Cities Changing Diabetes

Rule of Halves analysis for Copenhagen

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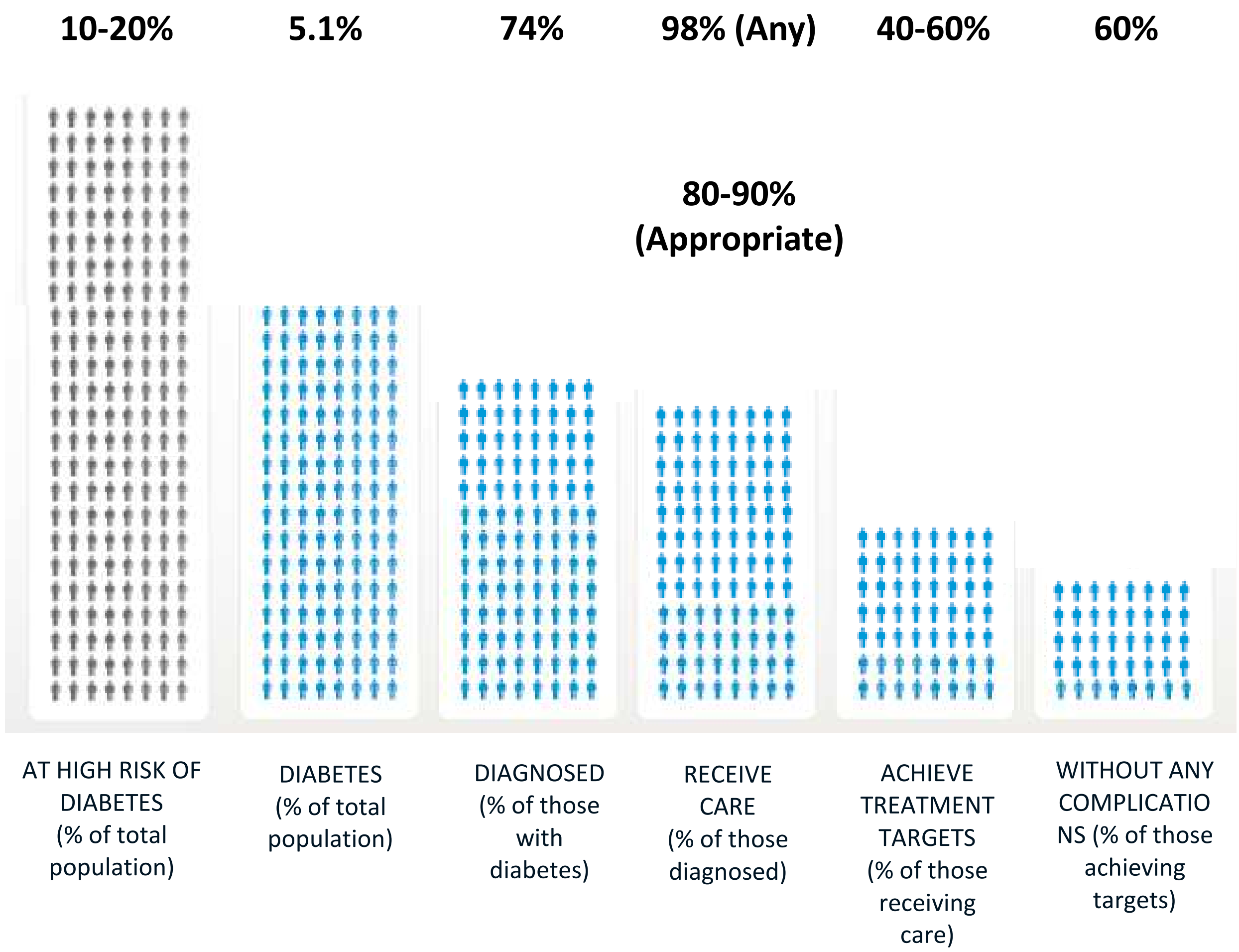
Summary

The Rule of Halves, stating that half of those with diabetes are diagnosed, half of those diagnosed received care, half of those receiving care achieve treatment targets, and finally half of those achieving targets also achieve desired outcomes, has not previously been assessed for diabetes in Copenhagen.



Rule of 'Halves' for Copenhagen with estimates of actual proportions at each analytical level and approximated ranges for population subgroups.

The results of the RoH-analyses conducted as part of the quantitative mapping-phase of the Cities Changing Diabetes project in Copenhagen, as described above, are summarized in figure 3. As it can be seen from the figure, the 'Halves' rule does not generally apply for Copenhagen. On most of the levels, the analyses show that Copenhagen is doing better than simple halves. For example, almost the same proportion of the population receives diabetes related care (either medicine or hospital based) as the proportion that has diagnosed diabetes. This indicates that almost all persons with diagnosed diabetes are receiving some form of care. The results also indicate that only about 1% in the general population have undetected diabetes, meaning that more than almost ¾ of the true diabetes population are diagnosed.

Although the RoH analysis indicates that Copenhagen is doing better than the Rule of Halves when it comes to diabetes treatment, there is still room for improvement. The proportions achieving treatment targets are only around 40-60%. Further, one out of four of those with diabetes have not been diagnosed, and approx. 50% of the diabetes population is achieving the desired outcomes in terms of no prevalent experiences cardiovascular complications. Furthermore, although 98% receive some form of care, that does not necessarily reflect appropriate and timely care, and our results show that the proportion of patients receiving complications screening and clinical assessment according to national guidelines is markedly lower and ranging between 80% and 90%).

Further, the results show that there are major socioeconomic differences in the prevalence of risk factors and occurrence of diabetes. Low educated have twice the prevalence of high risk score and diabetes compared to high educated. Not employed have 40 to 80% higher than rates than employed in the same age. Populations with non-western background also have twice the risk compared to others. Measured with biomarkers such as HbA1c>6,5% these inequalities are even larger. The clinical data concerning the quality of treatment have no socioeconomic data, and the ethnic differences are often not large enough to be verified due to lack of statistical power. We have however found that older people and migrants form the Middle East and Africa were less likely to have received foot examinations and to have well regulated HbA1c. Women with diabetes had less well regulated LDL cholesterol and men less well regulated blood pressure. People out of work (i.e. unemployed or retired) had a clearly elevated risk of macro-vascular complications and some immigrant groups scored high on microvascular complications. However, the results also indicate that people with short education and no employment more often had received information regarding preventive services and accepted offer of preventive services.

Background

387 million people are estimated to have diabetes worldwide, a number that is expected to rise over the next decades[1]. Further, it is estimated that almost half of those living with diabetes are undiagnosed[1]. Novo Nordisk has launched the initiative Cities Changing Diabetes (CCD) to try to counter the rise in diabetes, specifically focused on the growing urban populations around the world. The initiative includes five global cities: Mexico City, Copenhagen, Houston, Shanghai and Tianjin.

The aim of CCD is three-fold: First, the aim of the "Mapping"-phase is to conduct a qualitative and quantitative assessment of the epidemiology of diabetes and its correlated vulnerable populations. This phase will provide understanding of the challenges posed by diabetes in the local context. Second, the aim of the "Sharing"-phase is that learning gained from the mapping will be used to build understanding both within and between the five focus cities. These best practice experiences will also be shared with other cities around the world. Finally, the aim of the "Action"-phase is to develop Action Plans in each of the focus cities in collaboration with local policy-makers, authorities, private and voluntary sector stakeholders, and based on these plans to initiate interventions and policies.

The analytical approach in the CCD-initiative is composed of a quantitative Rules of Halves analysis and a mainly qualitative vulnerability assessment. The theoretical construct "Rule of Halves" (RoH) was first discussed in the context of hypertension[2], but has been proposed to also apply for other chronic diseases. The RoH state that only half of those with diabetes are actually diagnosed, half of those diagnosed received care, half of those who receive care achieve treatment targets, and finally half of those who achieve treatment targets also achieve desired outcomes. The RoH can also be broadened to include prevention among the population at risk, and for diabetes, this extended RoH can be illustrated as in figure 1. However, whether the Rules of Halves holds for diabetes, and in the context of Copenhagen, i.e. whether the steps between the different levels are really halves or other proportions, has not previously been studied. Further, there is a lack of evidence on whether the RoH can be used to describe risk, disease and care in different socio-demographic groups, and knowledge of this could provide information on relevant target groups

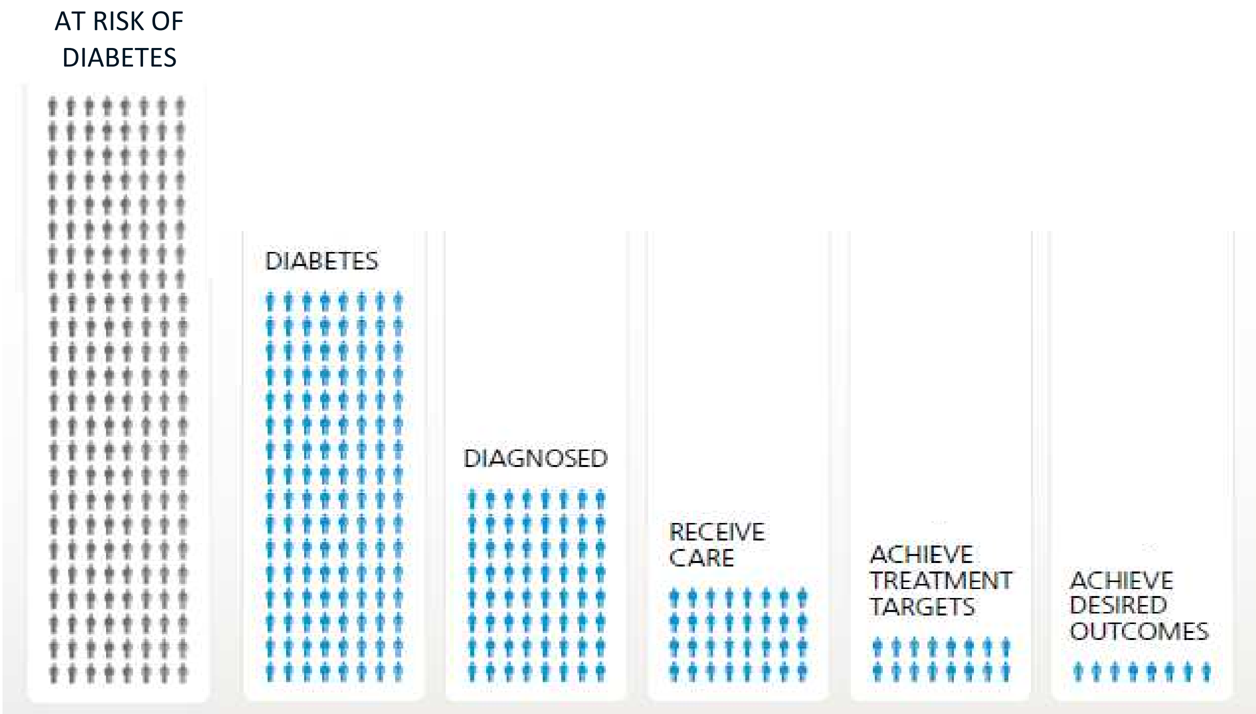


Figure 1. Rule of Halves for diabetes with six analytical levels.

Overall project goal

Based on the shortcomings of current evidence described above, the primary aim of the RoH analysis for Copenhagen was to analyse whether the RoH can be used to identify inequalities in the occurrence, care and consequences of diabetes in Copenhagen. This is in accordance with the overall aim of the CCD initiative and political priorities in Copenhagen, which is to address the social inequalities in prevalence of diabetes and in consequences of having diabetes.These results will also be used to guide the recruitment of interview persons for the vulnerability assessment.

Research questions

Based on these aims, 13 research questions were formulated for the RoH analysis for Copenhagen. These are stated in table 1 below, arranged according to analytical level in the RoH analysis.

Table 1. Research questions for the Rules of Halves analysis in Copenhagen

RoH indicator	Research question	Data
Level 0 'At Risk'		
#1	What is the prevalence of T2D risk factors across socio-demographics and CPH-subareas?	Health Profile 2010&13 CAMB
#2	What is the prevalence of pre-diabetes across socio-demographics?	CAMB
#3	What is the proportion of those with high diabetes risk receiving general preventive care?	Health Profile 2010&13
Level 1 'Diabetes'		
#4	What is the prevalence of undiagnosed T2D across socio-demographics?	CAMB
Level 2 'Diagnosed'		
#5	What is the prevalence of self-reported DM across socio-demographics and CPH-subareas?	Health Profile 2010&13 CAMB
Level 3 'Receive Care'		
#6	What is the proportion of diagnosed T2D receiving diabetes specific care?	DVDD
#7	What is the prevalence of pharmaceutical diabetes treatment and which socio-demographic factors determine treatment?	LMS
#8	What is the prevalence of diabetes treatment in secondary sector and which socio-demographic factors determine treatment?	LPR
#9	What is the proportion of those with T2D receiving appropriate (diabetes specific) care?	DVDD
#10	What is the proportion of those with T2D receiving general (non-diabetes specific) preventive guidance or interventions?	Health Profile 2010&13
Level 4 - 'Achieve treatment targets'		
#11	What is the proportion of those treated for T2D that has well-regulated HbA1c-levels, blood pressure and lipid-levels?	DVDD CAMB
Level 5 – 'Achieve desired outcome'		
#12	What is the incidence rate and proportion of treated T2D without micro vascular complications (nefropati, proliferative eye disease)?	DVDD
#13	What is the incidence rate and proportion of treated T2D without macro vascular complications (ischaemic heart disease, peripheral arterial disease and cerebro vascular disease)?	DVDD, CAMB, Health Profile 2010&13, LPR, LMS
Identification of high-risk groups		
	Identification of high risk groups and areas for the vulnerability assessment by combinations of socio-demographical variables.	Based on all of the above analyses

Data sources

The RoH analysis was conducted based on existing quantitative data from different registers and surveys. It would have been optimal if the same population had been used in all levels of the study, but since we have used existing data, the populations used are rather different in terms of background variables including age. Where possible the analyses were conducted specifically for data representative for the population of Copenhagen. However, not all data sources had this level of detail and some results are therefore based on the entire Danish population or on Danish subpopulations. Four different data sources were used in the RoH analysis for Copenhagen, and these are briefly described below.

