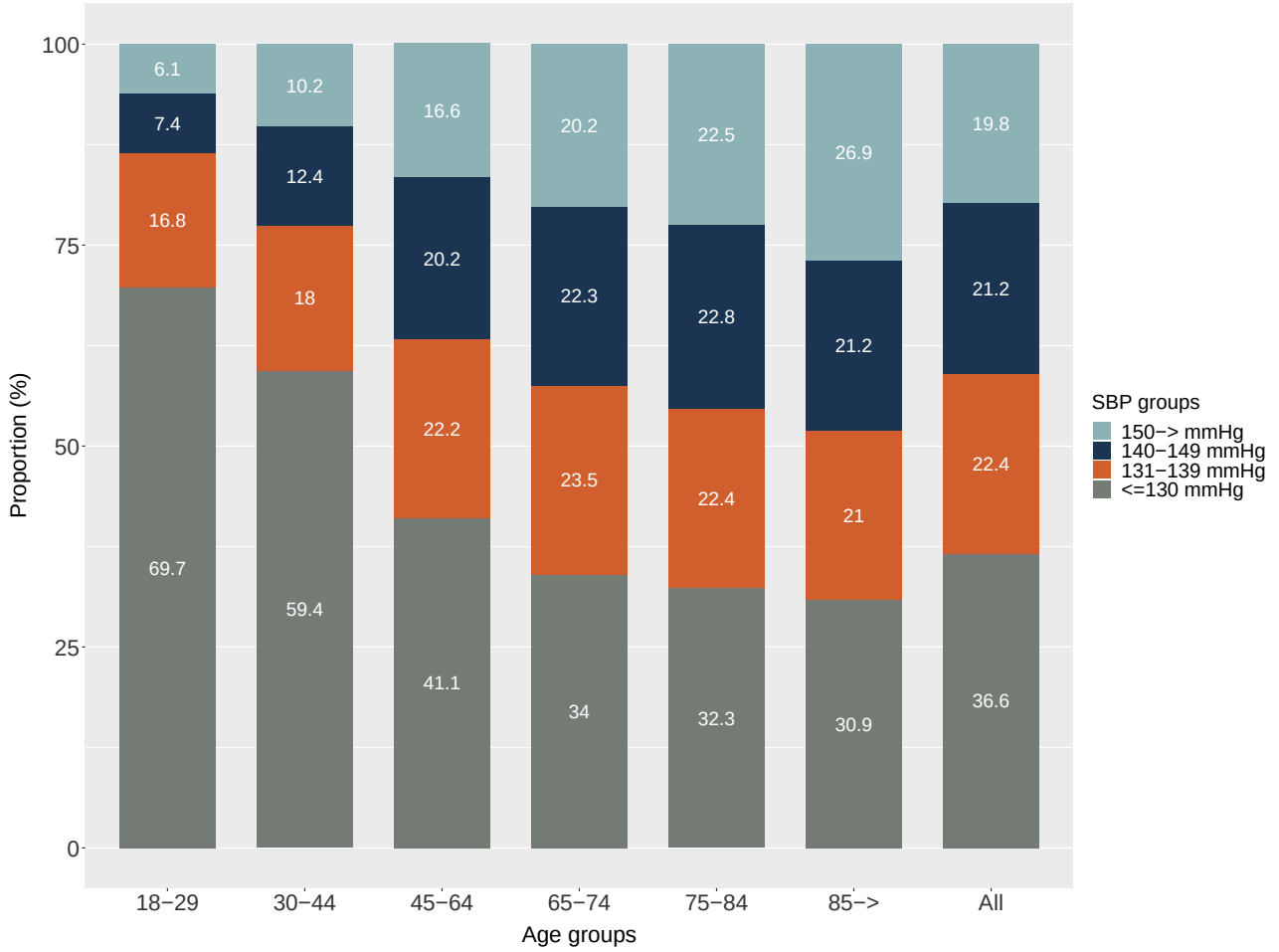


Figure 42: SBP categories by age groups for DM type II patients

10.4.5.2.2 Diastolic blood pressure (DBP)

Information on DBP was possible to obtain for 53,565 (56.6%) of 94,660 DM type II patients.

The following table presents mean DBP by age groups for DM type II patients ($\geqslant$ 18 years of age).

Table 80: DBP distribution for patients diagnosed with DM type II

Age group	Number of patients	Mean DBP	SD	Median DBP	IQR
18-29	242	78.4	10.4	78.3	12.7
30-44	2039	81.7	10.2	80.0	13.0
45-64	16838	81.0	9.4	80.0	11.6
65-74	16482	77.2	8.8	77.0	11.7
75-84	13216	74.7	8.7	74.3	11.0
85->	4748	73.0	8.6	72.5	11.2
Total	53565	77.6	9.5	77.5	12.4

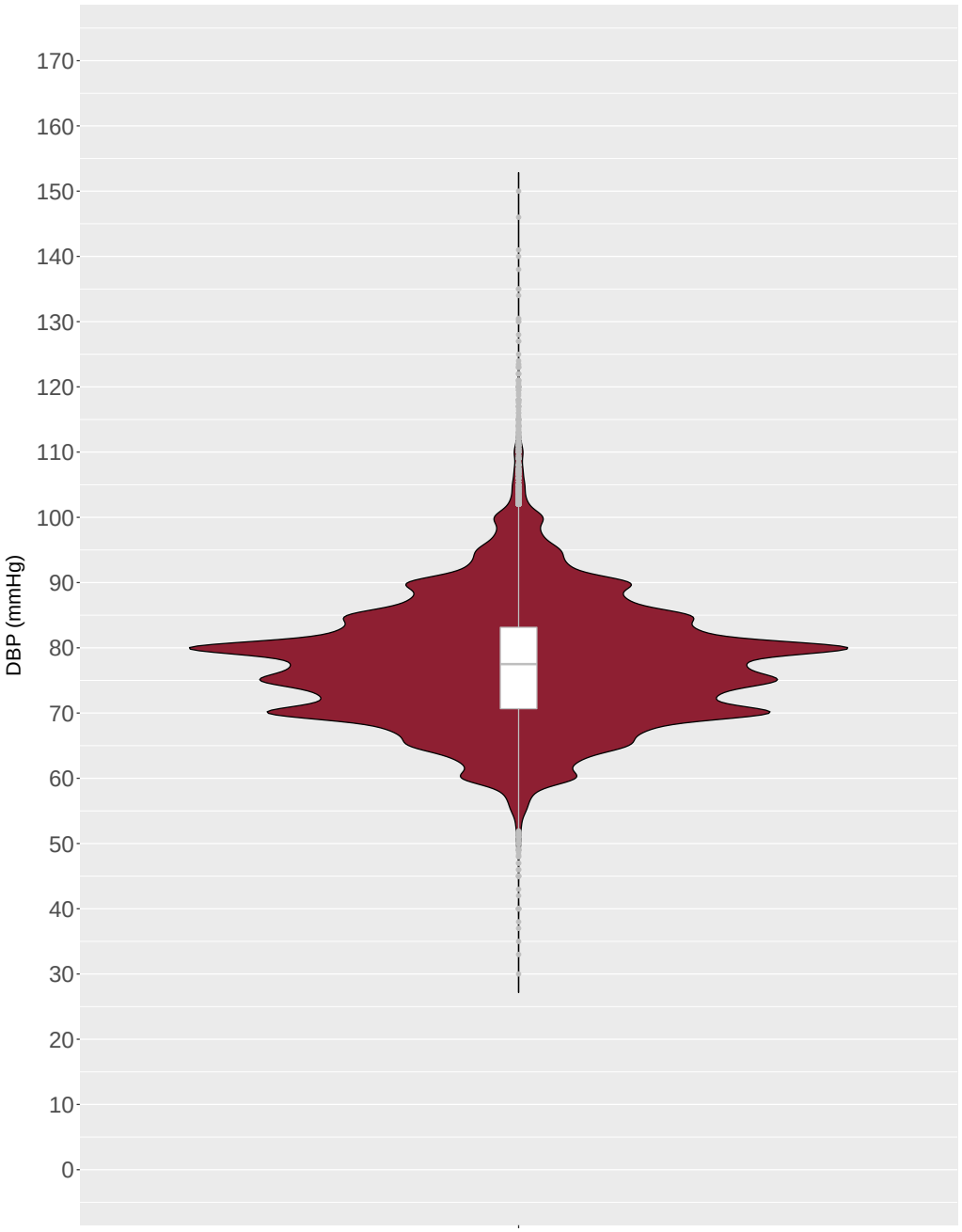


Figure 43: Distribution of DBP for DM type II patients $\geqslant$ 18 years of age

10.4.5.3 Estimated glomerular filtration rate (eGFR)

Information on eGFR was possible to extract for 55,196 (58.3%) of 94,660 DM type II patients ($\geqslant$ 18 years of age).

The table below shows the age distribution of patients with available eGFR measurements:

Table 81: Age distribution of the extracted measurements on eGFR

Age group	Number of patients
18-29	259
30-44	2116
45-64	16918
65-74	17087
75-84	13797
85->	5019
All	55196

The following figure presents eGFR categories by age groups:

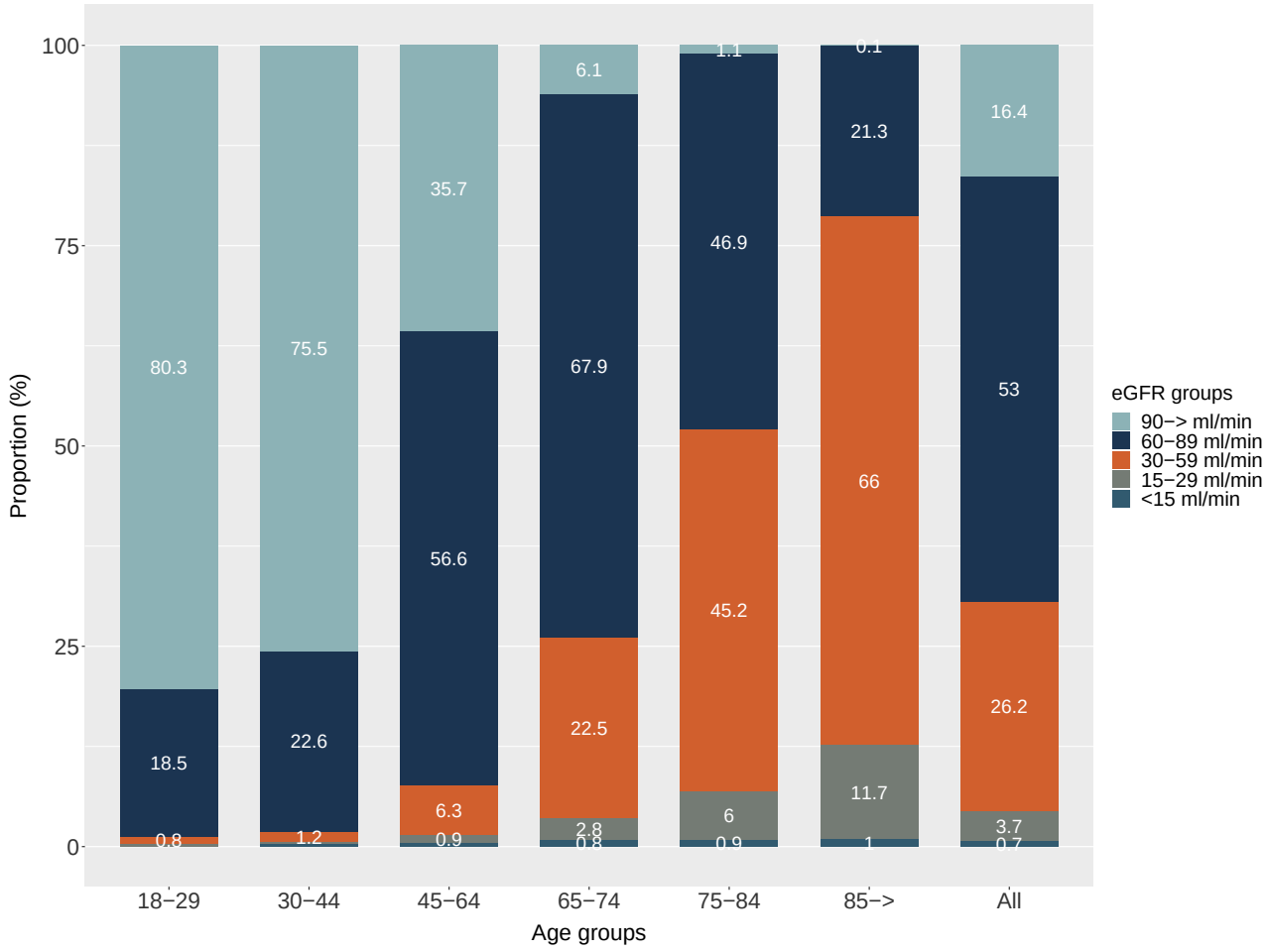


Figure 44: eGFR categories by age groups for DM type II patients

10.4.5.4 Microalbuminuria

Information on microalbuminuria (Yes/No) was possible to extract for 14,220 (15.0%) of 94,660 DM type II patients (>=18).

The table below shows age distribution of patients with available microalbuminuria measurements:

Table 82: Age distribution of the extracted measurements on microalbuminuria

Age group	Number of patients
18-29	59
30-44	568
45-64	5156
65-74	4746
75-84	3031
85->	660
All	14220

The following figure presents microalbuminuria by age groups:

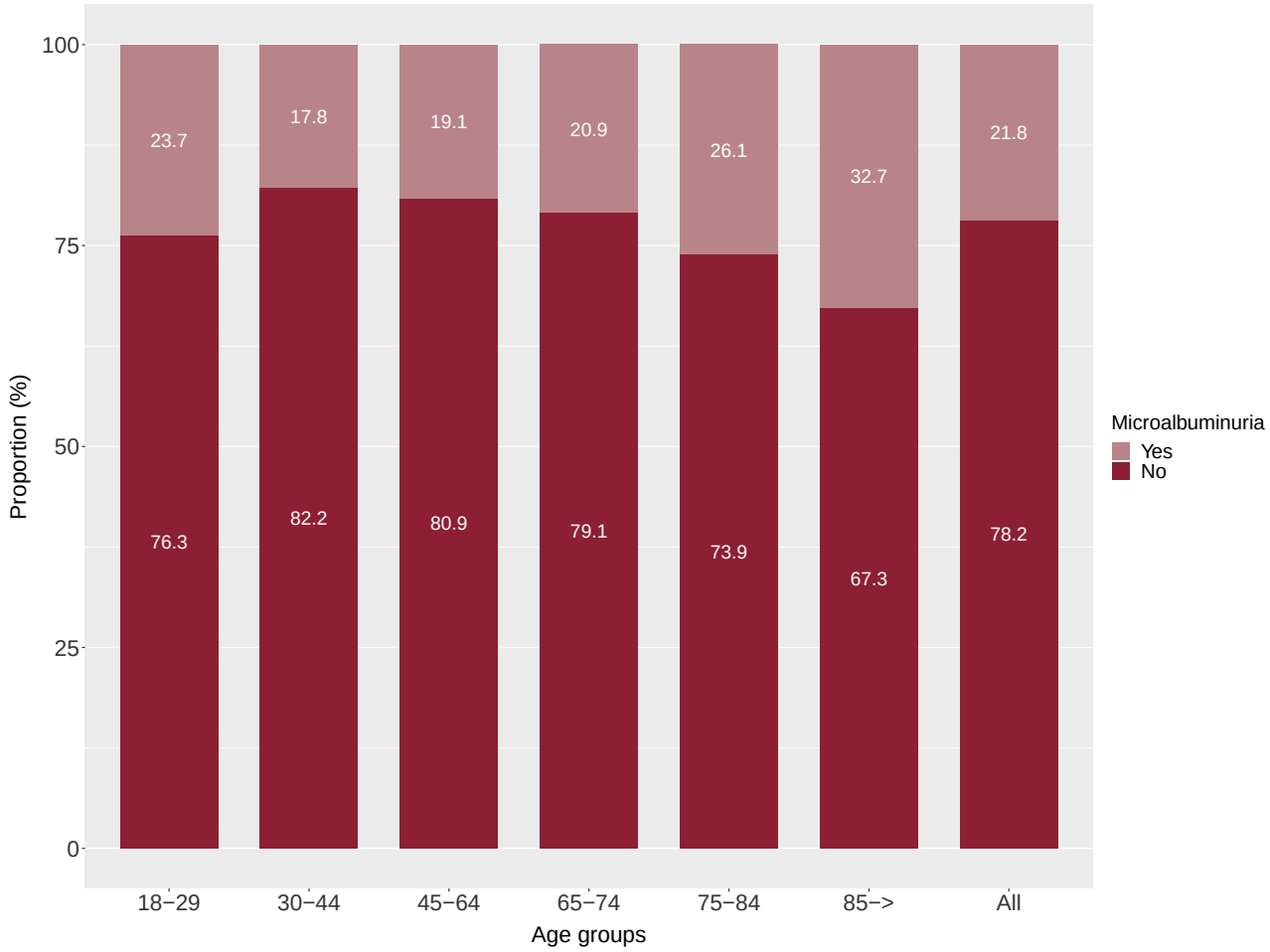


Figure 45: Microalbuminuria by age group for DM type II patients

10.4.5.5 Macroalbuminuria

Information on macroalbuminuria (Yes/No) was possible to extract for 8,954 (9.5%) of 94,660 DM type II patients.

The table below shows age distribution of patients with available macroalbuminuria measurements:

Table 83: Age distribution of the extracted measurements on macroalbuminuria

Age group	Number of patients
18-29	50
30-44	406
45-64	3363
65-74	2927
75-84	1800
85->	408
All	8954

The following figure presents macroalbuminuria by age groups:

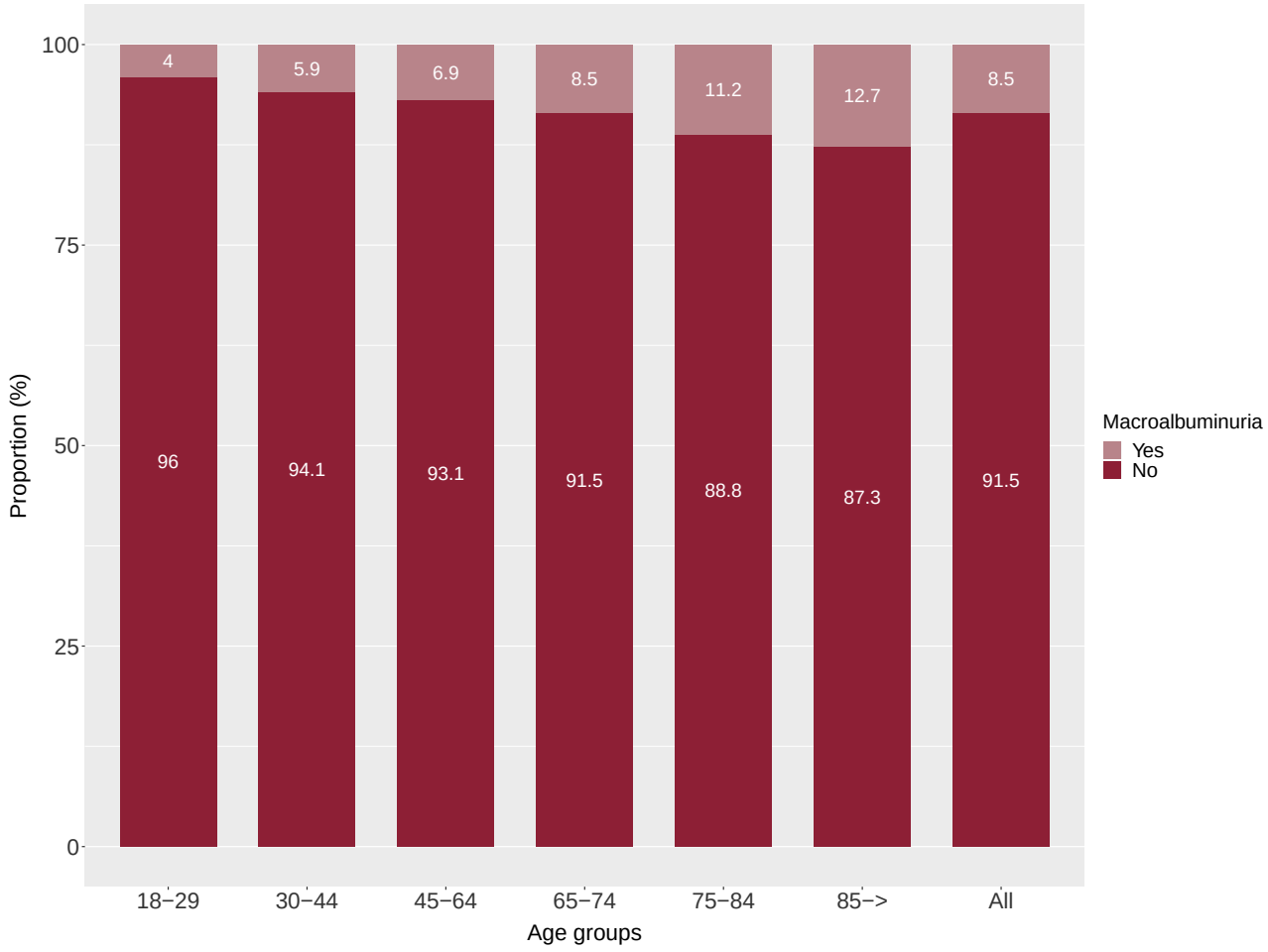


Figure 46: Macroalbuminuria by age group for DM type II patients

10.4.5.6 Smoking habits

Information on smoking habits was possible to extract for 65,543 (69.2%) of 94,660 DM type II patients ($\geqslant$ 18 years of age).

The table below shows the age distribution of the extracted information on smoking habits:

Table 84: Age distribution of the extracted information on smoking habits

Age group	Number of patients
18-29	304
30-44	2574
45-64	21307
65-74	20283
75-84	15621
85->	5454
All	65543

The figure below presents smoking habits by age groups:

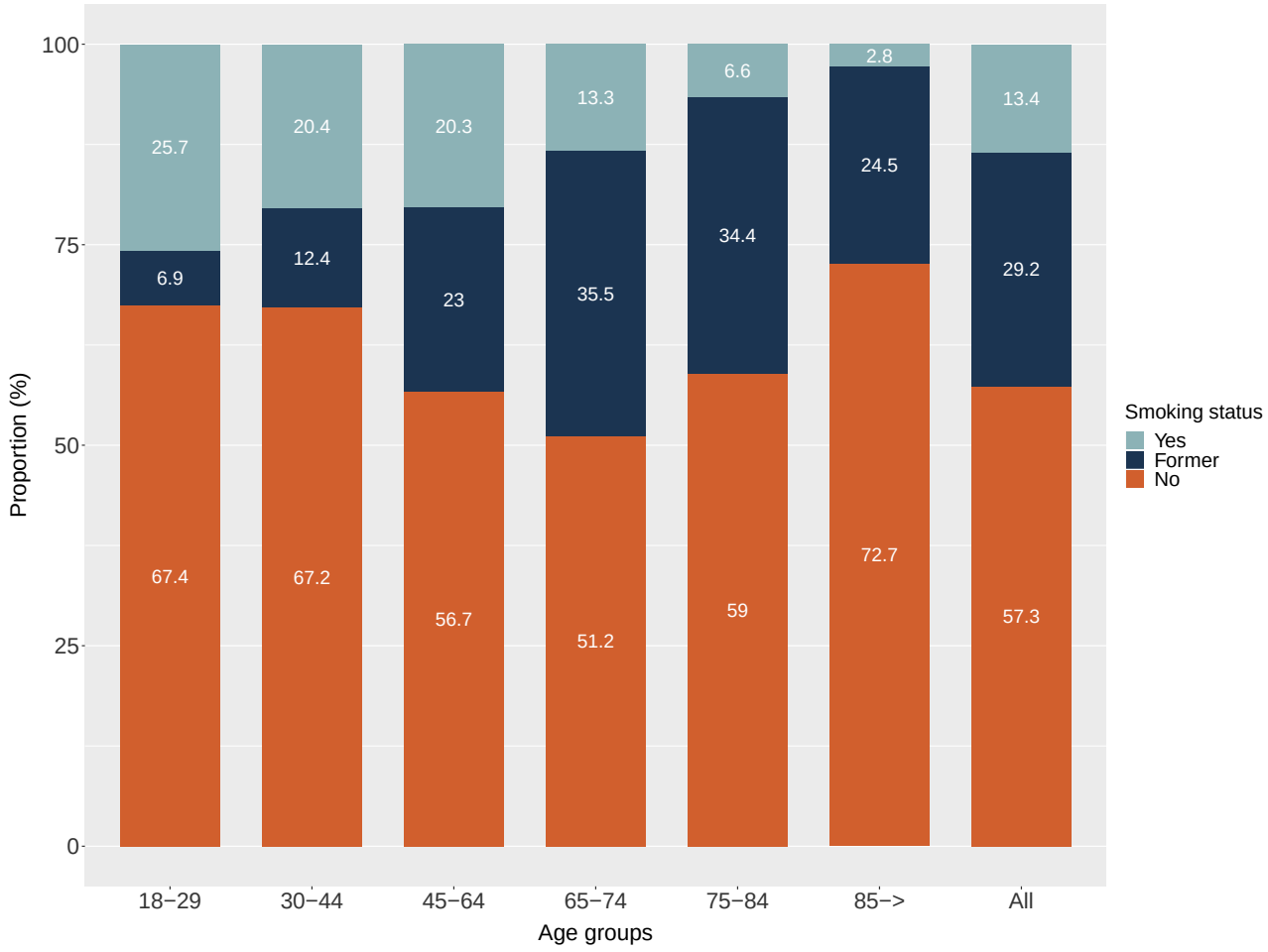


Figure 47: Smoking habits by age groups (DM type II)

10.4.5.7 HbA1c

Information on HbA1c was possible to extract for 45,925 (48.5%) of 94,660 DM type II patients.

Table 85: HbA1c distribution for patients diagnosed with DM type II

Age group	Number of patients	Mean HbA1c	SD	Median HbA1c	IQR
18-29	251	53.6	21.9	46	24.5
30-44	1987	55.1	19.3	49	21.0
45-64	15625	55.0	16.4	51	18.0
65-74	14321	52.8	13.9	50	14.0
75-84	10451	52.9	13.7	50	15.0
85->	3290	54.5	14.4	51	17.8
Total	45925	53.8	15.2	50	16.0

The following figure presents a violin plot for HbA1c:

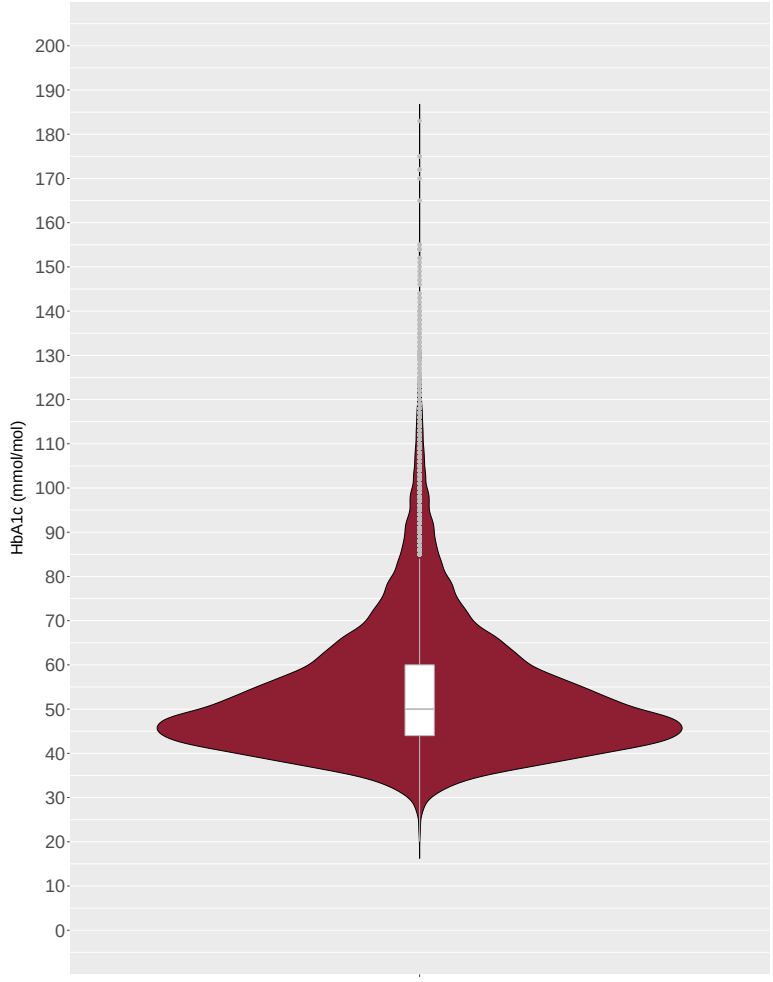


Figure 48: Distribution of HbA1c for DM type II patients $\geqslant$ 18 years of age

10.4.5.7.1 HbA1c categories

This chart presents proportion of DM type II patients in each HbA1c strata by age groups:

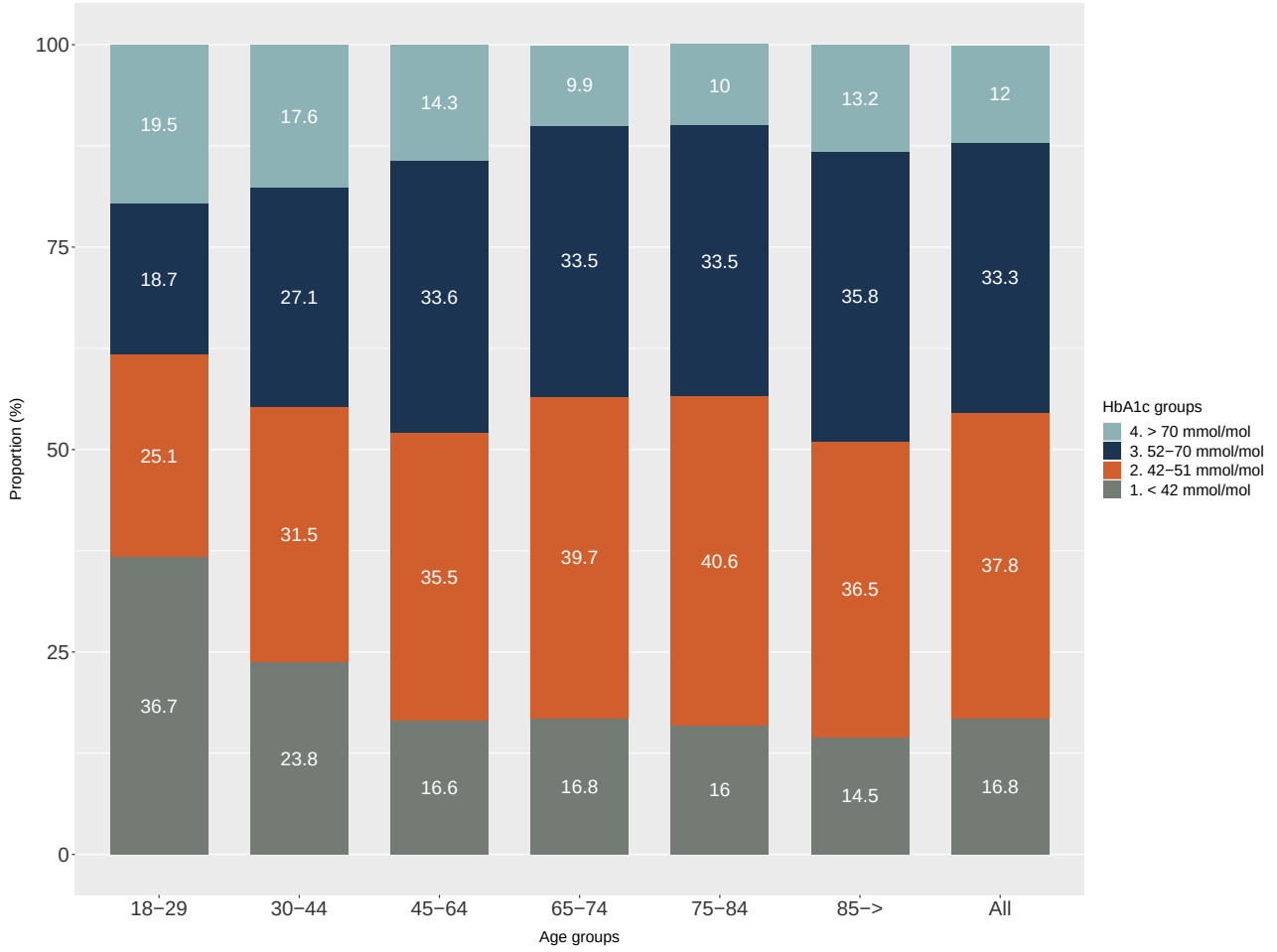


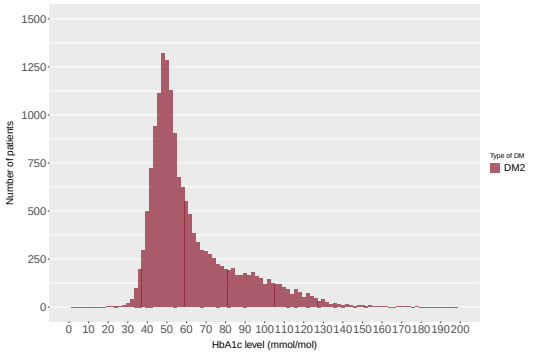
Figure 49: HbA1c strata by age groups for patients with DM type II