Health Profile 2010 & 2013

The Regional Health Profile is a repeated postal questionnaire survey conducted among a representative sample of citizens aged 16 or above. The Health Profile presents data on the health, sickness and health behaviour, and comparative surveys are conducted in each of the five Regions in Denmark. For the RoH analysis for Copenhagen we used data from the surveys conducted in the Capital Region and limited to respondents living in the Municipality of Copenhagen. Data from the two waves of the survey conducted in 2010 and 2013 were analysed (95.150 persons invited in both waves, with response rates of 52.3% and 43.5% respectively)[3;4].

Data for the Health Profile is collected from a representative sample of the population; however, the response rate is rather low, especially in the 2013 wave of the survey. To overcome this problem, all analyses are weighted for non-response, using a population weight calculated by Statistics Denmark. Further, information from the Health Profile is primarily based on self-report, which might cause some misclassification. Specifically for self-reported disease outcomes, including diabetes, the Capital Region has performed analysis of the coverage of self-reported disease compared to data from registers. For diabetes 65% of all identified with diabetes in either survey or register data (or both) are identified in both registers and the survey, and 73% of those diagnosed with the disease, are identified when using survey data only[5]. This partial overlap between Health Profile data and data from national registers is illustrated in figure 2.

Figure 2. Illustration of the partial overlap between different types of data sources used in the Rule of Halves analysis.

<u>Analysed variables from the Health Profiles:</u>

Diabetes outcomes:

- Self-reported diabetes
- Diabetes Risk Score (adapted version of a validated item based on age, sex, BMI, hypertension and physical activity[6])

Physiological and behavioural risk factors:

- BMI (self-reported weight and height)
- Hypertension (self-reported high blood pressure)
- Physical activity (self-reported activity level)
- Alcohol consumption (self-reported number of units consumed weekly)
- Smoking (self-reported smoking status)
- Diet (diet index related to compliance with the recommendations regarding intake of fruit, vegetables, fish and fat, based on self-reported diet)

Demographics and socioeconomic status:
- Age (based on linkage with register data)
- Sex (based on linkage with register data)
- Copenhagen city district (based on linkage with register data)
- Co-habitation status (self-reported)
- Children living at home (self-reported)
- Education (based on linkage with register data)
- Employment status (self-reported)
- Ethnicity (based on linkage with register data)
- Psychological problems (self-reported)
- Functional impairment (self-reported)

Diabetes complications (macro vascular):
- Myocardial infarction (self-reported)
- Angina pectoris (self-reported)
- Stroke(self-reported)

Variables regarding general prevention:
- Whether participants have received information or advice regarding life style changes (smoking, alcohol, diet and physical activity) from health care professionals.
- Whether participants have accepted interventions offered to them regarding life style changes (smoking, alcohol, diet and physical activity) from health care professionals.

CAMB - Copenhagen Ageing and Midlife Biobank

Copenhagen Ageing and Midlife Biobank (CAMB) is a Danish population-based study, combining detailed life-course information with measures of physiological functioning and health. Established in 2009–2011, CAMB is based on the populations of three existing Danish cohorts: the Metropolit 1953 Male Birth Cohort[7], the Danish Longitudinal Study of Work, Unemployment and Health[8], and the Copenhagen Perinatal Cohort[9]. All cohorts included participants from the Greater Copenhagen area, but not specifically from the Municipality of Copenhagen, and all participants were middleaged between **49 and 63 years**. Of the 17,937 invited participants, 7191 agreed to participate (40% response) by completing a postal questionnaire. The questionnaire included detailed questions on health behaviour, psychosocial factors, and physical conditions, enabling thorough adjustment for potential confounders. Participants underwent an extensive health examination including physiological tests and collection of blood samples for biological testing. The study protocol was approved by the local ethics committee (No. H-A-2008-126) and the Danish Data Protection Agency (No. 2008-41-2938). All participants gave informed consent at enrolment. Details of CAMB are described elsewhere[10].

As described above, there are certain limitations regarding data from surveys, and some of these also apply for CAMB data. However, in CAMB some of the central variables are not based on self-report, but on measured values, since the participants in CAMB completed both a questionnaire and a physical examination.

<u>Variables from CAMB used in analyses:</u>
Diabetes outcomes:

- Self-reported diabetes
- HbA1c level analysed from blood samples
    - Diabetes defined as HbA1c ≥ 6.5 % (48mmol/mol)[11]
    - High risk of diabetes defined as 6.0% ≥ HbA1c ≤ 6.5% (42-47mmol/mol)[12;13]

Physiological and behavioural risk factors:

- BMI (measured weight and height)
- Physical activity (self-reported activity level)
- Alcohol consumption (self-reported number of units consumed weekly)
- Smoking (self-reported smoking status)
- Hypertension (measured systolic (SBP) and diastolic (DBP) blood pressure – hypertension defined as SBP > 140 mmHg or DBP > 90 mmHg)[14]
- Cholesterol (measured LDL-cholesterol – high cholesterol defined as ≥ 2.5mmol/L)[15]

Demographics and socioeconomic status:

- Age (based on linkage with register data)
- Sex (based on linkage with register data)
- Education (self-reported)
- Employment status (self-reported)
- Co-habitation status (self-reported)
- Type of living (self-reported)

National health register data

The National Patient Register (Danish abbreviation LPR) covers all admissions to somatic hospital departments and outpatient treatments at public somatic hospital departments during each calendar year for the entire Danish population. Treatments at private hospital are not included in the register, but since this is not very common only limited information is lost. For every admission the register stores information on: dates of admission and discharge; type of hospitalization; code for cause of admission; and main diagnosis[16].

The Register of Medicinal Product Statistics (Danish abbreviation LMS) contains information about the total sales of medicinal products in Denmark. Pharmacies and other institutions selling medicinal products report their monthly sales to the register. Around 30 different items of information are registered every time a medicinal product is sold on prescription, including: identification of the medicine user; the identification code of the prescriber; information about the packet of medicine handed out; time and place of sale; recommendations regarding substitution; price; and reimbursement[17].

Both the LPR and LMR registers are operated by Statens Serum Institut (SSI) (previously the National Board of Health), but for the current analyses data was accessed and linked to socio-demographic data via Statistics Denmark. Data from the year 2011 is used for the analyses, and limited to residents in the Municipality of Copenhagen.

Data from the national Danish registers cover the entire Danish population and is generally of very high quality. Unfortunately, not one register cover all health related contacts: When using data from the LPR and LMR registers persons who are in contact with hospitals (either admitted or as outpatients) or who have filled prescriptions for drugs are included in the analyses. However, data from primary care is not included, and persons with diabetes in contact with their GP or other primary health care providers only (e.g. dietician) are not included in the analyses based on national health register data (primary care data are to some extent included in the DVDD data described below).

<u>Analysed variables from registers:</u>

Diabetes outcomes:

- Admission with primary diagnosis E10-E14 (ICD-10)
- Filled prescription for drugs with ATC-code A10

Demographics and socioeconomic status:

- Age
- Sex
- Education
- Employment status
- Ethnicity
- Co-habitation status

Diabetes complications (macro vascular):

- Ischaemic heart disease (ICD-10 codes: I20-I25)
- Peripheral arterial disease (ICD-10 codes: I70, E11.5, E13.5, E14.5)
- Cerebro-vascular disease (ICD-10 codes: I60-I69, G45)

DVDD - The Danish Adult Diabetes Database

The Danish Adult Diabetes Database (DVDD, Dansk Voksen Diabetes Database) is a nationwide clinical quality database on Diabetes treatment. Results of yearly clinical assessments of diagnosed type 1 and type 2 diabetes patients are reported to DVDD from hospital outpatient clinics and general practitioners (GPs). It has been mandatory for the Hospital outpatient clinics to report data to DVDD since 2005, whereas data reporting from the GPs was initiated in 2010 and made mandatory as of 2013.

All diabetic patients >17 years of age who have had contact with a hospital outpatient clinic or with a GP in Denmark are eligible for inclusion in the DVDD. The DVDD data used in the present report is listed below:

For the present report, **DVDD** data was linked through the personal identification number with data from the **National Patient Register** for identification of diagnoses related to micro- and macrovascular complications, the **Cause of Death Register** for information on deaths related to micro- and macrovascular complications and the **Central Personal Register** for information on country of origin.

From a total of 129,508 patients in DVDD, we excluded people with type 1 diabetes or without information on diabetes type (n= 20,541), leaving 104,500 people with type 2 diabetes for analyses.

<u>Variables from DVDD used in analyses:</u>

Background information:

- Date of birth
- Sex

Health systems data

- Treatment unit

Clinical data

- Height
- Weight
- BMI
- Blood pressure (diastolic, systolic)
- HbA1c
- Lipids

Other health related data

- Smoking

Clinical quality indicators

- Date of last eye examination
- Date of last foot examination

Analysed variables from registers linked with DVDD:

Macro-vascular complications

Cardiovascular disease:

- Ischaemic Heart Disease
  ICD-10: I20-I25
  Procedure codes (SKS): KFNG02, KFNG05, KFNA00, KFNC10, KFNC20, and KFNC30
- Peripheral Artery Disease
  ICD-10: I70-I71, I74-I75, I73.9
  Procedure codes (SKS): KPDH, KPDQ, KP[A-B]E,KP[D-F]E[*]
- Heart Failure *(ICD-10:* I50-I51, I11-I13)
  ICD-10: I50, I50.[0-1], I50.9, I11.0, I13.0, I13.2
- Stroke
  ICD-10: I63-I66, I69.[3-4])
  Procedure codes (SKS): KAAL1[0-1]
- Amputations
  ICD-10: Z89.4-Z89.7
  Procedure codes: KNGQ[1-2]9, KNFQ[1-2]9
- Other CVD codes
  ICD-10: E10.6, E11.6 E13.6, E14.6

Microvascular complications

- Nephropathy
  ICD-10: E10.2, E11.2, E13.2, E14.2, DN18.0, DN18.8, DN18.9, Z49.2, Z94.0, and Z99.2
- Retinopathy (severe retinopathy, including only diagnostic codes related to proliferative eye disease and maculopathy)
  ICD-10: H33, H34, H35 and H43
  Procedure codes (SKS): KCK, BCDE, BCHY8A
- Neuropathy
  ICD-10: E104, E114, E134, E144, and DD62-63

Since data reporting from the GPs was not made mandatory until 2013, the DVDD database does not contain complete information from the primary care setting in Denmark, and the vast majority of patients in DVDD are treated in hospital outpatient clinics.

It is uncertain to which extent the GPs reporting to DVDD comprise a representative sample of GPs in Denmark. The DVDD also does not contain data from the Danish consultant clinics.

For the analyses in the present report "Capital Region" will be defined as treatment at Steno Diabetes Center, Righshospitalet, Bispebjerg Hospital, Frederiksberg Hospital, Hvidovre Hospital, Amager Hospital, Gentofte Hospital, Glostrup Hospital, Herlev Hospital or any GP with address in postal zones 1100 to 2920.

Analyses

Frequency counts, means, medians and standard deviations will be calculated to characterize the overall population prevalence of diabetes outcomes (as defined above for each data source). Further, these descriptive measures will be stratified by relevant demographic, clinical and vulnerability identifiers. To determine the importance of different demographic, clinical and vulnerability identifiers, bivariate and multivariate logistic regression analysis will be performed with diabetes outcomes as the dependent variables, the main outcome of these analyses will be odds ratio (OR) estimates and 95% confidence intervals (CI95%). Differences in Crude incidence rates based on incident events and person-years at risk will be used to calculate the incidence of micro- and macro-vascular complications in analyses based on the DVDD database, and Cox regression models with adjustment for covariates will be used to compare differences in incident complications across subgroups. Differences in numbers receiving appropriate care and numbers achieving the national treatment targets are described in proportions and compared using logistic regression to account for confounding factors (receiving appropriate care: table 12-19), (achieving national treatment targets: table 23-25).

As described above the data from the Health Profile is weighted for non-response, and survey analysis techniques will be applied for the analyses of these data. Analyses are performed using SAS for Windows (version 9.3), SAS Institute Inc. or Stata/IC 12.1 for Windows, StataCorp LP.

Results

Level 0 – Population at risk of getting diabetes

We used data from the Health Profiles and CAMB to analyse factors of importance for the population at risk of diabetes (RoH indicators #1 and #2, as defined in table 1). These included risk factors (e.g. obesity, physical inactivity and smoking), high HbA1c-level (HbA1c between 42 and 47 mmol/mol measured in blood samples) and high diabetes risk score (defined from a Danish diabetes risk score[6], based on sex, age, BMI, hypertension and physical activity and adjusted to fit the data material in the Health Profile). Results are shown in tables 2 to 5.

Results from the analyses of Health Profile data are presented in table 2, which shows the prevalence of three diabetes risk factors and high risk on the diabetes risk score stratified by selected demographic and socioeconomic factors. Further, the table shows the absolute distribution of the population with a high diabetes risk score within each demographic and socioeconomic factor. Table 3 presents similar analyses of CAMB data: the prevalence of three diabetes risk factors and high HbA1c-level stratified by demographic and socioeconomic factors.

Table 2. Prevalence of diabetes risk factors and diabetes risk score stratified by demographic and socioeconomic factors; and distribution of high diabetes risk score within each factor. Based on data from the Health Profile.

Diabetes risk factors / ***Demographic and socioeconomic factors***		**Obesity** (% obese)	**Physical activity** (% inactive)	**Smoking** (% smokers)	**Risk score** (% high risk)	**% of high risk individuals in each category**
Total population		10.2	14.7	27.7	12.7	100
Sex	Female	10.0	15.4	24.6	-[1]	34.7
	Male	10.3	13.9	30.9	-[1]	65.3
Age	25-44	6.4	10.2	26.7	-[1]	2.7
	45-64	16.9	17.7	33.1	-[1]	52.3
	65+	16.7	33.0	21.9	-[1]	45.0
Education	Primary school and short education	14.1	19.6	33.4	19.0	73.6
	Secondary school	8.1	8.6	24.4	8.8	15.2
	University or higher	4.5	6.2	17.7	5.6	11.2
Employment	Employed	7.5	9.4	26.5	6.1	35.8
	Not employed	18.2	30.1	30.8	33.0	64.2
Ethnicity	Western	9.7	11.9	28.0	12.8	88.2
	Non-western	13.6	34.6	25.5	11.7	11.8
City district	Indre By	6.5	9.1	28.3	12.6	9.3
	Østerbro	8.8	10.8	25.5	12.2	12.7
	Nørrebro	8.7	15.7	32.1	9.2	10.2
	Vesterbro/Kongens Enghave	8.7	12.7	31.0	9.9	8.3
	Valby	12.4	18.5	25.3	15.0	10.4
	Vanløse	10.3	12.5	23.5	14.1	7.6
	Brønshøj-Husum	14.9	21.9	25.3	18.2	10.1
	Bispebjerg	11.2	18.8	28.9	12.2	9.2
	Amager Øst	11.5	13.9	27.5	13.8	10.5
	Amager Vest	11.5	15.9	25.9	13.6	11.7

[1] Sex and age are included in the calculation of diabetes risk score. The distribution of high risk score on these factors are therefore not calculated.

Table 3. Prevalence of diabetes risk factors and HbA1c-level stratified by demographic and socioeconomic factors. Based on data from CAMB.

Diabetes risk factors / ***Demographic and socioeconomic factors***		**Obesity (% obese)**	**Physical activity (% inactive)**	**Smoking (% smokers)**	***HbA1c-level* (% with 42-47 mmol/mol)**
Total population		14.9	30.2	23.2	6.6
Sex	Female	13.5	29.2	22.7	3.8
	Male	15.5	30.6	23.4	8.0
Age	49- 55	14.8	30.0	24.9	3.8
	55-63	14.9	30.3	22.0	8.7
Education	Primary school and short education	18.1	32.6	28.3	7.8
	Secondary school	12.0	27.6	18.9	5.6
	University or higher	8.5	25.8	12.7	4.2
Employment	Employed	14.0	28.6	21.5	6.4
	Not employed	21.7	44.4	38.3	9.5

From tables 2 and 3 it can be seen, that there is a higher prevalence of the three diabetes risk factors in the CAMB population than among the participants in the Health Profile, which pimarily is explained by differences in the age of the participants and the context of the data collection (survey only vs. survey combined with examination). Overall, and in both populations, there is a gradient in the prevalence of the risk factors, with higher risks seen among males, people with higher age, lower education and no employment (including unemployed and retired). For ethnicity the pattern is less clear; people with a non-western background have higher rates of obesity and physical inactivity, but more people with a western background smoke.

Table 4 shows the risk of having a high diabetes risk score (data from the Health Profile) or a HbA1c-level between 42 and 47mmol/mol (among the middle aged in the CAMB-study), for a range of demographic and socioeconomic factors. Similarly table 5 shows the risk of having a high diabetes risk score stratified by Copenhagen city districts (data from the Health Profile). These analyses show the same patterns as described above, with a higher risk for males, people with low education and no employment. Further, people who have children living at home have a lower diabetes risk score (this effect might be related to age differences between those with children living at home and those without). The differences regarding ethnicity, co-habitation and city districts are inconclusive, but with a tendency towards higher risk among those living alone and those living in Valby and Brønshøj-Husum districts. The tendency towards a lower diabetes risk score for those of non-western ethnicity might be affected by a very low proportion of participants having a non-western background (7% of the analysed population) and generally a lower age among these participants than among participants with western background.

Table 4. Odds ratio estimates for high diabetes risk score (Health Profile) and HbA1c-level ≥ 6.0% (CAMB)

Socio-demographic factors		***High diabetes risk score*** *OR*	*CI95%*		***Elevated HbA1c-level* (42-47 mmol/mol)** *OR*	*CI95%*	
Sex	Female		-[1]		ref		
	Male		-[1]		1.77	1.30	2.41
Age	49- 55		-[1]		ref		
	55-63		-[1]		1.96	1.49	2.57
Education	Primary school and short education	2.42	2.08	2.82	2.02	1.42	2.86
	Secondary school	1.40	1.17	1.68	1.48	0.99	2.20
	University or higher	ref			ref		
Employment	Employed	ref			ref		
	Not employed	5.39	4.81	6.04	1.42	1.03	1.97
Ethnicity	Western	ref				-[2]	
	Non-western	0.85	0.66	1.09		-[2]	
Co-habitation	Living with others	ref			ref		
	Living alone	0.96	0.85	1.07	1.41	1.07	1.86
Children	Children living at home	ref				-[2]	
	No children living at home	3.28	2.65	4.06		-[2]	

[1] Sex and age are included in the calculation of Diabetes risk score, and are therefore not included in the regression
[2] Variable not available in CAMB data

Table 5. Odds ratio estimates for high diabetes risk score (Health Profile) in Copenhagen city districts.

		Unadjusted			Adjusted[1]		
	High diabetes risk score	***OR***	***CI95%***		***OR***	***CI95%***	
City district	Indre By	ref			ref		
	Østerbro	0.96	0.79	1.17	0.95	0.73	1.23
	Nørrebro	0.70	0.56	0.88	0.91	0.67	1.24
	Vesterbro/Kongens Enghave	0.76	0.61	0.95	1.04	0.78	1.39
	Valby	1.22	1.01	1.48	1.13	0.87	1.47
	Vanløse	1.14	0.94	1.36	1.06	0.83	1.35
	Brønshøj-Husum	1.55	1.28	1.86	1.19	0.93	1.53
	Bispebjerg	0.96	0.78	1.18	0.97	0.72	1.29
	Amager Øst	1.11	0.91	1.36	1.24	0.95	1.63
	Amager Vest	1.10	0.91	1.33	1.26	0.98	1.62

[1] Adjusted for sex, age, education, employment, ethnicity, co-habitation and children living at home.

In the Health Profile survey the participants were asked whether they have been advised by their general practitioner to quit smoking, lower their alcohol consumption, change dietary habits or increase their level of physical activity, or if they have received information from different categories of health personal regarding smoking cessation, alcohol consumption, dietary habits or physical activity. These questions are used together to analyse whether citizens with two important diabetes risk factors (high BMI and physical inactivity) or a high value on the diabetes risk score have received information regarding general health prevention and preventive interventions. Further, the participants were asked whether they have accepted interventions offered to them (e.g. courses or personal counselling) regarding smoking cessation, alcohol consumption, dietary habits or physical activity. This question is used to describe whether citizens at risk of diabetes utilize preventive interventions.

Table 6. Information regarding prevention and preventive interventions offered to citizens, stratified by health outcomes and socioeconomic status

	Health outcomes	**BMI**		**Physical activity**		**Risk score**	
Socioeconomic status		**> 30**	**18.5-25**	**Inactive**	**Very active**	**High**	**Low**
% Received information regarding prevention and interventions							
Education	Primary school and short education	46.6	19.9	37.3	14.5	42.6	22.4
	Secondary school	42.3	15.1	34.0	11.9	38.4	17.3
	University or higher	36.3	10.4	26.1	8.4	29.5	12.1
Employment	Employed	38.3	13.9	27.8	11.2	39.2	15.9
	Not employed	52.4	26.1	42.5	23.7	42.6	29.8
% Accepted offer of preventive intervention							
Education	Primary school and short education	15.3	4.1	10.8	3.1	13.0	5.3
	Secondary school	10.8	2.6	7.6	1.6	11.4	3.1
	University or higher	6.3	1.2	5.0	0.8	6.3	1.3
Employment	Employed	9.3	1.7	4.4	1.6	9.0	2.3
	Not employed	18.0	7.7	13.8	5.1	13.9	9.1

Table 6 shows the proportion of the population with high or low risk of diabetes (here defined by BMI, physical activity and diabetes risk score) that have received information regarding prevention and interventions or have accepted an offer to participate in a preventive intervention (RoH indicator #3). From the table it can be seen that only 30-50% of those at risk of diabetes has been given information regarding prevention and only 5-15% have accepted to participate in preventive interventions. However, a higher proportion of those at high risk of diabetes have received information and interventions than those at low risk, which indicate that the health care system is – to some extent – able to identify those with the highest need for preventive interventions.

Level 0 summary

#1 What is the prevalence of T2D risk factors across socio-demographics and CPH-subareas?

10-20% Obese and up to 40% physically inactive and smokers.

A tendency towards higher levels among the older, the unemployed, those with a shorter education, with a non-western background and people living in Valby or Brønshøj-Husum.

#2 What is the prevalence of pre-diabetes across socio-demographics?

10-20% with pre-diabetes as measured with a risk-score questionnaire, and 6.6% with elevated HbA1c levels on a pre-diabetes level (among middle aged).

A higher levels among men, the older, the unemployed, those with a shorter education, with a non-western background and people living alone.

#3 What is the proportion of those with high diabetes risk receiving general preventive care?

30-50% of those at risk of diabetes received information on prevention

5-15% have accepted to participate in preventive interventions

A higher proportion of those at high risk of diabetes including those with short education and out of work have received information and interventions

Level 1 – Population with diabetes

Research question #4 concerns the prevalence of undiagnosed diabetes in Copenhagen. In the CAMB study, participants were asked whether they have diabetes (self-reported diagnosed diabetes) and HbA1c-levels were analysed from blood samples. The population with diabetes is defined as having self-reported diabetes and/or having a HbA1c-level of ≥48 mmol/mol. Further, we attempt to estimate the level of undiagnosed diabetes, which is assumed among those without self-reported diabetes, but with an HbA1c-level of ≥48 mmol/mol. The results of these analyses are shown in table 7, both unadjusted and stratified by education and employment status.

Table 7. Distribution (%) of the CAMB-population on self-reported diabetes status and measured HbA1c-level.Age49-63 years.

		Self-reported diabetes and/or HbA1c ≥48 mmol/mol			No self-reported diabetes (%) HbA1c (mmol/mol		
Socioeconomic stratification		**Yes**	**No**	**p-value**	**<48**	**≥48**	**p-value**
Overall		4.2	95.8		98.9	1.1	
Education	Primary school and short education	5.2	94.8	0.0001	98.5	1.5	0.0018
	Secondary school	3.5	96.5		99.4	0.7	
	University or higher	2.2	97.8		99.7	0.3	
Employment	Employed	3.6	96.4	<0.0001	99.1	0.9	<0.0001
	Not employed	10.2	89.9		97.0	3.0	

With the definition stated above, the overall prevalence of diabetes is 4.2% in the middleaged CAMB population. However, from table 8 it can be seen that the overall prevalence of self reported diabetes is slightly higher at 3.8% in the Health Profile data, compared to 3.2% in middleaged CAMB population. Thus, if we assume that the proportion of undiagnosed diabetes of 26% (calculated as 1.1%/4.2%=0.26 based on the CAMB data) applies in all age groups of the adult population and use this proportion of undiagnosed together with the proportion diagnosed estimated from the Health Profile data, the prevalence in Copenhagen will be 3.8/0.74 = **5.1%**. Because of the underreporting in surveys this is probably a low estimate. It should also be kept in mind that the prevlance in Copenhagen is low due to a relatively young and well educated population. Stratification by education and employment shows that the prevalence of diabetes in the CAMB population is highest among those without employment and with a short education.

Based on the analyses of CAMB data, 1.1% of the population has undiagnosed diabetes, and the results in table 7 show that the proportion of undiagnosed diabetes is slightly higher (1.2 %-point) among those with a short education compared to those with an university degree, and markedly higher among the participants without employment.