10.4.5.7.2 HbA1c levels at initiation of GLD therapy

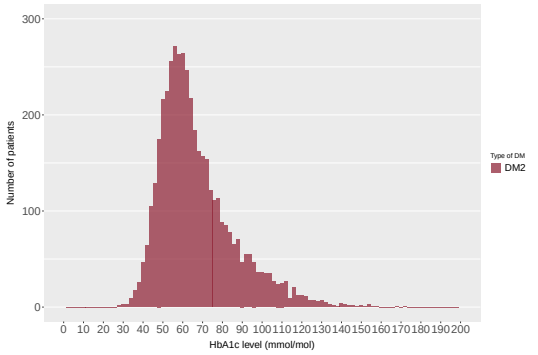
In this section, HbA1c levels at initiation of different GLD classes have been analysed according to the following procedure:

1. Select the patients' first recorded dispensation within each drug class
2. Select all patients having their first dispensation between 01 January 2012 and 31 December 2018
3. Categorize all patients into DM type I and type II according to the defined epidemiologic algorithm
4. Select the most recent HbA1c level before initiation of the drug (the HbA1c level must have been recorded within two years before initiation of the drug)

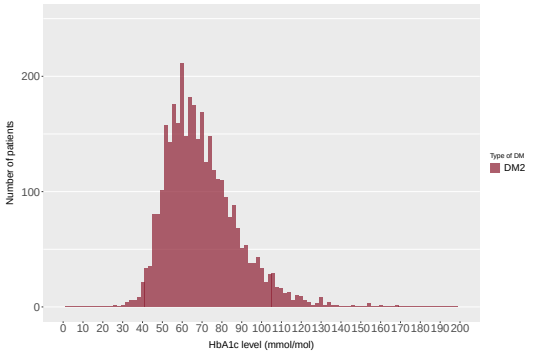
The histogram below presents HbA1c levels at initiation of GLD drug classes:



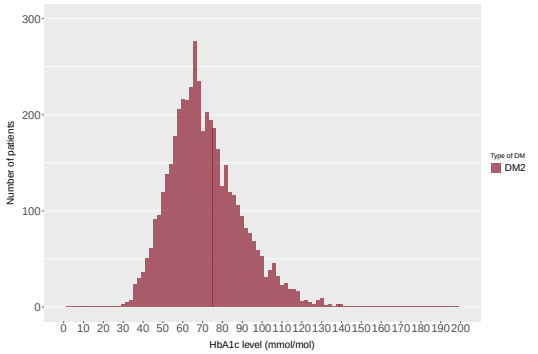
(a) Last recorded HbA1c value before initiation of metformin⩾ 18 years of age



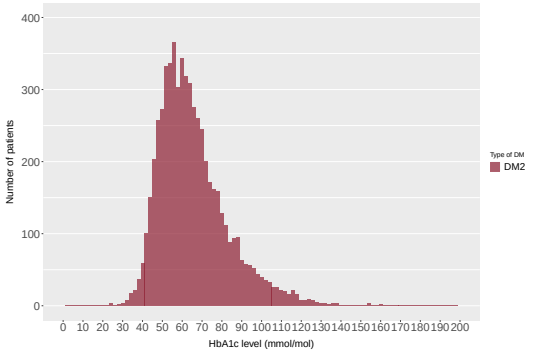
(b) Last recorded HbA1c value before initiation of sulfonylurea⩾ 18 years of age



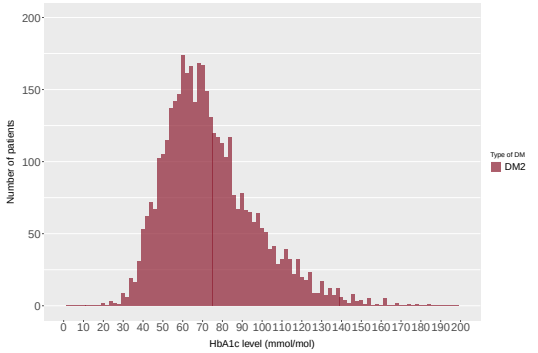
(c) Last recorded HbA1c value before initiation of SGLT-2-i⩾ 18 years of age



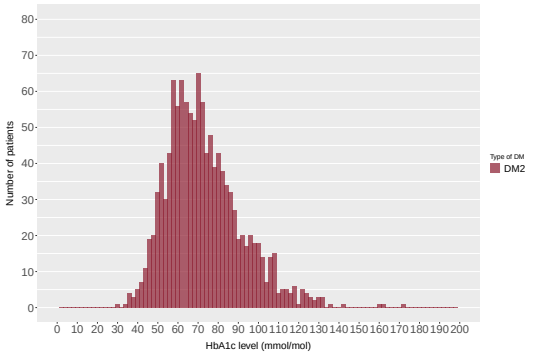
(d) Last recorded HbA1c value before initiation of GLP1-a ⩾ 18 years of age



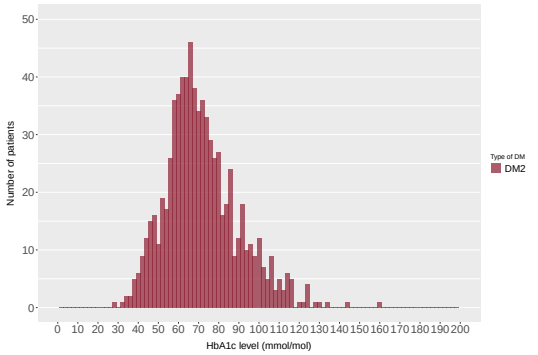
(e) Last recorded HbA1c value before initiation of DPP4-i ⩾ 18 years of age



(f) Last recorded HbA1c value before initiation of insulin glargin 100 ⩾ 18 years of age



(g) Last recorded HbA1c value before initiation of insulin glargin 300 ⩾ 18 years of age



(h) Last recorded HbA1c value before initiation of insulin degludec ⩾ 18 years of age

Figure 50: HbA1c levels at initiation of GLD drug classes among DM type II patients

10.4.5.8 Lipid profile

Blood lipid profile (total cholesterol, LDL, HDL and triglycerides) were analysed for DM type II patients $\geqslant$ 18 years of age.

Blood lipids were possible to obtain for the following number of patients:

Table 86: Number of patients with data on total cholesterol

Age group	Number of patients
18-29	205
30-44	1646
45-64	13692
65-74	12669
75-84	9074
85->	2393
All	39679

Table 87: Number of patients with data on LDL cholesterol

Age group	Number of patients
18-29	182
30-44	1563
45-64	13176
65-74	12312
75-84	8823
85->	2308
All	38364

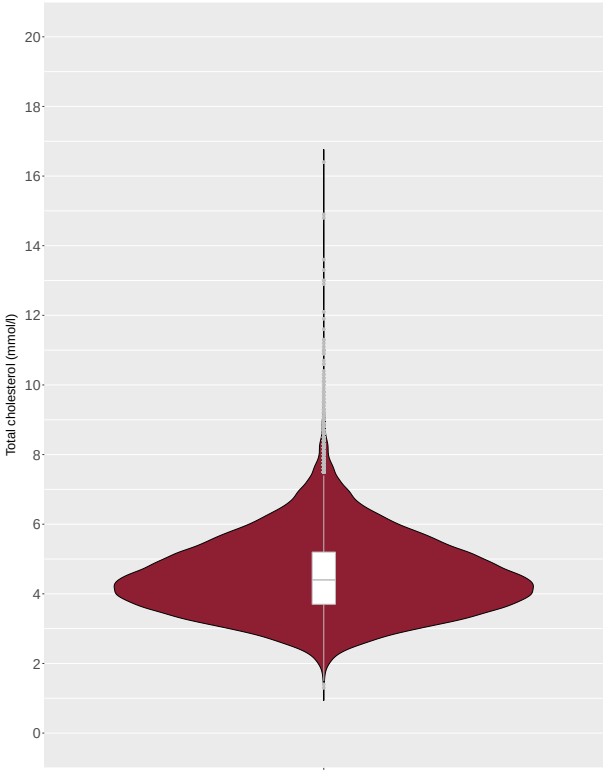
Table 88: Number of patients with data on HDL cholesterol

Age group	Number of patients
18-29	193
30-44	1566
45-64	12945
65-74	11965
75-84	8475
85->	2194
All	37338

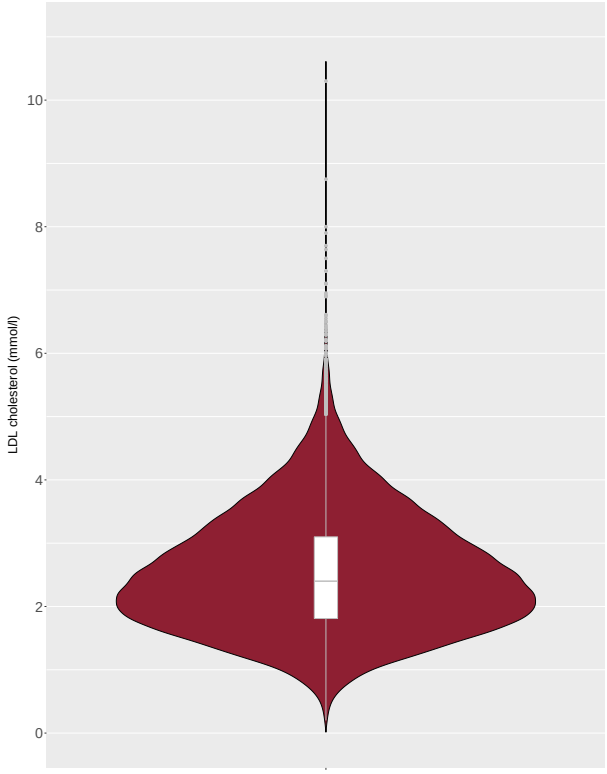
Table 89: Number of patients with data on triglycerides

Age group	Number of patients
18-29	201
30-44	1604
45-64	13341
65-74	12369
75-84	8823
85->	2296
All	38634

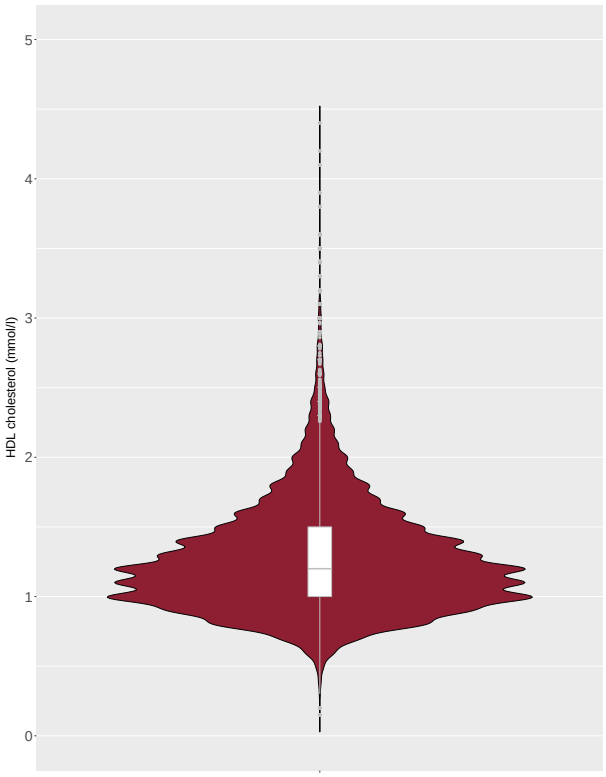
The following figures present violin plots for lipid profile in patients with DM type II ⩾ 18 years of age:



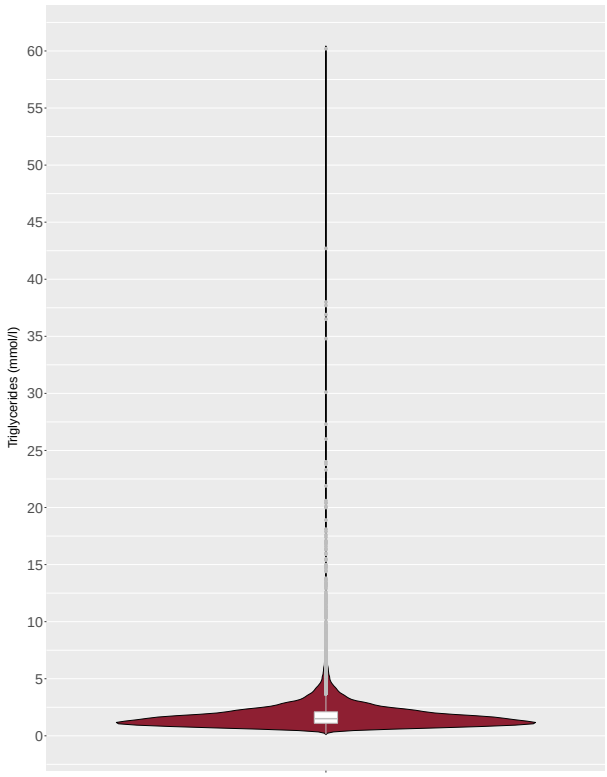
(a) Distribution of total cholesterol for DM type II patients (⩾ 18 years of age)



(b) Distribution of LDL cholesterol for DM type II patients (⩾ 18 years of age)



(c) Distribution of HDL cholesterol for DM type II patients (⩾ 18 years of age)



(d) Distribution of triglycerides for DM type II patients (⩾ 18 years of age)

Figure 51: Blood lipid profile for DM type II patients (⩾ 18 years of age)

10.4.5.9 Hypoglycaemias

10.4.5.9.1 Information on severe hypoglycaemias based on EHR data

Information on severe hypoglycaemias (past 12 months) was possible to obtain from EHRs for the following number of patients:

Table 90: Number of patients with data recorded on severe hypoglycaemia

Variable	Age group	Number of patients with recording	All patients with DM type II	Proportion of patients with a recording of hypoglycemia
Information on severe hypoglycemia (past 12 months)	18-29	107	494	21.7
	30-44	809	3772	21.4
	45-64	6208	31096	20.0
	65-74	5155	29645	17.4
	75-84	3419	21954	15.6
	85->	821	7699	10.7
	All	16519	94660	17.5

Note: This table only presents if information on hypoglycaemia has been recorded in the EHR and **not** if the patient has had a severe hypoglycaemia.

The figure below presents the frequency of hypoglycaemias (past 12 months) by age groups using data from EHRs:

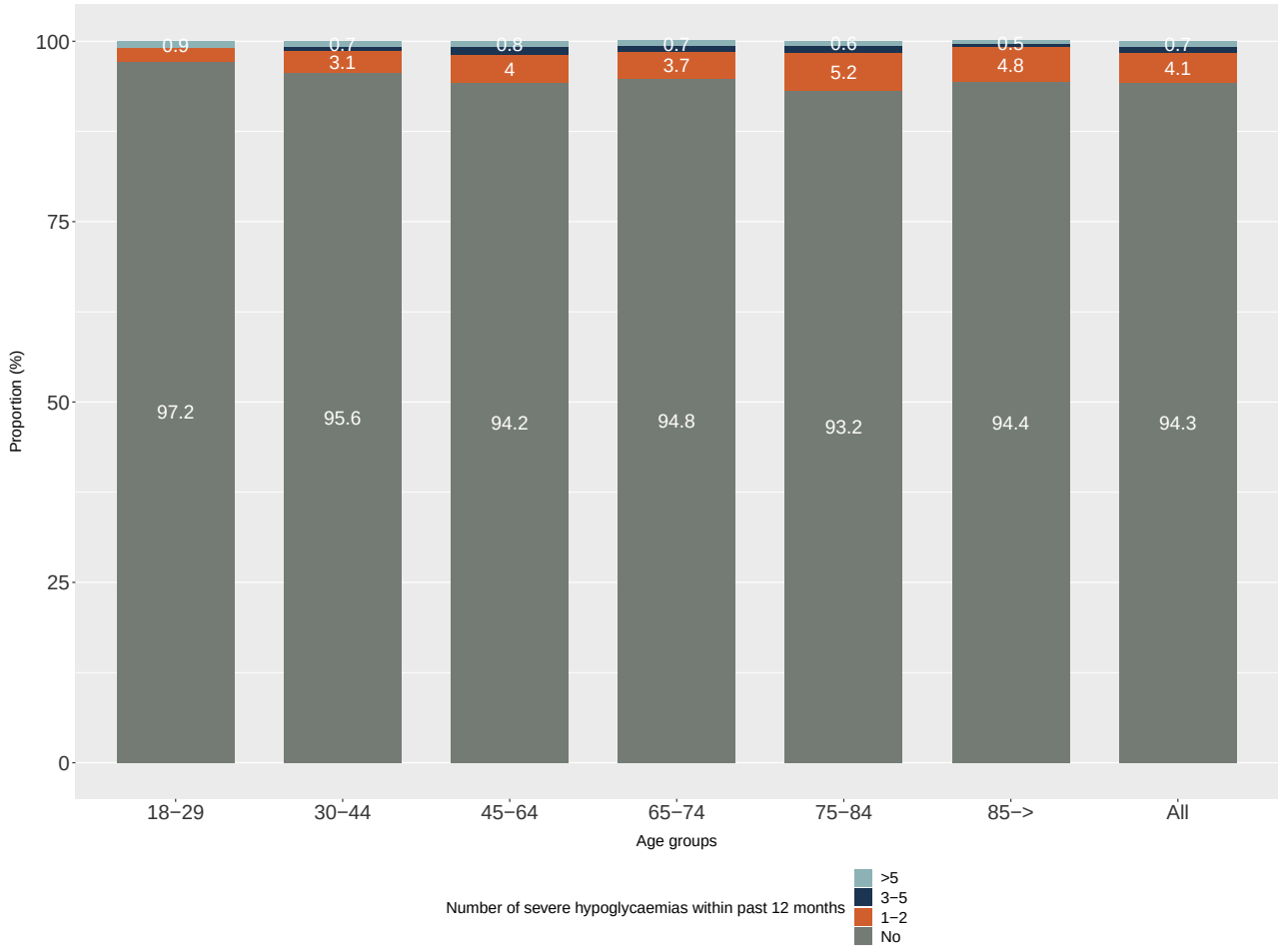


Figure 52: Recording of severe hypoglycaemia (past 12 months) for patients with DM type II

10.4.5.9.2 Information on hypoglycaemias based on diagnosis data

Table 91: Number of patients with a recorded diagnosis of hypoglycaemia within the past two years (based on VAL data)

	Age group	Patients (n) with hypoglycaemia	All DM II patients (>=18 years)	Proportion of DM II patients with hypoglycaemia
Hypoglycemia (according to diagnosis)	18-29	<5	494	n/a
	30-44	18	3772	0.5
	45-64	132	31096	0.4
	65-74	143	29645	0.5
	75-84	224	21954	1
	85->	114	7699	1.5
	All	634	94660	0.7

10.4.5.10 Lactic acidosis

Table 92: Number of patients with a recorded diagnosis of lactic acidosis within the past two years (based on diagnosis data)

	Age group	Patients (n) with lactic acidosis	All DM II patients	Proportion of DM II patients with lactic acidosis
Lactic acidosis (according to diagnosis)	All	35	94660	0.04

10.4.5.11 Diabetic ketoacidosis

Table 93: Number of patients with a recorded diagnosis of ketoacidosis within the past two years

	Age group	Patients (n) with ketoacidosis	All DM II patients (>=18 years)	Proportion of DM II patients with ketoacidosis
Ketoacidosis (according to diagnosis)	18-29	<5	494	n/a
	30-44	11	3772	0.29
	45-64	21	31096	0.07
	65-74	18	29645	0.06
	75-84	13	21954	0.06
	85->	5	7699	0.06
	All	69	94660	0.07

10.4.5.12 Diabetes eyes

10.4.5.12.1 Fundus photography

The table below presents data on performed fundus photography for patients with DM type II.

Table 94: Number of patients with a recorded clinical procedure code for fundus photography

	Age group	Patients (n) with fundus photography	All DM II patients (>= 18 years)	Proportion of DM II patients with fundus photography
Fundus photography within past 12 months	18-29	118	494	23.9
	30-44	1317	3772	34.9
	45-64	11831	31096	38.0
	65-74	10827	29645	36.5
	75-84	7061	21954	32.2
	85->	1551	7699	20.1
	All	32705	94660	34.5
Fundus photography within past 36 months	18-29	197	494	39.9
	30-44	2374	3772	62.9
	45-64	22441	31096	72.2
	65-74	21317	29645	71.9
	75-84	14339	21954	65.3
	85->	3586	7699	46.6
	All	64254	94660	67.9
Fundus photography (ever)	18-29	240	494	48.6
	30-44	2679	3772	71.0
	45-64	25520	31096	82.1
	65-74	24726	29645	83.4
	75-84	17786	21954	81.0
	85->	5538	7699	71.9
	All	76489	94660	80.8

10.4.5.12.2 Retinopathy

The following table presents the number of DM type II patients ($\geqslant$ 18 years) with information on retinopathy from EHRs:

Table 95: Number of patients with information on retinopathy (EHR data)

Age group	Patients (n) with information on retinopathy	All DM II patients (>=18)	Proportion of DM II patients with information on retinopathy
18-29	170	494	34.4
30-44	1748	3772	46.3
45-64	16677	31096	53.6
65-74	16205	29645	54.7
75-84	11187	21954	51.0
85->	3162	7699	41.1
All	49149	94660	51.9

Note: This table only presents if information on retinopathy has been recorded in the EHR and **not** if the patients have retinopathy.

The figures below present frequency of retinopathy among patients with DM type II:

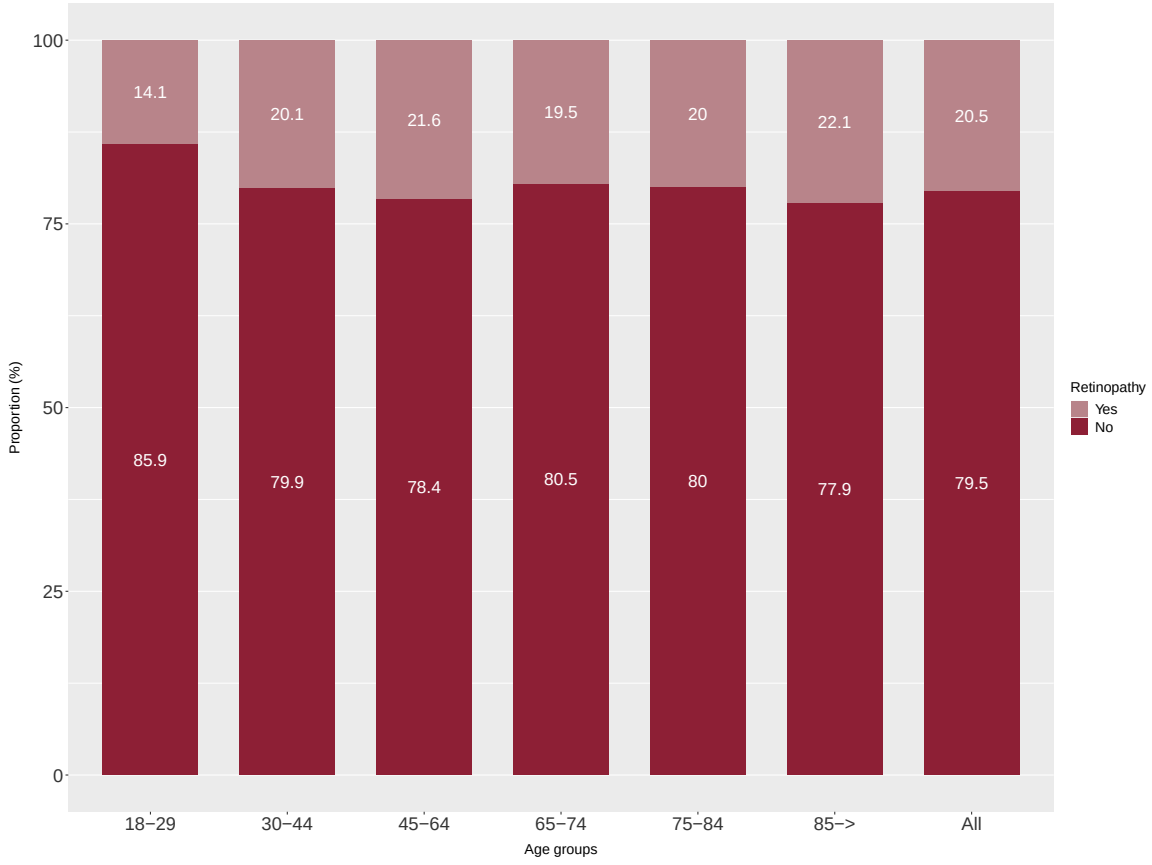


Figure 53: Retinopathy among patients with DM type II (EHR data)

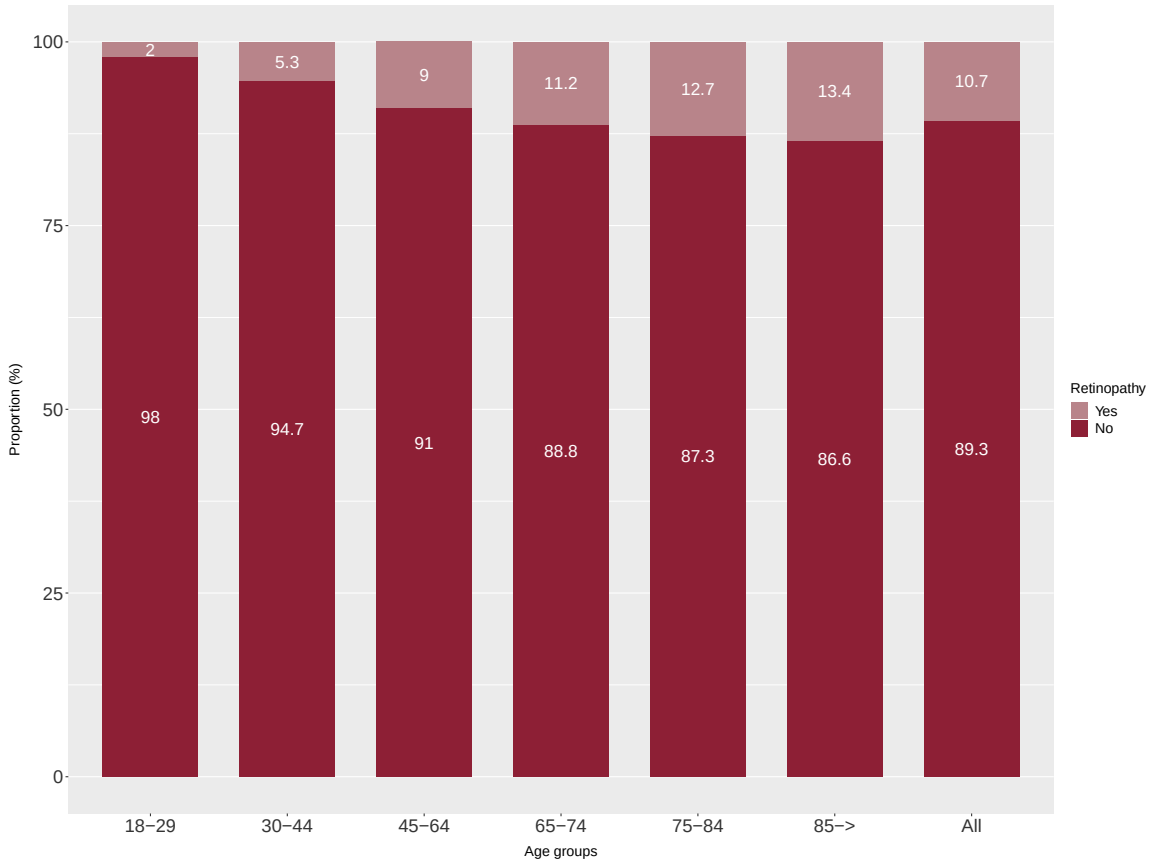


Figure 54: Retinopathy among patients with DM type II (based on diagnosis data)

10.4.5.12.3 DME

The following table presents data on DME for patients with DM type II:

Table 96: Number of patients with a recorded ICD10 diagnosis of DME

	Age group	Patients (n) with DME	All DM II patients	Proportion of DM II patients with DME
DME (ever recorded)	18-29	0	494	0.0
	30-44	16	3772	0.4
	45-64	361	31096	1.2
	65-74	379	29645	1.3
	75-84	283	21954	1.3
	85->	75	7699	1.0
	All	1114	94660	1.2

Note: Since the selection of DME was only based on recorded ICD10 diagnoses, we expect an underestimation of DME in this analysis. It is likely that DME patients are also present among patients with retinopathy above.

10.4.5.12.4 Vitreous body treatment

The following table presents data on patients with a recorded procedure code for drug therapy in the vitreous body.

Table 97: Patients treated with drugs in the vitreous body

	Age group	Patients (n) treated	All DM II patients	Proportion of patients treated (%)
Drug therapy in the vitreous body (ever recorded)	18-29	0	494	0.0
	30-44	24	3772	0.6
	45-64	452	31096	1.5
	65-74	707	29645	2.4
	75-84	818	21954	3.7
	85->	481	7699	6.2
	All	2482	94660	2.6

10.4.5.13 Bariatric surgery

The following table presents data on the frequency of bariatric surgery for patients with DM type II:

Table 98: Bariatric surgery among patient with DM type II

	Age group	Patients (n) with bariatric surgery	All DM II patients	Proportion of patients with a bariatric surgery
Bariatric surgery (according to procedure codes)	18-29	32	494	6.5
	30-44	250	3772	6.6
	45-64	1386	31096	4.5
	65-74	461	29645	1.6
	75-84	60	21954	0.3
	85->	<5	7699	n/a
	All	2191	94660	2.3

10.4.5.14 Diabetes foot

10.4.5.14.1 Diabetic foot ulcer

The following table presents data on the frequency of diabetic foot ulcer for patients with DM type II:

Table 99: Diabetic foot ulcer among patients with DM type II

	Age group	Patients (n) with foot ulcer	All DM II patients (>=18 years)	Proportion of patients with foot ulcer
Diabetic foot ulcer (according to diagnosis)	18-29	6	494	1.2
	30-44	59	3772	1.6
	45-64	821	31096	2.6
	65-74	1089	29645	3.7
	75-84	1182	21954	5.4
	85->	613	7699	8.0
	All	3770	94660	4.0

10.4.5.14.2 Charcot foot

The following table presents data on the frequency of Charcot foot for patients with DM type II:

Table 100: Charcot foot among patients with DM type II

	Age group	Patients (n) with Charcot foot	All DM II patients (>=18 years)	Proportion of patients with Charcot foot
Charcot foot (according to diagnosis)	18-29	0	494	0.0
	30-44	7	3772	0.2
	45-64	106	31096	0.3
	65-74	140	29645	0.5
	75-84	85	21954	0.4
	85->	17	7699	0.2
	All	355	94660	0.4

10.4.5.14.3 Amputation of lower limb

The following table presents data on the frequency of amputation of lower limb for patients with DM type II:

Table 101: Amputation of lower limb among patients with DM type II

	Age group	Patients (n) with an amputation	All DM II patients (>=18 years)	Proportion of patients with an amputation
Amputation of lower limb (according to procedure codes)	18-29	0	2048	0
	30-44	<5	3772	n/a
	45-64	151	31096	0.5
	65-74	230	29645	0.8
	75-84	226	21954	1
	85->	120	7699	1.6
	All	730	94660	0.8

10.4.5.14.4 Revascularization of lower limb

The following table presents data on the frequency of revascularization of lower limb for patients with DM type II:

Table 102: Revascularization of lower limb among patients with DM type II

	Age group	Patients (n) with revascularization	All DM II patients	Proportion of patients with a revascularization
Revascularization of lower limb (according to procedure codes)	18-29	0	494	0
	30-44	<5	3772	n/a
	45-64	203	31096	0.7
	65-74	598	29645	2
	75-84	700	21954	3.2
	85->	262	7699	3.4
	All	1766	94660	1.9

10.4.5.15 Insulin pumps and glucose monitoring

10.4.5.15.1 Insulin pumps

The following table presents data on insulin pumps for patients with DM type II:

Table 103: DM type II patients with insulin pumps

	Age group	Patients (n) with insulin pumps	All DM II patients	Proportion of DM II patients with insulin pump
Insulin pump use	18-29	<5	494	n/a
	30-44	5	3772	0.1
	45-64	43	31096	0.1
	65-74	31	29645	0.1
	75-84	7	21954	0
	All	88	94660	0.1

10.4.5.15.2 CGM/FGM

The following table presents data on CGM/FGM for patients with DM type II:

Table 104: DM type II patients with CGM/FGM

	Age group	Patients (n) with CGM/FGM	All DM II patients	Proportion of DM II patients with CGM/FGM
CGM/FGM use	18-29	26	494	5.3
	30-44	86	3772	2.3
	45-64	546	31096	1.8
	65-74	338	29645	1.1
	75-84	160	21954	0.7
	85->	21	7699	0.3
	All	1177	94660	1.2

10.4.6 Comorbidity

This section presents comorbid conditions among patients with DM type II.