Level 1 Summary

#4a What is the prevalence of undiagnosed T2D across socio-demographics?

> *Undiagnosed diabetes was 1.1% among the middleaged overall (table 7) and ranged between 0.3-3% with highest levels among the unemployed and those with a shorter education. It is probably higher among those 64 years or older*

#4b What is the prevalence of both diagnosed and undiagnosed T2D across socio-demographics?

> *Since the proportion with assumed undiagnosed diabetes was 1.1% (table 7), the proportion of undiagnosed diabetes among all people with diabetes in CAMB was 1.1%/4.2%=0.26. Consequently, an estimated **74%** of all people with diabetes in the CAMB study were diagnosed.That figure might be lower among the elderly. If this figure is applied for all age groups (16+) the overall prevalence of diabetes in Copenhagen can be estimated as **5.1%.***

Level 2 – Population diagnosed with diabetes

Data from the Health Profile and CAMB were used to describe the population with diagnosed diabetes and analyse factors of importance for diabetes diagnosis (research question #5). Both surveys included a question regarding self-reported diabetes, which is used to define diabetes status. In the Health Profile 3.8% of the population from Copenhagen indicated that they have diabetes, which is slightly higher than in CAMB, where 3.2% of the participants indicated having diabetes (table 8). When self-reported diabetes is stratified by demographic and socioeconomic factors it can be seen that diabetes is more prevalent among males, those with higher age, with short education, non-western background, those living alone and especially among those who are not employed.

Table 8. Prevalence of self-reported diabetes stratified by demographic and socioeconomic factors, based on data from the Health Profile aged 16+ and CAMB aged 49-63 years.

		Self-reported diabetes	
Demographic and socioeconomic factors		***Health Profile data***	***CAMB data***
Total population		3.8	3.2
Sex	Female	3.3	1.8
	Male	4.3	3.8
Age	Health Profile: 25-44	0.8	
	Health Profile: 45-64 / CAMB: 49- 63	6.9	3.2
	Health Profile: ≥ 65	14.1	
Education	Primary school and short education	5.4	3.7
	Secondary school	1.9	2.9
	University or higher	1.3	1.9
Employment	Employed	1.6	2.7
	Not employed	10.4	7.4
Ethnicity	Western	3.4	-[1]
	Non-western	6.4	-[1]
Co-habitation	Living with others	2.9	5.9
	Living alone	5.1	2.7
Children	Children living at home	1.5	-[1]
	No children living at home	4.1	-[1]

[1] Variable not available in CAMB data

Table 9 show the results of logistic regression analyses of factors related to having self-reported diabetes, based on data from the Health Profile and CAMB.

Table 9. Effects of demographic and socioeconomic factors on self-reported diabetes in Copenhagen

		Health Profile data			***CAMB data***		
Demographic and socioeconomic factors		***OR***	***CI95%***		***OR***	***CI95%***	
Sex	Female	ref			ref		
	Male	1.63	1.32	2.02	1.79	1.16	2.77
Age	Health Profile: 25-44	ref					
	Health Profile: 45-64 / CAMB:49-63	6.22	4.52	8.55			
	Health Profile: ≥ 65	9.79	6.59	14.55		-	
Education	Primary school and short education	2.04	1.48	2.83	1.97	1.15	3.36
	Secondary school	1.21	0.81	1.78	1.73	0.96	3.12
	University or higher	ref			ref		
Employment	Employed	ref			ref		
	Not employed	1.97	1.47	2.62	2.38	1.61	3.51
Ethnicity	Western	ref				-[1]	
	Non-western	2.12	1.47	3.05		-[1]	
Co-habitation	Living with others	ref			ref		
	Living alone	1.29	1.04	1.61	1.99	1.40	2.82
Children	Children living at home	ref				-[1]	
	No children living at home	1.45	0.98	2.13		-[1]	

[1] Variable not available in CAMB data

Based on self-reported diabetes status and relevant covariates included in the health profile and CAMB, it can be seen that factors that increase the risk of having diabetes include being male, higher age, lower education, being unemployed, having a non-western background and living alone (without partner and/or children).

Geographical differences in diabetes risk are seen between city districts in Copenhagen. The adjusted analysis of geographical differences in self-reported diabetes seen in table 10, account for differences in socio-demographic factors between districts and can therefore illustrate whether diabetes cases in Copenhagen are clustered in specific districts.

Table 10. Odds ratio estimates for self-reported diabetes in Copenhagen city districts. Based on Health Profile data.

		Unadjusted			***Adjusted[1]***		
	Self-reported diabetes (Health Profile data)	***OR***	***CI95%***		***OR***	***CI95%***	
City district	Indre By	ref			Ref		
	Østerbro	1.62	1.09	2.41	1.38	0.88	2.17
	Nørrebro	1.59	1.05	2.40	1.50	0.92	2.46
	Vesterbro/Kongens Enghave	1.10	0.70	1.70	1.00	0.58	1.72
	Valby	2.23	1.51	3.30	1.70	1.08	2.66
	Vanløse	1.69	1.15	2.49	1.43	0.92	2.21
	Brønshøj-Husum	3.21	2.22	4.65	1.88	1.23	2.89
	Bispebjerg	1.82	1.22	2.73	1.40	0.86	2.26
	Amager Øst	1.67	1.12	2.49	1.37	0.86	2.19
	Amager Vest	1.49	1.01	2.22	1.10	0.69	1.76

[1] Adjusted for sex, age, education, employment, ethnicity, co-habitation and children living at home.

With regards geographical differences between the city districts of Copenhagen, the risk of diabetes is lowest in the relatively affluent Inner City district, and the risk is highest in Valby and Brønshøj-Husum. For these two districts the higher risk of diabetes is also significant in the adjusted analysis.

Level 2 Summary

#5 What is the prevalence of self-reported DM across socio-demographics and CPH-subareas?

The prevalence of self-reported diabetes was 3.2% in CAMB and 3.8% in the Health Profile study overall and ranged between <1-15% for subgroups. Men, older aged, unemployed, people with low education, - non-western background and –living alone were particular high risk groups. Increased prevalence was also seen for geopgraphical areas Valby and Brønshøj-Husum.

Level 3 – Population receiving any diabetes care

The proportion of diabetes patients receiving care in the primary sector (RoH indicator #6) is crudely assessed through two sources. In 2013 there were an estimated 206,500 people with diagnosed type 2 diabetes in Denmark based on the newly established Registret for Udvalgte Kroniske Sygdomme (RUKS). Of these, 201,100 or 97.6% had some contact with the Danish primary health care system (GP) in 2013, but not necessarily related to the type 2 diabetes care. In the DVDD database, which contains all outpatient clinic registrations in 2013, 23,729 people with type 2 diabetes on antidiabetic treament were seen in an outpatient clinic in 2013. Thus, the estimated proportion of type 2 diabetes patients seen at the outpatient clinic was 11.5% (23,729/206,500), whereas the remaining 88.5% (182,771/206,500) were expectedly followed mainly in the Danish primary health care system. There were no differences between Copenhagen and the rest of Denmark in the estimated prevalence seen in the primary health care system.

RoH indicators #7 and #8 focus on the proportion of the population who are present in The National Patient Register (LPR) and The Register of Medicinal Product Statistics (LMR) with diagnosis and/or treatment for diabetes. Based on data from both LPR and LMR 3.6% of the population in Copenhagen aged 16 or older is receiving treatment for diabetes, either medical treatment from pharmacies or as hospital in- or out patients (3.4% receive medical treatment and 1.7% receive hospital treatment[a]). Table 11 show the results of logistic regression analyses of factors related to receiving diabetes treatment.

Table 11. Association between diabetes cases in LPR and LMR registers and demographic and socioeconomic factors in Copenhagen

Demographic and socioeconomic factors (mutually adjusted)		**LPR & LMR**			**LPR**			**LMR**		
		OR	***CI95%***		***OR***	***CI95%***		***OR***	***CI95%***	
Sex	Female	ref			ref			Ref		
	Male	1.41	1.36	1.46	1.52	1.45	1.59	1.41	1.36	1.46
Age	25-44	ref			1			1		
	45-64	4.40	4.18	4.62	3.64	3.40	3.90	4.39	4.18	4.63
	65+	7.39	6.96	7.84	5.27	4.86	5.71	7.37	6.93	7.82
Education	Primary school and shorter practical education	1.92	1.80	2.05	1.75	1.60	1.91	1.92	1.80	2.05
	Secondary school	1.62	1.52	1.72	1.53	1.41	1.67	1.62	1.52	1.73
	University or higher	ref			ref			Ref		
Employment	Employed	ref			ref			Ref		
	Not employed	1.91	1.83	2.00	2.18	2.05	2.32	1.87	1.79	1.96
Ethnicity	Western	ref			ref			Ref		
	Non-western	2.30	2.20	2.41	1.76	1.65	1.88	2.33	2.22	2.44
Co-habitation	Living with others	ref			ref			Ref		
	Living alone	0.89	0.85	0.92	0.94	0.89	0.99	0.87	0.84	0.90
Children	Children living at home	ref			ref			Ref		
	No children living at home	1.34	1.27	1.41	1.22	1.14	1.32	1.35	1.28	1.43

The sociodemographic pattern showing up in these tables are very similar to what we have seen already. This applies to sex, age, education, employment, ethnicity and having children living at home. However, for co-habitation status the result is opposite, with people living alone being less likely to receive treatment.
But one should be aware that many people can be treated for diabetes without being present in these register because they are treated in primary care with lifestyle advice only.

To describe the proportion of type-2 diabetes patients receiving appropriate care (RoH indicator #9) we looked at the extent to which patients in the DVDD database received examinations for complications and had clinical markers assessed according to national guidelines. The national guidelines suggest eye examinations every 2nd year, foot examinations every year in addition to yearly assessment of HbA1c, lipids and blood pressure.

[a] Some patients receive both medical and hospital treatment, which explains that these two prevalences does not sum to 3.6%.

Biennial eye-screening: Among 104,500 people with type 2 diabetes in DVDD, we identified everyone with minimum two years follow-up time and a valid date of eye-examination was identified. In these 45,807 people the proportion with an eye examination within two years of the last clinical examination was calculated. We then calculated the proportion with a biennial examination by sex, age group, region of origin and treatment in the capital region, and used logistic regression to compare differences in proportions adjusted for a number of background clinical covariates (table 12).

*Table 12. Proportions and Odds Ratio for **eye examination** according to national guidelines (every second year) by sex, age, region of origin and treatment in the Capital region*

	Eye-screened	Total	% Eye-screened	OR for Eye-screening*
Overall	38,410	45,807	83.8	
Sex				
Women	16,121	19,228	83.8	ref
Men	22,289	26,579	83.8	1.05 (0.97;1.13)
Age				
17-44	8,935	10,156	87.98	1.09 (0.92;1.30)
45-64	18,554	21,964	84.47	ref
65+	10,253	12,917	79.38	0.95 (0.74;1.22)
Region of origin				
Denmark	34,380	40,907	84.0	ref
Europe	1,131	1,395	81.1	0.92 (0.76;1.12)
Sub-Saharan Africa	175	215	81.4	1.07 (0.62;1.83)
Middle East and North Africa	1,466	1,789	82.0	0.92 (0.78;1.08)
Asia	429	523	82.0	0.94 (0.71;1.25)
America and Oceania	81	104	77.9	0.77 (0.40;1.51)
Place of treatment				
Capital Region	6,149	7,685	80.01	0.93 (0.86;1.01)
Rest of Denmark	16,728	21,017	79.59	ref

* Adjusted odds ratio from logistic regression models controlling for age, diabetes duration, treatment unit, HbA1c levels, BMI, blood pressure, lipid levels and smoking at baseline

More than 80% of the type 2 diabetes patients had a biennial eye screening as recommended in the national guidelines. There were no significant differences in the odds for having eye screening across sex, age groups, region of origin or place of treatment (table 12).

*Table 13. Odds Ratio for **eye examination** according to national guidelines (every second year) by sex, age, region of origin and stratified on place of treatment.*

	Capital region OR (CI95%)*	*Rest of Denmark* OR (CI95%)*
Sex		
Men	1.17 (1.02;1.36)	1.01 (0.92;1.10)
Women	Ref	ref
Age		
17-44 y	1.11 (0.80;1.55)	1.10 (0.90;1.35)
45-64 y	Ref	ref
>64 y	1.04 (0.64;1.68)	0.94 (0.70;1.26)
Region of origin		
Denmark	Ref	ref

Europe	0.99 (0.72;1.37)	0.89 (0.70;1.14)
Sub-Saharan Africa	0.97 (0.47;2.00)	1.33 (0.59;3.01)
Middle East and North Africa	1.00 (0.79;1.25)	0.84 (0.67;1.06)
Asia	0.83 (0.51;1.34)	1.01 (0.71;1.45)
America and Oceania	1.36 (0.46;4.05)	0.49 (0.21;1.16)

* Adjusted odds ratio from logistic regression models controlling for age, diabetes duration, treatment unit, HbA1c levels, BMI, blood pressure, lipid levels and smoking at baseline

When analyses were stratified on place of treatment, men in the capital region were more likely to receive eye screening according to national guidelines compared with women (table 13).

<u>Annual foot-examination</u>: Among 104,500 people with type 2 diabetes in DVDD, we identified everyone with minimum 1 year follow-up time and a valid date of last foot examination. In these 37,779 people, the proportion with a foot examination within 15 months of their latest clinical examination was calculated. We then calculated the proportion with a yearly examination by sex, age group, region of origin and treatment in the capital region, and used logistic regression to compare differences in proportions adjusted for a number of background clinical covariates (table 14).

Table 14. Proportions and Odds Ratio for ***foot examination*** *according to national guidelines (every year) by sex, age, region of origin and treatment in the Capital region*

	Foot examination	Total	% Foot examination	OR for Foot examination*
Overall	32,337	37,779	85.60	
Sex				
Women	13,585	15,749	86.26	ref
Men	18,752	22,030	85.12	0.86 (0.80;0.93)
Age				
17-44	2,633	3,263	80.69	0.63 (0.54;0.75)
45-64	16,247	19,044	85.31	ref
65+	13,371	15,349	87.11	1.18 (1.04;1.33)
Region of origin				
Denmark	28,860	33,396	86.42	ref
Europe	1,094	1,315	83.19	0.74 (0.61;0.89)
Sub-Saharan Africa	138	189	73.02	0.44 (0.29;0.68)
Middle East and North Africa	1,548	2,004	77.25	0.64 (0.55;0.73)
Asia	463	564	82.09	0.72 (0.55;0.95)
America and Oceania	69	86	82.09	0.93 (0.46;1.90)
Place of treatment				
Capital Region	7,755	9,519	81.47	0.77 (0.71;0.83)
Rest of Denmark	23,960	27,513	87.09	Ref

* Adjusted odds ratio from logistic regression models controlling for age, diabetes duration, treatment unit, HbA1c levels, BMI, blood pressure, lipid levels and smoking at baseline

Around 85% of the patients had a foot examination within a year of the last clinical examination. Older age groups were more likely to receive yearly foot examination, whereas migrants were generally less likely to receive yearly foot examination compared to Danish born. Further, patients treated in the Capital region were also less likely to receive foot examination according to guidelines. The findings on national level were also reflected in analyses specifically for the Capital region (table 14-15).

*Table 15. Odds Ratio for **foot examination** according to national guidelines (yearly) by sex, age, region of origin and stratified on treatment in the Capital region vs. rest of Denmark.*

	Capital region OR (CI95%)*	*Rest of Denmark* OR (CI95%)*
Sex		
Men	0.79 (0.68;0.91)	0.90 (0.82;0.98)
Women	Ref	ref
Age		
17-44 y	0.54 (0.39;0.74)	0.68 (0.56;0.83)
45-64 y	Ref	ref
>64 y	1.14 (0.90;1.44)	1.19 (1.03;1.38)
Region of origin		
Denmark	Ref	ref
Europe	0.80 (0.59;1.08)	0.71 (0.56;0.90)
Sub-Saharan Africa	0.67 (0.34;1.33)	0.32 (0.18;0.55)
Middle East and North Africa	0.66 (0.54;0.81)	0.59 (0.49;0.73)
Asia	0.62 (0.39;1.00)	0.79 (0.56;1.11)
America and Oceania	0.66 (0.26;1.64)	1.51 (0.46;4.97)

* Adjusted odds ratio from logistic regression models controlling for age, diabetes duration, treatment unit, HbA1c levels, BMI, blood pressure, lipid levels and smoking at baseline

Annual HbA1c assessment: Among 104,500 people with type 2 diabetes in DVDD, we identified everyone with minimum 1 years follow-up time and a valid date of last Hba1c assessment. In these 47,883 people the proportion with a HbA1c assessment within a year of their latest clinical examination was calculated. We then calculated the proportion with a yearly assessment by sex, age group, region of origin and treatment in the capital region, and used logistic regression to compare differences in proportions adjusted for a number of background clinical covariates (table 16).

*Table 16. Proportions and Odds Ratio for **HbA1c measurement** according to national guidelines (at least every year) by sex, age, region of origin and treatment in the Capital region*

	HbA1c measured	Total	% HbA1c measured	OR for HbA1c measurement*
Overall	45,787	47,591	96.21	
Sex				
Women	19,138	19,891	96.21	ref
Men	26,649	27,700	96.21	0.88 (0.77;1.00)
Age				
17-44	3,903	4,099	95.22	0.73 (0.54;0.99)
45-64	22,477	23,326	96.36	ref
65+	19,225	19,967	96.28	1.06 (0.85;1.31)
Region of origin				
Denmark	40,527	42,041	96.40	ref
Europe	1,605	1,679	95.59	0.96 (0.69;1.33)
Sub-Saharan Africa	238	248	95.97	1.24 (0.50;3.06)
Middle East and North Africa	2,344	2,489	94.17	0.90 (0.70;1.16)
Asia	666	696	95.69	1.20 (0.68;2.11)
America and Oceania	106	112	94.64	0.97 (0.30;3.11)
Place of treatment				
Capital Region	11,066	11,937	92.70	0.38 (0.33;0.43)
Rest of Denmark	33,630	34,530	97.39	ref

* Adjusted odds ratio from logistic regression models controlling for age, diabetes duration, treatment unit, HbA1c levels, BMI, blood pressure, lipid levels and smoking at baseline

Overall, more than 95% of the patients in the analyses had an HbA1c assessment within the last year of last clinical examination, and were thus in accordance with the national guidelines. Compared to the rest of Denmark, people treated in the capital region were less likely to have a HbA1c assessment within a year of last clinical examination, whereas younger ages (17-44y) were more likely to have a yearly assessment. There were no specific differences across sex, age groups or region of origin in analyses of the Capital region, but this could also be due to limited data size (table 16-17).

Table 17. Odds Ratio for ***HbA1c measurement*** *according to national guidelines (yearly) by sex, age, region of origin and stratified on treatment in the Capital region vs. rest of Denmark.*

	Capital region OR (CI95%)*	*Rest of Denmark* OR (CI95%)*
Sex		
Men	0.88 (0.72;1.08)	0.88 (0.73;1.05)
Women	Ref	ref
Age		
17-44 y	0.75 (0.47;1.19)	0.74 (0.50;1.10)
45-64 y	Ref	ref
>64 y	1.15 (0.83;1.59)	0.99 (0.75;1.32)
Region of origin		
Denmark	Ref	ref
Europe	0.73 (0.49;1.10)	1.47 (0.80;2.69)
Sub-Saharan Africa	0.98 (0.35;2.76)	2.03 (0.28;14.69)
Middle East and North Africa	0.81 (0.60;1.11)	1.08 (0.66;1.78)
Asia	1.09 (0.50;2.37)	1.34 (0.59;3.05)
America and Oceania	Insufficient data	Insufficient data

* Adjusted odds ratio from logistic regression models controlling for age, diabetes duration, treatment unit, HbA1c levels, BMI, blood pressure, lipid levels and smoking at baseline

Annual Blood pressure assessment:

A total of 47,246 patients were included in the analyses of blood pressure assessment according to national guidelines. analysed the case for HbA1c, more than 90% of the patients had a blood pressure assessment within the last year of last clinical examination and were thus treated according to national guidelines for blood pressure assessment. Young people and patients in the capital region were less likely to have blood pressure assessment according to national guidelines, but still >90% of the patients in these subgroups received assessment according to guidelines. Further, the national guidelines on assessment only cover people over the age of 40, so it is not surprising that there is a lower OR for annual assessment among the younger. Migrants from the America and Oceania were also less likely to receive assessment according to national guidelines (table 18-19).

*Table 18. Proportions and Odds Ratio for **Blood pressure assessment** according to national guidelines (at least every year) by sex, age, region of origin and treatment in the Capital region*

	Blood pressure measured	Total	% Blood pressure measured	OR for Blood pressure measurement*
Overall	43,614	47,164	92.5	
Sex				
Women	18,176	19,711	92.2	ref
Men	25,438	27,453	92.7	1.04 (0.94;1.14)
Age				
17-44	3,691	4,063	90.8	0.69 (0.56;0.86)
45-64	21,478	23,161	92.7	ref
65+	18,288	19,741	92.6	1.03 (0.88;1.20)
Region of origin				
Denmark	38,614	41,651	92.7	ref
Europe	1,520	1,662	91.5	0.83 (0.66;1.05)
Sub-Saharan Africa	231	247	93.5	0.82 (0.44;1.54)
Middle East and North Africa	2,244	2,473	90.7	0.81 (0.66;0.98)
Asia	641	694	92.4	0.89 (0.61;1.29)
America and Oceania	97	112	86.6	0.41 (0.21;0.78)
Place of treatment				
Capital Region	10,682	11,858	90.1	0.72 (0.65;0.79)
Rest of Denmark	31,906	34,187	92.5	ref

* Adjusted odds ratio from logistic regression models controlling for age, diabetes duration, treatment unit, HbA1c levels, BMI, blood pressure, lipid levels and smoking at baseline

*Table 19. Odds Ratio for **Blood pressure measurement** according to national guidelines (yearly) by sex, age, region of origin and stratified on treatment in the Capital region vs. rest of Denmark.*

	Capital region OR (CI95%)*	*Rest of Denmark* OR (CI95%)*
Sex		
Men	0.90 (0.75;1.08)	1.10 (0.98;1.23)
Women	Ref	ref
Age		
17-44 y	0.75 (0.50;1.11)	0.67 (0.52;0.86)
45-64 y	Ref	ref
>64 y	1.02 (0.76;1.36)	1.04 (0.86;1.25)
Region of origin		
Denmark	Ref	ref
Europe	0.73 (0.51;1.04)	0.93 (0.68;1.28)
Sub-Saharan Africa	2.00 (0.62;6.49)	0.46 (0.22;0.97)
Middle East and North Africa	0.95 (0.71;1.27)	0.68 (0.52;0.90)
Asia	0.76 (0.42;1.38)	0.96 (0.59;1.57)
America and Oceania	0.35 (0.14;0.88)	0.48 (0.19;1.22)

* Adjusted odds ratio from logistic regression models controlling for age, diabetes duration, treatment unit, HbA1c levels, BMI, blood pressure, lipid levels and smoking at baseline

Annual Lipid assessment:

A total of 47,542 patients were included in the analyses of lipid assessment according to national guidelines. Overall, close to 90% of the patients received lipid assessment according to national guidelines, but again, young people and patients treated in the capital region were significantly less likely to receive assessment according to national guidelines (table 20). As mentioned, only people over 40 are covered by the national guidelines so lower OR for the younger are expected.

*Table 20. Proportions and Odds Ratio for **Lipid assessment** according to national guidelines (at least every year) by sex, age, region of origin and treatment in the Capital region*

	Lipid levels measured	Total	% Lipid levels measured	OR for Lipid level measurement*
Overall	42,338	47,416	89.2	
Sex				
Women	17,673	19,804	89.2	ref
Men	24,665	27,612	89.3	0.94 (0.86;1.02)
Age				
17-44	3,599	4,076	88.3	0.61 (0.51;0.74)
45-64	20,853	23,270	89.6	ref
65+	17,728	19,874	89.2	1.22 (1.06;1.39)
Region of origin				
Denmark	37,574	41,891	89.7	ref
Europe	1,455	1,674	86.9	0.82 (0.68;1.00)
Sub-Saharan Africa	215	247	87.0	0.94 (0.56;1.60)
Middle East and North Africa	2,107	2,473	85.2	1.03 (0.88;1.22)
Asia	619	696	88.9	1.12 (0.81;1.57)
America and Oceania	97	112	86.6	0.83 (0.42;1.64)
Place of treatment				
Capital Region	9,413	11,874	79.3	0.31 (0.28;0.33)
Rest of Denmark	31,964	34,424	92.9	ref

* Adjusted odds ratio from logistic regression models controlling for age, diabetes duration, treatment unit, HbA1c levels, BMI, blood pressure, lipid levels and smoking at baseline

In analyses stratified on treatment in Capital region vs. rest of Denmark there was a notable difference among migrants compared to native born Danes. In general, migrants treated outside the capital region were more likely to receive lipid assessment according to national guidelines compared with native born Danes, but this difference was not seen in the Capital region where migrants were, if anything, less likely to receive lipid assessment according to national guidelines for lipid assessment.

Table 21. Odds Ratio for ***Lipid measurement*** *according to national guidelines (yearly) by sex, age, region of origin and stratified on treatment in the Capital region vs. rest of Denmark.*

	Capital region OR (CI95%)*	*Rest of Denmark* OR (CI95%)*
Sex		
Men	0.96 (0.84;1.09)	0.94 (0.84;1.05)
Women	Ref	ref
Age		
17-44 y	0.50 (0.37;0.67)	0.75 (0.58;0.97)
45-64 y	Ref	ref
>64 y	1.44 (1.17;1.76)	1.04 (0.87;1.24)
Region of origin		
Denmark	Ref	ref
Europe	0.66 (0.51;0.86)	1.10 (0.79;1.51)
Sub-Saharan Africa	0.68 (0.37;1.27)	1.76 (0.55;5.62)
Middle East and North Africa	0.90 (0.74;1.09)	1.45 (1.04;2.04)
Asia	0.97 (0.61;1.54)	1.34 (0.82;2.21)
America and Oceania	0.48 (0.22;1.07)	3.12 (0.43;22.73)

* Adjusted odds ratio from logistic regression models controlling for age, diabetes duration, treatment unit, HbA1c levels, BMI, blood pressure, lipid levels and smoking at baseline

RoH indicator #10 concerning general preventive care for the diabetes population is analysed using the variables regarding information on and utilization of non-pharmaceutical preventive interventions targeted health behaviour included in the Health Profile (see the 'Data sources' section). Descriptive analyses of whether people with and without diabetes have received information regarding prevention and interventions, and whether they have accepted offers to participate in interventions are shown in table 22. Generally, a rather small proportion of the population has received information regarding prevention and interventions from health care personal. However, it can be seen that a higher proportion of people with diabetes receive information regarding prevention and preventive interventions and that they are also more likely to accept to participate in these interventions than people without diabetes. Further, with regards to socioeconomic status, it can be seen that a higher proportion of those with lower education and without employment – which the previous analysis have shown to be at highest risk – have received information and interventions.