10.4.6.1 Cardiovascular comorbidity

The following table presents data on cardiovascular comorbidity for patients with DM type II:

Table 105: Cardiovascular comorbidity among patients with DM type II

Comorbidity		All	18-29	30-44	45-64	65-74	75-84	85->
N		94,660	494	3,772	31,096	29,645	21,954	7,699
Age	Mean (SD)	67.7 (12.7)	24.9 (3.4)	39.5 (3.9)	56.8 (5.3)	69.9 (2.8)	78.8 (2.8)	88.8 (3.3)
	Median (IQR)	69.0 (59.4, 76.1)	25.1 (22.1, 28.0)	40.1 (37.0, 43.0)	57.2 (53.0, 61.1)	70.0 (67.2, 72.1)	78.2 (76.1, 81.0)	88.0 (86.0, 91.0)
Sex	Female	40,175 (42.4%)	250 (50.6%)	1,582 (41.9%)	11,700 (37.6%)	11,858 (40.0%)	10,101 (46.0%)	4,684 (60.8%)
	Male	54,485 (57.6%)	244 (49.4%)	2,190 (58.1%)	19,396 (62.4%)	17,787 (60.0%)	11,853 (54.0%)	3,015 (39.2%)
Cardiovascular comorbidity (IHD, CHF, AFIB, STROKE/TIA, PAD) - all healthcare levels	Yes	37,639 (39.8%)	<5	194 (5.1%)	6,848 (22.0%)	12,339 (41.6%)	12,641 (57.6%)	5,614 (72.9%)
	No	57,021 (60.2%)	n/a	3,578 (94.9%)	24,248 (78.0%)	17,306 (58.4%)	9,313 (42.4%)	2,085 (27.1%)
Cardiovascular comorbidity (IHD, CHF, AFIB, STROKE/TIA, PAD) - inpatient care (all diagnosis positions)	Yes	30,030 (31.7%)	0 (0.0%)	120 (3.2%)	5,140 (16.5%)	9,677 (32.6%)	10,274 (46.8%)	4,819 (62.6%)
	No	64,630 (68.3%)	494 (100.0%)	3,652 (96.8%)	25,956 (83.5%)	19,968 (67.4%)	11,680 (53.2%)	2,880 (37.4%)
Cardiovascular comorbidity (IHD, CHF, AFIB, STROKE/TIA, PAD) - inpatient care (primary diagnosis position)	Yes	25,998 (27.5%)	0 (0.0%)	101 (2.7%)	4,606 (14.8%)	8,493 (28.6%)	8,789 (40.0%)	4,009 (52.1%)
	No	68,662 (72.5%)	494 (100.0%)	3,671 (97.3%)	26,490 (85.2%)	21,152 (71.4%)	13,165 (60.0%)	3,690 (47.9%)
Cardiovascular comorbidity (excl AFIB) - all healthcare levels	Yes	33,922 (35.8%)	<5	171 (4.5%)	6,247 (20.1%)	10,996 (37.1%)	11,321 (51.6%)	5,184 (67.3%)
	No	60,738 (64.2%)	n/a	3,601 (95.5%)	24,849 (79.9%)	18,649 (62.9%)	10,633 (48.4%)	2,515 (32.7%)
Cardiovascular comorbidity (excl AFIB) - inpatient care (all diagnosis positions)	Yes	26,851 (28.4%)	0 (0.0%)	106 (2.8%)	4,688 (15.1%)	8,597 (29.0%)	9,092 (41.4%)	4,368 (56.7%)
	No	67,809 (71.6%)	494 (100.0%)	3,666 (97.2%)	26,408 (84.9%)	21,048 (71.0%)	12,862 (58.6%)	3,331 (43.3%)
Cardiovascular comorbidity (excl AFIB) - inpatient care (primary diagnosis position)	Yes	23,640 (25.0%)	0 (0.0%)	91 (2.4%)	4,233 (13.6%)	7,666 (25.9%)	7,948 (36.2%)	3,702 (48.1%)
	No	71,020 (75.0%)	494 (100.0%)	3,681 (97.6%)	26,863 (86.4%)	21,979 (74.1%)	14,006 (63.8%)	3,997 (51.9%)
AMI - all healthcare levels	Yes	8,722 (9.2%)	0 (0.0%)	36 (1.0%)	1,861 (6.0%)	2,938 (9.9%)	2,651 (12.1%)	1,236 (16.1%)
	No	85,938 (90.8%)	494 (100.0%)	3,736 (99.0%)	29,235 (94.0%)	26,707 (90.1%)	19,303 (87.9%)	6,463 (83.9%)
AMI - inpatient care (all diagnosis positions)	Yes	8,172 (8.6%)	0 (0.0%)	32 (0.8%)	1,742 (5.6%)	2,777 (9.4%)	2,470 (11.3%)	1,151 (14.9%)
	No	86,488 (91.4%)	494 (100.0%)	3,740 (99.2%)	29,354 (94.4%)	26,868 (90.6%)	19,484 (88.7%)	6,548 (85.1%)
AMI - inpatient care (primary diagnosis position)	Yes	7,728 (8.2%)	0 (0.0%)	31 (0.8%)	1,679 (5.4%)	2,648 (8.9%)	2,315 (10.5%)	1,055 (13.7%)
	No	86,932 (91.8%)	494 (100.0%)	3,741 (99.2%)	29,417 (94.6%)	26,997 (91.1%)	19,639 (89.5%)	6,644 (86.3%)
CHF - all healthcare levels	Yes	11,555 (12.2%)	<5	42 (1.1%)	1,434 (4.6%)	3,090 (10.4%)	4,308 (19.6%)	2,679 (34.8%)
	No	83,105 (87.8%)	n/a	3,730 (98.9%)	29,662 (95.4%)	26,555 (89.6%)	17,646 (80.4%)	5,020 (65.2%)
CHF - inpatient care (all diagnosis positions)	Yes	8,365 (8.8%)	0 (0.0%)	33 (0.9%)	1,028 (3.3%)	2,206 (7.4%)	3,045 (13.9%)	2,053 (26.7%)
	No	86,295 (91.2%)	494 (100.0%)	3,739 (99.1%)	30,068 (96.7%)	27,439 (92.6%)	18,909 (86.1%)	5,646 (73.3%)
CHF - inpatient care (primary diagnosis position)	Yes	4,464 (4.7%)	0 (0.0%)	24 (0.6%)	557 (1.8%)	1,132 (3.8%)	1,601 (7.3%)	1,150 (14.9%)
	No	90,196 (95.3%)	494 (100.0%)	3,748 (99.4%)	30,539 (98.2%)	28,513 (96.2%)	20,353 (92.7%)	6,549 (85.1%)
STROKE/TIA - all healthcare levels	Yes	11,353 (12.0%)	0 (0.0%)	47 (1.2%)	1,683 (5.4%)	3,452 (11.6%)	4,133 (18.8%)	2,038 (26.5%)
	No	83,307 (88.0%)	494 (100.0%)	3,725 (98.8%)	29,413 (94.6%)	26,193 (88.4%)	17,821 (81.2%)	5,661 (73.5%)
STROKE/TIA - inpatient care (all diagnosis positions)	Yes	9,333 (9.9%)	0 (0.0%)	26 (0.7%)	1,349 (4.3%)	2,799 (9.4%)	3,429 (15.6%)	1,730 (22.5%)
	No	85,327 (90.1%)	494 (100.0%)	3,746 (99.3%)	29,747 (95.7%)	26,846 (90.6%)	18,525 (84.4%)	5,969 (77.5%)
STROKE/TIA - inpatient care (primary diagnosis position)	Yes	8,805 (9.3%)	0 (0.0%)	24 (0.6%)	1,268 (4.1%)	2,644 (8.9%)	3,238 (14.7%)	1,631 (21.2%)
	No	85,855 (90.7%)	494 (100.0%)	3,748 (99.4%)	29,828 (95.9%)	27,001 (91.1%)	18,716 (85.3%)	6,068 (78.8%)
PAD - all healthcare levels	Yes	7,015 (7.4%)	<5	25 (0.7%)	925 (3.0%)	2,340 (7.9%)	2,626 (12.0%)	1,098 (14.3%)
	No	87,645 (92.6%)	n/a	3,747 (99.3%)	30,171 (97.0%)	27,305 (92.1%)	19,328 (88.0%)	6,601 (85.7%)
PAD - inpatient care (all diagnosis positions)	Yes	3,610 (3.8%)	0 (0.0%)	11 (0.3%)	451 (1.5%)	1,171 (4.0%)	1,385 (6.3%)	592 (7.7%)
	No	91,050 (96.2%)	494 (100.0%)	3,761 (99.7%)	30,645 (98.5%)	28,474 (96.0%)	20,569 (93.7%)	7,107 (92.3%)
PAD - inpatient care (primary diagnosis position)	Yes	2,640 (2.8%)	0 (0.0%)	5 (0.1%)	310 (1.0%)	866 (2.9%)	1,038 (4.7%)	421 (5.5%)
	No	92,020 (97.2%)	494 (100.0%)	3,767 (99.9%)	30,786 (99.0%)	28,779 (97.1%)	20,916 (95.3%)	7,278 (94.5%)
AFIB - all healthcare levels	Yes	13,294 (14.0%)	0 (0.0%)	31 (0.8%)	1,340 (4.3%)	3,917 (13.2%)	5,313 (24.2%)	2,693 (35.0%)
	No	81,366 (86.0%)	494 (100.0%)	3,741 (99.2%)	29,756 (95.7%)	25,728 (86.8%)	16,641 (75.8%)	5,006 (65.0%)
AFIB - inpatient care (all diagnosis positions)	Yes	10,578 (11.2%)	0 (0.0%)	21 (0.6%)	974 (3.1%)	2,952 (10.0%)	4,272 (19.5%)	2,359 (30.6%)
	No	84,082 (88.8%)	494 (100.0%)	3,751 (99.4%)	30,122 (96.9%)	26,693 (90.0%)	17,682 (80.5%)	5,340 (69.4%)
AFIB - inpatient care (primary diagnosis position)	Yes	5,123 (5.4%)	0 (0.0%)	17 (0.5%)	594 (1.9%)	1,537 (5.2%)	1,980 (9.0%)	995 (12.9%)
	No	89,537 (94.6%)	494 (100.0%)	3,755 (99.5%)	30,502 (98.1%)	28,108 (94.8%)	19,974 (91.0%)	6,704 (87.1%)
IHD - all healthcare levels	Yes	19,960 (21.1%)	0 (0.0%)	75 (2.0%)	3,862 (12.4%)	6,611 (22.3%)	6,526 (29.7%)	2,886 (37.5%)
	No	74,700 (78.9%)	494 (100.0%)	3,697 (98.0%)	27,234 (87.6%)	23,034 (77.7%)	15,428 (70.3%)	4,813 (62.5%)
IHD - inpatient care (all diagnosis positions)	Yes	15,827 (16.7%)	0 (0.0%)	49 (1.3%)	2,901 (9.3%)	5,241 (17.7%)	5,220 (23.8%)	2,416 (31.4%)
	No	78,833 (83.3%)	494 (100.0%)	3,723 (98.7%)	28,195 (90.7%)	24,404 (82.3%)	16,734 (76.2%)	5,283 (68.6%)
IHD - inpatient care (primary diagnosis position)	Yes	13,261 (14.0%)	0 (0.0%)	44 (1.2%)	2,591 (8.3%)	4,547 (15.3%)	4,260 (19.4%)	1,819 (23.6%)
	No	81,399 (86.0%)	494 (100.0%)	3,728 (98.8%)	28,505 (91.7%)	25,098 (84.7%)	17,694 (80.6%)	5,880 (76.4%)
Hypertension - all healthcare levels	Yes	73,136 (77.3%)	51 (10.3%)	1,207 (32.0%)	20,381 (65.5%)	24,808 (83.7%)	19,600 (89.3%)	7,089 (92.1%)
	No	21,524 (22.7%)	443 (89.7%)	2,565 (68.0%)	10,715 (34.5%)	4,837 (16.3%)	2,354 (10.7%)	610 (7.9%)
Hypertension - inpatient care (all diagnosis positions)	Yes	41,455 (43.8%)	8 (1.6%)	332 (8.8%)	8,626 (27.7%)	13,770 (46.4%)	13,082 (59.6%)	5,637 (73.2%)
	No	53,205 (56.2%)	486 (98.4%)	3,440 (91.2%)	22,470 (72.3%)	15,875 (53.6%)	8,872 (40.4%)	2,062 (26.8%)
Hypertension - inpatient care (primary diagnosis position)	Yes	2,130 (2.3%)	0 (0.0%)	25 (0.7%)	507 (1.6%)	670 (2.3%)	595 (2.7%)	333 (4.3%)
	No	92,530 (97.7%)	494 (100.0%)	3,747 (99.3%)	30,589 (98.4%)	28,975 (97.7%)	21,359 (97.3%)	7,366 (95.7%)

10.4.6.2 Psychiatric comorbidity

The following table presents data on psychiatric comorbid conditions for patients with DM type II:

Table 106: Psychiatric comorbidity among patients with DM type II

Comorbidity		All	18-29	30-44	45-64	65-74	75-84	85->
N		94,660	494	3,772	31,096	29,645	21,954	7,699
Age	Mean (SD)	67.7 (12.7)	24.9 (3.4)	39.5 (3.9)	56.8 (5.3)	69.9 (2.8)	78.8 (2.8)	88.8 (3.3)
	Median (IQR)	69.0 (59.4, 76.1)	25.1 (22.1, 28.0)	40.1 (37.0, 43.0)	57.2 (53.0, 61.1)	70.0 (67.2, 72.1)	78.2 (76.1, 81.0)	88.0 (86.0, 91.0)
Sex	Female	40,175 (42.4%)	250 (50.6%)	1,582 (41.9%)	11,700 (37.6%)	11,858 (40.0%)	10,101 (46.0%)	4,684 (60.8%)
	Male	54,485 (57.6%)	244 (49.4%)	2,190 (58.1%)	19,396 (62.4%)	17,787 (60.0%)	11,853 (54.0%)	3,015 (39.2%)
Psychiatric comorbidity - all healthcare levels	Yes	28,089 (29.7%)	212 (42.9%)	1,344 (35.6%)	10,830 (34.8%)	7,458 (25.2%)	5,500 (25.1%)	2,745 (35.7%)
	No	66,571 (70.3%)	282 (57.1%)	2,428 (64.4%)	20,266 (65.2%)	22,187 (74.8%)	16,454 (74.9%)	4,954 (64.3%)
Psychiatric comorbidity- inpatient care (all diagnosis positions)	Yes	8,348 (8.8%)	62 (12.6%)	420 (11.1%)	2,805 (9.0%)	1,972 (6.7%)	1,794 (8.2%)	1,295 (16.8%)
	No	86,312 (91.2%)	432 (87.4%)	3,352 (88.9%)	28,291 (91.0%)	27,673 (93.3%)	20,160 (91.8%)	6,404 (83.2%)
Psychiatric comorbidity - inpatient care (primary diagnosis position)	Yes	4,521 (4.8%)	30 (6.1%)	294 (7.8%)	1,850 (5.9%)	1,076 (3.6%)	792 (3.6%)	479 (6.2%)
	No	90,139 (95.2%)	464 (93.9%)	3,478 (92.2%)	29,246 (94.1%)	28,569 (96.4%)	21,162 (96.4%)	7,220 (93.8%)
Anxiety - all healthcare levels	Yes	13,749 (14.5%)	116 (23.5%)	858 (22.7%)	6,005 (19.3%)	3,544 (12.0%)	2,252 (10.3%)	974 (12.7%)
	No	80,911 (85.5%)	378 (76.5%)	2,914 (77.3%)	25,091 (80.7%)	26,101 (88.0%)	19,702 (89.7%)	6,725 (87.3%)
Anxiety - inpatient care (all diagnosis positions)	Yes	2,447 (2.6%)	18 (3.6%)	160 (4.2%)	940 (3.0%)	595 (2.0%)	460 (2.1%)	274 (3.6%)
	No	92,213 (97.4%)	476 (96.4%)	3,612 (95.8%)	30,156 (97.0%)	29,050 (98.0%)	21,494 (97.9%)	7,425 (96.4%)
Anxiety - inpatient care (primary diagnosis position)	Yes	951 (1.0%)	12 (2.4%)	80 (2.1%)	426 (1.4%)	216 (0.7%)	147 (0.7%)	70 (0.9%)
	No	93,709 (99.0%)	482 (97.6%)	3,692 (97.9%)	30,670 (98.6%)	29,429 (99.3%)	21,807 (99.3%)	7,629 (99.1%)
Depression - all healthcare levels	Yes	18,362 (19.4%)	98 (19.8%)	861 (22.8%)	7,712 (24.8%)	5,135 (17.3%)	3,221 (14.7%)	1,335 (17.3%)
	No	76,298 (80.6%)	396 (80.2%)	2,911 (77.2%)	23,384 (75.2%)	24,510 (82.7%)	18,733 (85.3%)	6,364 (82.7%)
Depression - inpatient care (all diagnosis positions)	Yes	3,756 (4.0%)	24 (4.9%)	178 (4.7%)	1,460 (4.7%)	1,016 (3.4%)	729 (3.3%)	349 (4.5%)
	No	90,904 (96.0%)	470 (95.1%)	3,594 (95.3%)	29,636 (95.3%)	28,629 (96.6%)	21,225 (96.7%)	7,350 (95.5%)
Depression - inpatient care (primary diagnosis position)	Yes	1,896 (2.0%)	15 (3.0%)	104 (2.8%)	829 (2.7%)	494 (1.7%)	326 (1.5%)	128 (1.7%)
	No	92,764 (98.0%)	479 (97.0%)	3,668 (97.2%)	30,267 (97.3%)	29,151 (98.3%)	21,628 (98.5%)	7,571 (98.3%)
Dementia - all healthcare levels	Yes	3,549 (3.7%)	0 (0.0%)	<5	116 (0.4%)	550 (1.9%)	1,558 (7.1%)	1,324 (17.2%)
	No	91,111 (96.3%)	494 (100.0%)	n/a	30,980 (99.6%)	29,095 (98.1%)	20,396 (92.9%)	6,375 (82.8%)
Dementia - inpatient care (all diagnosis positions)	Yes	1,859 (2.0%)	0 (0.0%)	<5	30 (0.1%)	234 (0.8%)	765 (3.5%)	829 (10.8%)
	No	92,801 (98.0%)	494 (100.0%)	n/a	31,066 (99.9%)	29,411 (99.2%)	21,189 (96.5%)	6,870 (89.2%)
Dementia - inpatient care (primary diagnosis position)	Yes	683 (0.7%)	0 (0.0%)	0 (0.0%)	16 (0.1%)	91 (0.3%)	288 (1.3%)	288 (3.7%)
	No	93,977 (99.3%)	494 (100.0%)	3,772 (100.0%)	31,080 (99.9%)	29,554 (99.7%)	21,666 (98.7%)	7,411 (96.3%)
Psychosis - all healthcare levels	Yes	2,477 (2.6%)	9 (1.8%)	210 (5.6%)	1,284 (4.1%)	638 (2.2%)	257 (1.2%)	79 (1.0%)
	No	92,183 (97.4%)	485 (98.2%)	3,562 (94.4%)	29,812 (95.9%)	29,007 (97.8%)	21,697 (98.8%)	7,620 (99.0%)
Psychosis - inpatient care (all diagnosis positions)	Yes	1,824 (1.9%)	<5	170 (4.5%)	942 (3.0%)	482 (1.6%)	180 (0.8%)	46 (0.6%)
	No	92,836 (98.1%)	n/a	3,602 (95.5%)	30,154 (97.0%)	29,163 (98.4%)	21,774 (99.2%)	7,653 (99.4%)
Psychosis - inpatient care (primary diagnosis position)	Yes	1,536 (1.6%)	<5	154 (4.1%)	820 (2.6%)	401 (1.4%)	132 (0.6%)	27 (0.4%)
	No	93,124 (98.4%)	n/a	3,618 (95.9%)	30,276 (97.4%)	29,244 (98.6%)	21,822 (99.4%)	7,672 (99.6%)
Neuropsychiatric disorder - all healthcare levels	Yes	3,310 (3.5%)	132 (26.7%)	444 (11.8%)	1,862 (6.0%)	645 (2.2%)	188 (0.9%)	39 (0.5%)
	No	91,350 (96.5%)	362 (73.3%)	3,328 (88.2%)	29,234 (94.0%)	29,000 (97.8%)	21,766 (99.1%)	7,660 (99.5%)
Neuropsychiatric disorder - inpatient care (all diagnosis positions)	Yes	981 (1.0%)	45 (9.1%)	156 (4.1%)	551 (1.8%)	169 (0.6%)	53 (0.2%)	7 (0.1%)
	No	93,679 (99.0%)	449 (90.9%)	3,616 (95.9%)	30,545 (98.2%)	29,476 (99.4%)	21,901 (99.8%)	7,692 (99.9%)
Neuropsychiatric disorder - inpatient care (primary diagnosis position)	Yes	487 (0.5%)	14 (2.8%)	85 (2.3%)	294 (0.9%)	71 (0.2%)	20 (0.1%)	<5
	No	94,173 (99.5%)	480 (97.2%)	3,687 (97.7%)	30,802 (99.1%)	29,574 (99.8%)	21,934 (99.9%)	n/a

10.4.6.3 Cancer

The following table presents data on cancer for patients with DM type II:

Table 107: Cancer among patients with DM type II

Comorbidity		All	18-29	30-44	45-64	65-74	75-84	85->
N		94,660	494	3,772	31,096	29,645	21,954	7,699
Age	Mean (SD)	67.7 (12.7)	24.9 (3.4)	39.5 (3.9)	56.8 (5.3)	69.9 (2.8)	78.8 (2.8)	88.8 (3.3)
	Median (IQR)	69.0 (59.4, 76.1)	25.1 (22.1, 28.0)	40.1 (37.0, 43.0)	57.2 (53.0, 61.1)	70.0 (67.2, 72.1)	78.2 (76.1, 81.0)	88.0 (86.0, 91.0)
Sex	Female	40,175 (42.4%)	250 (50.6%)	1,582 (41.9%)	11,700 (37.6%)	11,858 (40.0%)	10,101 (46.0%)	4,684 (60.8%)
	Male	54,485 (57.6%)	244 (49.4%)	2,190 (58.1%)	19,396 (62.4%)	17,787 (60.0%)	11,853 (54.0%)	3,015 (39.2%)
Cancer (malignancy) - all healthcare levels	Yes	19,762 (20.9%)	18 (3.6%)	111 (2.9%)	2,638 (8.5%)	6,753 (22.8%)	7,272 (33.1%)	2,970 (38.6%)
	No	74,898 (79.1%)	476 (96.4%)	3,661 (97.1%)	28,458 (91.5%)	22,892 (77.2%)	14,682 (66.9%)	4,729 (61.4%)
Cancer (malignancy) inpatient care (all diagnosis positions)	Yes	10,979 (11.6%)	12 (2.4%)	62 (1.6%)	1,526 (4.9%)	3,868 (13.0%)	3,993 (18.2%)	1,518 (19.7%)
	No	83,681 (88.4%)	482 (97.6%)	3,710 (98.4%)	29,570 (95.1%)	25,777 (87.0%)	17,961 (81.8%)	6,181 (80.3%)
Cancer (malignancy) - inpatient care (primary diagnosis position)	Yes	9,158 (9.7%)	9 (1.8%)	50 (1.3%)	1,331 (4.3%)	3,284 (11.1%)	3,313 (15.1%)	1,171 (15.2%)
	No	85,502 (90.3%)	485 (98.2%)	3,722 (98.7%)	29,765 (95.7%)	26,361 (88.9%)	18,641 (84.9%)	6,528 (84.8%)
Breast cancer - all healthcare levels	Yes	2,911 (3.1%)	0 (0.0%)	10 (0.3%)	423 (1.4%)	1,019 (3.4%)	1,037 (4.7%)	422 (5.5%)
	No	91,749 (96.9%)	494 (100.0%)	3,762 (99.7%)	30,673 (98.6%)	28,626 (96.6%)	20,917 (95.3%)	7,277 (94.5%)
Breast cancer - inpatient care (all diagnosis positions)	Yes	2,173 (2.3%)	0 (0.0%)	10 (0.3%)	329 (1.1%)	788 (2.7%)	752 (3.4%)	294 (3.8%)
	No	92,487 (97.7%)	494 (100.0%)	3,762 (99.7%)	30,767 (98.9%)	28,857 (97.3%)	21,202 (96.6%)	7,405 (96.2%)
Breast cancer - inpatient care (primary diagnosis position)	Yes	2,074 (2.2%)	0 (0.0%)	10 (0.3%)	317 (1.0%)	762 (2.6%)	716 (3.3%)	269 (3.5%)
	No	92,586 (97.8%)	494 (100.0%)	3,762 (99.7%)	30,779 (99.0%)	28,883 (97.4%)	21,238 (96.7%)	7,430 (96.5%)
Prostate cancer - all healthcare levels	Yes	4,219 (4.5%)	0 (0.0%)	0 (0.0%)	306 (1.0%)	1,634 (5.5%)	1,759 (8.0%)	520 (6.8%)
	No	90,441 (95.5%)	494 (100.0%)	3,772 (100.0%)	30,790 (99.0%)	28,011 (94.5%)	20,195 (92.0%)	7,179 (93.2%)
Prostate cancer - inpatient care (all diagnosis positions)	Yes	2,806 (3.0%)	0 (0.0%)	0 (0.0%)	192 (0.6%)	1,088 (3.7%)	1,195 (5.4%)	331 (4.3%)
	No	91,854 (97.0%)	494 (100.0%)	3,772 (100.0%)	30,904 (99.4%)	28,557 (96.3%)	20,759 (94.6%)	7,368 (95.7%)
Prostate cancer - inpatient care (primary diagnosis position)	Yes	1,881 (2.0%)	0 (0.0%)	0 (0.0%)	158 (0.5%)	796 (2.7%)	793 (3.6%)	134 (1.7%)
	No	92,779 (98.0%)	494 (100.0%)	3,772 (100.0%)	30,938 (99.5%)	28,849 (97.3%)	21,161 (96.4%)	7,565 (98.3%)
Pancreas cancer - all healthcare levels	Yes	354 (0.4%)	<5	<5	71 (0.2%)	125 (0.4%)	118 (0.5%)	37 (0.5%)
	No	94,306 (99.6%)	n/a	n/a	31,025 (99.8%)	29,520 (99.6%)	21,836 (99.5%)	7,662 (99.5%)
Pancreas cancer - inpatient care (all diagnosis positions)	Yes	238 (0.3%)	<5	<5	47 (0.2%)	84 (0.3%)	78 (0.4%)	26 (0.3%)
	No	94,422 (99.7%)	n/a	n/a	31,049 (99.8%)	29,561 (99.7%)	21,876 (99.6%)	7,673 (99.7%)
Pancreas cancer - inpatient care (primary diagnosis position)	Yes	204 (0.2%)	<5	0 (0.0%)	44 (0.1%)	75 (0.3%)	65 (0.3%)	19 (0.2%)
	No	94,456 (99.8%)	n/a	3,772 (100.0%)	31,052 (99.9%)	29,570 (99.7%)	21,889 (99.7%)	7,680 (99.8%)
Bladder cancer - all healthcare levels	Yes	1,185 (1.3%)	0 (0.0%)	<5	117 (0.4%)	388 (1.3%)	507 (2.3%)	170 (2.2%)
	No	93,475 (98.7%)	494 (100.0%)	n/a	30,979 (99.6%)	29,257 (98.7%)	21,447 (97.7%)	7,529 (97.8%)
Bladder cancer - inpatient care (all diagnosis positions)	Yes	837 (0.9%)	0 (0.0%)	<5	74 (0.2%)	263 (0.9%)	366 (1.7%)	132 (1.7%)
	No	93,823 (99.1%)	494 (100.0%)	n/a	31,022 (99.8%)	29,382 (99.1%)	21,588 (98.3%)	7,567 (98.3%)
Bladder cancer - inpatient care (primary diagnosis position)	Yes	786 (0.8%)	0 (0.0%)	<5	65 (0.2%)	247 (0.8%)	348 (1.6%)	124 (1.6%)
	No	93,874 (99.2%)	494 (100.0%)	n/a	31,031 (99.8%)	29,398 (99.2%)	21,606 (98.4%)	7,575 (98.4%)
Colon cancer cancer - all healthcare levels	Yes	1,366 (1.4%)	0 (0.0%)	4 (0.1%)	154 (0.5%)	364 (1.2%)	524 (2.4%)	320 (4.2%)
	No	93,294 (98.6%)	494 (100.0%)	3,768 (99.9%)	30,942 (99.5%)	29,281 (98.8%)	21,430 (97.6%)	7,379 (95.8%)
Colon cancer - inpatient care (all diagnosis positions)	Yes	1,071 (1.1%)	0 (0.0%)	<5	118 (0.4%)	287 (1.0%)	417 (1.9%)	246 (3.2%)
	No	93,589 (98.9%)	494 (100.0%)	n/a	30,978 (99.6%)	29,358 (99.0%)	21,537 (98.1%)	7,453 (96.8%)
Colon cancer - inpatient care (primary diagnosis position)	Yes	1,017 (1.1%)	0 (0.0%)	<5	108 (0.3%)	272 (0.9%)	397 (1.8%)	237 (3.1%)
	No	93,643 (98.9%)	494 (100.0%)	n/a	30,988 (99.7%)	29,373 (99.1%)	21,557 (98.2%)	7,462 (96.9%)

10.4.6.4 Other comorbidity

The following table presents data on other cormobidity for patients with DM type II:

Table 108: Other comorbidities among patients with DM type II

Comorbidity		All	18-29	30-44	45-64	65-74	75-84	85->
N		94,660	494	3,772	31,096	29,645	21,954	7,699
Age	Mean (SD)	67.7 (12.7)	24.9 (3.4)	39.5 (3.9)	56.8 (5.3)	69.9 (2.8)	78.8 (2.8)	88.8 (3.3)
	Median (IQR)	69.0 (59.4, 76.1)	25.1 (22.1, 28.0)	40.1 (37.0, 43.0)	57.2 (53.0, 61.1)	70.0 (67.2, 72.1)	78.2 (76.1, 81.0)	88.0 (86.0, 91.0)
Sex	Female	40,175 (42.4%)	250 (50.6%)	1,582 (41.9%)	11,700 (37.6%)	11,858 (40.0%)	10,101 (46.0%)	4,684 (60.8%)
	Male	54,485 (57.6%)	244 (49.4%)	2,190 (58.1%)	19,396 (62.4%)	17,787 (60.0%)	11,853 (54.0%)	3,015 (39.2%)
Addisons disease - all healthcare levels	Yes	98 (0.1%)	0 (0.0%)	5 (0.1%)	27 (0.1%)	28 (0.1%)	27 (0.1%)	11 (0.1%)
	No	94,562 (99.9%)	494 (100.0%)	3,767 (99.9%)	31,069 (99.9%)	29,617 (99.9%)	21,927 (99.9%)	7,688 (99.9%)
Addisons disease- inpatient care (all diagnosis positions)	Yes	51 (0.1%)	0 (0.0%)	<5	13 (0.0%)	15 (0.1%)	15 (0.1%)	6 (0.1%)
	No	94,609 (99.9%)	494 (100.0%)	n/a	31,083 (100.0%)	29,630 (99.9%)	21,939 (99.9%)	7,693 (99.9%)
Addisons disease - inpatient care (primary diagnosis position)	Yes	27 (0.0%)	0 (0.0%)	<5	10 (0.0%)	6 (0.0%)	5 (0.0%)	5 (0.1%)
	No	94,633 (100.0%)	494 (100.0%)	n/a	31,086 (100.0%)	29,639 (100.0%)	21,949 (100.0%)	7,694 (99.9%)
Thyroid disease - all healthcare levels	Yes	13,337 (14.1%)	64 (13.0%)	488 (12.9%)	3,690 (11.9%)	3,919 (13.2%)	3,560 (16.2%)	1,616 (21.0%)
	No	81,323 (85.9%)	430 (87.0%)	3,284 (87.1%)	27,406 (88.1%)	25,726 (86.8%)	18,394 (83.8%)	6,083 (79.0%)
Thyroid disease - inpatient care (all diagnosis positions)	Yes	5,561 (5.9%)	19 (3.8%)	193 (5.1%)	1,201 (3.9%)	1,498 (5.1%)	1,665 (7.6%)	985 (12.8%)
	No	89,099 (94.1%)	475 (96.2%)	3,579 (94.9%)	29,895 (96.1%)	28,147 (94.9%)	20,289 (92.4%)	6,714 (87.2%)
Thyroid disease - inpatient care (primary diagnosis position)	Yes	624 (0.7%)	<5	21 (0.6%)	211 (0.7%)	202 (0.7%)	143 (0.7%)	46 (0.6%)
	No	94,036 (99.3%)	n/a	3,751 (99.4%)	30,885 (99.3%)	29,443 (99.3%)	21,811 (99.3%)	7,653 (99.4%)
Celiac disease - all healthcare levels	Yes	347 (0.4%)	<5	9 (0.2%)	110 (0.4%)	107 (0.4%)	90 (0.4%)	27 (0.4%)
	No	94,313 (99.6%)	n/a	3,763 (99.8%)	30,986 (99.6%)	29,538 (99.6%)	21,864 (99.6%)	7,672 (99.6%)
Celiac disease - inpatient care (all diagnosis positions)	Yes	66 (0.1%)	0 (0.0%)	<5	16 (0.1%)	18 (0.1%)	24 (0.1%)	6 (0.1%)
	No	94,594 (99.9%)	494 (100.0%)	n/a	31,080 (99.9%)	29,627 (99.9%)	21,930 (99.9%)	7,693 (99.9%)
Celiac disease - inpatient care (primary diagnosis position)	Yes	6 (0.0%)	0 (0.0%)	0 (0.0%)	<5	<5	1 (0.0%)	<5
	No	94,654 (100.0%)	494 (100.0%)	3,772 (100.0%)	n/a	n/a	21,953 (100.0%)	n/a
Pernicious anemia - all healthcare levels	Yes	116 (0.1%)	0 (0.0%)	<5	29 (0.1%)	32 (0.1%)	31 (0.1%)	22 (0.3%)
	No	94,544 (99.9%)	494 (100.0%)	n/a	31,067 (99.9%)	29,613 (99.9%)	21,923 (99.9%)	7,677 (99.7%)
Pernicious anemia - inpatient care (all diagnosis positions)	Yes	37 (0.0%)	0 (0.0%)	0 (0.0%)	9 (0.0%)	5 (0.0%)	15 (0.1%)	8 (0.1%)
	No	94,623 (100.0%)	494 (100.0%)	3,772 (100.0%)	31,087 (100.0%)	29,640 (100.0%)	21,939 (99.9%)	7,691 (99.9%)
Pernicious anemia - inpatient care (primary diagnosis position)	Yes	12 (0.0%)	0 (0.0%)	0 (0.0%)	5 (0.0%)	<5	6 (0.0%)	0 (0.0%)
	No	94,648 (100.0%)	494 (100.0%)	3,772 (100.0%)	31,091 (100.0%)	n/a	21,948 (100.0%)	7,699 (100.0%)
Vitiligo - all healthcare levels	Yes	426 (0.5%)	<5	19 (0.5%)	168 (0.5%)	125 (0.4%)	84 (0.4%)	27 (0.4%)
	No	94,234 (99.5%)	n/a	3,753 (99.5%)	30,928 (99.5%)	29,520 (99.6%)	21,870 (99.6%)	7,672 (99.6%)
Vitiligo - inpatient care (all diagnosis positions)	Yes	10 (0.0%)	0 (0.0%)	<5	<5	4 (0.0%)	<5	<5
	No	94,650 (100.0%)	494 (100.0%)	n/a	n/a	29,641 (100.0%)	n/a	n/a
Vitiligo - inpatient care (primary diagnosis position)	Yes	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
	No	94,660 (100.0%)	494 (100.0%)	3,772 (100.0%)	31,096 (100.0%)	29,645 (100.0%)	21,954 (100.0%)	7,699 (100.0%)

10.4.7 Drug utilization

Drug utilization among patients with DM type II is only presented for patients ⩾ 18 years of age.