Table 22. Information regarding prevention and offer of preventive interventions[1], stratified by socioeconomic status.

		Diabetes	
Socioeconomic status		**Yes**	**No**
% Received information regarding prevention and interventions			
Education	Primary school and short education	64.5	24.1
	Secondary school	51.6	18.5
	University or higher	45.8	12.7
Employment	Employed	53.9	16.7
	Not employed	63.1	31.0
% Accepted offer of preventive intervention			
Education	Primary school and short education	25.7	5.7
	Secondary school	17.8	3.4
	University or higher	16.6	1.4
Employment	Employed	20.6	2.5
	Not employed	25.2	9.2

[1] Non-pharmaceutical preventive interventions targeted health behaviour (see the 'Data sources' section for details)

Level 3 Summary

#6 What is the proportion of diagnosed T2D receiving diabetes specific care?

97.8% of the diabetes patients received some type of diabetes related care

#7 What is the prevalence of pharmaceutical diabetes treatment

3.4% of the population in Copenhagen receive some kind of diabetes related medical treatment

#8 What is the prevalence of diabetes treatment in secondary sector?

1.7% of the population in Copenhagen receive some kind of diabetes-related hospital treatment.

Men, older people, unemployed, people with lower education, people with non-western background and without children living at home were more likely to have diabetes according to these registerdata, while people living alone were less likely to be present in the register.

#9 What is the proportion of those with T2D receiving appropriate (diabetes specific) care?

80.1% of the Diabetes patients received eye-screening according to national guidelines. Women were less likely to receive eye-screening compared to men.

85.6% of the patients received foot-examination according to national guidelines. Men, younger people and migrants were less likely to receive foot-examination.

92.7% received HbA1c assessment according to national guidelines. There were no differences across socio-demographics.

90.1% received blood pressure assessment according to the national guidelines.

79.3% received lipid assessments according to national guidelines. Older people were more likely to receive lipid assessment.

#10 What is the proportion of those with T2D receiving general (non-diabetes specific) preventive guidance or interventions?

45-65% of the diabetes patients have received information regarding prevention and interventions from health care personal. This is only the case for 10-30% of the population in among the population without diabetes. People with diabetes are more likely to accept participation in interventions compared to people without diabetes. A higher proportion with lower education and without employment have received information and interventions.

Level 4 – Population achieving treatment targets

RoH indicator # 11 focus on the proportion of those treated for type 2 diabetes that have well-regulated HbA1c-, LDL cholesterol- and blood pressure levels. Dyslipidaemia, hypertension and elevated HbA1c levels are all known risk factors for development of diabetes complication. The national guidelines for treatment of type-2 diabetes includes the following treatment targets for these factors[18]:

- Hyperglycaemia: HbA1c <53 mmol/mol

- Dyslipidaemia: LDL-cholesterol <2.5 mmol/L in patients without existing complications, and <1.8 mmol/L for patients with existing complications (15).
- Hypertension: <130/80 mmHg

Based on data from the DVDD database on 104,500 type 2 diabetes patients we calculated the proportion of patients in 2012 whose clinical values were within the national treatment targets.

Table 23. Proportion (in %) of the type 2 patients in DVDD with LDL-cholesterol, blood pressure and HbA1c-levels fulfilling the national treatment target

	Treatment targets		
	HbA1c < 53 mmol/mol	LDL-cholesterol <2.5 mmol/L	Blood pressure <130/80 mm/Hg
Overall	59.5	64.3	41.2
Sex			
Men	58.1	66.1	40.2
Women	61.3	61.9	42.5
Age			
25-44	46.7	48.5	43.1
25-64	54.6	60.9	39.9
65+	63.3	67.8	41.8
Region of origin			
Denmark	61.4	65.0	40.8
Europe	53.7	59.9	40.1
Sub-Saharan Africa	50.0	52.8	50.4
Middle East and North Africa	40.7	58.6	45.7
Asia	45.1	59.3	48.5
America and Oceania	54.9	55.2	42.6
Place of treatment			
Capital region	56.1	60.7	39.0
Rest of Denmark	60.9	65.4	41.8

Overall, around 60% of the patients with a valid measurement of HbA1c in 2012, had an HbA1c level within the national treatment target. This was the case for almost 65% for LDL-cholesterol, but only little over 40% for blood pressure. However, the national target for blood pressure is currently discussed and setting the target at 140/90 mm/Hg or 140/80 would affect the proportion reaching the target (table 23).

Table 24. Odds ratio for being within national treatment target on HbA1c, LDL-cholesterol and blood pressure, by sex age, region of origin and treatment within capital region. Mutually adjusted.

	HbA1c < 53 mmol/mol OR (CI95%)	*LDL-cholesterol <2.5* OR (CI95%)	*Blood pressure <130/80* OR (CI95%)
Sex			
Men	0.87 (0.84;0.90)	1.21 (1.17;1.25)	0.92 (0.89;0.95)
Women	Ref	Ref	ref
Age			
17-44	0.78 (0.72;0.84)	0.63 (0.58;0.68)	1.11 (1.02;1.20)
25-64	Ref	Ref	ref
65+	1.36 (1.31;1.41)	1.34 (1.29;1.39)	1.11 (1.07;1.15)
Region of origin			
Denmark	Ref	Ref	ref
Europe	0.75 (0.69;0.81)	0.85 (0.78;0.92)	0.99 (0.91;1.09)
Sub-Saharan Africa	0.75 (0.59;0.97)	0.76 (0.59;0.97)	1.57 (1.21;2.03)
Middle East and North Africa	0.50 (0.46;0.54)	0.93 (0.86;1.01)	1.32 (1.21;1.43)
Asia	0.58 (0.51;0.67)	0.93 (0.82;1.07)	1.43 (1.24;1.64)
America and Oceania	0.80 (0.57;1.12)	0.73 (0.52;1.01)	1.11 (0.78;1.57)
Place of treatment			
Capital region	0.89 (0.85;0.92)	0.84 (0.80;0.87)	0.87 (0.83;0.90)
Rest of Denmark	Ref	Ref	ref

In adjusted models men were less likely to be within the HbA1c-target and the blood pressure target, but more likely to be within the LDL-cholesterol target, compared with women. Younger people (17-44 y) were less likely to reach target for HbA1c and LDL but more likely to reach target for blood pressure, compared with middle-aged (45-64y), whereas older (65+) were more likely to be within all targets. As is the case for national assessment guidelines, treatment targets are also only described for people over the age of 40. Therefore it is expected to find lower OR for being within treatment target for people under the age of 40.

Overall analyses on national data showed that men, young people (age 17-44), migrants and people living in the capital region, were less likely to be within the national treatment target for HbA1C, compared to women, middle aged and older people, native born Danes and people living outside the capital region. For LDL-cholesterol, there was a similar pattern, except for men as they were more likely to be within the treatment target for LDL-cholesterol compared to women. For blood pressure, men and people living in the capital region were less likely to be within treatment target, whereas migrants, young (17-44 y) and older aged (45-64 y) were more likely to be within treatment target compared to their respective reference groups (table 24).

Further analyses revealed that living in the capital region modified the association between migrant status and HbA1c treatment target (LR test for interaction, p=0.002), the association between age group and HbA1c treatment targets (LR test for interaction, p=0.024) and the association between migrant status and Blood pressure treatment target (LR test for interaction, p=0.025). Therefore, further analyses were performed with stratification on whether people were treated in the capital region or rest of Denmark (table 25).

Table 25. Odds ratio for being within national treatment target on HbA1c, LDL-cholesterol and blood pressure, by sex age, region of origin, by treatment within Capital region. Mutually adjusted.

	HbA1c < 53 mmol/mol		*LDL-cholesterol <2.5*		*Blood pressure <130/80*	
	Capital Region	*Rest of DK*	*Capital Region*	*Rest of DK*	*Capital Region*	*Rest of DK*
Sex						
Men	0.91 (0.85;0.98)	0.86 (0.83;0.89)	1.20 (1.12;1.28)	1.21 (1.17;1.26)	0.91 (0.85;0.98)	0.92 (0.89;0.96)
Women	ref	ref	ref	ref	ref	ref
Age						
17-44 y	0.96 (0.81;1.13)	0.73 (0.67;0.80)	0.69 (0.58;0.82)	0.61 (0.56;0.67)	1.12 (0.93;1.34)	1.11 (1.00;1.22)
45-64 y	ref	ref	ref	ref	ref	ref
>64 y	1.31 (1.22;1.41)	1.37 (1.32;1.43)	1.39 (1.29;1.50)	1.33 (1.27;1.38)	1.09 (1.01;1.18)	1.11 (1.07;1.16)
Region of origin						
Denmark	ref	ref	ref	ref	ref	ref
Europe	0.66 (0.57;0.77)	0.79 (0.71;0.87)	0.82 (0.71;0.96)	0.86 (0.77;0.95)	0.96 (0.81;1.13)	1.01 (0.90;1.12)
Sub-Saharan Africa	0.69 (0.47;1.01)	0.79 (0.57;1.09)	0.78 (0.53;1.14)	0.74 (0.53;1.03)	1.43 (0.96;2.13)	1.67 (1.18;2.35)
Middle East and North Africa	0.42 (0.37;0.47)	0.59 (0.53;0.66)	0.90 (0.81;1.01)	0.97 (0.86;1.08)	1.35 (1.20;1.51)	1.26 (1.12;1.42)
Asia	0.57 (0.45;0.72)	0.59 (0.50;0.69)	0.74 (0.59;0.93)	1.05 (0.89;1.24)	1.00 (0.78;1.29)	1.68 (1.42;1.98)
America and Oceania	0.68 (0.39;1.18)	0.87 (0.57;1.33)	0.65 (0.38;1.12)	0.78 (0.51;1.19)	1.02 (0.57;1.84)	1.16 (0.75;1.79)

The stratified analyses revealed that migrants in the capital region were particularly less likely to be within the national treatment target for HbA1c (table 25).

Based on data from the CAMB-study we estimated the proportion of the population achieving treatment targets as those with self-reported diabetes that has a measured HbA1c-level below 53 mmol/mol. Table 26 show the results of this analysis, including stratification by socioeconomic status.

Table 26. Proportion of the population with self-reported diabetes with HbA1c-level below or above 53 mmol/mol

		Have self-reported diabetes		
Socioeconomic stratification		**HbA1c < 53 mmol/mol**	**HbA1c ≥ mmol/mol**	**p-value**
Overall		74.7	25.3	
Education	Primary school and short education	77.4	22.6	0.478
	Secondary school	68.3	31.7	
	University or higher	70.6	29.4	
Employment	Employed	73.9	26.1	0.644
	Not employed	77.5	22.5	

Overall, almost 75% of the diabetes population has well-regulated HbA1c-levels. Further, the results indicate that there are only minor and insignificant socioeconomic differences in whether people with diabetes have well-regulated blood glucose level.

Level 4 Summary

#11 What is the proportion of those treated for T2D that has well-regulated HbA1c-levels, blood pressure and lipid levels?

Overall, 56.1% have well-regulated HbA1c, 60.7% have well regulated LDL-cholesterol levels, and 39.0% have well regulated blood pressure levels. Men, young people and migrants were less likely to have well-regulated HbA1c, whereas women, young people and migrants from Asia were less likely to have well-regulated LDL-cholesterol levels. Men were also less likely to have well regulated blood pressure.*

** This proportion is dependent on the chosen cutoff level for blood-pressure. In the current report we used a 130/80 cutoff level. A cutoff of 140/90 which is also commonly used, would offcourse yield a higher proportion with good regulation.*

Level 5 – Population achieving desired outcomes

Based on the DVDD database comprising all patients treated at the Danish outpatient clinics and a substantial proportion of the people treated for type 2 diabetes in primary care, we calculated the prevalence of micro- and macrovascular complications among those alive and followed in DVDD as of December 31, 2012. We also calculated the incidence rate for micro- and macrovascular complications (RoH indicators #12 and #13). The prevalence estimates are presented on an overall level for the whole of Denmark and for the capital region. The incidence rates are presented on an overall level and also stratified by sex, age region of origin and whether treated in the capital region or elsewhere. Further, cox-regression models are used to estimate differences in the risk of complications across sex, age, and region of origin both on an overall level and separately for people treated in the capital region and elsewhere in Denmark.

Microvascular complications

Prevalent severe retinopathy

A total of 98,975 people with type 2 diabetes were alive and followed in DVDD as of 31 December 2012. Of these 10.0% (n=9,911) had a severe retinopathy diagnosis at some point following their diabetes diagnosis. In the capital region the proportion was **11.4%** (2,561/19,969) which was significantly higher than in the rest of Denmark.

<u>Incident severe retinopathy</u>: Out of 104,500 people with type 2 diabetes in DVDD, 9,307 had a severe retinopathy event prior to entry into the DVDD and were excluded from analyses of incident severe retinopathy. Among the remaining 95,161 people 3,506 incident severe retinopathy events occurred (3.68%) during a total of 241,720 person-years of follow-up (table 27).

Table 27. Overall and by group crude incidence rates and adjusted hazard ratio for ***severe retinopathy***

	Person-years	Events	Incidence Rate (95% CI) (/1000 py)	Adjusted[1] Hazard Ratio
Overall	241,721	3,506	14.5 (14.0;15.0)	
Sex				
Women	101,548	1,528	15.0 (14.3;15.8)	ref
Men	140,171	1,978	14.1 (13.5;14.7)	1.02 (0.93;1.12))
Age				
17-44	22,833	180	7.9 (6.8;9.1)	0.78 (0.64;0.94)
45-64	118,844	1,464	12.3 (11.7;13.0)	ref
65+	100,043	1,862	18.6 (17.8;19.5)	1.30 (1.18;1.42)
Region of origin				
Denmark	214,308	3,042	14.2 (13.7;14.7)	ref
Europe	8,528	141	16.5 (14.0;19.5)	1.19 (0.96;1.47)
Sub-Saharan Africa	1,327	13	9.8 (5.7;16.9)	1.25 (0.69;2.28)
Middle East and North Africa	12,794	235	18.4 (16.2;20.9)	1.39 (1.17;1.64)
Asia	3,439	56	16.3 (12.5;21.2)	1.29 (0.92;1.81)
America and Oceania	569	9	15.8 (8.2;30.4)	0.86 (0.32;2.29)
Place of treatment				
Capital Region	60,287	1007	16.7 (15.7;17.8)	1.23 (1.12;1.36)
Rest of Denmark	181,433	2499	13.8 (13.2;14.3)	ref

[1] Adjusted HR from Cox regression models with duration of diabetes as time scale and controlling for age, diabetes type, treatment unit, HbA1c, BMI, blood pressure, lipids and smoking at baseline

The overall incidence rate for severe retinopathy in type 2 diabetes patients was 14.5 per 1,000 person years on a national level and 16.7 per 1,000 person-years in the Capital region. Migrants from the Middle East and North Africa, and people treated in the capital region had a higher risk of developing severe retinopathy compared with native born Danes and people treated in the rest of Denmark, respectively. Analyses on the capital region alone confirmed that migrants from the Middle East and North Africa were at increased risk of incident severe retinopathy (table 27-28).

Table 28. Overall and by group crude incidence rates and adjusted hazard ratio for ***severe retinopathy stratified on place of treatment***

	Capital Region		Rest of Denmark	
	Incidence Rate (95% CI)	Adjusted[1] Hazard Ratio	Incidence Rate (95% CI)	Adjusted[1] Hazard Ratio
Overall	16.7 (15.7;17.8)		13.8 (13.2;14.3)	
Sex				
Women	17.0 (15.4;18.6)	ref	14.4 (13.6;15.3)	ref
Men	16.5 (15.2;17.9)	1.10 (0.93;1.30)	13.3 (12.6;14.0)	0.99 (0.89;1.10)
Age				
17-44	9.2 (7.0;12.0)	0.81 (0.56;1.15)	7.4 (6.2;8.8)	0.77 (0.61;0.97)
45-64	14.8 (13.5;16.2)	ref	11.4 (10.8;12.2)	ref
65+	21.2 (19.4;23.1)	1.22 (1.02;1.45)	17.8 (16.9;18.8)	1.33 (1.19;1.49)
Region of origin				
Denmark	15.8 (14.7;17.0)	ref	13.7 (13.2;14.3)	ref
Europe	19.6 (15.2;25.2)	1.34 (0.97;1.85)	14.8 (11.9;18.4)	1.10 (0.83;1.47)
Sub-Saharan Africa	9.7 (4.4;21.6)	1.26 (0.52;3.06)	9.9 (4.7;20.7)	1.27 (0.57;2.83)
Middle East and North Africa	21.3 (18.2;24.9)	1.46 (1.16;1.84)	14.5 (11.6;18.1)	1.28 (0.98;1.67)
Asia	21.7 (14.5;32.3)	1.12 (0.59;2.10)	13.7 (9.7;19.4)	1.40 (0.94;2.09)
America and Oceania	11.5 (3.7;35.6)	0.50 (0.07;3.56)	19.5 (8.8;43.4)	1.15 (0.37;3.58)

[1] Adjusted HR from Cox regression models with duration of diabetes as time scale and controlling for age, diabetes type, treatment unit, HbA1c, BMI, blood pressure, lipids and smoking at baseline

Nephropathy

Prevalent nephropathy*

A total of 44,969 people with type 2 diabetes were alive, treated at a Danish outpatient clinic and followed in DVDD as of 31 December 2012. Out of these, 8,166 (18,2%) had a nephropathy diagnoses at some point following their diabetes diagnosis. In the capital region the proportion was **18.3%** (2,312/12,632) and thus similar to the rest of Denmark.

* Nephropathy diagnoses are not consistently used in primary care. Therefore, analyses of nephropathy are only based on data from the Danish outpatient clinics. This may lead to over- or underestimated proportions.

Incident nephropathy:

The overall incidence rate for nephropathy in type 2 diabetes patients was 24.5 per 1,000 person-years on a national level and significantly less at 18.6 per 1,000 person-years in the Capital region (table 29).

Table 29. Overall and by group crude incidence rates and adjusted hazard ratio for ***nephropathy***

	Person-years	Events	Incidence Rate (95% CI) (/1000 py)	Adjusted[1] Hazard Ratio
Overall	169,097	4,149	24.5 (23.8; 25.3)	
Sex				
Women	71,788	1,439	20.0 (19.0; 21.1)	ref
Men	97,309	2,710	27.8 (26.8; 28.9)	1.36 (1.26;1.49)
Age				
17-44	19,006	246	12.9 (11.4; 14.7)	0.75 (0.63;0.88)
45-64	88,668	1,905	21.5 (20.5; 22.5)	Ref
65+	61,422	1,998	32.5 (31.1; 34.0)	1.43 (1.31;1.55)
Region of origin				
Denmark	147,6301	3,696	25.0 (24.2; 25.9)	ref
Europe	6,193	134	21.6 (18.3; 25.6)	0.93 (0.75;1.16)
Sub-Saharan Africa	1,146	20	17.4 (11.3; 27.0)	0.94 (0.50;1.75)
Middle East and North Africa	10,388	211	20.3 (17.7; 23.2)	1.03 (0.86;1.23)
Asia	2,672	65	24.3 (19.1; 31.0)	1.32 (0.98;1.77)
America and Oceania	464	6	12.9 (5.8; 28.7)	0.59 (0.22;1.57)
Place of treatment				
Capital Region	46,206	858	18.6 (17.4; 19.9)	0.71 (0.64;0.78)
Rest of Denmark	122,891	3,291	26.8 (25.9; 27.7)	ref

[1] Adjusted HR from Cox regression models with duration of diabetes as time scale and controlling for age, diabetes type, treatment unit, HbA1c, BMI, blood pressure, lipids and smoking at baseline

Men and older aged were at increased risk of developing nephropathy whereas there were no significant differences between migrants and native born Danes in overall analyses or in analyses specific for the capital region. Interestingly, patients treated in the capital region were at reduced risk of developing nephropathy (table 29-30).

Table 30. Overall and by group crude incidence rates and adjusted hazard ratio for ***nephropathy stratified on place of treatment***

	Capital Region		Rest of Denmark	
	Incidence Rate (95% CI)	Adjusted[1] Hazard Ratio	Incidence Rate (95% CI)	Adjusted[1] Hazard Ratio
Overall	18.6 (17.4; 19.9)		26.8 (25.9; 27.7)	
Sex				
Women	15.8 (14.2; 17.7)	ref	21.7 (20.5; 23.0)	ref
Men	20.7 (19.0; 22.6)	1.27 (1.05;1.54)	30.4 (29.2; 31.7)	1.40 (1.28;1.54)
Age				
17-44	7.9 (5.8; 10.8)	0.75 (0.50;1.13)	14.8 (12.9; 16.9)	0.75 (0.62;0.90)
45-64	16.0 (14.5; 17.7)	1.00 (1.00;1.00)	23.6 (22.4; 24.8)	1.00 (1.00;1.00)
65+	25.7 (23.3; 28.2)	1.75 (1.44;2.13)	35.0 (33.3; 36.8)	1.37 (1.25;1.50)
Region of origin				
Denmark	19.2 (17.8; 20.7)	ref	26.9 (26.0; 27.9)	ref
Europe	15.1 (10.9; 20.9)	0.60 (0.37;0.98)	25.7 (21.1; 31.4)	1.06 (0.83;1.36)
Sub-Saharan Africa	7.6 (2.8; 20.2)	0.31 (0.04;2.19)	25.9 (15.9; 42.2)	1.24 (0.64;2.39)
Middle East and North Africa	17.3 (14.3; 21.0)	0.94 (0.70;1.27)	24.5 (20.3; 29.7)	1.11 (0.89;1.38)
Asia	18.3 (11.2; 29.9)	1.46 (0.77;2.75)	27.2 (20.6; 36.0)	1.28 (0.91;1.80)
America and Oceania	4.4 (0.6; 30.9)	0.00 (0.00;.)	21.3 (8.8; 51.1)	0.88 (0.33;2.34)

[1] Adjusted HR from Cox regression models with duration of diabetes as time scale and controlling for age, diabetes type, treatment unit, HbA1c, BMI, blood pressure, lipids and smoking at baseline

Neuropathy

Prevalent neuropathy*

A total of 44,969 people with type 2 diabetes were alive, treated at a Danish outpatient clinic and followed in DVDD as of 31 December 2012. Of these 14.1% (n=6,345) had a neuropathy diagnoses at some point following their diabetes diagnosis. In the capital region the proportion was **18.3%** (2,308/10,324) and significantly more than in the rest of Denmark.

* Neuropathy diagnoses are not consistently used in primary care. Therefore, analyses of neuropathy are only based on data from the Danish outpatient clinics. This may lead to over- or underestimated proportions.

Incident neuropathy:

The overall incidence of neuropathy was 14.8 per 1,000 person years in the overall population and 17.7 in the capital region. The stratified and adjusted analyses showed that the incidence rate was significantly higher among men and in people of older age. Migrants from Asia on the other hand, had a reduced risk of developing neuropathy compared with native born Danes (table 31-32).

Table 31. Overall and by group crude incidence rates and adjusted hazard ratio for ***neuropathy***[1]

	Person-years	Events	Incidence Rate (95% CI) (/1000 py)	Adjusted[2] Hazard Ratio
Overall	170,226	2,517	14.8 (14.2;15.4)	
Sex				
Women	720,68	866	12.0 (11.2;12.8)	ref
Men	98,158	1,651	16.8 (16;17.7)	1.49 (1.34;1.65)
Age				
17-44	19,519	151	7.7 (6.6;9.1)	0.62 (0.50;0.77)
45-64	88,489	1,213	13.7 (13;14.5)	ref
65+	62,218	1,153	18.5 (17.5;19.6)	1.21 (1.09;1.34)
Region of origin				
Denmark	148,432	2,246	15.1 (14.5;15.8)	ref
Europe	6,352	89	14.0 (11.4;17.2)	0.93 (0.72;1.21)
Sub-Saharan Africa	1,170	15	12.8 (7.7;21.3)	1.09 (0.58;2.04)
Middle East and North Africa	10,348	136	13.1 (11.1;15.5)	0.82 (0.66;1.03)
Asia	2,841	20	7.0 (4.5;10.9)	0.44 (0.25;0.78)
America and Oceania	457	5	11.0 (4.6;26.3)	0.87 (0.33;2.33)
Place of treatment				
Capital Region	45,054	798	17.7 (16.5;19.0)	1.35 (1.21;1.50)
Rest of Denmark	125,172	1,719	13.7 (13.1;14.4)	ref

[1] Analyses were only based on data from hospital treated patients, because it is known that some diagnostic codes are not used by the GP's. Using only data from outpatient clinics will result in fewer events in and person-years, but will reflect a closer estimate of the actual expected incidence rates.