10.4.7.1 Glucose lowering drug use

The following table presents data on blood glucose lowering drugs for patients with DM type II:

Table 109: GLD drug use among patients with DM type II (age ⩾ 18 years)

Comorbidity		All	18-29	30-44	45-64	65-74	75-84	85->
N		94,660	494	3,772	31,096	29,645	21,954	7,699
Age	Mean (SD)	67.7 (12.7)	24.9 (3.4)	39.5 (3.9)	56.8 (5.3)	69.9 (2.8)	78.8 (2.8)	88.8 (3.3)
	Median (IQR)	69.0 (59.4, 76.1)	25.1 (22.1, 28.0)	40.1 (37.0, 43.0)	57.2 (53.0, 61.1)	70.0 (67.2, 72.1)	78.2 (76.1, 81.0)	88.0 (86.0, 91.0)
Sex	Female	40,175 (42.4%)	250 (50.6%)	1,582 (41.9%)	11,700 (37.6%)	11,858 (40.0%)	10,101 (46.0%)	4,684 (60.8%)
	Male	54,485 (57.6%)	244 (49.4%)	2,190 (58.1%)	19,396 (62.4%)	17,787 (60.0%)	11,853 (54.0%)	3,015 (39.2%)
Treatment with any type of GLD drug - ever recorded	Yes	76,649 (81.0%)	305 (61.7%)	3,182 (84.4%)	26,686 (85.8%)	24,343 (82.1%)	16,967 (77.3%)	5,166 (67.1%)
	No	18,011 (19.0%)	189 (38.3%)	590 (15.6%)	4,410 (14.2%)	5,302 (17.9%)	4,987 (22.7%)	2,533 (32.9%)
Treatment with any type of GLD drug - recorded within past 6 months	Yes	66,956 (70.7%)	214 (43.3%)	2,530 (67.1%)	23,576 (75.8%)	21,834 (73.7%)	14,849 (67.6%)	3,953 (51.3%)
	No	27,704 (29.3%)	280 (56.7%)	1,242 (32.9%)	7,520 (24.2%)	7,811 (26.3%)	7,105 (32.4%)	3,746 (48.7%)
Insulin - ever recorded	Yes	28,543 (30.2%)	131 (26.5%)	1,275 (33.8%)	9,220 (29.7%)	8,579 (28.9%)	6,746 (30.7%)	2,592 (33.7%)
	No	66,117 (69.8%)	363 (73.5%)	2,497 (66.2%)	21,876 (70.3%)	21,066 (71.1%)	15,208 (69.3%)	5,107 (66.3%)
Insulin - recorded within past 6 months	Yes	22,692 (24.0%)	85 (17.2%)	706 (18.7%)	7,059 (22.7%)	7,099 (23.9%)	5,662 (25.8%)	2,081 (27.0%)
	No	71,968 (76.0%)	409 (82.8%)	3,066 (81.3%)	24,037 (77.3%)	22,546 (76.1%)	16,292 (74.2%)	5,618 (73.0%)
Metformin - ever recorded	Yes	69,404 (73.3%)	292 (59.1%)	2,996 (79.4%)	25,104 (80.7%)	22,468 (75.8%)	14,860 (67.7%)	3,684 (47.9%)
	No	25,256 (26.7%)	202 (40.9%)	776 (20.6%)	5,992 (19.3%)	7,177 (24.2%)	7,094 (32.3%)	4,015 (52.1%)
Metformin - recorded within past 6 months	Yes	51,535 (54.4%)	161 (32.6%)	2,113 (56.0%)	19,860 (63.9%)	17,515 (59.1%)	10,187 (46.4%)	1,699 (22.1%)
	No	43,125 (45.6%)	333 (67.4%)	1,659 (44.0%)	11,236 (36.1%)	12,130 (40.9%)	11,767 (53.6%)	6,000 (77.9%)
SGLT2-inhibitors - ever recorded	Yes	6,290 (6.6%)	24 (4.9%)	260 (6.9%)	3,104 (10.0%)	2,037 (6.9%)	792 (3.6%)	73 (0.9%)
	No	88,370 (93.4%)	470 (95.1%)	3,512 (93.1%)	27,992 (90.0%)	27,608 (93.1%)	21,162 (96.4%)	7,626 (99.1%)
SGLT2-inhibitors - recorded within past 6 months	Yes	4,661 (4.9%)	16 (3.2%)	190 (5.0%)	2,366 (7.6%)	1,509 (5.1%)	536 (2.4%)	44 (0.6%)
	No	89,999 (95.1%)	478 (96.8%)	3,582 (95.0%)	28,730 (92.4%)	28,136 (94.9%)	21,418 (97.6%)	7,655 (99.4%)
GLP-1 receptor agonists - ever recorded	Yes	8,806 (9.3%)	69 (14.0%)	497 (13.2%)	4,198 (13.5%)	2,769 (9.3%)	1,164 (5.3%)	109 (1.4%)
	No	85,854 (90.7%)	425 (86.0%)	3,275 (86.8%)	26,898 (86.5%)	26,876 (90.7%)	20,790 (94.7%)	7,590 (98.6%)
GLP-1 receptor agonists - recorded within past 6 months	Yes	6,380 (6.7%)	46 (9.3%)	347 (9.2%)	3,134 (10.1%)	1,994 (6.7%)	806 (3.7%)	53 (0.7%)
	No	88,280 (93.3%)	448 (90.7%)	3,425 (90.8%)	27,962 (89.9%)	27,651 (93.3%)	21,148 (96.3%)	7,646 (99.3%)
DPP-4 inhibitors - ever recorded	Yes	13,512 (14.3%)	35 (7.1%)	439 (11.6%)	4,789 (15.4%)	4,408 (14.9%)	3,060 (13.9%)	781 (10.1%)
	No	81,148 (85.7%)	459 (92.9%)	3,333 (88.4%)	26,307 (84.6%)	25,237 (85.1%)	18,894 (86.1%)	6,918 (89.9%)
DPP-4 inhibitors - recorded within past 6 months	Yes	8,235 (8.7%)	14 (2.8%)	253 (6.7%)	2,791 (9.0%)	2,728 (9.2%)	1,975 (9.0%)	474 (6.2%)
	No	86,425 (91.3%)	480 (97.2%)	3,519 (93.3%)	28,305 (91.0%)	26,917 (90.8%)	19,979 (91.0%)	7,225 (93.8%)
Sulfonylureas - ever recorded	Yes	19,980 (21.1%)	36 (7.3%)	538 (14.3%)	6,281 (20.2%)	6,392 (21.6%)	4,936 (22.5%)	1,797 (23.3%)
	No	74,680 (78.9%)	458 (92.7%)	3,234 (85.7%)	24,815 (79.8%)	23,253 (78.4%)	17,018 (77.5%)	5,902 (76.7%)
Sulfonylureas - recorded within past 6 months	Yes	8,713 (9.2%)	17 (3.4%)	243 (6.4%)	2,915 (9.4%)	2,952 (10.0%)	2,066 (9.4%)	520 (6.8%)
	No	85,947 (90.8%)	477 (96.6%)	3,529 (93.6%)	28,181 (90.6%)	26,693 (90.0%)	19,888 (90.6%)	7,179 (93.2%)
Alpha-glucosidase inhibitor - ever recorded	Yes	364 (0.4%)	<5	10 (0.3%)	129 (0.4%)	109 (0.4%)	76 (0.3%)	38 (0.5%)
	No	94,296 (99.6%)	n/a	3,762 (99.7%)	30,967 (99.6%)	29,536 (99.6%)	21,878 (99.7%)	7,661 (99.5%)
Alpha-glucosidase inhibitor - recorded within past 6 months	Yes	92 (0.1%)	0 (0.0%)	<5	31 (0.1%)	26 (0.1%)	19 (0.1%)	15 (0.2%)
	No	94,568 (99.9%)	494 (100.0%)	n/a	31,065 (99.9%)	29,619 (99.9%)	21,935 (99.9%)	7,684 (99.8%)
Glitazones - ever recorded	Yes	1,412 (1.5%)	<5	21 (0.6%)	387 (1.2%)	512 (1.7%)	385 (1.8%)	106 (1.4%)
	No	93,248 (98.5%)	n/a	3,751 (99.4%)	30,709 (98.8%)	29,133 (98.3%)	21,569 (98.2%)	7,593 (98.6%)
Glitazones - recorded within past 6 months	Yes	251 (0.3%)	0 (0.0%)	5 (0.1%)	70 (0.2%)	101 (0.3%)	62 (0.3%)	13 (0.2%)
	No	94,409 (99.7%)	494 (100.0%)	3,767 (99.9%)	31,026 (99.8%)	29,544 (99.7%)	21,892 (99.7%)	7,686 (99.8%)

10.4.7.2 Insulin use

The following table presents data on insulin use for patients with DM type I:

Table 110: Insulin use among patients with DM type II (age ⩾ 18 years)

GLD drug class		All	18-29	30-44	45-64	65-74	75-84	85->
N		94,660	494	3,772	31,096	29,645	21,954	7,699
Age	Mean (SD)	67.7 (12.7)	24.9 (3.4)	39.5 (3.9)	56.8 (5.3)	69.9 (2.8)	78.8 (2.8)	88.8 (3.3)
	Median (IQR)	69.0 (59.4, 76.1)	25.1 (22.1, 28.0)	40.1 (37.0, 43.0)	57.2 (53.0, 61.1)	70.0 (67.2, 72.1)	78.2 (76.1, 81.0)	88.0 (86.0, 91.0)
Sex	Female	40,175 (42.4%)	250 (50.6%)	1,582 (41.9%)	11,700 (37.6%)	11,858 (40.0%)	10,101 (46.0%)	4,684 (60.8%)
	Male	54,485 (57.6%)	244 (49.4%)	2,190 (58.1%)	19,396 (62.4%)	17,787 (60.0%)	11,853 (54.0%)	3,015 (39.2%)
Insulin - Ever recorded	Yes	28,543 (30.2%)	131 (26.5%)	1,275 (33.8%)	9,220 (29.7%)	8,579 (28.9%)	6,746 (30.7%)	2,592 (33.7%)
	No	66,117 (69.8%)	363 (73.5%)	2,497 (66.2%)	21,876 (70.3%)	21,066 (71.1%)	15,208 (69.3%)	5,107 (66.3%)
Insulin - recorded within past 6 months	Yes	22,692 (24.0%)	85 (17.2%)	706 (18.7%)	7,059 (22.7%)	7,099 (23.9%)	5,662 (25.8%)	2,081 (27.0%)
	No	71,968 (76.0%)	409 (82.8%)	3,066 (81.3%)	24,037 (77.3%)	22,546 (76.1%)	16,292 (74.2%)	5,618 (73.0%)
Insulin glargin 100 - Ever recorded	Yes	8,391 (8.9%)	58 (11.7%)	330 (8.7%)	2,671 (8.6%)	2,448 (8.3%)	2,014 (9.2%)	870 (11.3%)
	No	86,269 (91.1%)	436 (88.3%)	3,442 (91.3%)	28,425 (91.4%)	27,197 (91.7%)	19,940 (90.8%)	6,829 (88.7%)
Insulin glargin 100 - recorded within past 6 months	Yes	5,601 (5.9%)	33 (6.7%)	197 (5.2%)	1,754 (5.6%)	1,649 (5.6%)	1,373 (6.3%)	595 (7.7%)
	No	89,059 (94.1%)	461 (93.3%)	3,575 (94.8%)	29,342 (94.4%)	27,996 (94.4%)	20,581 (93.7%)	7,104 (92.3%)
Insulin glargin 300 - Ever recorded	Yes	1,809 (1.9%)	5 (1.0%)	51 (1.4%)	594 (1.9%)	585 (2.0%)	446 (2.0%)	128 (1.7%)
	No	92,851 (98.1%)	489 (99.0%)	3,721 (98.6%)	30,502 (98.1%)	29,060 (98.0%)	21,508 (98.0%)	7,571 (98.3%)
Insulin glargin 300 - recorded within past 6 months	Yes	1,547 (1.6%)	<5	42 (1.1%)	511 (1.6%)	510 (1.7%)	387 (1.8%)	93 (1.2%)
	No	93,113 (98.4%)	n/a	3,730 (98.9%)	30,585 (98.4%)	29,135 (98.3%)	21,567 (98.2%)	7,606 (98.8%)
Insulin degludek - Ever recorded	Yes	1,730 (1.8%)	11 (2.2%)	63 (1.7%)	694 (2.2%)	541 (1.8%)	345 (1.6%)	76 (1.0%)
	No	92,930 (98.2%)	483 (97.8%)	3,709 (98.3%)	30,402 (97.8%)	29,104 (98.2%)	21,609 (98.4%)	7,623 (99.0%)
Insulin degludek - recorded within past 6 months	Yes	1,408 (1.5%)	8 (1.6%)	53 (1.4%)	566 (1.8%)	443 (1.5%)	285 (1.3%)	53 (0.7%)
	No	93,252 (98.5%)	486 (98.4%)	3,719 (98.6%)	30,530 (98.2%)	29,202 (98.5%)	21,669 (98.7%)	7,646 (99.3%)
NPH Insulin - Ever recorded	Yes	19,422 (20.5%)	80 (16.2%)	982 (26.0%)	6,573 (21.1%)	5,775 (19.5%)	4,405 (20.1%)	1,607 (20.9%)
	No	75,238 (79.5%)	414 (83.8%)	2,790 (74.0%)	24,523 (78.9%)	23,870 (80.5%)	17,549 (79.9%)	6,092 (79.1%)
NPH Insulin - recorded within past 6 months	Yes	10,947 (11.6%)	37 (7.5%)	369 (9.8%)	3,509 (11.3%)	3,464 (11.7%)	2,643 (12.0%)	925 (12.0%)
	No	83,713 (88.4%)	457 (92.5%)	3,403 (90.2%)	27,587 (88.7%)	26,181 (88.3%)	19,311 (88.0%)	6,774 (88.0%)
Mix insulin - Ever recorded	Yes	6,784 (7.2%)	7 (1.4%)	141 (3.7%)	1,730 (5.6%)	2,084 (7.0%)	1,965 (9.0%)	857 (11.1%)
	No	87,876 (92.8%)	487 (98.6%)	3,631 (96.3%)	29,366 (94.4%)	27,561 (93.0%)	19,989 (91.0%)	6,842 (88.9%)
Mix insulin - recorded within past 6 months	Yes	3,296 (3.5%)	<5	45 (1.2%)	717 (2.3%)	1,037 (3.5%)	1,047 (4.8%)	446 (5.8%)
	No	91,364 (96.5%)	n/a	3,727 (98.8%)	30,379 (97.7%)	28,608 (96.5%)	20,907 (95.2%)	7,253 (94.2%)

10.4.7.3 Cardiovascular drug use

The following table presents data on cardiovascular drug use for patients with DM type II:

Table 111: Cardiovascular drug use among patients with DM type II (age ⩾ 18 years)

Comorbidity		All	18-29	30-44	45-64	65-74	75-84	85->
N		94,660	494	3,772	31,096	29,645	21,954	7,699
Age	Mean (SD)	67.7 (12.7)	24.9 (3.4)	39.5 (3.9)	56.8 (5.3)	69.9 (2.8)	78.8 (2.8)	88.8 (3.3)
	Median (IQR)	69.0 (59.4, 76.1)	25.1 (22.1, 28.0)	40.1 (37.0, 43.0)	57.2 (53.0, 61.1)	70.0 (67.2, 72.1)	78.2 (76.1, 81.0)	88.0 (86.0, 91.0)
Sex	Female	40,175 (42.4%)	250 (50.6%)	1,582 (41.9%)	11,700 (37.6%)	11,858 (40.0%)	10,101 (46.0%)	4,684 (60.8%)
	Male	54,485 (57.6%)	244 (49.4%)	2,190 (58.1%)	19,396 (62.4%)	17,787 (60.0%)	11,853 (54.0%)	3,015 (39.2%)
RAAS (ACE-I/ARB/Renin-inhibitors) - ever recorded	Yes	68,986 (72.9%)	60 (12.1%)	1,188 (31.5%)	19,778 (63.6%)	23,506 (79.3%)	18,229 (83.0%)	6,225 (80.9%)
	No	25,674 (27.1%)	434 (87.9%)	2,584 (68.5%)	11,318 (36.4%)	6,139 (20.7%)	3,725 (17.0%)	1,474 (19.1%)
RAAS (ACE-I/ARB/Renin-inhibitors) - recorded within past 6 months	Yes	56,829 (60.0%)	35 (7.1%)	900 (23.9%)	16,532 (53.2%)	19,891 (67.1%)	14,931 (68.0%)	4,540 (59.0%)
	No	37,831 (40.0%)	459 (92.9%)	2,872 (76.1%)	14,564 (46.8%)	9,754 (32.9%)	7,023 (32.0%)	3,159 (41.0%)
Calcium channel blocker- ever recorded	Yes	42,700 (45.1%)	14 (2.8%)	503 (13.3%)	11,075 (35.6%)	14,811 (50.0%)	11,992 (54.6%)	4,305 (55.9%)
	No	51,960 (54.9%)	480 (97.2%)	3,269 (86.7%)	20,021 (64.4%)	14,834 (50.0%)	9,962 (45.4%)	3,394 (44.1%)
Calcium channel blocker - recorded within past 6 months	Yes	29,572 (31.2%)	7 (1.4%)	310 (8.2%)	7,898 (25.4%)	10,666 (36.0%)	8,070 (36.8%)	2,621 (34.0%)
	No	65,088 (68.8%)	487 (98.6%)	3,462 (91.8%)	23,198 (74.6%)	18,979 (64.0%)	13,884 (63.2%)	5,078 (66.0%)
Beta blockers- ever recorded	Yes	46,865 (49.5%)	35 (7.1%)	655 (17.4%)	11,092 (35.7%)	15,971 (53.9%)	13,854 (63.1%)	5,258 (68.3%)
	No	47,795 (50.5%)	459 (92.9%)	3,117 (82.6%)	20,004 (64.3%)	13,674 (46.1%)	8,100 (36.9%)	2,441 (31.7%)
Beta blockers - recorded within past 6 months	Yes	36,568 (38.6%)	13 (2.6%)	317 (8.4%)	8,026 (25.8%)	12,776 (43.1%)	11,310 (51.5%)	4,126 (53.6%)
	No	58,092 (61.4%)	481 (97.4%)	3,455 (91.6%)	23,070 (74.2%)	16,869 (56.9%)	10.644 (48.5%)	3,573 (46.4%)
Alpha blockers- ever recorded	Yes	3,737 (3.9%)	7 (1.4%)	61 (1.6%)	1,102 (3.5%)	1,310 (4.4%)	1,028 (4.7%)	229 (3.0%)
	No	90,923 (96.1%)	487 (98.6%)	3,711 (98.4%)	29,994 (96.5%)	28,335 (95.6%)	20,926 (95.3%)	7,470 (97.0%)
Alpha blockers - recorded within past 6 months	Yes	1,470 (1.6%)	<5	15 (0.4%)	358 (1.2%)	559 (1.9%)	457 (2.1%)	80 (1.0%)
	No	93,190 (98.4%)	n/a	3,757 (99.6%)	30,738 (98.8%)	29,086 (98.1%)	21,497 (97.9%)	7,619 (99.0%)
Thiazide diuretics- ever recorded	Yes	33,270 (35.1%)	5 (1.0%)	289 (7.7%)	8,022 (25.8%)	11,979 (40.4%)	9,616 (43.8%)	3,359 (43.6%)
	No	61,390 (64.9%)	489 (99.0%)	3,483 (92.3%)	23,074 (74.2%)	17,666 (59.6%)	12,338 (56.2%)	4,340 (56.4%)
Thiazide diuretics - recorded within past 6 months	Yes	19,524 (20.6%)	<5	182 (4.8%)	5,232 (16.8%)	7,511 (25.3%)	5,307 (24.2%)	1,288 (16.7%)
	No	75,136 (79.4%)	n/a	3,590 (95.2%)	25,864 (83.2%)	22,134 (74.7%)	16,647 (75.8%)	6,411 (83.3%)
Statin- ever recorded	Yes	64,840 (68.5%)	54 (10.9%)	1,274 (33.8%)	19,354 (62.2%)	22,170 (74.8%)	16,885 (76.9%)	5,103 (66.3%)
	No	29,820 (31.5%)	440 (89.1%)	2,498 (66.2%)	11,742 (37.8%)	7,475 (25.2%)	5,069 (23.1%)	2,596 (33.7%)
Statin - recorded within past 6 months	Yes	49,271 (52.1%)	33 (6.7%)	842 (22.3%)	14,575 (46.9%)	17,463 (58.9%)	13,172 (60.0%)	3,186 (41.4%)
	No	45,389 (47.9%)	461 (93.3%)	2,930 (77.7%)	16,521 (53.1%)	12,182 (41.1%)	8,782 (40.0%)	4,513 (58.6%)
Platelet inhibitors- ever recorded	Yes	37,646 (39.8%)	9 (1.8%)	252 (6.7%)	7,566 (24.3%)	12,831 (43.3%)	12,096 (55.1%)	4,892 (63.5%)
	No	57,014 (60.2%)	485 (98.2%)	3,520 (93.3%)	23,530 (75.7%)	16,814 (56.7%)	9,858 (44.9%)	2,807 (36.5%)
Platelet inhibitors - recorded within past 6 months	Yes	25,383 (26.8%)	<5	107 (2.8%)	5,172 (16.6%)	9,063 (30.6%)	8,038 (36.6%)	3,000 (39.0%)
	No	69,277 (73.2%)	n/a	3,665 (97.2%)	25,924 (83.4%)	20,582 (69.4%)	13,916 (63.4%)	4,699 (61.0%)
Anticoagulants- ever recorded	Yes	26,556 (28.1%)	65 (13.2%)	574 (15.2%)	5,413 (17.4%)	8,456 (28.5%)	8,536 (38.9%)	3,512 (45.6%)
	No	68,104 (71.9%)	429 (86.8%)	3,198 (84.8%)	25,683 (82.6%)	21,189 (71.5%)	13,418 (61.1%)	4,187 (54.4%)
Anticoagulants - recorded within past 6 months	Yes	12,863 (13.6%)	10 (2.0%)	101 (2.7%)	1,526 (4.9%)	3,932 (13.3%)	5,018 (22.9%)	2,276 (29.6%)
	No	81,797 (86.4%)	484 (98.0%)	3,671 (97.3%)	29,570 (95.1%)	25,713 (86.7%)	16,936 (77.1%)	5,423 (70.4%)
Antihypertensives (any type)- ever recorded	Yes	77,288 (81.6%)	93 (18.8%)	1,511 (40.1%)	22,296 (71.7%)	25,962 (87.6%)	20,238 (92.2%)	7,188 (93.4%)
	No	17,372 (18.4%)	401 (81.2%)	2,261 (59.9%)	8,800 (28.3%)	3,683 (12.4%)	1,716 (7.8%)	511 (6.6%)
Antihypertensives (any type) - recorded within past 6 months	Yes	69,184 (73.1%)	51 (10.3%)	1,075 (28.5%)	19,361 (62.3%)	23,713 (80.0%)	18,591 (84.7%)	6,393 (83.0%)
	No	25,476 (26.9%)	443 (89.7%)	2,697 (71.5%)	11,735 (37.7%)	5,932 (20.0%)	3,363 (15.3%)	1,306 (17.0%)

10.4.7.4 Glucose lowering drug classes grouped by cardiovascular comorbidity

The following table presents data on glucose lowering drug classes grouped by cardiovascular comorbidity for patients with DM type II:

Table 112: GLD therapy use by cardiovascular comorbidity, DM type II (age >= 18 years)

Comorbidity		DM type II (>=18 years)	Any GLD drug	Insulin	Metformin	SGLT2-I	GLP1-A	DPP4-I	Sulfonylurea	Alpha glucosidase I	Glitazones
N		94,660	66,956	22,692	51,535	4,661	6,380	8,235	8,713	92	251
Age	Mean	67.7 (12.7)	67.0 (12.0)	68.8 (12.4)	65.7 (11.5)	62.7 (10.4)	62.4 (11.2)	67.7 (11.5)	67.9 (11.5)	70.5 (11.9)	68.7 (10.1)
	Median	69.0 (59.4, 76.1)	68.1 (59.1, 75.1)	70.0 (61.0, 77.1)	67.0 (58.1, 74.0)	63.1 (56.0, 70.1)	63.0 (55.0, 71.0)	69.0 (60.0, 76.0)	69.0 (60.1, 76.0)	71.5 (62.0, 77.3)	69.0 (63.6, 76.0)
Sex	Female	40,175 (42.4%)	26,788 (40.0%)	8,942 (39.4%)	20,229 (39.3%)	1,515 (32.5%)	2,569 (40.3%)	3,068 (37.3%)	3,149 (36.1%)	38 (41.3%)	76 (30.3%)
	Male	54,485 (57.6%)	40,168 (60.0%)	13,750 (60.6%)	31,306 (60.7%)	3,146 (67.5%)	3,811 (59.7%)	5,167 (62.7%)	5,564 (63.9%)	54 (58.7%)	175 (69.7%)
Cardiovascular comorbidity (IHD, CHF, AFIB, STROKE/TIA, PAD) - all healthcare levels	Yes	37,639 (39.8%)	25,881 (38.7%)	10,738 (47.3%)	17,730 (34.4%)	1,913 (41.0%)	2,360 (37.0%)	3,417 (41.5%)	3,199 (36.7%)	30 (32.6%)	87 (34.7%)
	No	57,021 (60.2%)	41,075 (61.3%)	11,954 (52.7%)	33,805 (65.6%)	2,748 (59.0%)	4,020 (63.0%)	4,818 (58.5%)	5,514 (63.3%)	62 (67.4%)	164 (65.3%)
Cardiovascular comorbidity (IHD, CHF, AFIB, STROKE/TIA, PAD) - inpatient care (all diagnosis positions)	Yes	30,030 (31.7%)	20,569 (30.7%)	8,986 (39.6%)	13,662 (26.5%)	1,565 (33.6%)	1,877 (29.4%)	2,718 (33.0%)	2,447 (28.1%)	20 (21.7%)	65 (25.9%)
	No	64,630 (68.3%)	46,387 (69.3%)	13,706 (60.4%)	37,873 (73.5%)	3,096 (66.4%)	4,503 (70.6%)	5,517 (67.0%)	6,266 (71.9%)	72 (78.3%)	186 (74.1%)
Cardiovascular comorbidity (IHD, CHF, AFIB, STROKE/TIA, PAD) - inpatient care (primary diagnosis position)	Yes	25,998 (27.5%)	17,885 (26.7%)	7,757 (34.2%)	11,988 (23.3%)	1,421 (30.5%)	1,628 (25.5%)	2,359 (28.6%)	2,141 (24.6%)	17 (18.5%)	51 (20.3%)
	No	68,662 (72.5%)	49,071 (73.3%)	14,935 (65.8%)	39,547 (76.7%)	3,240 (69.5%)	4,752 (74.5%)	5,876 (71.4%)	6,572 (75.4%)	75 (81.5%)	200 (79.7%)
Cardiovascular comorbidity (excl AFIB) - all healthcare levels	Yes	33,922 (35.8%)	23,433 (35.0%)	9,961 (43.9%)	15,891 (30.8%)	1,765 (37.9%)	2,145 (33.6%)	3,089 (37.5%)	2,886 (33.1%)	27 (29.3%)	81 (32.3%)
	No	60,738 (64.2%)	43,523 (65.0%)	12,731 (56.1%)	35,644 (69.2%)	2,896 (62.1%)	4,235 (66.4%)	5,146 (62.5%)	5,827 (66.9%)	65 (70.7%)	170 (67.7%)
Cardiovascular comorbidity (excl AFIB) - inpatient care (all diagnosis positions)	Yes	26,851 (28.4%)	18,517 (27.7%)	8,266 (36.4%)	12,182 (23.6%)	1,434 (30.8%)	1,692 (26.5%)	2,448 (29.7%)	2,188 (25.1%)	19 (20.7%)	58 (23.1%)
	No	67,809 (71.6%)	48,439 (72.3%)	14,426 (63.6%)	39,353 (76.4%)	3,227 (69.2%)	4,688 (73.5%)	5,787 (70.3%)	6,525 (74.9%)	73 (79.3%)	193 (76.9%)
Cardiovascular comorbidity (excl AFIB) - inpatient care (primary diagnosis position)	Yes	23,640 (25.0%)	16,364 (24.4%)	7,252 (32.0%)	10,857 (21.1%)	1,308 (28.1%)	1,492 (23.4%)	2,169 (26.3%)	1,946 (22.3%)	16 (17.4%)	49 (19.5%)
	No	71,020 (75.0%)	50,592 (75.6%)	15,440 (68.0%)	40,678 (78.9%)	3,353 (71.9%)	4,888 (76.6%)	6,066 (73.7%)	6,767 (77.7%)	76 (82.6%)	202 (80.5%)
AMI - all healthcare levels	Yes	8,722 (9.2%)	6,250 (9.3%)	2,691 (11.9%)	4,230 (8.2%)	666 (14.3%)	610 (9.6%)	837 (10.2%)	806 (9.3%)	<5	20 (8.0%)
	No	85,938 (90.8%)	60,706 (90.7%)	20,001 (88.1%)	47,305 (91.8%)	3,995 (85.7%)	5,770 (90.4%)	7,398 (89.8%)	7,907 (90.7%)	n/a	231 (92.0%)
AMI - inpatient care (all diagnosis positions)	Yes	8,172 (8.6%)	5,847 (8.7%)	2,529 (11.1%)	3,962 (7.7%)	640 (13.7%)	586 (9.2%)	792 (9.6%)	756 (8.7%)	<5	17 (6.8%)
	No	86,488 (91.4%)	61,109 (91.3%)	20,163 (88.9%)	47,573 (92.3%)	4,021 (86.3%)	5,794 (90.8%)	7,443 (90.4%)	7,957 (91.3%)	n/a	234 (93.2%)
AMI - inpatient care (primary diagnosis position)	Yes	7,728 (8.2%)	5,549 (8.3%)	2,367 (10.4%)	3,797 (7.4%)	617 (13.2%)	559 (8.8%)	757 (9.2%)	725 (8.3%)	<5	17 (6.8%)
	No	86,932 (91.8%)	61,407 (91.7%)	20,325 (89.6%)	47,738 (92.6%)	4,044 (86.8%)	5,821 (91.2%)	7,478 (90.8%)	7,988 (91.7%)	n/a	234 (93.2%)
CHF - all healthcare levels	Yes	11,555 (12.2%)	7,712 (11.5%)	3,941 (17.4%)	4,320 (8.4%)	489 (10.5%)	737 (11.6%)	1,061 (12.9%)	817 (9.4%)	6 (6.5%)	21 (8.4%)
	No	83,105 (87.8%)	59,244 (88.5%)	18,751 (82.6%)	47,215 (91.6%)	4,172 (89.5%)	5,643 (88.4%)	7,174 (87.1%)	7,896 (90.6%)	86 (93.5%)	230 (91.6%)
CHF - inpatient care (all diagnosis positions)	Yes	8,365 (8.8%)	5,546 (8.3%)	3,049 (13.4%)	2,904 (5.6%)	356 (7.6%)	539 (8.4%)	755 (9.2%)	551 (6.3%)	<5	10 (4.0%)
	No	86,295 (91.2%)	61,410 (91.7%)	19,643 (86.6%)	48,631 (94.4%)	4,305 (92.4%)	5,841 (91.6%)	7,480 (90.8%)	8,162 (93.7%)	n/a	241 (96.0%)
CHF - inpatient care (primary diagnosis position)	Yes	4,464 (4.7%)	2,989 (4.5%)	1,762 (7.8%)	1,407 (2.7%)	193 (4.1%)	296 (4.6%)	422 (5.1%)	281 (3.2%)	0 (0.0%)	6 (2.4%)
	No	90,196 (95.3%)	63,967 (95.5%)	20,930 (92.2%)	50,128 (97.3%)	4,468 (95.9%)	6,084 (95.4%)	7,813 (94.9%)	8,432 (96.8%)	92 (100.0%)	245 (97.6%)
STROKE/TIA - all healthcare levels	Yes	11,353 (12.0%)	7,527 (11.2%)	3,343 (14.7%)	4,996 (9.7%)	418 (9.0%)	540 (8.5%)	921 (11.2%)	811 (9.3%)	13 (14.1%)	23 (9.2%)
	No	83,307 (88.0%)	59,429 (88.8%)	19,349 (85.3%)	46,539 (90.3%)	4,243 (91.0%)	5,840 (91.5%)	7,314 (88.8%)	7,902 (90.7%)	79 (85.9%)	228 (90.8%)
STROKE/TIA - inpatient care (all diagnosis positions)	Yes	9,333 (9.9%)	6,167 (9.2%)	2,793 (12.3%)	4,045 (7.8%)	323 (6.9%)	436 (6.8%)	766 (9.3%)	645 (7.4%)	8 (8.7%)	18 (7.2%)
	No	85,327 (90.1%)	60,789 (90.8%)	19,899 (87.7%)	47,490 (92.2%)	4,338 (93.1%)	5,944 (93.2%)	7,469 (90.7%)	8,068 (92.6%)	84 (91.3%)	233 (92.8%)
STROKE/TIA - inpatient care (primary diagnosis position)	Yes	8,805 (9.3%)	5,822 (8.7%)	2,628 (11.6%)	3,827 (7.4%)	305 (6.5%)	408 (6.4%)	718 (8.7%)	609 (7.0%)	8 (8.7%)	16 (6.4%)
	No	85,855 (90.7%)	61,134 (91.3%)	20,064 (88.4%)	47,708 (92.6%)	4,356 (93.5%)	5,972 (93.6%)	7,517 (91.3%)	8,104 (93.0%)	84 (91.3%)	235 (93.6%)
PAD - all healthcare levels	Yes	7,015 (7.4%)	4,793 (7.2%)	2,384 (10.5%)	2,893 (5.6%)	295 (6.3%)	400 (6.3%)	630 (7.7%)	560 (6.4%)	7 (7.6%)	17 (6.8%)
	No	87,645 (92.6%)	62,163 (92.8%)	20,308 (89.5%)	48,642 (94.4%)	4,366 (93.7%)	5,980 (93.7%)	7,605 (92.3%)	8,153 (93.6%)	85 (92.4%)	234 (93.2%)
PAD - inpatient care (all diagnosis positions)	Yes	3,610 (3.8%)	2,467 (3.7%)	1,356 (6.0%)	1,354 (2.6%)	133 (2.9%)	206 (3.2%)	326 (4.0%)	263 (3.0%)	5 (5.4%)	8 (3.2%)
	No	91,050 (96.2%)	64,489 (96.3%)	21,336 (94.0%)	50,181 (97.4%)	4,528 (97.1%)	6,174 (96.8%)	7,909 (96.0%)	8,450 (97.0%)	87 (94.6%)	243 (96.8%)
PAD - inpatient care (primary diagnosis position)	Yes	2,640 (2.8%)	1,825 (2.7%)	1,001 (4.4%)	1,008 (2.0%)	95 (2.0%)	156 (2.4%)	232 (2.8%)	194 (2.2%)	<5	5 (2.0%)
	No	92,020 (97.2%)	65,131 (97.3%)	21,691 (95.6%)	50,527 (98.0%)	4,566 (98.0%)	6,224 (97.6%)	8,003 (97.2%)	8,519 (97.8%)	n/a	246 (98.0%)
AFIB - all healthcare levels	Yes	13,294 (14.0%)	8,589 (12.8%)	3,741 (16.5%)	5,432 (10.5%)	526 (11.3%)	696 (10.9%)	1,179 (14.3%)	969 (11.1%)	9 (9.8%)	19 (7.6%)
	No	81,366 (86.0%)	58,367 (87.2%)	18,951 (83.5%)	46,103 (89.5%)	4,135 (88.7%)	5,684 (89.1%)	7,056 (85.7%)	7,744 (88.9%)	83 (90.2%)	232 (92.4%)
AFIB - inpatient care (all diagnosis positions)	Yes	10,578 (11.2%)	6,756 (10.1%)	3,138 (13.8%)	4,095 (7.9%)	417 (8.9%)	552 (8.7%)	935 (11.4%)	725 (8.3%)	5 (5.4%)	14 (5.6%)
	No	84,082 (88.8%)	60,200 (89.9%)	19,554 (86.2%)	47,440 (92.1%)	4,244 (91.1%)	5,828 (91.3%)	7,300 (88.6%)	7,988 (91.7%)	87 (94.6%)	237 (94.4%)
AFIB - inpatient care (primary diagnosis position)	Yes	5,123 (5.4%)	3,273 (4.9%)	1,397 (6.2%)	2,082 (4.0%)	233 (5.0%)	284 (4.5%)	450 (5.5%)	365 (4.2%)	<5	5 (2.0%)
	No	89,537 (94.6%)	63,683 (95.1%)	21,295 (93.8%)	49,453 (96.0%)	4,428 (95.0%)	6,096 (95.5%)	7,785 (94.5%)	8,348 (95.8%)	n/a	246 (98.0%)
IHD - all healthcare levels	Yes	19,960 (21.1%)	14,183 (21.2%)	6,007 (26.5%)	9,664 (18.8%)	1,284 (27.5%)	1,375 (21.6%)	1,939 (23.5%)	1,865 (21.4%)	17 (18.5%)	46 (18.3%)
	No	74,700 (78.9%)	52,773 (78.8%)	16,685 (73.5%)	41,871 (81.2%)	3,377 (72.5%)	5,005 (78.4%)	6,296 (76.5%)	6,848 (78.6%)	75 (81.5%)	205 (81.7%)
IHD - inpatient care (all diagnosis positions)	Yes	15,827 (16.7%)	11,201 (16.7%)	4,929 (21.7%)	7,461 (14.5%)	1,072 (23.0%)	1,073 (16.8%)	1,527 (18.5%)	1,442 (16.5%)	13 (14.1%)	34 (13.5%)
	No	78,833 (83.3%)	55,755 (83.3%)	17,763 (78.3%)	44,074 (85.5%)	3,589 (77.0%)	5,307 (83.2%)	6,708 (81.5%)	7,271 (83.5%)	79 (85.9%)	217 (86.5%)
IHD - inpatient care (primary diagnosis position)	Yes	13,261 (14.0%)	9,473 (14.1%)	4,071 (17.9%)	6,438 (12.5%)	960 (20.6%)	931 (14.6%)	1,311 (15.9%)	1,249 (14.3%)	8 (8.7%)	29 (11.6%)
	No	81,399 (86.0%)	57,483 (85.9%)	18,621 (82.1%)	45,097 (87.5%)	3,701 (79.4%)	5,449 (85.4%)	6,924 (84.1%)	7,464 (85.7%)	84 (91.3%)	222 (88.4%)
Hypertension - all healthcare levels	Yes	73,136 (77.3%)	52,213 (78.0%)	18,622 (82.1%)	39,441 (76.5%)	3,645 (78.2%)	5,213 (81.7%)	6,607 (80.2%)	6,986 (80.2%)	74 (80.4%)	203 (80.9%)
	No	21,524 (22.7%)	14,743 (22.0%)	4,070 (17.9%)	12,094 (23.5%)	1,016 (21.8%)	1,167 (18.3%)	1,628 (19.8%)	1,727 (19.8%)	18 (19.6%)	48 (19.1%)
Hypertension - inpatient care (all diagnosis positions)	Yes	41,455 (43.8%)	28,897 (43.2%)	12,400 (54.6%)	19,811 (38.4%)	1,936 (41.5%)	2,882 (45.2%)	3,783 (45.9%)	3,618 (41.5%)	39 (42.4%)	109 (43.4%)
	No	53,205 (56.2%)	38,059 (56.8%)	10,292 (45.4%)	31,724 (61.6%)	2,725 (58.5%)	3,498 (54.8%)	4,452 (54.1%)	5,095 (58.5%)	53 (57.6%)	142 (56.6%)
Hypertension - inpatient care (primary diagnosis position)	Yes	2,130 (2.3%)	1,364 (2.0%)	551 (2.4%)	900 (1.7%)	81 (1.7%)	127 (2.0%)	211 (2.6%)	155 (1.8%)	<5	<5
	No	92,530 (97.7%)	65,592 (98.0%)	22,141 (97.6%)	50,635 (98.3%)	4,580 (98.3%)	6,253 (98.0%)	8,024 (97.4%)	8,558 (98.2%)	n/a	n/a

10.4.8 Healthcare resource utilization and costs

10.4.8.1 Outpatient

The following tables present the annual (2018) outpatient healthcare utilization and costs for patients with DM type II:

Table 113: Outpatient healthcare utilization and costs for patients with DM type II

Type of healthcare		All	18-29	30-44	45-64	65-74	75-84	85->
N		94660	494	3772	31096	29645	21954	7699
All outpatient healthcare events	visits/person-year	30.7	16.6	17.6	19.8	25.6	40.8	71.3
All primary healthcare events	visits/person-year	21.9	6.2	8.6	11.2	16.8	31.4	64.1
All specialised outpatient healthcare events	visits/person-year	8.6	10.2	8.8	8.4	8.7	9.3	7.1
All outpatient healthcare events by physicians (physical visits)	visits/person-year	7.5	5.6	6.1	6.3	7.3	9.0	9.3
All primary healthcare events by physicians (physical visits)	visits/person-year	4.0	2.2	3.1	3.4	3.6	4.8	5.7
All specialised outpatient healthcare events by physicians (physical visits)	visits/person-year	3.5	3.4	3.0	2.9	3.7	4.2	3.6
Outpatient healthcare costs (SEK)	costs (SEK)/person-year	35095.8	26603.9	25427.6	28069.8	32902.5	42435.4	55203.3

10.4.8.2 Inpatient

The following tables present the annual (2018) inpatient healthcare utilization and costs for patients with DM type II:

Table 114: Inpatient healthcare utilization and costs for patients with DM type II

Type of healthcare		All	18-29	30-44	45-64	65-74	75-84	85->
N		94660	494	3772	31096	29645	21954	7699
Inpatient bed-days	bed-days/person-year	2.7	1.9	1.6	1.5	2.3	3.7	6.3
Inpatient bed-days in acute somatic care	bed-days/person-year	1.5	0.5	0.8	1.0	1.5	2.1	2.5
Inpatient bed-days in psychiatric care	bed-days/person-year	0.2	1.4	0.7	0.3	0.2	0.1	0.1
Inpatient bed-days in geriatric care	bed-days/person-year	0.8	0.0	0.0	0.1	0.5	1.4	3.7
Inpatient bed-days in other care	bed-days/person-year	0.1	0.0	0.0	0.1	0.2	0.1	0.0
Inpatient healthcare costs (SEK)	costs (SEK)/person-year	27980.2	16655.2	15210.9	17567.3	27843.9	37235.1	49750.3

10.4.9 Drug costs

Table 115: Drug costs for patients with DM type II

Drug class		All	18-29	30-44	45-64	65-74	75-84	85->
N		94660	494	3772	31096	29645	21954	7699
Total drug costs (ATC chaptes: A-V)	costs (SEK)/person-year	8654.0	13949.5	6175.5	8357.8	9118.7	9035.8	7797.1
Costs for drugs used in diabetes (ATC: A10) -also inlcuded in the A-chapter below	costs (SEK)/person-year	2411.7	1621.0	2079.4	2905.5	2542.1	2030.9	1259.9
Drug costs for ATC chapter A: ALIMENTARY TRACT AND METABOLISM (includes diabetes drugs, A10)	costs (SEK)/person-year	2827.2	4524.3	2338.4	3257.6	2954.8	2490.1	1732.2
Drug costs for ATC chapter B: BLOOD AND BLOOD FORMING ORGANS	costs (SEK)/person-year	1027.0	114.7	350.6	590.0	1071.9	1450.2	1741.8
Drug costs for ATC chapter C: CARDIOVASCULAR SYSTEM	costs (SEK)/person-year	688.0	43.0	136.7	483.3	754.8	916.4	885.6
Drug costs for ATC chapter D: DERMATOLOGICALS	costs (SEK)/person-year	161.9	114.4	94.0	149.2	163.1	175.5	203.7
Drug costs for ATC chapter G: GENITO URINARY SYSTEM AND SEX HORMONES	costs (SEK)/person-year	192.7	204.3	133.0	167.1	200.6	236.4	166.2
Drug costs for ATC chapter H: SYSTEMIC HORMONAL PREPARATIONS, EXCL. SEX HORMONES AND INSULINS	costs (SEK)/person-year	204.4	596.5	214.2	123.3	250.1	251.2	187.7
Drug costs for ATC chapter J: ANTIINFECTIVES FOR SYSTEMIC USE	costs (SEK)/person-year	174.3	1850.4	140.8	172.6	174.7	161.9	128.0
Drug costs for ATC chapter L: ANTINEOPLASTIC AND IMMUNOMODULATING AGENTS	costs (SEK)/person-year	1757.1	863.2	1101.3	1765.1	2045.2	1732.0	1061.1
Drug costs for ATC chapter M: MUSCULO-SKELETAL SYSTEM	costs (SEK)/person-year	80.8	16.8	39.9	75.6	81.7	89.2	97.4
Drug costs for ATC chapter N: NERVOUS SYSTEM	costs (SEK)/person-year	884.3	1319.3	1264.0	1095.9	736.9	730.6	846.7
Drug costs for ATC chapter P: ANTIPARASITIC PRODUCTS, INSECTICIDES AND REPELLENTS	costs (SEK)/person-year	4.2	0.3	29.5	3.6	3.3	2.8	2.4
Drug costs for ATC chapter R: RESPIRATORY SYSTEM	costs (SEK)/person-year	448.8	3135.8	273.1	361.2	476.7	518.5	406.4
Drug costs for ATC chapter S: SENSORY ORGANS	costs (SEK)/person-year	148.9	16.9	26.6	69.2	141.3	230.8	322.8
Drug costs for ATC chapter V: VARIOUS	costs (SEK)/person-year	54.5	1149.8	33.5	44.2	63.6	50.1	15.2

10.4.10 Time to event analyses for diabetes type II

This section presents results from analyses restricted to patients with DM type II; we therefore present the methods and definitions in this section.

10.4.10.1 First cardiovascular event

This longitudinal analysis includes all incident patients with DM type II between 01 January 2012 and 31 December 2018, and follows them until first cardiovascular event, loss to follow-up (emigration from Region Stockholm), death, and end of follow-up (31 December 2018), whatever comes first.

10.4.10.1.1 Definition of cardiovascular event

In the definitions section, we presented the definition of cardiovascular comorbidity. That table was used to define comorbid conditions among patients with DM. In this analysis (time to first cardiovascular event), a cardiovascular event is defined using a sligthly narrower definition, to ensure specificity. A composite cardiovascular event outcome including any of the following ICD10 codes was used, and each of these codes were also analysed separately.

The following ICD10 codes have been included in the definition of a cardiovascular event:

Table 116: Included ICD10 codes to select cardiovascular event

ICD10 code	Name
I20-I25	Ischemic heart disease
I21	Acute myocardial infarction
I50, I110, I42 (excluding I421 and I422), I43	Heart failure
I60-I62, I63-I64, G45	Stroke - hemorrhagic, ischemic and TIA

10.4.10.1.2 Inclusion criteria

All patients ($\geqslant$ 18 years of age) in Region Stockholm having their first recorded DM type II diagnosis (3-digit ICD10: E11) between 01 January 2012 and 31 December 2018, and classified as type II using the previously defined algorithm. Patients had to have been resident in Region Stockholm for 15 months to be included in the analysis.

10.4.10.1.3 Exclusion criteria

Patients with a recorded diagnosis of a cardiovascular event before first diagnosis of DM type II were excluded.

10.4.10.1.4 Results

Study population flow chart

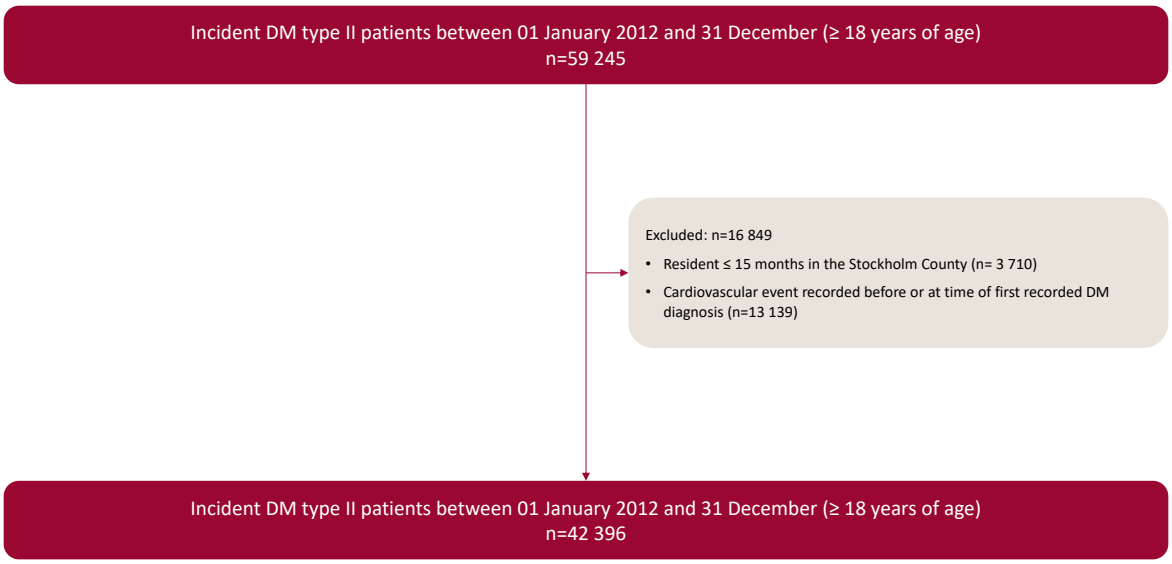


Figure 55: Study population flowchart for analysis of time to first cardiovascular event

Time to first cardiovascular event

This Kaplan-Meier plot presents the following three curves:

1. Time to first cardiovascular event - recorded in any diagnosis position
2. Time to first cardiovascular event - recorded in inpatient care and in any diagnosis position
3. Time to first cardiovascular event - recorded in inpatient care and only in primary diagnosis position

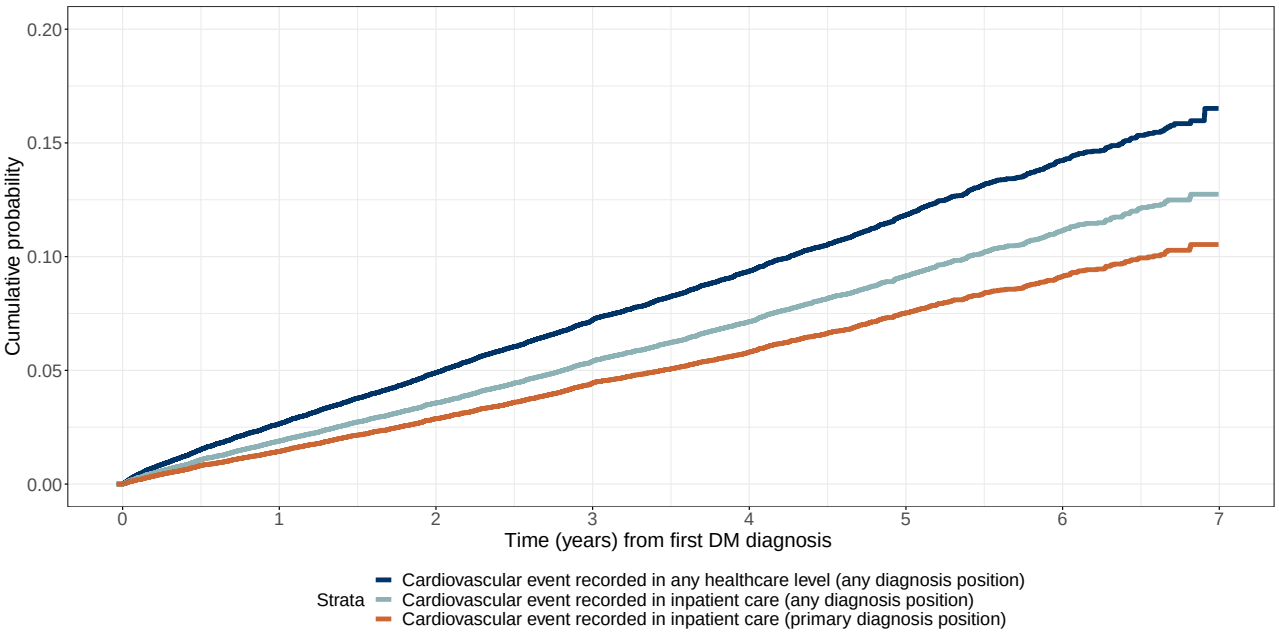


Figure 56: Kaplan-meier curve presenting time from incident DM type II to first cardiovascular event

Time to first ischemic heart disease (IHD) event

This Kaplan-Meier plot presents the following three curves:

1. Time to first IHD event - recorded in any diagnosis position
2. Time to first IHD event - recorded in inpatient care and in any diagnosis position
3. Time to first IHD event - recorded in inpatient care and only in primary diagnosis position

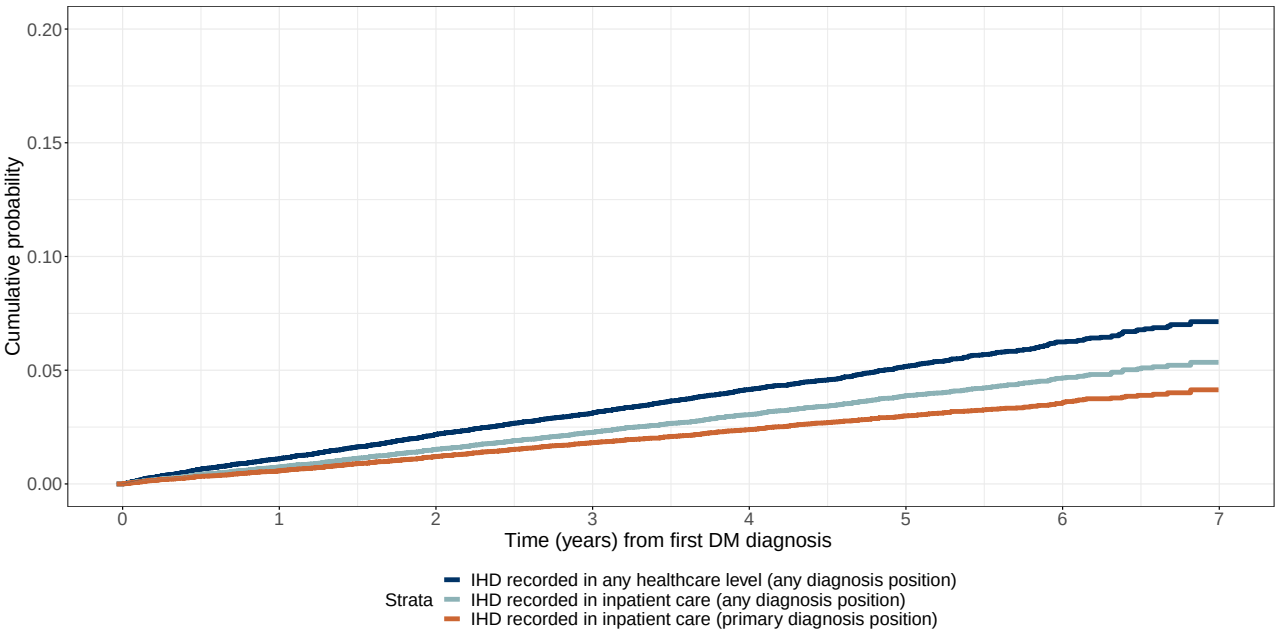


Figure 57: Kaplan-meier curve presenting time from incident DM type II to first IHD event

Time to acute myocardial infarction (AMI)

This Kaplan-Meier plot presents the following three curves:

1. Time to first AMI - recorded in any diagnosis position
2. Time to first AMI - recorded in inpatient care and in any diagnosis position
3. Time to first AMI - recorded in inpatient care and only in primary diagnosis position

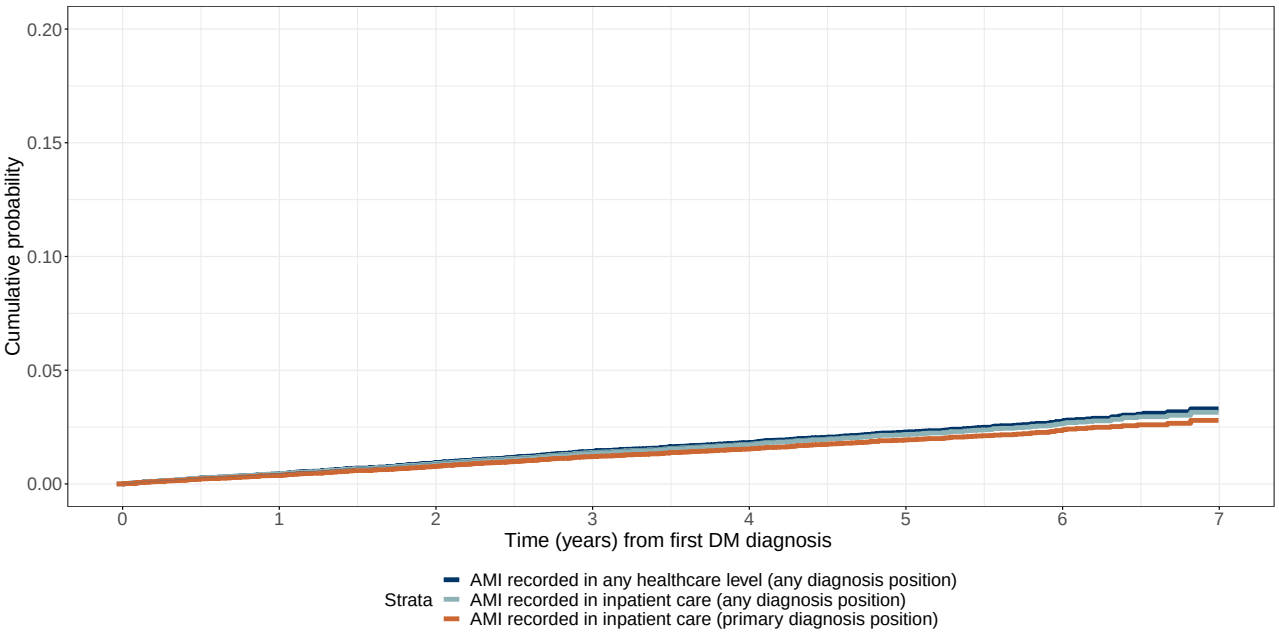


Figure 58: Kaplan-meier curve presenting time from incident DM type II to first AMI event

10.4.10.1.5 Time to heart failure

This Kaplan-Meier plot presents the following three curves:

1. Time to first heart failure event - recorded in any diagnosis position
2. Time to first heart failure event- recorded in inpatient care and in any diagnosis position
3. Time to first heart failure event- recorded in inpatient care and only in primary diagnosis position

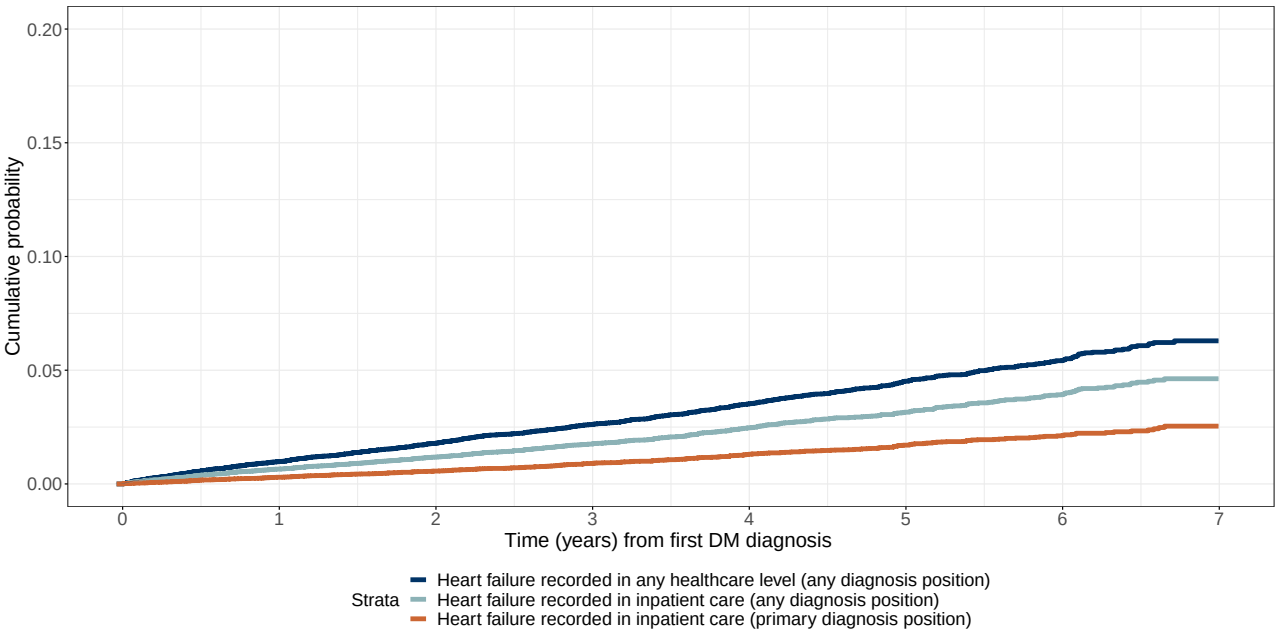


Figure 59: Kaplan-meier curve presenting time from incident DM type II to first HF event

10.4.10.1.6 Time to stroke

This Kaplan-Meier plot presents the following three curves:

1. Time to first stroke - recorded in any diagnosis position
2. Time to first stroke - recorded in inpatient care and in any diagnosis position
3. Time to first stroke - recorded in inpatient care and only in primary diagnosis position

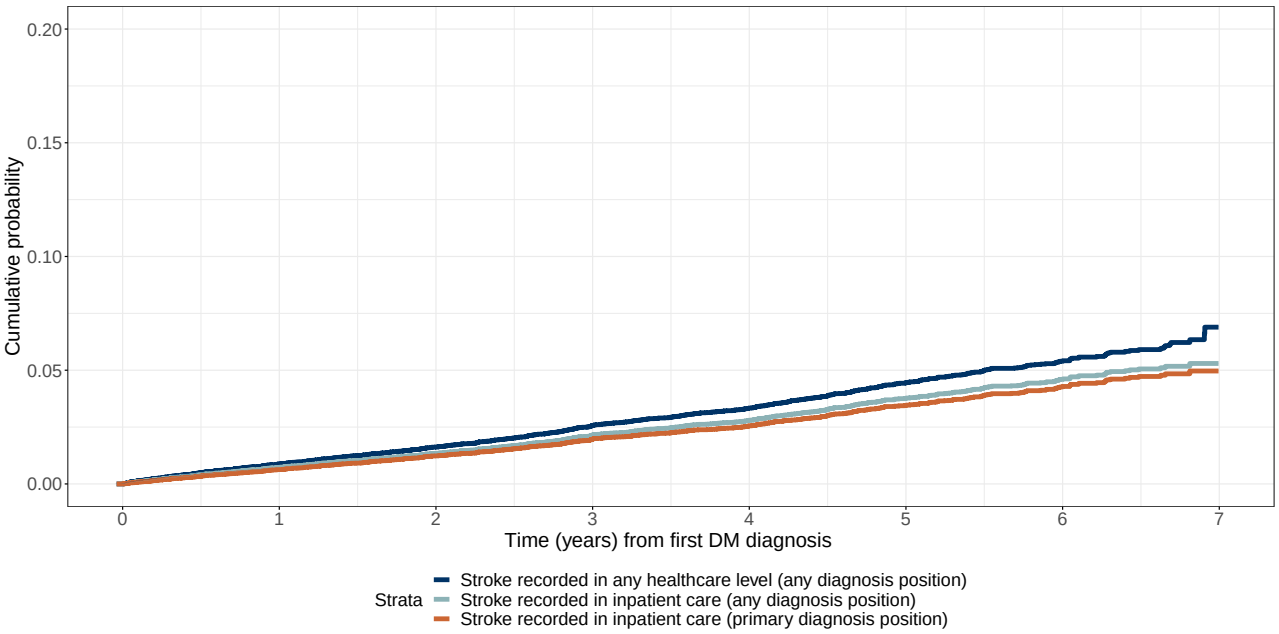


Figure 60: Kaplan-meier curve presenting time from incident DM type II to first stroke event

10.4.11 Persistence to GLD therapy

Persistence and adherence are related concepts, but answer different questions. Persistence is defined as "the duration of time from initiation to discontinuation of therapy" and medication adherence is defined as "the extent to which a patient acts in accordance with the prescribed interval and dose of a dosing regimen". In the following analyses we have analysed persistence (i.e. time to discontinuation) of GLD therapy. There are several methods for estimating drug persistence, involving analysing dosage information, calculation of proportion of days covered with drug, and analysing time between filled dispensations. In this project, we do not have access to the specific dosage text for each dispensation and we can therefore not readily calculate the duration of each dispensation. To estimate the persistence, we have therefore adopted the following method:

1. We assigned a duration of 100 days for each dispensation of a specific GLD drug. The motivation for choosing 100 days is that the Swedish reimbursement system for medicines allows for a maximum of 3 months drug usage at each dispensation.

2. For each drug dispensation, we then analysed the duration until the patient's next dispensation of that GLD. A patient was considered persistent to that drug therapy if they had less than 180 days between the dispensations. If more time had elapsed between the dispensations, the patient was categorized as non-persistent. Since patients may sometimes have unexpected but legitimate delays in dispensations, we also considered cutoff at 365 days (12 months) in all analyses.

Persistence analyses were carried out on the drug class levels. The following drug classes were analysed: metformin, SU-drugs, SGLT2-inhibitors, GLP1-agonists, DPP4-inhibitors and insulin. In separate analyses, persistence to liraglutide (A10BJ02) and dulaglutide (A10BJ05) were also analysed. A patient could only be included once in each graph.

10.4.11.1 Inclusion criteria

All DM type II patients (⩾ 18 years of age) in Region Stockholm initiating their first GLD therapy (3 digit ATC code: A10 - Drugs used in diabetes) between 01 January 2012 and 31 December 2018, and classified as type II using the previously defined algorithm. Patients had to have been resident in Region Stockholm for 15 months to be included in the analysis.

10.4.11.2 Results

10.4.11.3 Persistence to any insulin

This Kaplan-Meier curve presents persistence to insulin therapy. Each step in the Kaplan-Meier curve represents a failure (i.e. discontinuing insulin therapy)

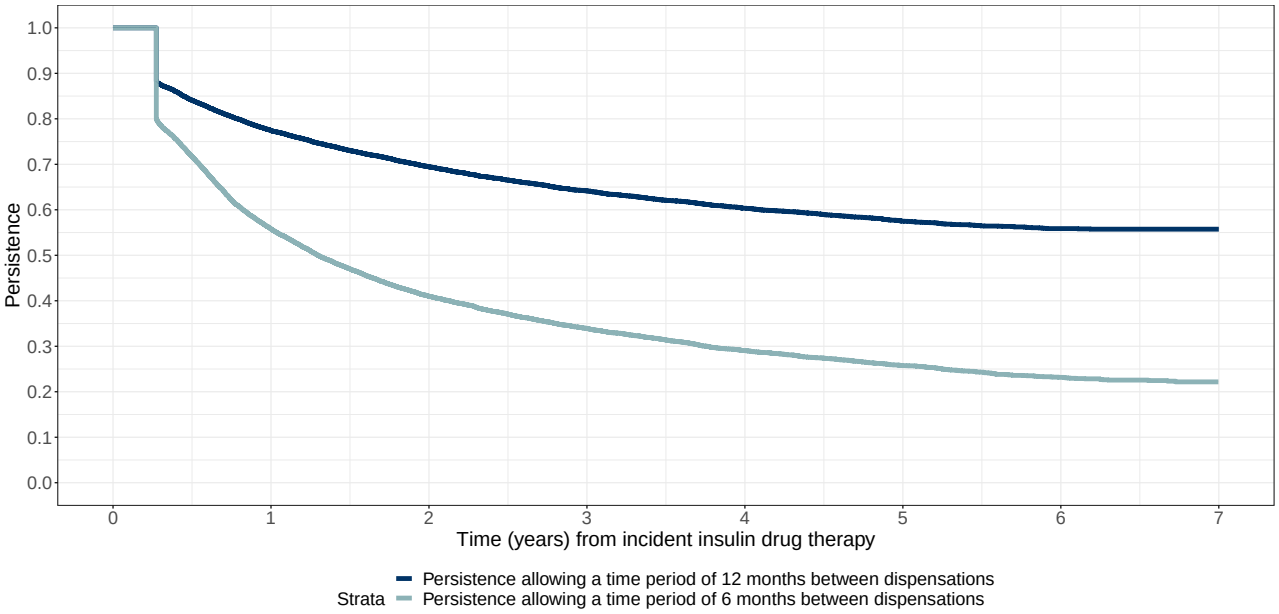


Figure 61: Persistence to insulin therapy for patients with DM type II (⩾ 18 years of age)

10.4.11.4 Persistence to metformin

This Kaplan-Meier curve presents persistence to metformin. Each step in the Kaplan-Meier curve represents a failure (i.e. discontinuing metformin therapy)

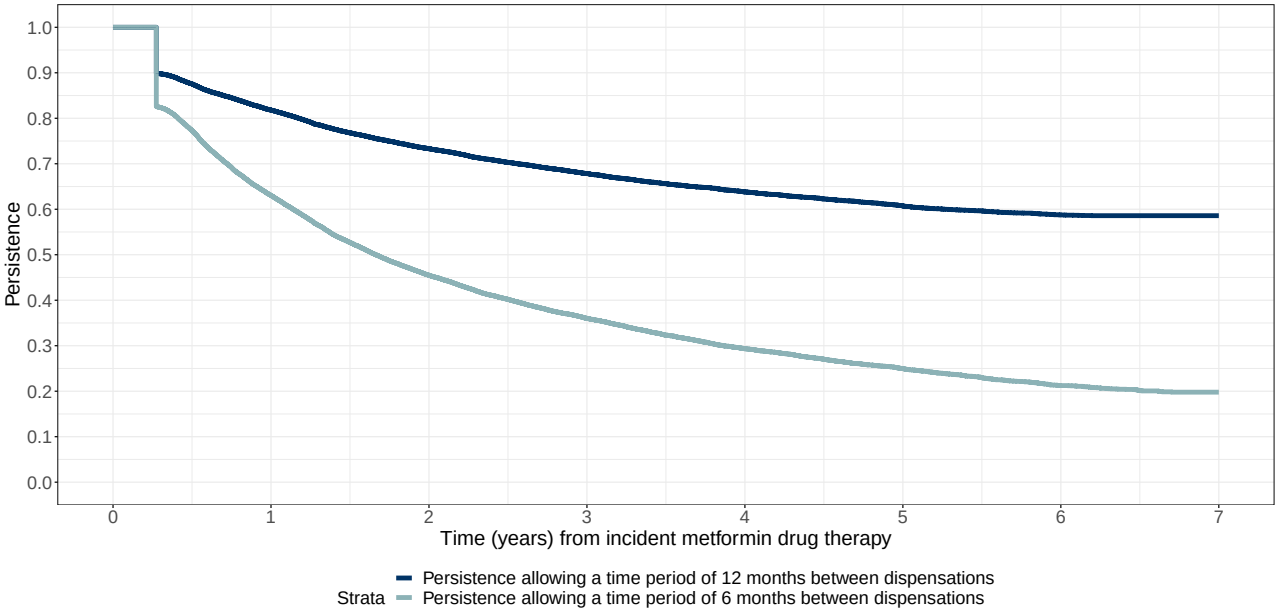


Figure 62: Persistence to metformin therapy for patients with DM type II ($\geqslant$ 18 years of age)

10.4.11.5 Persistence to any SGLT2-i

This Kaplan-Meier curve presents persistence to SGLT2-i. Each step in the Kaplan-Meier curve represents a failure (i.e. discontinuing SGLT2-i therapy)

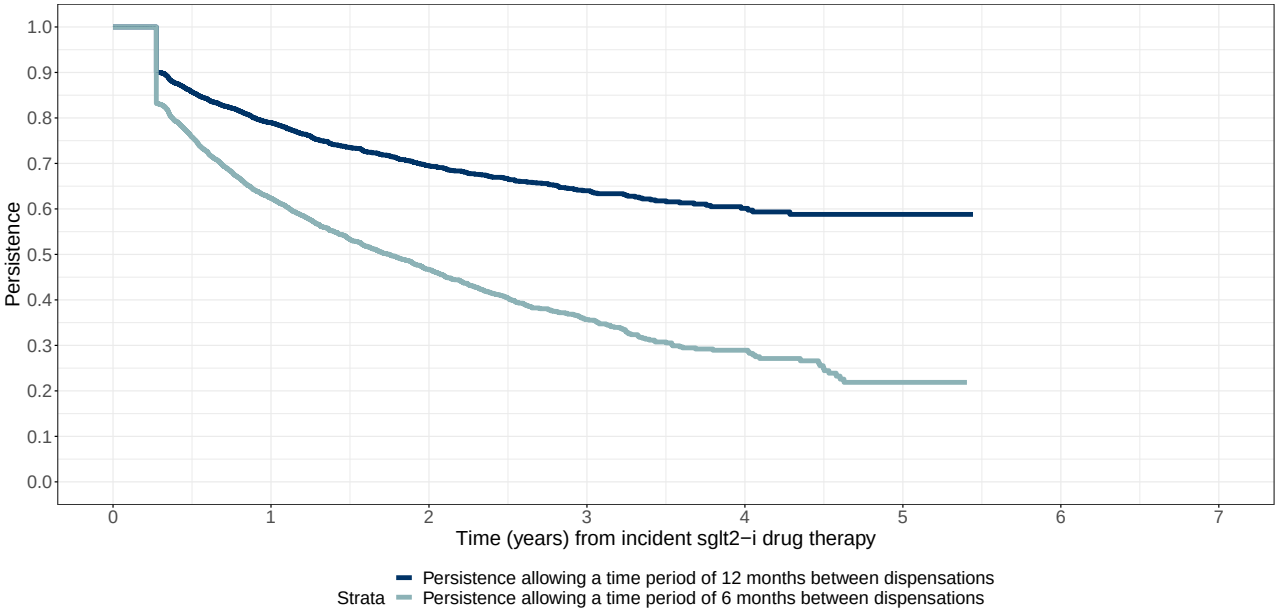


Figure 63: Persistence to SGLT2-i therapy for patients with DM type II ($\geqslant$ 18 years of age)

10.4.11.6 Persistence to any GLP1-A

This Kaplan-Meier curve presents persistence to GLP1-A. Each step in the Kaplan-Meier curve represents a failure (i.e. discontinuing GLP1-A therapy)

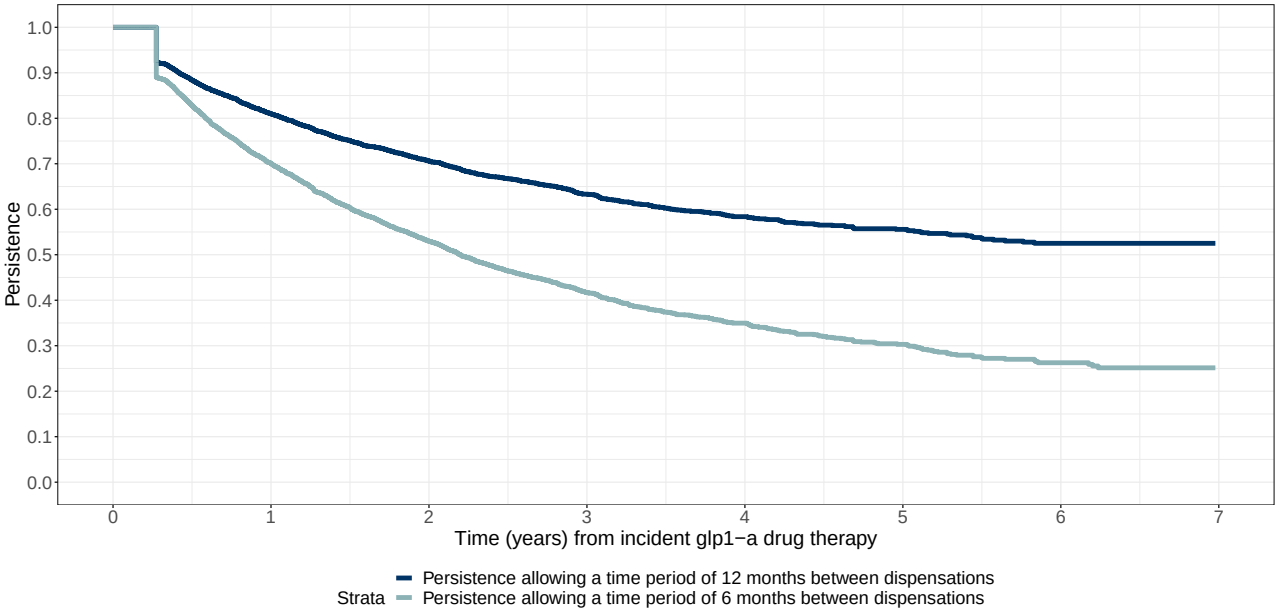


Figure 64: Persistence to GLP1-A therapy for patients with DM type II ($\geqslant$ 18 years of age)

10.4.11.7 Persistence to any DPP4-I

This Kaplan-Meier curve presents persistence to DPP4-I. Each step in the Kaplan-Meier curve represents a failure (i.e. discontinuing DPP4-I therapy)

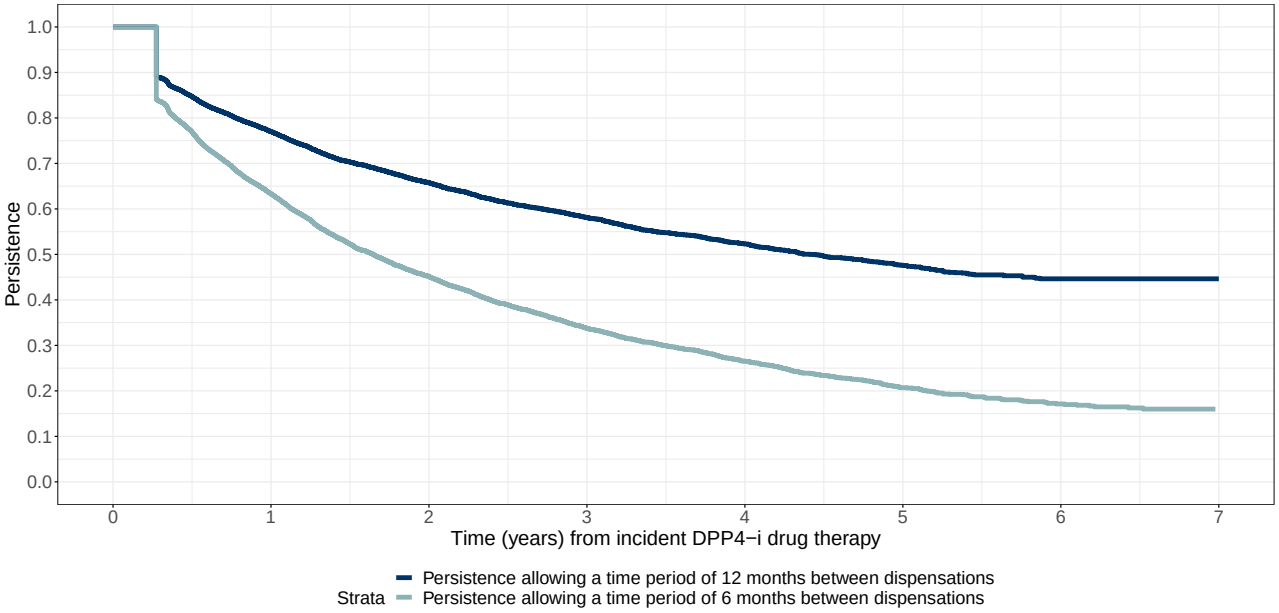


Figure 65: Persistence to DPP4-I therapy for patients with DM type II ($\geqslant$ 18 years of age)

10.4.11.8 Persistence to liraglutide

This Kaplan-Meier curve presents persistence to liraglutide. Each step in the Kaplan-Meier curve represents a failure (i.e. discontinuing liraglutide therapy)

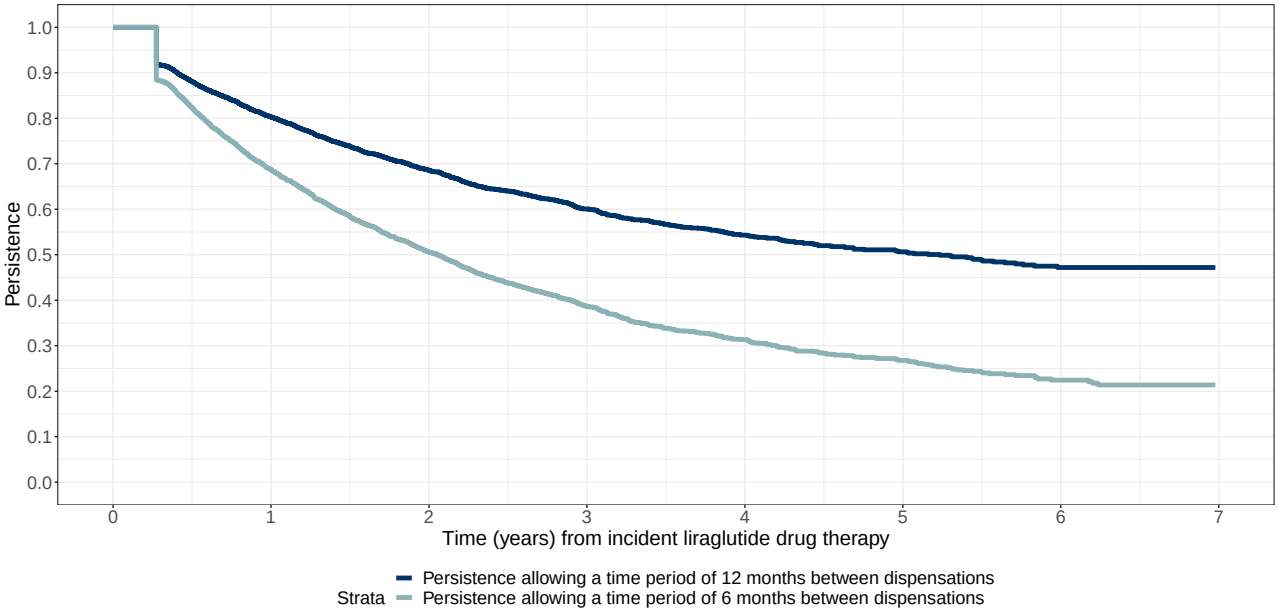


Figure 66: Persistence to liraglutide therapy for patients with DM type II ($\geqslant$ 18 years of age)

10.4.11.9 Persistence to dulaglutide

This Kaplan-Meier curve presents persistence to dulaglutide. Each step in the Kaplan-Meier curve represents a failure (i.e. discontinuing dulaglutide therapy)

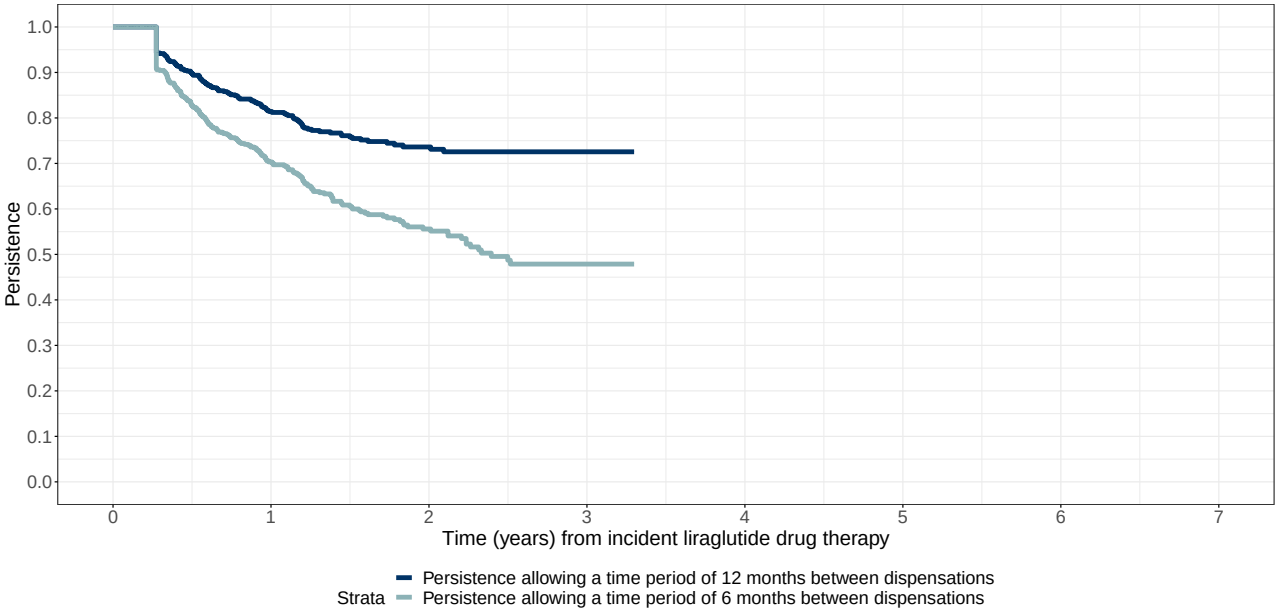


Figure 67: Persistence to dulaglutide therapy for patients with DM type II ($\geqslant$ 18 years of age)

10.4.12 Time from diabetes type II diagnosis to initiation of GLD therapy

This longitudinal analysis includes all incident patients with DM type II between 01 January 2012 and 31 December 2018, and follows them until first dispensation of a GLD drug (ATC code: A10). Time to initiation of GLD therapy will be analyzed by drug class strata.

10.4.12.1 Inclusion criteria

All patients ($\geqslant$ 18 years of age) in Region Stockholm having their first recorded DM type II diagnosis between 01 January 2012 and 31 December 2018, and classified as type II using the previously defined algorithm. Patients had to have been resident in Region Stockholm for $>$ 15 months to be included in the analysis.

10.4.12.2 Exclusion criteria

Patients treated with GLD therapy before first diagnosis of diabetes.

10.4.12.3 Results

Study population flowchart:

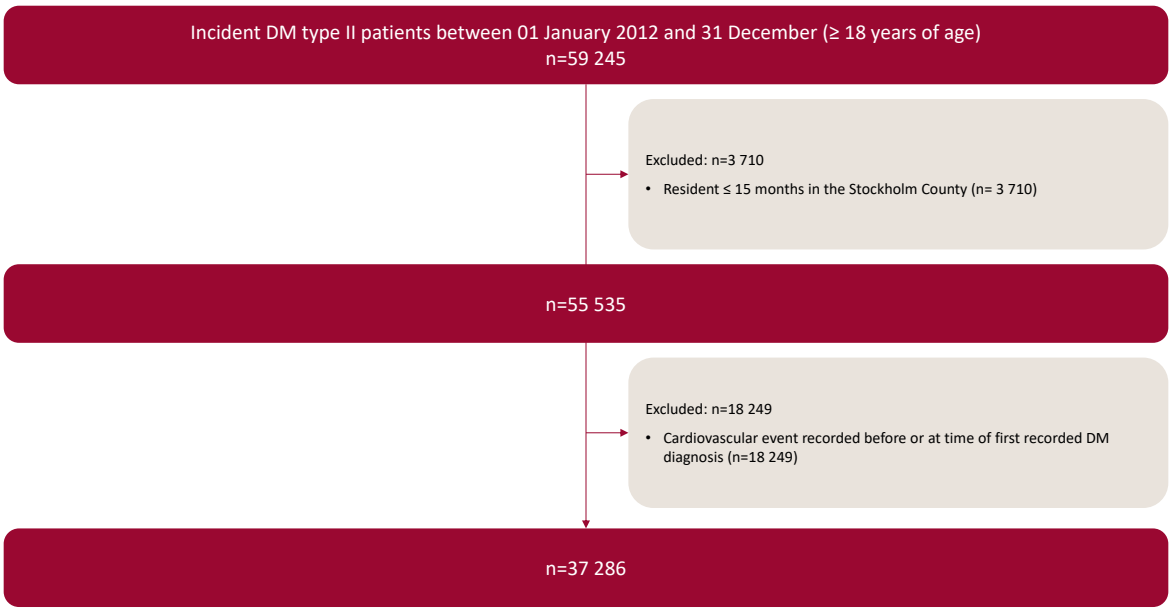


Figure 68: Study population flowchart for analysis of time to first GLD therapy

This Kaplan-Meier plot presents the time from incident DM type II to first GLD therapy

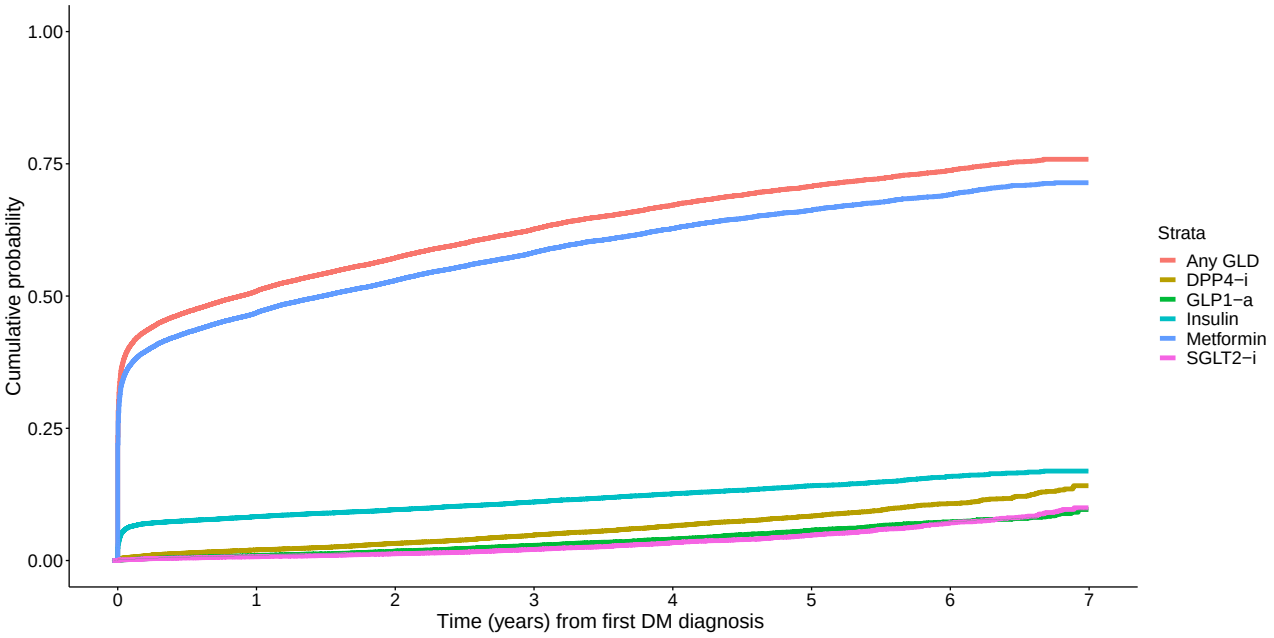


Figure 69: Kaplan-meier curve presenting time from incident DM type II to first GLD therapy

10.4.13 Time from first non-insulin GLD therapy to insulin treatment

This longitudinal analysis includes all DM type II patients (according to the epidemiologic algorithm) initiating their first non-insulin GLD and follows them until first dispensation of insulin (ATC code: A10A).

10.4.13.1 Inclusion criteria

All DM type II patients ($\geqslant$ 18 years of age) in Region Stockholm having their first non-insulin GLD therapy initiated between 01 January 2012 and 31 December 2018. Patients had to have been resident in Region Stockholm for $>$ 15 months to be included in the analysis.

10.4.13.2 Exclusion criteria

Treatment with insulin before first treatment with GLD.

10.4.13.3 Results

Study population flowchart:

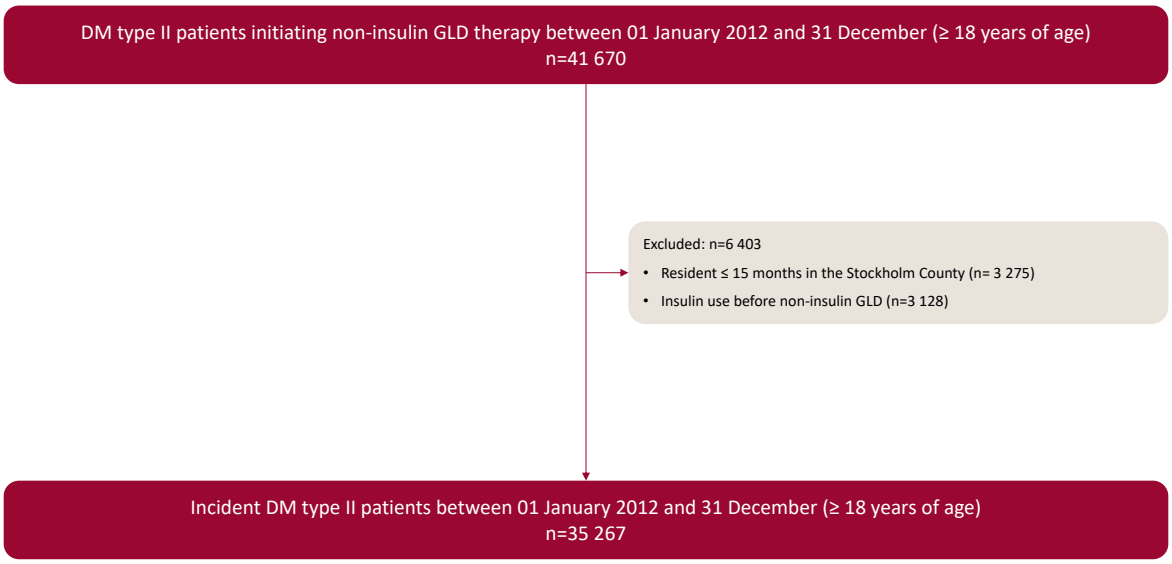


Figure 70: Study population flowchart for analysis of time from first GLD therapy to insulin use

This Kaplan-Meier plot presents the time from incident GLD therapy to insulin use

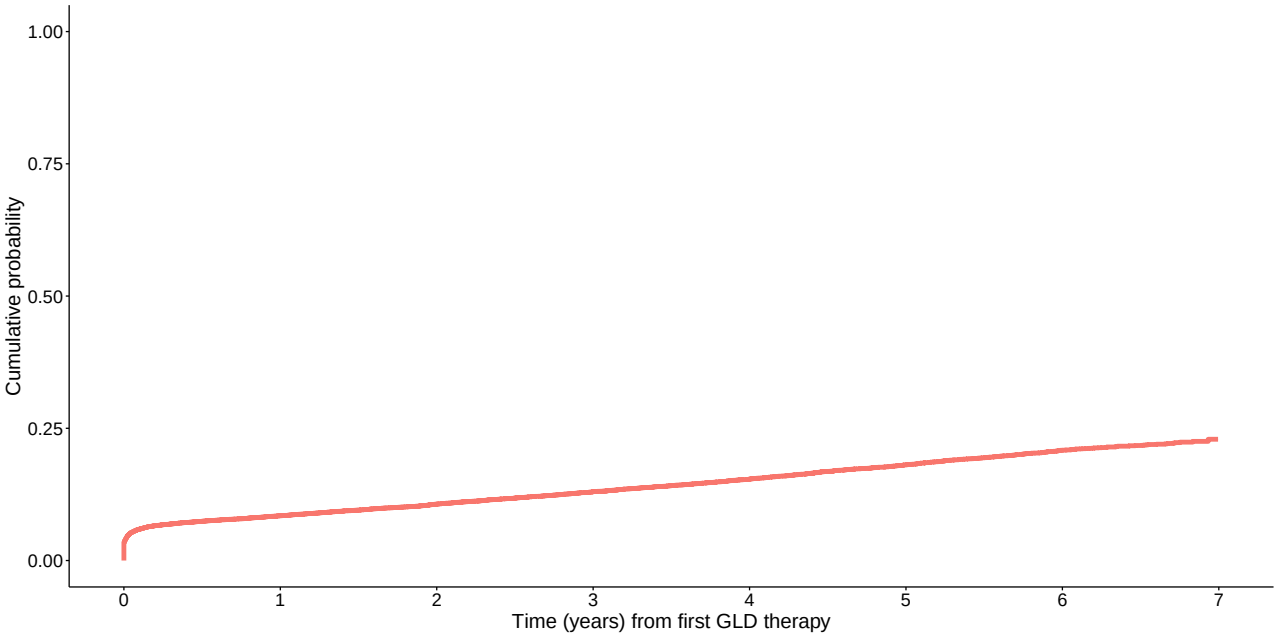


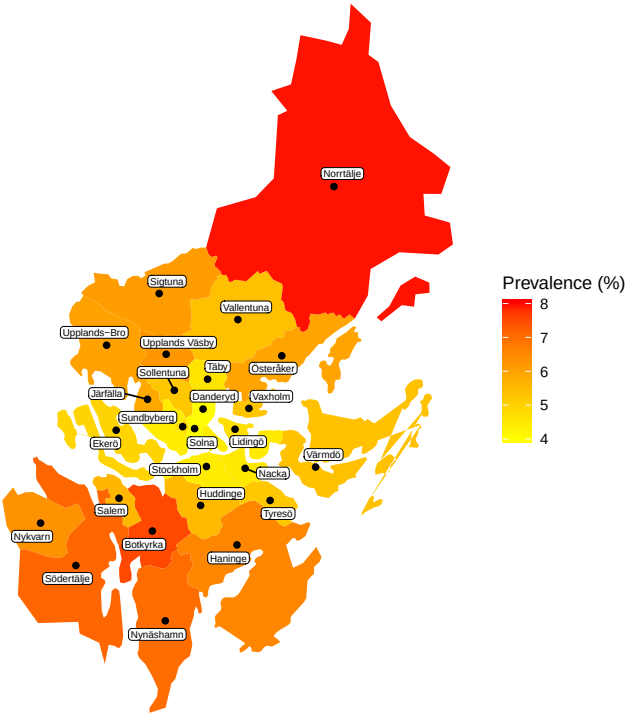
Figure 71: Kaplan-meier curve presenting time from incident GLD therapy to insulin use for DM type II patients

10.4.14 Regional differences in diabetes type II

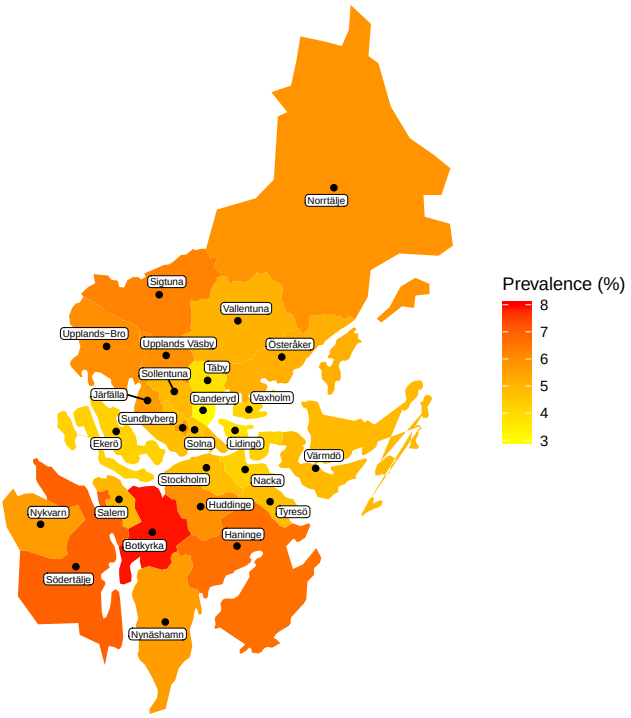
This section presents results from analyses restricted to diabetes type II; we therefore present the methods and definitions in this section.

10.4.14.1 Prevalence of DM type II

In this additional analysis of prevalence, we have estimated the prevalence of DM type II ($\geqslant$ 18 years of age) for each municipality in Stockholm. Furthermore, we present one crude (i.e. number of patients in each municipality/the total population ($\geqslant$ 18 years of age) in the same municipality) analysis and one age standardised analysis where we have adjusted the age distribution in each municipality to harmonize with the age distribution in the Stockholm county.



(a) Crude - prevalence of DM type II (⩾18 years of age) by each municipality in Stockholm



(b) Age standardized - prevalence of DM type II (⩾18 years of age) by each municipality in Stockholm

Figure 72: Prevalence of DM type II by municipality

10.4.14.2 Mean age of DM type II patients

The figure below presents the mean age for patients with DM type II (⩾ 18 years of age) for each municipality.

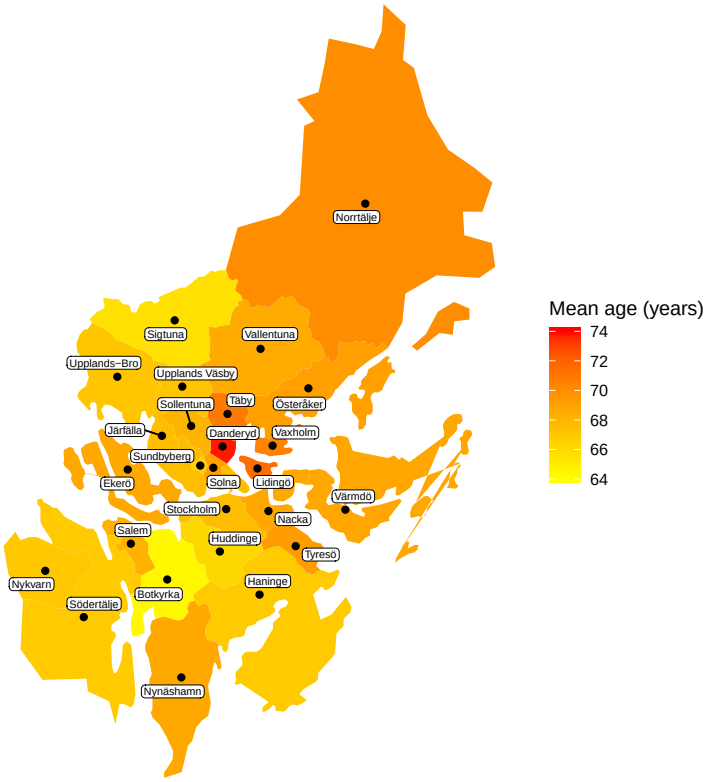


Figure 73: Mean age for patients with DM type II (⩾ 18 years of age)

10.4.14.3 Mean duration of DM

In this analysis we have estimated the duration of DM for each patient. We have utilized a combination of data on first recorded DM diagnosis and with data on year of DM onset from EHRs. We allowed EHR data to override VAL data, i.e. if the first recorded DM diagnosis in VAL was in 2010 and information from EHRs indicated that the year of onset was 2002, the EHR information was used to determine date of DM onset.

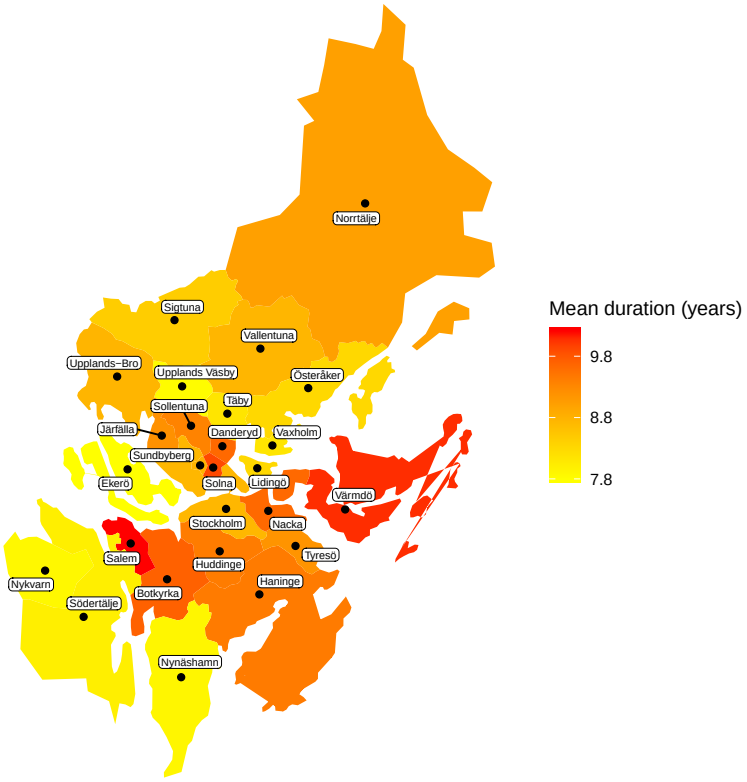


Figure 74: Mean duration of DM for patients with DM type II ($\geqslant$ 18 years of age)

10.4.14.4 Drug utilization by municipality

10.4.14.4.1 Ongoing treatment with any type of GLD drugs

In this analysis we estimated the proportion of patients with ongoing treatment with glucose lowering drugs (GLD) of any type. As a proxy for ongoing treatment we have in this method analysed if the patient have had a dispensation within six (6) months before 31 December 2018.

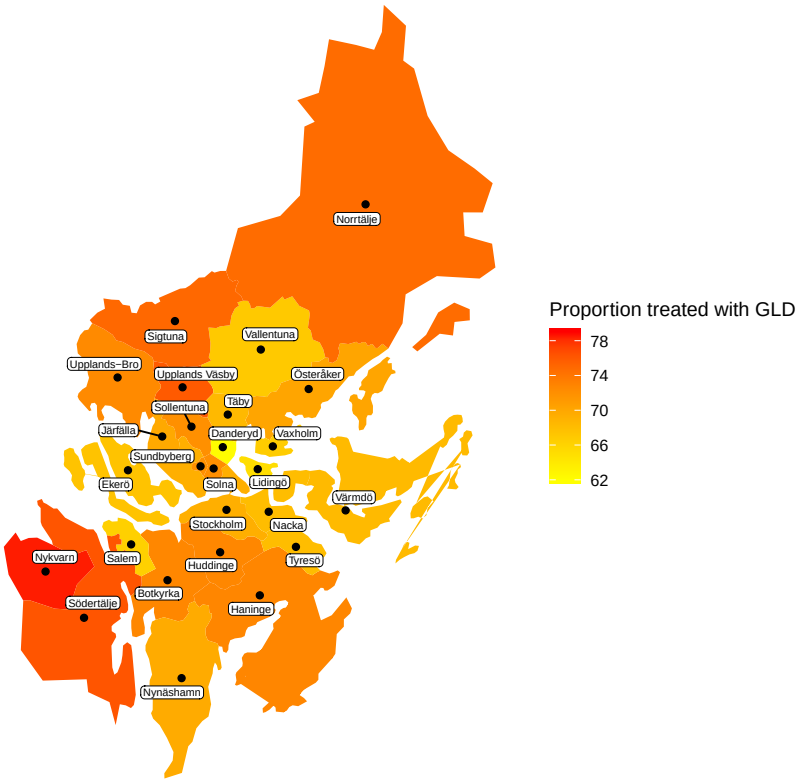


Figure 75: Ongoing GLD treatment for patients with DM type II (⩾ 18 years of age)

10.4.14.4.2 Ongoing treatment with GLD by drug class

In this analysis we estimated the proportion of patients with ongoing treatment with glucose lowering drugs (GLD) by drug class strata. The denominator in each analysis is the number of DM type II patients (⩾18 years of age) treated with any type of GLD drug in each municipality.

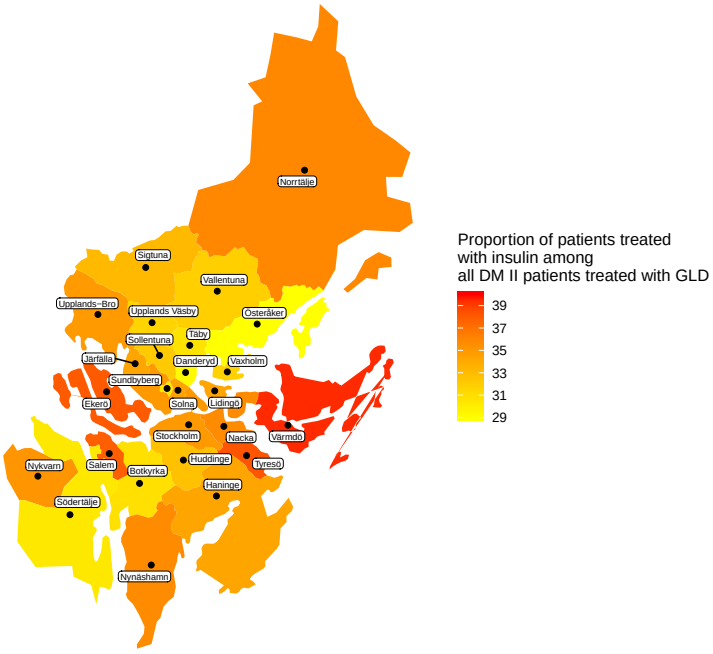


Figure 76: Insulin use among patients with DM type II treated with GLD (⩾18 years of age)

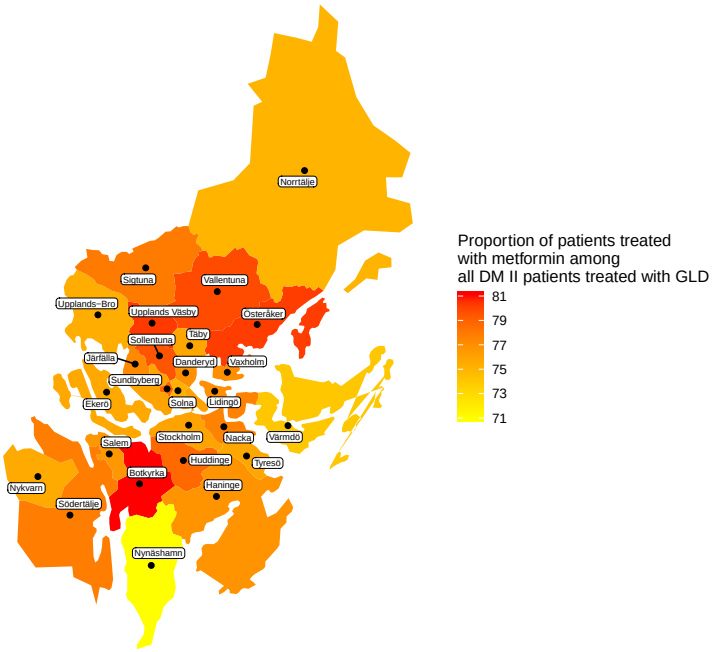


Figure 77: Metformin use among patients with DM type II treated with GLD (⩾18 years of age)

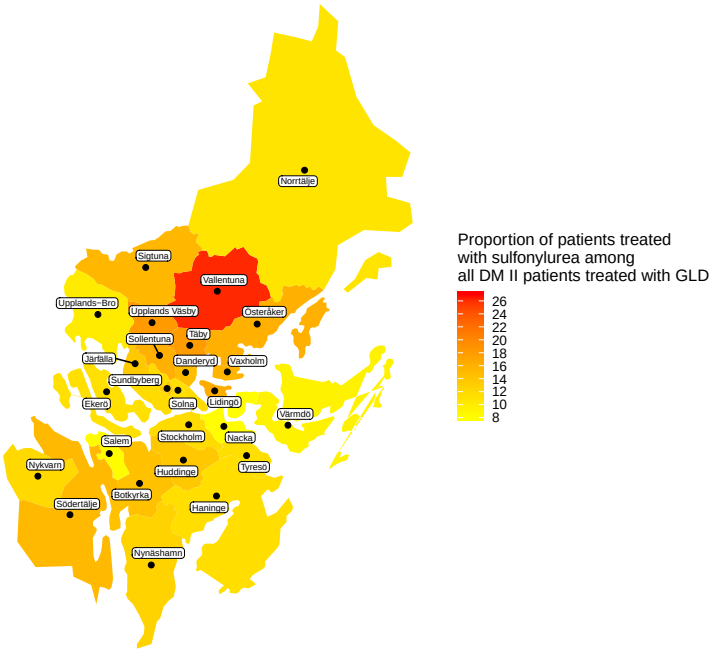


Figure 78: Sulfonylurea use among patients with DM type II treated with GLD (⩾18 years of age)

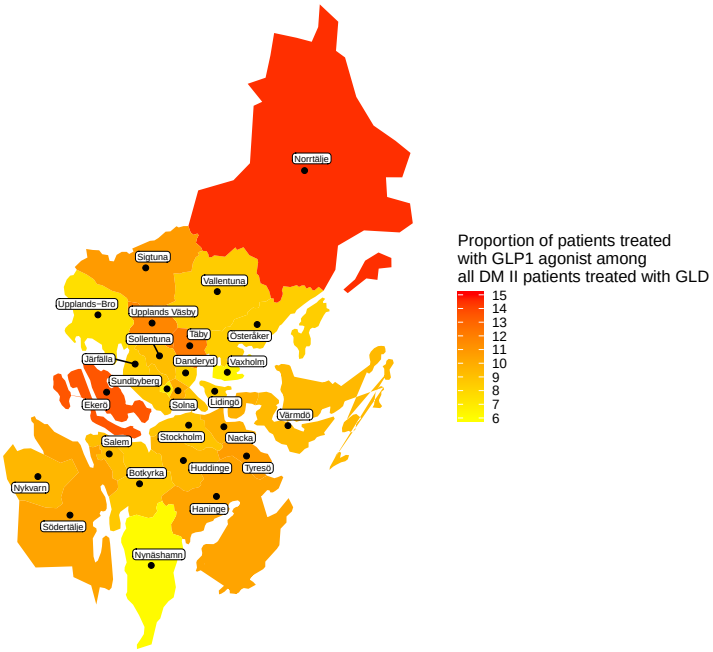


Figure 79: GLP1 agonist use among patients with DM type II treated with GLD (⩾18 years of age)

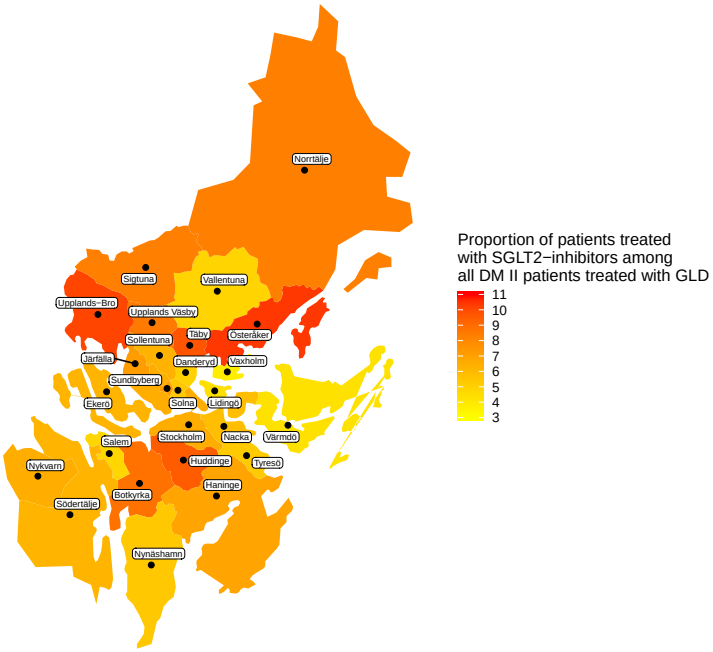


Figure 80: SGLT2 inhibitors use among patients with DM type II treated with GLD (⩾18 years of age)

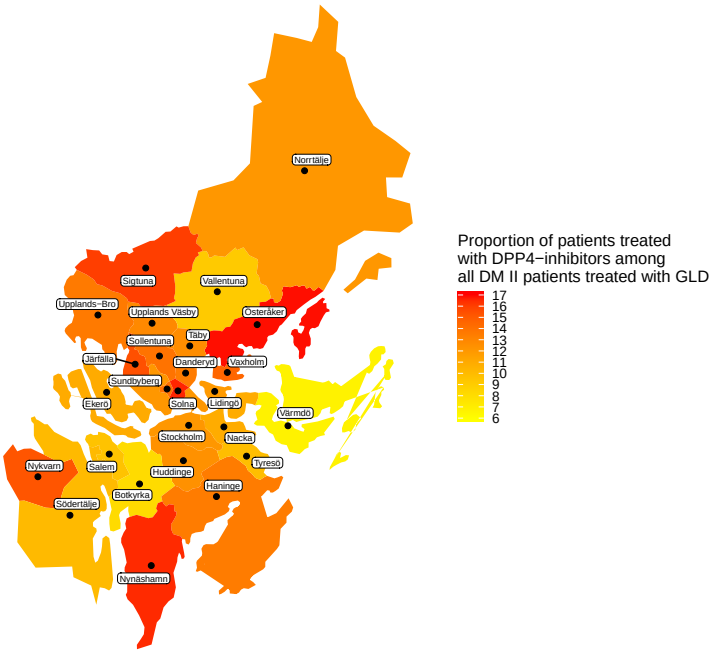


Figure 81: DPP4 inhibitors agonist use among patients with DM type II treated with GLD (⩾18 years of age)

10.4.14.5 BMI by municipality

In this analysis we calculate mean BMI for each municipality. Since the captured values of BMI in the research data are varying for municipalities, we present a table with data on available information on BMI for each municipality.

The following table presents data on the coverage of BMI values for each municipality:

Table 117: Proportion of DM type II patients with a BMI value (age $\geqslant$ 18 years)

Municipality	No of patients with a BMI recording	DM type II (>= 18 years)	Proportion of DM II patients with a BMI value
Salem	634	690	91.9
Värmdö	1624	1783	91.1
Danderyd	873	1002	87.1
Botkyrka	4621	5312	87.0
Haninge	3668	4492	81.7
Nacka	2842	3484	81.6
Huddinge	3650	4615	79.1
Solna	2154	2736	78.7
Upplands-Bro	997	1296	76.9
Tyresö	1446	1888	76.6
Norrtälje	3039	4012	75.7
Sundbyberg	1434	1910	75.1
Sollentuna	2107	2849	74.0
Lidingö	1232	1718	71.7
Järfälla	2527	3528	71.6
Vallentuna	922	1337	69.0
Vaxholm	319	477	66.9
Stockholm	22693	34137	66.5
Sigtuna	1479	2225	66.5
Täby	1621	2489	65.1
Södertälje	3427	5385	63.6
Upplands Väsby	1200	2179	55.1
Österåker	1097	2021	54.3
Nynäshamn	820	1565	52.4
Nykvarn	265	510	52.0
Ekerö	340	1020	33.3

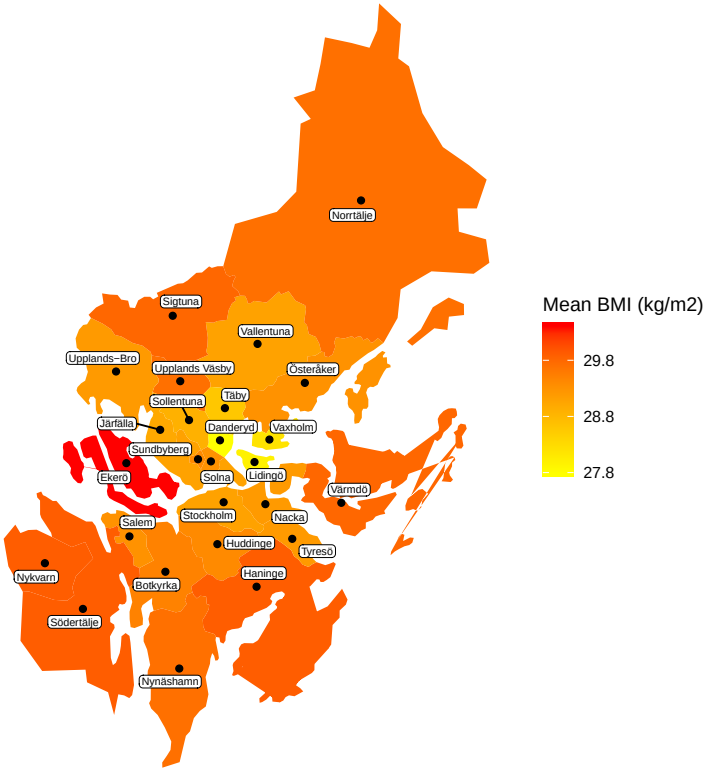


Figure 82: Mean BMI for patients with DM type II ($\geqslant$ 18 years of age)

10.4.14.6 HbA1c by municipality

In this analysis we analyzed HbA1c levels by municipality. Since the captured values of HbA1c in the research data are varying for municipalities, we present a table with data on available information on HbA1c for each municipality.

The following table presents data on the coverage of HbA1c values for each municipality:

Table 118: Proportion of DM II patients with HbA1c value (age $\geqslant$ 18 years)

Municipality	No of patients with a HbA1c recording	DM type II (>= 18 years)	Proportion of DM type II patients with HbA1c value
Värmdö	1525	1783	85.5
Botkyrka	3922	5312	73.8
Danderyd	737	1002	73.6
Haninge	3034	4492	67.5
Norrtälje	2642	4012	65.9
Nacka	2251	3484	64.6
Solna	1645	2736	60.1
Tyresö	1117	1888	59.2
Upplands-Bro	755	1296	58.3
Huddinge	2688	4615	58.2
Sollentuna	1543	2849	54.2
Sundbyberg	1004	1910	52.6
Järfälla	1755	3528	49.7
Sigtuna	965	2225	43.4
Lidingö	743	1718	43.2
Stockholm	14661	34137	42.9
Täby	925	2489	37.2
Vallentuna	487	1337	36.4
Södertälje	1746	5385	32.4
Vaxholm	154	477	32.3
Upplands Väsby	544	2179	25.0
Salem	153	690	22.2
Nykvarn	112	510	22.0
Österåker	437	2021	21.6
Nynäshamn	255	1565	16.3
Ekerö	125	1020	12.3

Note: In the table above we observe a large variability in the coverage of HbA1c recordings between municipalities and analysis on HbA1c levels must be therefore be interpreted with caution.

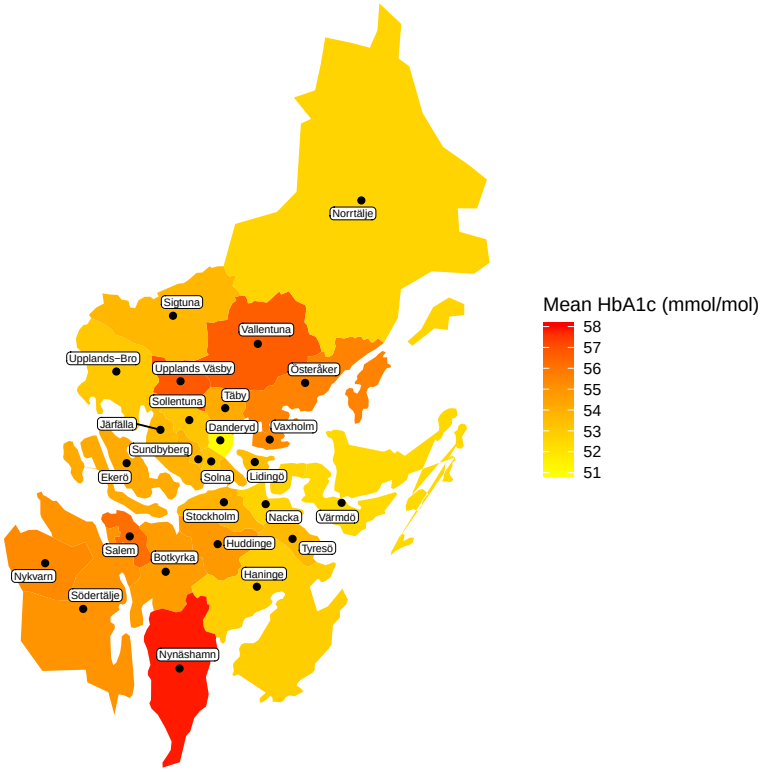


Figure 83: Mean HbA1c for patients with DM type II ($\geqslant$ 18 years of age)

10.4.14.6.1 HbA1c levels by cardiovascular disease

The following table presents HbA1c levels by cardiovascular disease for patients (⩾ 18 years of age) with DM type II:

Table 119: Categories of HbA1c and cardiovascular comorbidity (age ⩾ 18 years)

Variable		All DM type II patients (>=18)	HbA1c < 42	HbA1c 42-51	HbA1c 52-70	HbA1c >70
N		94,660	7,715	17,368	15,315	5,527
Age	Mean	67.7 (12.7)	66.0 (13.5)	68.0 (12.1)	67.7 (12.3)	65.1 (13.8)
	Median	69.0 (59.4, 76.1)	68.0 (58.0, 75.1)	69.1 (60.1, 76.1)	69.0 (60.0, 76.0)	65.1 (56.0, 75.0)
Sex	Female	40,175 (42.4%)	3,380 (43.8%)	7,549 (43.5%)	5,978 (39.0%)	2,158 (39.0%)
	Male	54,485 (57.6%)	4,335 (56.2%)	9,819 (56.5%)	9,337 (61.0%)	3,369 (61.0%)
Cardiovascular comorbidity (IHD, CHF, AFIB, STROKE/TIA, PAD) - all healthcare levels	Yes	37,639 (39.8%)	3,088 (40.0%)	7,398 (42.6%)	6,890 (45.0%)	2,480 (44.9%)
	No	57,021 (60.2%)	4,627 (60.0%)	9,970 (57.4%)	8,425 (55.0%)	3,047 (55.1%)
Cardiovascular comorbidity (IHD, CHF, AFIB, STROKE/TIA, PAD) - inpatient care (all diagnosis positions)	Yes	30,030 (31.7%)	2,484 (32.2%)	5,901 (34.0%)	5,655 (36.9%)	2,128 (38.5%)
	No	64,630 (68.3%)	5,231 (67.8%)	11,467 (66.0%)	9,660 (63.1%)	3,399 (61.5%)
Cardiovascular comorbidity (IHD, CHF, AFIB, STROKE/TIA, PAD) - inpatient care (primary diagnosis position)	Yes	25,998 (27.5%)	2,122 (27.5%)	5,175 (29.8%)	4,954 (32.3%)	1,844 (33.4%)
	No	68,662 (72.5%)	5,593 (72.5%)	12,193 (70.2%)	10,361 (67.7%)	3,683 (66.6%)
Cardiovascular comorbidity (excl AFIB) - all healthcare levels	Yes	33,922 (35.8%)	2,770 (35.9%)	6,653 (38.3%)	6,342 (41.4%)	2,359 (42.7%)
	No	60,738 (64.2%)	4,945 (64.1%)	10,715 (61.7%)	8,973 (58.6%)	3,168 (57.3%)
Cardiovascular comorbidity (excl AFIB) - inpatient care (all diagnosis positions)	Yes	26,851 (28.4%)	2,201 (28.5%)	5,305 (30.5%)	5,177 (33.8%)	1,990 (36.0%)
	No	67,809 (71.6%)	5,514 (71.5%)	12,063 (69.5%)	10,138 (66.2%)	3,537 (64.0%)
Cardiovascular comorbidity (excl AFIB) - inpatient care (primary diagnosis position)	Yes	23,640 (25.0%)	1,938 (25.1%)	4,715 (27.1%)	4,590 (30.0%)	1,745 (31.6%)
	No	71,020 (75.0%)	5,777 (74.9%)	12,653 (72.9%)	10,725 (70.0%)	3,782 (68.4%)
AMI - all healthcare levels	Yes	8,722 (9.2%)	658 (8.5%)	1,831 (10.5%)	1,891 (12.3%)	705 (12.8%)
	No	85,938 (90.8%)	7,057 (91.5%)	15,537 (89.5%)	13,424 (87.7%)	4,822 (87.2%)
AMI - inpatient care (all diagnosis positions)	Yes	8,172 (8.6%)	618 (8.0%)	1,735 (10.0%)	1,774 (11.6%)	669 (12.1%)
	No	86,488 (91.4%)	7,097 (92.0%)	15,633 (90.0%)	13,541 (88.4%)	4,858 (87.9%)
AMI - inpatient care (primary diagnosis position)	Yes	7,728 (8.2%)	580 (7.5%)	1,650 (9.5%)	1,671 (10.9%)	634 (11.5%)
	No	86,932 (91.8%)	7,135 (92.5%)	15,718 (90.5%)	13,644 (89.1%)	4,893 (88.5%)
CHF - all healthcare levels	Yes	11,555 (12.2%)	887 (11.5%)	2,171 (12.5%)	2,306 (15.1%)	946 (17.1%)
	No	83,105 (87.8%)	6,828 (88.5%)	15,197 (87.5%)	13,009 (84.9%)	4,581 (82.9%)
CHF - inpatient care (all diagnosis positions)	Yes	8,365 (8.8%)	647 (8.4%)	1,567 (9.0%)	1,767 (11.5%)	751 (13.6%)
	No	86,295 (91.2%)	7,068 (91.6%)	15,801 (91.0%)	13,548 (88.5%)	4,776 (86.4%)
CHF - inpatient care (primary diagnosis position)	Yes	4,464 (4.7%)	330 (4.3%)	827 (4.8%)	992 (6.5%)	441 (8.0%)
	No	90,196 (95.3%)	7,385 (95.7%)	16,541 (95.2%)	14,323 (93.5%)	5,086 (92.0%)
STROKE/TIA - all healthcare levels	Yes	11,353 (12.0%)	1,016 (13.2%)	2,134 (12.3%)	1,984 (13.0%)	794 (14.4%)
	No	83,307 (88.0%)	6,699 (86.8%)	15,234 (87.7%)	13,331 (87.0%)	4,733 (85.6%)
STROKE/TIA - inpatient care (all diagnosis positions)	Yes	9,333 (9.9%)	843 (10.9%)	1,739 (10.0%)	1,646 (10.7%)	656 (11.9%)
	No	85,327 (90.1%)	6,872 (89.1%)	15,629 (90.0%)	13,669 (89.3%)	4,871 (88.1%)
STROKE/TIA - inpatient care (primary diagnosis position)	Yes	8,805 (9.3%)	801 (10.4%)	1,635 (9.4%)	1,539 (10.0%)	610 (11.0%)
	No	85,855 (90.7%)	6,914 (89.6%)	15,733 (90.6%)	13,776 (90.0%)	4,917 (89.0%)
PAD - all healthcare levels	Yes	7,015 (7.4%)	616 (8.0%)	1,393 (8.0%)	1,417 (9.3%)	538 (9.7%)
	No	87,645 (92.6%)	7,099 (92.0%)	15,975 (92.0%)	13,898 (90.7%)	4,989 (90.3%)
PAD - inpatient care (all diagnosis positions)	Yes	3,610 (3.8%)	338 (4.4%)	743 (4.3%)	786 (5.1%)	336 (6.1%)
	No	91,050 (96.2%)	7,377 (95.6%)	16,625 (95.7%)	14,529 (94.9%)	5,191 (93.9%)
PAD - inpatient care (primary diagnosis position)	Yes	2,640 (2.8%)	244 (3.2%)	543 (3.1%)	590 (3.9%)	239 (4.3%)
	No	92,020 (97.2%)	7,471 (96.8%)	16,825 (96.9%)	14,725 (96.1%)	5,288 (95.7%)
AFIB - all healthcare levels	Yes	13,294 (14.0%)	1,118 (14.5%)	2,547 (14.7%)	2,327 (15.2%)	806 (14.6%)
	No	81,366 (86.0%)	6,597 (85.5%)	14,821 (85.3%)	12,988 (84.8%)	4,721 (85.4%)
AFIB - inpatient care (all diagnosis positions)	Yes	10,578 (11.2%)	908 (11.8%)	2,000 (11.5%)	1,900 (12.4%)	710 (12.8%)
	No	84,082 (88.8%)	6,807 (88.2%)	15,368 (88.5%)	13,415 (87.6%)	4,817 (87.2%)
AFIB - inpatient care (primary diagnosis position)	Yes	5,123 (5.4%)	424 (5.5%)	984 (5.7%)	930 (6.1%)	314 (5.7%)
	No	89,537 (94.6%)	7,291 (94.5%)	16,384 (94.3%)	14,385 (93.9%)	5,213 (94.3%)
IHD - all healthcare levels	Yes	19,960 (21.1%)	1,513 (19.6%)	4,065 (23.4%)	4,008 (26.2%)	1,469 (26.6%)
	No	74,700 (78.9%)	6,202 (80.4%)	13,303 (76.6%)	11,307 (73.8%)	4,058 (73.4%)
IHD - inpatient care (all diagnosis positions)	Yes	15,827 (16.7%)	1,206 (15.6%)	3,222 (18.6%)	3,270 (21.4%)	1,216 (22.0%)
	No	78,833 (83.3%)	6,509 (84.4%)	14,146 (81.4%)	12,045 (78.6%)	4,311 (78.0%)
IHD - inpatient care (primary diagnosis position)	Yes	13,261 (14.0%)	985 (12.8%)	2,745 (15.8%)	2,763 (18.0%)	1,013 (18.3%)
	No	81,399 (86.0%)	6,730 (87.2%)	14,623 (84.2%)	12,552 (82.0%)	4,514 (81.7%)
Hypertension - all healthcare levels	Yes	73,136 (77.3%)	5,840 (75.7%)	13,651 (78.6%)	12,123 (79.2%)	4,190 (75.8%)
	No	21,524 (22.7%)	1,875 (24.3%)	3,717 (21.4%)	3,192 (20.8%)	1,337 (24.2%)
Hypertension - inpatient care (all diagnosis positions)	Yes	41,455 (43.8%)	3,597 (46.6%)	7,919 (45.6%)	7,480 (48.8%)	2,782 (50.3%)
	No	53,205 (56.2%)	4,118 (53.4%)	9,449 (54.4%)	7,835 (51.2%)	2,745 (49.7%)
Hypertension - inpatient care (primary diagnosis position)	Yes	2,130 (2.3%)	192 (2.5%)	410 (2.4%)	353 (2.3%)	138 (2.5%)
	No	92,530 (97.7%)	7,523 (97.5%)	16,958 (97.6%)	14,962 (97.7%)	5,389 (97.5%)

Annual incidence of GLD therapy

In this section we present data on annual incidence of GLD by drug class.

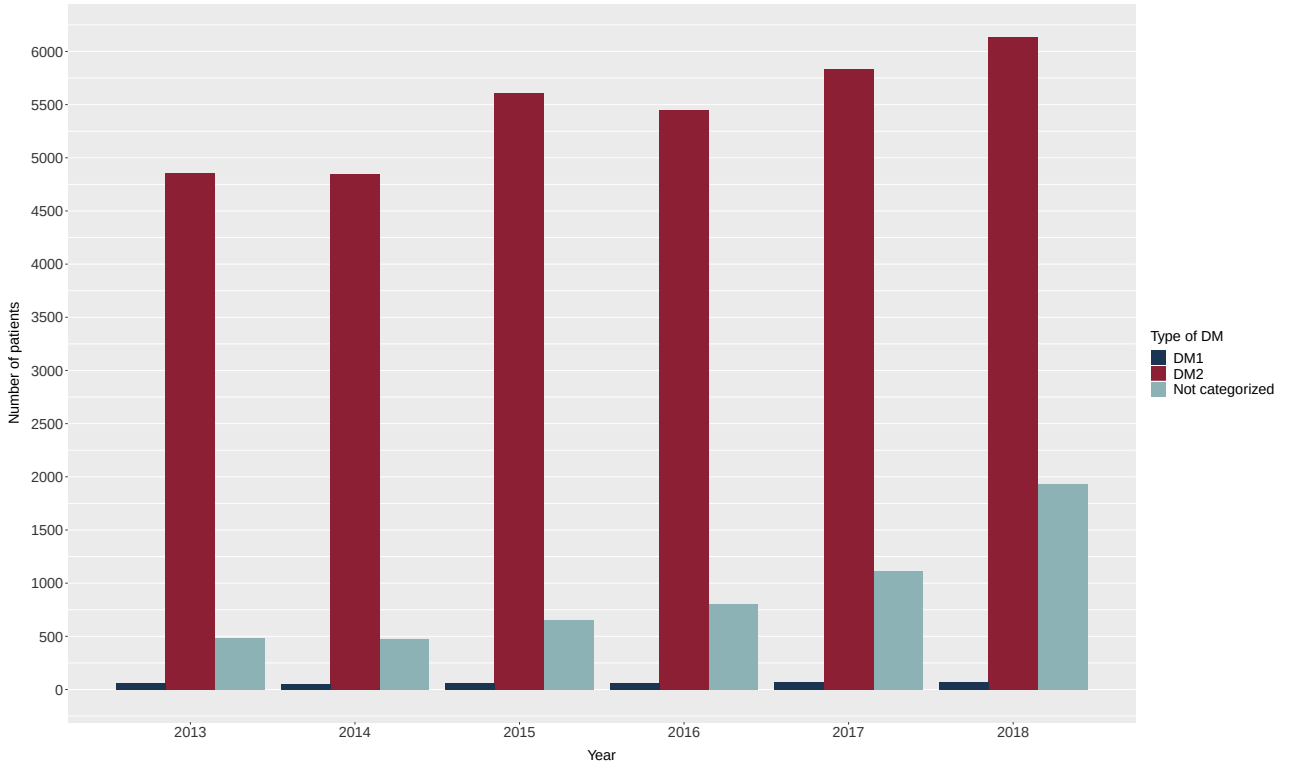


Figure 84: Annual incidence of metformin

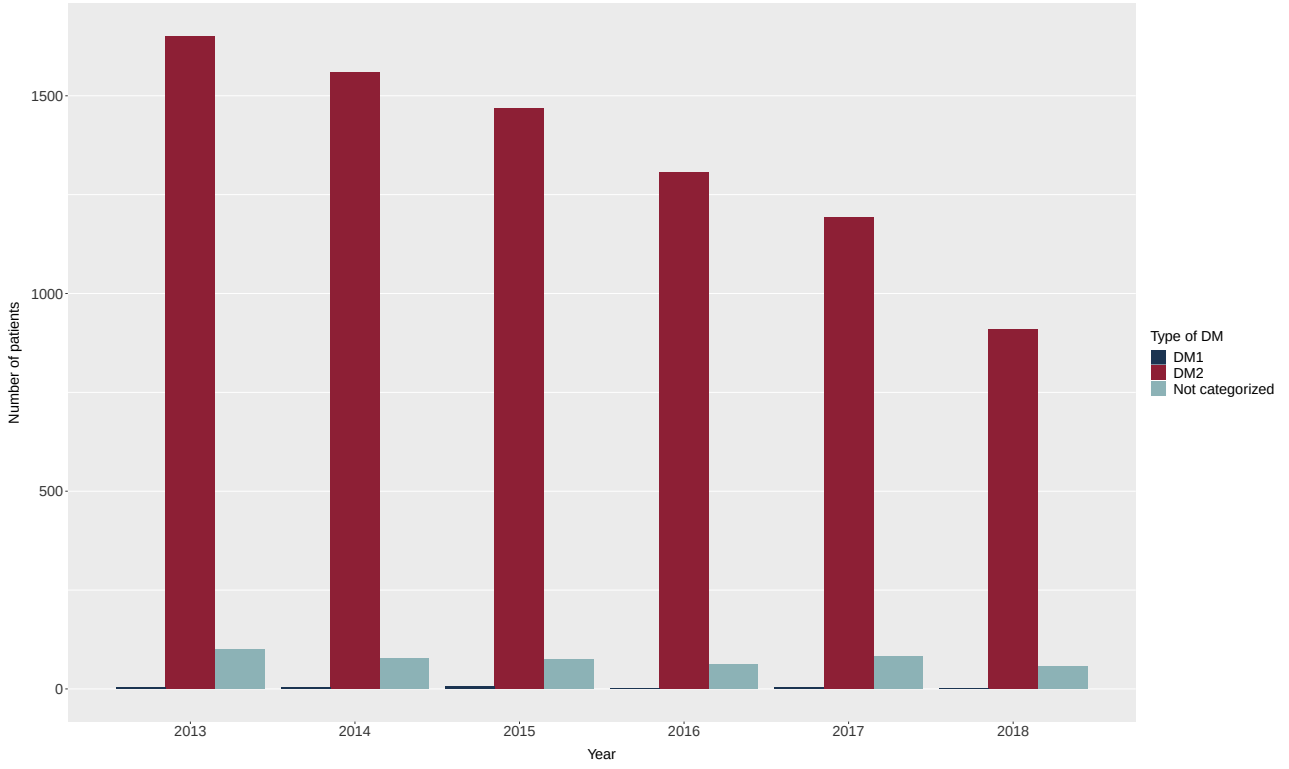


Figure 85: Annual incidence of SU drugs

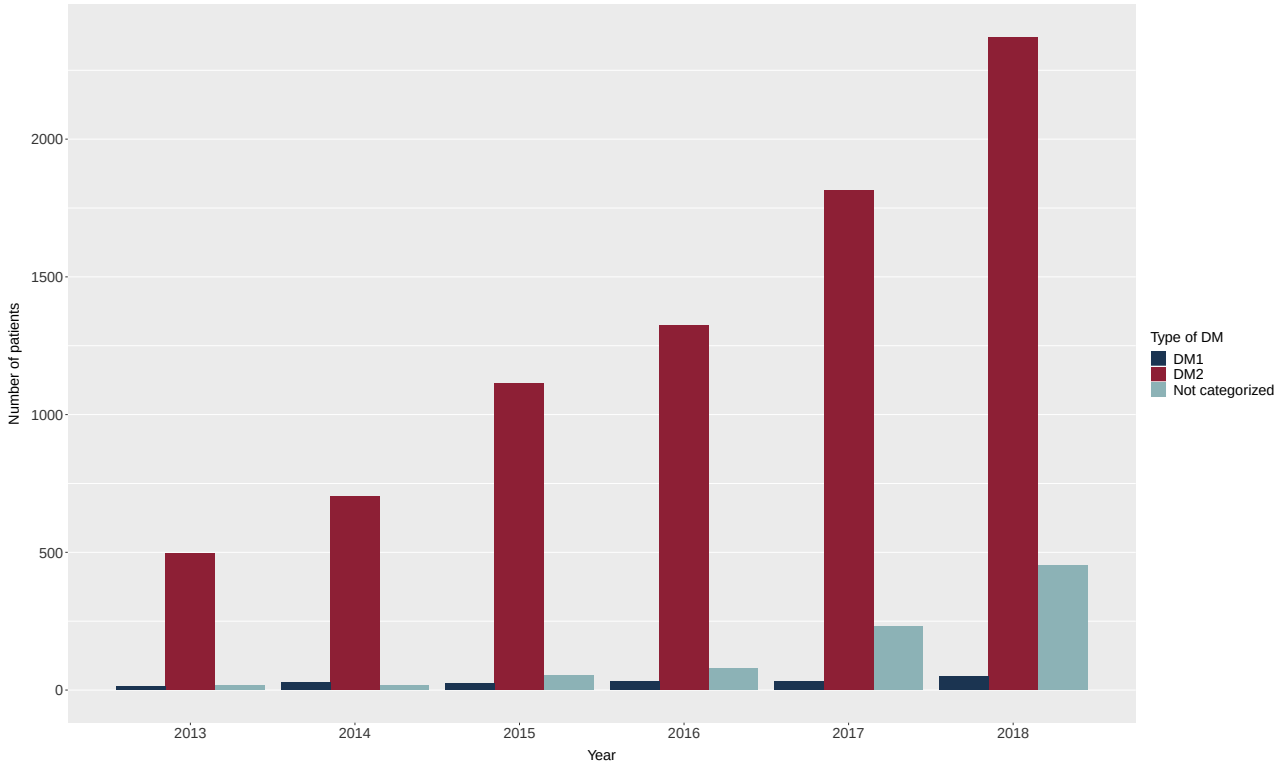


Figure 86: Annual incidence of GLP1-agonists

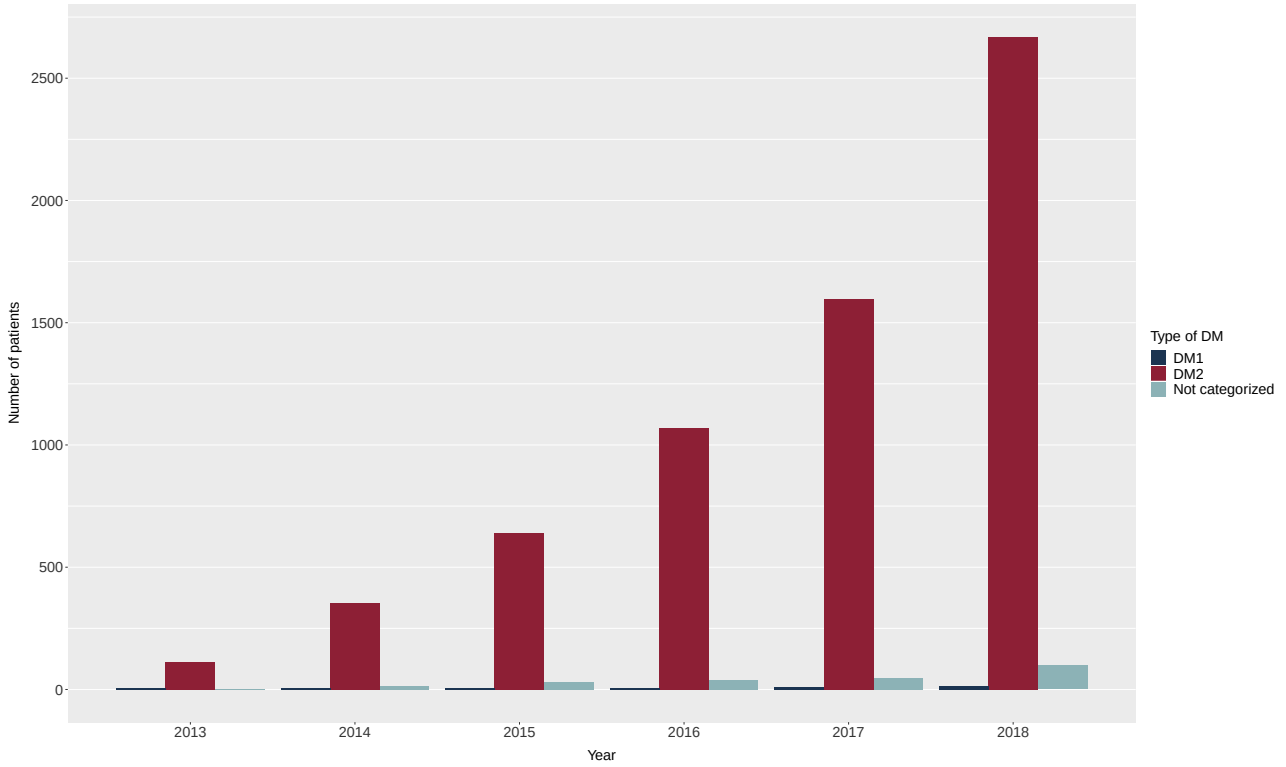


Figure 87: Annual incidence of SGLT2-inhibitors

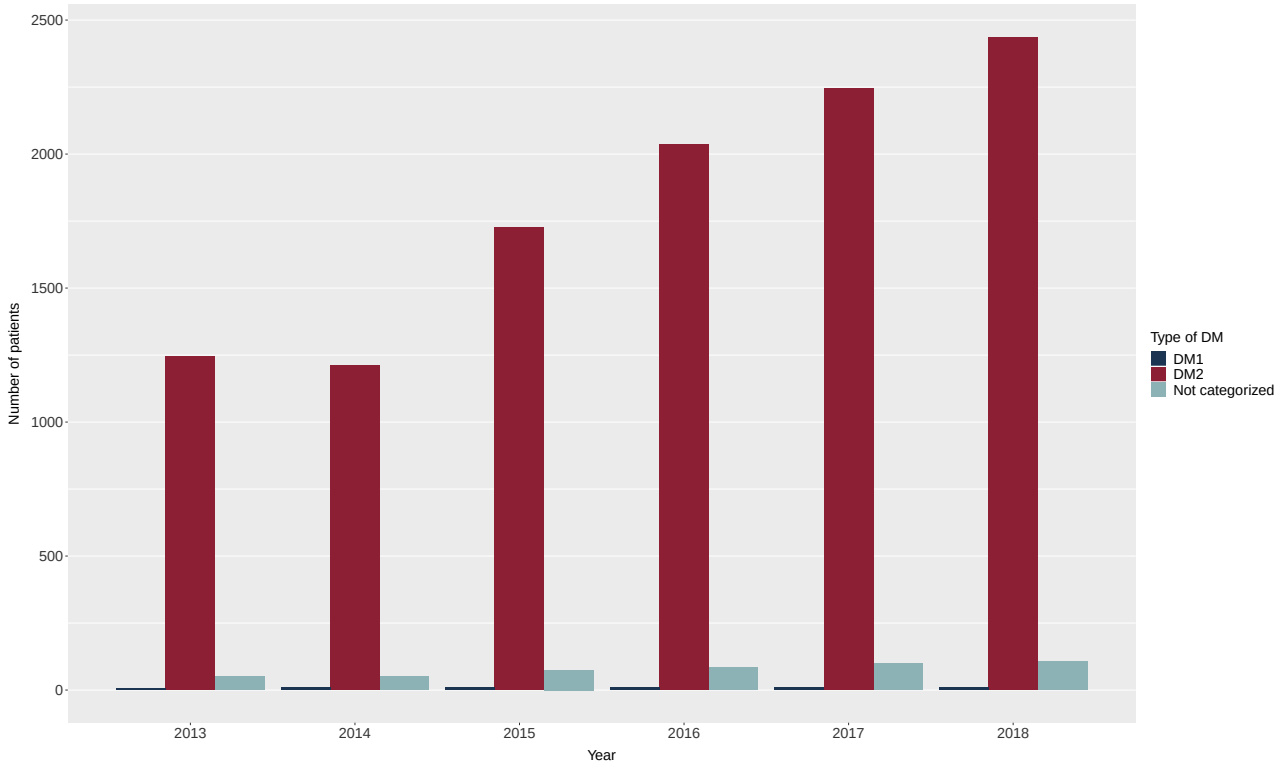


Figure 88: Annual incidence of DPP4-inhibitors

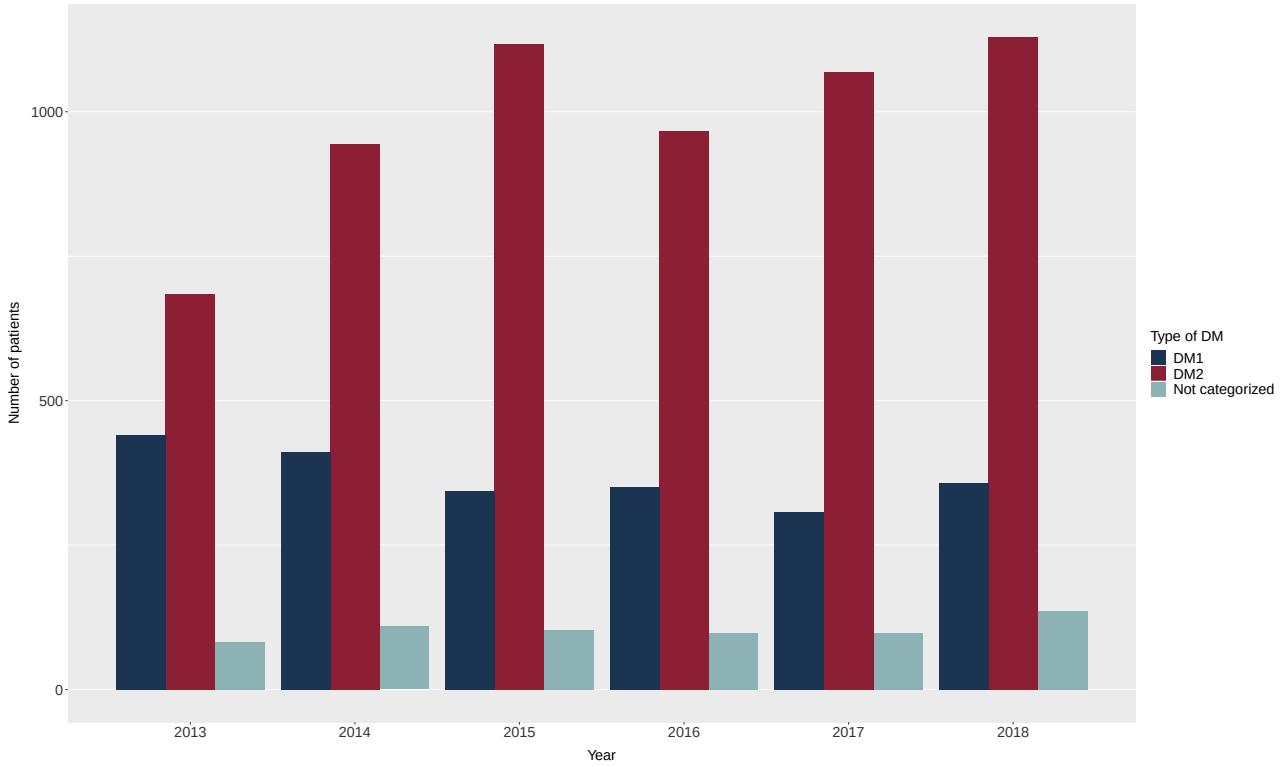


Figure 89: Annual incidence of insulin glargin 100

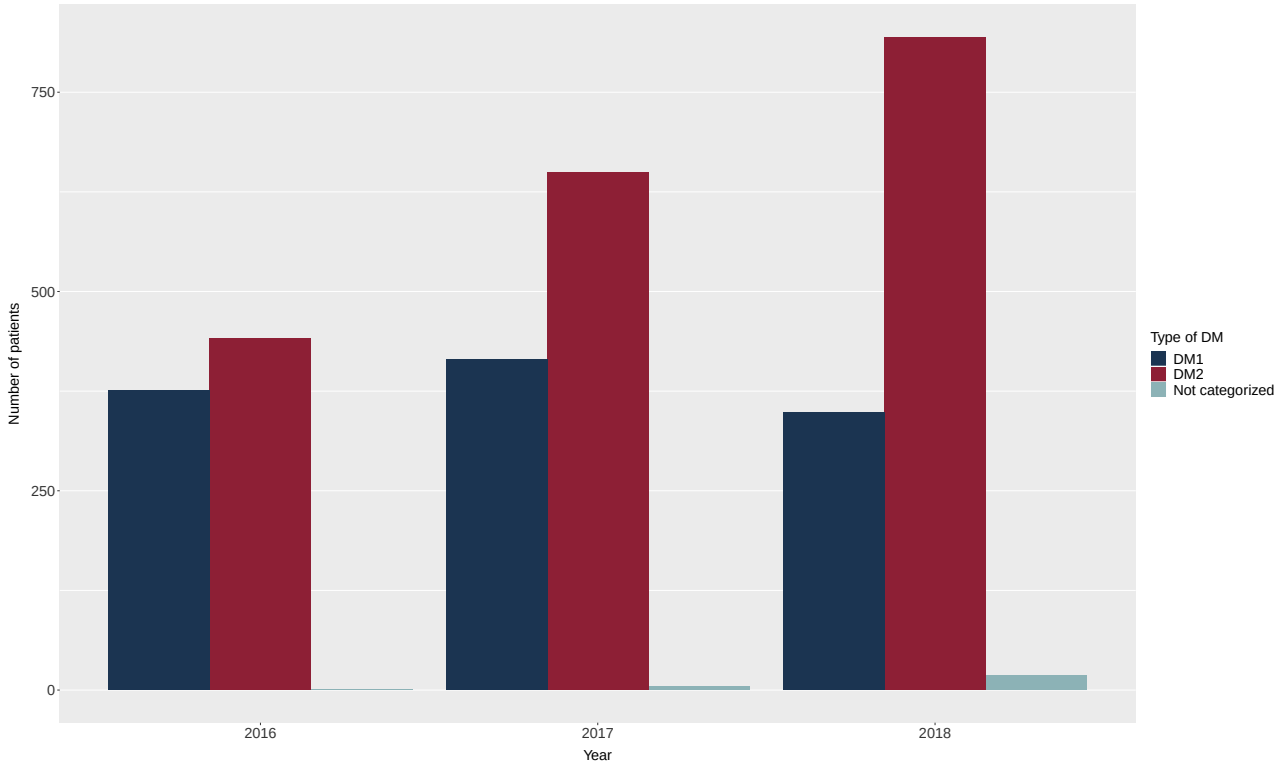


Figure 90: Annual incidence of insulin glargin 300

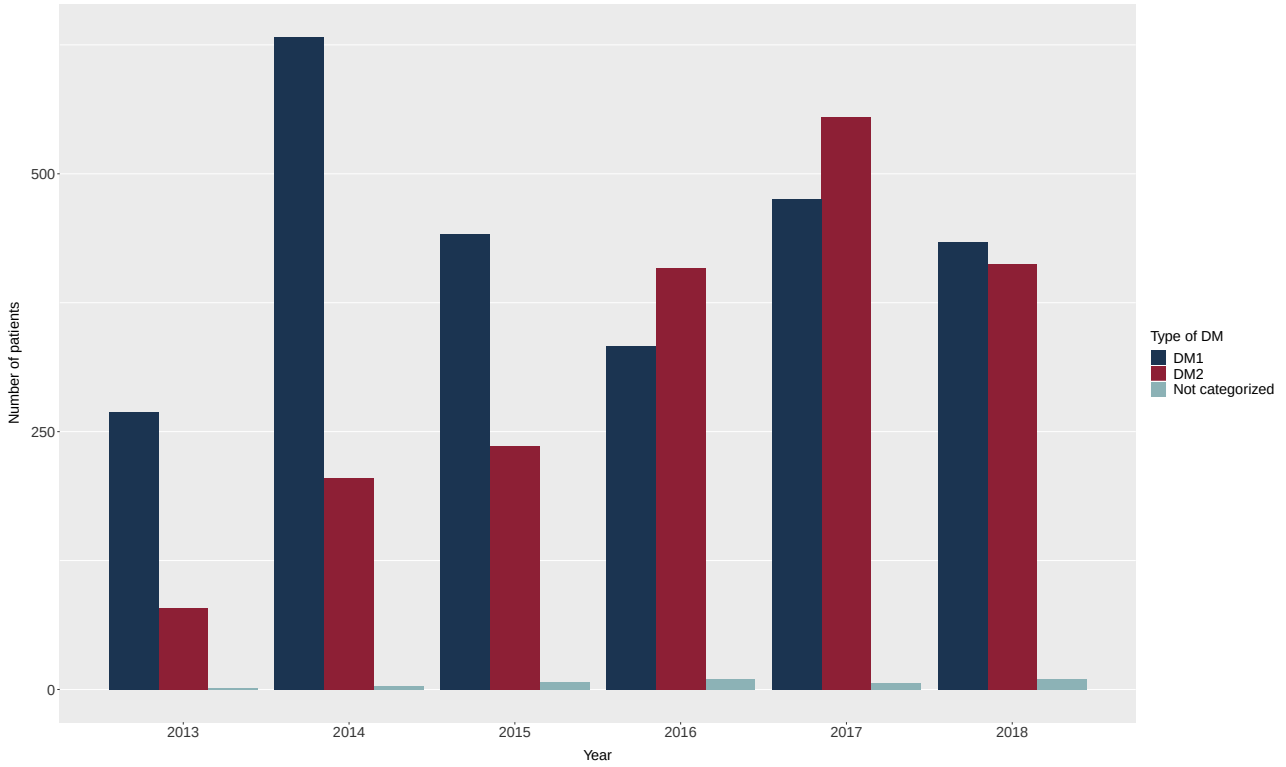


Figure 91: Annual incidence of insulin degludec

11 Revision history

Table 120: Revision history

Version	Date	Authors	Note
0.1	November 28, 2019	Thomas Cars, Matilda Almstedt	First draft
0.2	December 3, 2019	Thomas Cars, Matilda Almstedt	Updates according to comments from the scientific group
0.3	February 14, 2020	Thomas Cars, Matilda Almstedt	Updates according to comments from the project group
1.0	February 25, 2020	Thomas Cars, Matilda Almstedt	First edition
2.0	March 31, 2020	Thomas Cars, Matilda Almstedt	The report has been updated: 1. We have observed uncertainties in research data regarding the date of onset of DM. Since date of onset is used in the epidemiological algorithm to categorize patients, this uncertainty will likely lead to an underestimation of patients with DM type I in the older age categories. Therefore, patients with an uncertain date of DM onset will not be categorized in the steps involving DM onset but passed through to the next step in the algorithm. This update has resulted in minor changes in patient counts throughout the report. 2. Table 50 corrected 3. Tables 65 and 105 updated. The category "Cardiovascular comorbidity (excl AFIB)" has been added 4. Table 70 and 110 added 5. The censor time inte the persistence analyses has been corrected and updated. 6. The product Xultophy has been added to the substance group insulin degludec.

12 References

References

[1] World Health Organization. The top 10 causes of death, 2018. Available at: http://www.who.int/mediacentre/factsheets/fs310/en/. (Accessed: 20th November 2019).

[2] Zhou B *et.al.* Worldwide trends in diabetes since 1980: a pooled analysis of 751 population-based studies with 4.4 million participants. *Lancet*, 387, 2016.

[3] World Health Organization. Global report on diabetes, 2016. Available at: http://apps.who.int/iris/bitstream/10665/204871/1/9789241565257_eng.pdf. (Accessed: 20th November 2019).

[4] International Diabetes Federation. IDF Diabetes Atlas Eigth Edition, 2018. Available at: https://diabetesatlas.org/en/resources/. (Accessed: 20th November 2019).

[5] Läkemedelsverket. Läkemedelsboken. Diabetes mellitus, 2018. Available at: https://lakemedelsboken.se/kapitel/endokrinologi/diabetes_mellitus.html. (Accessed: 20th November 2019).

[6] Berry C, Tardif J-C, Bourassa MG. Coronary heart disease in patients with diabetes: part II: recent advances in coronary revascularization. *J. Am. Coll. Cardiol.*, 49:643–656, 2007.

[7] International Diabetes Federation. DF Diabetes Atlas Seventh Edition, 2015. Available at: https://diabetesatlas.org/en/resources/. (Accessed: 20th November 2019).

[8] Stockholms läns landsting. Förslag till fouu-strategi, 2010. Available at: http://sammantradeshandlingar.sll.se/sites/sammantradeshandlingar.sll.se/Handlingar/Landstingsfullmaktige/2011/2011-03-22/11-013.pdf. (Accessed: 20th November 2019).

[9] Stockholms läns landsting. Strategi för forskning, utveckling och utbildning för hälso- och sjukvården, tandvården och kollektivtrafiken i stockholms läns landsting 2015-2019, 2019. Available at: http://www.sll.se/Global/Omlandstinget/Styrdokument/FoUU-strategi/FoUUstrategiförSLL2015-2019.pdf. (Accessed: 20th November 2019).

[10] Stockholms läns landsting. Läkemedelsstrategi 2013-2017 (in swedish), 2017. Available at: https://www.janusinfo.se/download/18.10adba9e1616f8edbc9124af/1535626545729/l%C3%A4kemedelsstrategi_ny.pdf. (Accessed: 20th November 2019).

[11] EU. General Data Protection Regulation (GDPR), 2016. Available at: http://eur-lex.europa.eu/eli/reg/2016/679/oj. (Accessed: 20th November 2019).

[12] Wettermark B *et al.* The new swedish prescribed drug register opportunities for pharmacoepidemiological research and experience from the first six months. *Pharmacoepidemiol. Drug Saf.*, 16:726–735, 2007.

[13] Cars T *et al.* Extraction of electronic health record data in a hospital setting: Comparison of automatic and semi-automatic methods using anti-tnf therapy as model. *Basic Clin. Pharmacol. Toxicol.*, 112:392–400, 2013.

[14] Cars T. *Real-Time Monitoring of Healthcare Interventions in Routine Care: Effectiveness and Safety of Newly Introduced Medicines.* PhD thesis, Uppsala University, 2016. Available at: http://uu.diva-portal.org/smash/get/diva2:1015130/FULLTEXT01.pdf. (Accessed: 20th November 2019).

[15] Eeg-Olofsson K, Cederholm J, Nilsson PM, Zethelius B, Svensson AM, Gudbjörnsdóttir S, and Eliasson B. Glycemic control and cardiovascular disease in 7,454 patients with type 1 diabetes: an observational study from the Swedish National Diabetes Register (NDR). *Diabetes Care*, 33: 1640–1646, 2010.

[16] Nyman U, Grubb A, Larsson A, Hansson L-O, Flodin Ma, Nordin G, Lindström V, and Björk J. The revised Lund-Malmö GFR estimating equation outperforms MDRD and CKD-EPI across GFR, age and BMI intervals in a large Swedish population. *Clinical Chemistry and Laboratory Medicine (CCLM)*, 52, 2014.

[17] Socialstyrelsen. Sekundär klassificering av diagnosrelaterade grupper (DRG), 2016. Available at: https://www.socialstyrelsen.se/globalassets/sharepoint-dokument/artikelkatalog/ovrigt/2015-12-29.pdf. (Accessed: 20th November 2019).

[18] SCB. Statistikdatabasen, 2019. Available at: http://www.statistikdatabasen.scb.se/pxweb/sv/ssd/. (Accessed: 20th November 2019).