[2] Adjusted HR from Cox regression models with duration of diabetes as time scale and controlling for age, diabetes type, treatment unit, HbA1c, BMI, blood pressure, lipids and smoking at baseline

Table 32. Overall and by group crude incidence rates and adjusted hazard ratio for ***neuropathy stratified on place of treatment***[1]

	Capital Region		Rest of Denmark	
	Incidence Rate (95% CI)	Adjusted[2] Hazard Ratio	Incidence Rate (95% CI)	Adjusted[2] Hazard Ratio
Overall	17.7 (16.5;19.0)		13.7 (13.1;14.4)	
Sex				
Women	15.7 (14.0;17.6)	ref	10.7 (9.8;11.6)	ref
Men	19.2 (17.6;21.0)	1.24 (1.02;1.49)	16.0 (15.1;16.9)	1.61 (1.41;1.82)
Age				
17-44	8.5 (6.3;11.4)	0.54 (0.35;0.84)	7.5 (6.2;9.0)	0.65 (0.50;0.83)
45-64	16.4 (14.8;18.1)	ref	12.7 (11.9;13.6)	ref
65+	17.1 (20.5;25.3)	1.21 (1.00;1.47)	17.1 (15.9;18.3)	1.21 (1.06;1.37)
Region of origin				
Denmark	18.9 (17.5;20.4)	ref	14.0 (13.3;14.7)	ref
Europe	14.0 (10.0;19.6)	0.67 (0.42;1.05)	14.0 (10.7;18.2)	1.16 (0.85;1.58)
Sub-Saharan Africa	15.5 (7.7;30.9)	1.22 (0.50;2.96)	10.7 (5.1;22.5)	0.96 (0.40;2.33)
Middle East and North Africa	14.1 (11.4;17.4)	0.79 (0.58;1.08)	11.9 (9.0;15.6)	0.85 (0.62;1.18)
Asia	9.9 (5.2;19.1)	0.42 (0.16;1.14)	5.7 (3.2;10.3)	0.43 (0.21;0.87)
America and Oceania	4.8 (0.7;34.1)	Lack of data	16.1 (6.0;42.9)	1.55 (0.58;4.14)

[1] Analyses were only based on data from hospital treated patients, because it is known that some diagnostic codes are not used by the GP's. Using only data from outpatient clinics will result in fewer events in and person-years, but will reflect a closer estimate of the actual expected incidence rates.
[2] Adjusted HR from Cox regression models with duration of diabetes as time scale and controlling for age, diabetes type, treatment unit, HbA1c, BMI, blood pressure, lipids and smoking at baseline

Macro-vascular complications

Prevalent cardiovascular disease

A total of 98,975 people with type 2 diabetes were alive and followed in DVDD as of 31 December 2012. Of these 24% (n=23,720) had a CVD diagnoses at some point following their diabetes diagnosis. In the capital region the proportion was 26.7% (6,004/16,526) which was significantly higher than in the rest of Denmark.

Incident cardiovascular disease (CVD): Out of 104,500 people with T2D in DVDD, 35,159 had a CVD event prior to entry into the DVDD and were excluded from analyses of incident macro-vascular complications. Among the remaining 69,308 people 7,717 incident CVD events occurred (11.1%) during a total of 164,905 person-years.

*Table 33. Overall and by group crude incidence rates and adjusted hazard ratio for **cardiovascular disease***

	Person-years	Events	Incidence Rate (95% CI) (/1000 py)	Adjusted[1] Hazard Ratio
Overall	164,905	7,717	46.8 (45.8;47.9)	
Sex				
Women	75,488	3,203	42.4 (41.0;43.9)	ref
Men	89,416	4,514	50.5 (49.0;52.0)	1.21 (1.14;1.29)
Age				
17-44	20,7534	419	20.2 (18.3;22.2)	0.52 (0.45;0.59)
45-64	86,659	3,471	40.1 (38.7;41.4)	ref
65+	57,492	3,827	66.6 (64.5;68.7)	1.67 (1.57;1.78)
Region of origin				
Denmark	145,021	6,860	47.3 (46.2;48.4)	ref
Europe	5,630	238	42.3 (37.2;48.0)	0.89 (0.75;1.06)
Sub-Saharan Africa	1,171	35	29.9 (21.5;41.6)	0.97 (0.63;1.51)
Middle East and North Africa	9,256	464	50.1 (45.8;54.9)	1.38 (1.22;1.56)
Asia	2,893	85	29.4 (23.8;36.3)	0.81 (0.61;1.07)
America and Oceania	398	12	30.2 (17.1;53.1)	0.63 (0.30;1.33)
Place of treatment				
Capital Region	40,666	2,090	51.4 (49.2;53.6)	1.16 (1.09;1.24)
Rest of Denmark	124,239	5,627	45.3 (44.1;46.5)	Ref.

[1] Adjusted HR from Cox regression models with duration of diabetes as time scale and controlling for age, diabetes type, treatment unit, HbA1c, BMI, blood pressure, lipids and smoking at baseline

The overall incidence rate for CVD in type 2 diabetes patients was 46.8 per 1,000 person-years on a national level and slightly higher at 51.4 per 1,000 person-years in the capital region, and with marked differences between sex, age groups, migrant groups and place of treatment. Further analyses showed that men had a higher risk of developing CVD compared to women and this was expectedly also the case for older age groups compared to middle aged and younger people with type 2 diabetes. Migrants from the Middle East and North Africa were also at increased risk of developing CVD with a crude incidence rate of more than 50 per 1,000 person-years. People treated in the capital region were also at increased risk of developing CVD when compared with people treated in the rest of Denmark. Further analyses stratified on place of treatment indicated that the increased risk among migrants from the Middle East and North Africa was particularly seen in the rest of Denmark and to less extent in the Capital region.

Table 34. Overall and by group crude incidence rates and adjusted hazard ratio for ***cardiovascular disease stratified on place of treatment***

	Capital Region		Rest of Denmark	
	Incidence Rate (95% CI)	Adjusted[1] Hazard Ratio	Incidence Rate (95% CI)	Adjusted[1] Hazard Ratio
Overall	51.4 (49.2;53.6)		45.3 (44.1;46.5)	
Sex				
Women	48.1 (45.1;51.4)	ref	40.5(38.9;42.2)	ref
Men	54.2 (51.2;57.4)	1.20 (1.07;1.36)	49.3(47.6;51.0)	1.21 (1.13;1.30)
Age				
17-44	22.6 (18.9;27.1)	0.50 (0.38;0.65)	19.4 (17.3;21.7)	0.52 (0.45;0.60)
45-64	44.1 (41.4;46.9)	ref	38.6 (37.2;40.2)	ref
65+	75.6 (71.0;80.5)	1.68 (1.49;1.90)	63.9 (61.6;66.3)	1.67 (1.55;1.80)
Region of origin				
Denmark	52.9 (50.4;55.5)	ref	45.7 (44.5;47.0)	ref
Europe	42.2 (34.3;51.9)	0.77 (0.58;1.03)	42.3 (36.1;49.7)	0.91 (0.73;1.13)
Sub-Saharan Africa	28.8 (17.3;47.7)	0.62 (0.28;1.39)	30.8 (19.8;47.7)	1.09 (0.65;1.85)
Middle East and North Africa	50.4 (44.7;56.8)	1.05 (0.87;1.26)	49.8 (43.2;57.3)	1.46 (1.23;1.73)
Asia	33.3 (23.0;48.3)	0.70 (0.41;1.18)	27.8 (21.4;36.0)	0.76 (0.54;1.05)
America and Oceania	53.0 (26.5;105.9)	1.06 (0.40;2.82)	16.2 (6.1;43.2)	0.43 (0.14;1.35)

[1] Adjusted HR from Cox regression models with duration of diabetes as time scale and controlling for age, diabetes type, treatment unit, HbA1c, BMI, blood pressure, lipids and smoking at baseline

The part of the population with type 2 diabetes that experiences macro-vascular complications – RoH indicator #13, regarding the diabetes population not achieving the desired treatment outcomes – was also assessed based on data from the LPR register[b] and from the Health Profile for Copenhagen. Macro-vascular complications were defined as a diagnosis of ischaemic heart disease, peripheral arterial disease or cerebro-vascular disease in the LPR register, and in the Health Profile it was defined as self-reported ischaemic heart disease, angina pectoris or stroke (see the 'Data sources' section).

Based on register and survey data respectively 11.4% and 24.8% of the population with diabetes have macro-vascular disorders. This rather large difference is most likely due to many patients with mild disorders not being treated in the hospital system. Table 35 below show the results of logistic regression analyses of factors related to macro-vascular complications among the population with diabetes.

[b] For the analyses on complications we did not use data on prescribed drugs from the LMR register.

Table 35. Odds ratio estimates for macro vascular complications among people with register detected and self-reported diabetes respectively.

		Register data (LPR)			Health Profile data		
Demographic and socioeconomic factors		**OR**	**CI95%**		**OR**	**CI95%**	
Sex	Female	ref			ref		
	Male	1.46	1.31	1.62	1.59	0.97	2.60
Age	25-44	ref			ref		
	45-64	4.18	3.08	5.66	2.63	0.82	8.46
	65+	5.94	4.35	8.10	3.26	0.94	11.35
Education	Primary school and shorter practical education	1.23	0.97	1.56	1.03	0.47	2.29
	Secondary school	1.14	0.90	1.46	0.67	0.24	1.85
	University or higher	ref			ref		
Employment	Employed	ref			ref		
	Not employed	1.91	1.63	2.23	3.37	1.72	6.62
Ethnicity	Western	ref			ref		
	Non-western	1.04	0.91	1.19	1.77	0.86	3.65
Risk factors (adjusted for the demographic and socioeconomic factors listed above)*							
Alcohol consumption	≤ 14/21 units per week (female/male)				ref		
	> 14/21 units per week (female/male)				0.34	0.14	0.78
Hypertension	No				ref		
	Yes				1.89	1.08	3.29

* Only available from Health Profile data

The results indicate that the risk of having macro-vascular complications increases with age and is higher among males, those with lower education and no employment. The effect of ethnicity is less clear. The differences seen might be due to differences in occurrence of disorders between socio-demographic groups, or be due to differences in the proportion of cases offered treatment within each group. The effect of two physiological risk factors was examined in Health Profile data, and here it can be seen that the risk of macro-vascular complications is increased for people with hypertension, but is decreased by alcohol consumption above the guidelines.

Studies have shown[i] that different cardiovascular risk factors might cluster and interact (on the additive scale) with diabetes [19]. Thus, the distribution of these risk factors is interesting, since risk factor exposure could then affect diabetes severity. Using data from the CAMB-study we examined the distribution of hypertension and LDL cholesterol levels stratified by education and employment groups, and found only insignificant differences between the socioeconomic groups (table 36).

Table 36. Prevalence of measured hypertension and LDL cholesterol among patients with diabetes in CAMB

		Hypertension			LDL cholesterol		
		No	**Yes**	**p-value**	**< 2.5mmol/L**	**≥ 2.5mmol/L**	**p-value**
Education	Primary school and short education	59.1	40.9	0.830	68.7	31.3	0.659
	Secondary school	56.1	43.9		61.0	39.0	
	University or higher	64.7	35.3		64.7	35.3	
Employment	Employed	61.9	38.1	0.104	67.2	32.8	0.799
	Not employed	47.5	52.5		65.0	35.0	

Prevalence of any complications

In total 39.6% (8,914/22,530) of the people with type 2 diabetes in the capital region that were alive and followed in DVDD as of 31 December 2012 had some type of complication. This was significantly more than in the rest of Denmark. To what extent this is a result of more control and diagnostic activity or less good treatment is unknown.

Table 37 shows the prevalence of complications among people in the DVDD database with and without well-regulated HbA1c, LDL-cholesterol and blood pressure in 2012. The prevalence of any complication among patients within treatment target in 2012 was 29.5% for the HbA1c target, 41.8% for the LDL-cholesterol target, and 41.4% for the blood pressure target. Based on these results and the overall prevalence of any complications among people with type 2 diabetes in the capital region we suggest that approximately 60% of the people within treatment targets are without complications.

Table 37. Prevalence of micro- or macro-vascular complications for people within and outside treatment targets based on records in DVDD in 2012.

	Any complication	
Within target of	**Yes**	**No**
HbA1c < 53 mmol/mol)		
Yes	**29.5**	70.5
No	51.1	48.9
LDL-cholesterol <2.5		
Yes	**41.8**	58.2
No	34.3	65.7
Blood pressure <130/80		
Yes	**41.4**	58.6
No	40.9	59.1

Level 5 Summary

#12 What is the prevalence and incidence rate of treated T2D with/without micro vascular complications (nephropathies, proliferative eye disease (severe retinopathy) and neuropathy)?

The prevalence of severe retinopathy was 11.4% and the incidence was 16.7 per 1,000 person-years *in the capital region. Migrants from the middle east and north Africa had an increased risk of developing severe retinopathy*

The prevalence of nephropathy was 18.3% and the incidence was 18.6 per 1,000 person-years *in the capital region. Men and older people were at increased risk.*

The prevalence of neuropathy 18.5% and the incidence was 17.7 per 1,000 person-years *in the capital region. Men and older people were at increased risk. Migrants from Asia had a lower risk of developing neuropathy.*

#13 What is the incidence rate or proportion of treated T2D with/without macro vascular complications (ischaemic heart disease, peripheral arterial disease and cerebrovascular disease)?

The prevalence of CVD was 24.8% - 26.7% *and the incidence was 51.4* per 1,000 person-years *in the capital region. Men, older people and the unemployed were at particular risk.*

The prevalence of any complication (micro- or macrovascular) in the DVDD database was 39.6%. Among persons in the DVDD database that were within their treatment target in 2012, the prevalence of complications ranged between 29.5 – 41.8% depending on treatment target. Based on these data we estimate that approximately 60% of the persons that are within their treatment target are without complications.

Conclusion

The Rule of Halves, stating that half of those with diabetes are diagnosed, half of those diagnosed received care, half of those receiving care achieve treatment targets, and finally half of those achieving targets also achieve desired outcomes, has not previously been assessed for diabetes in Copenhagen.

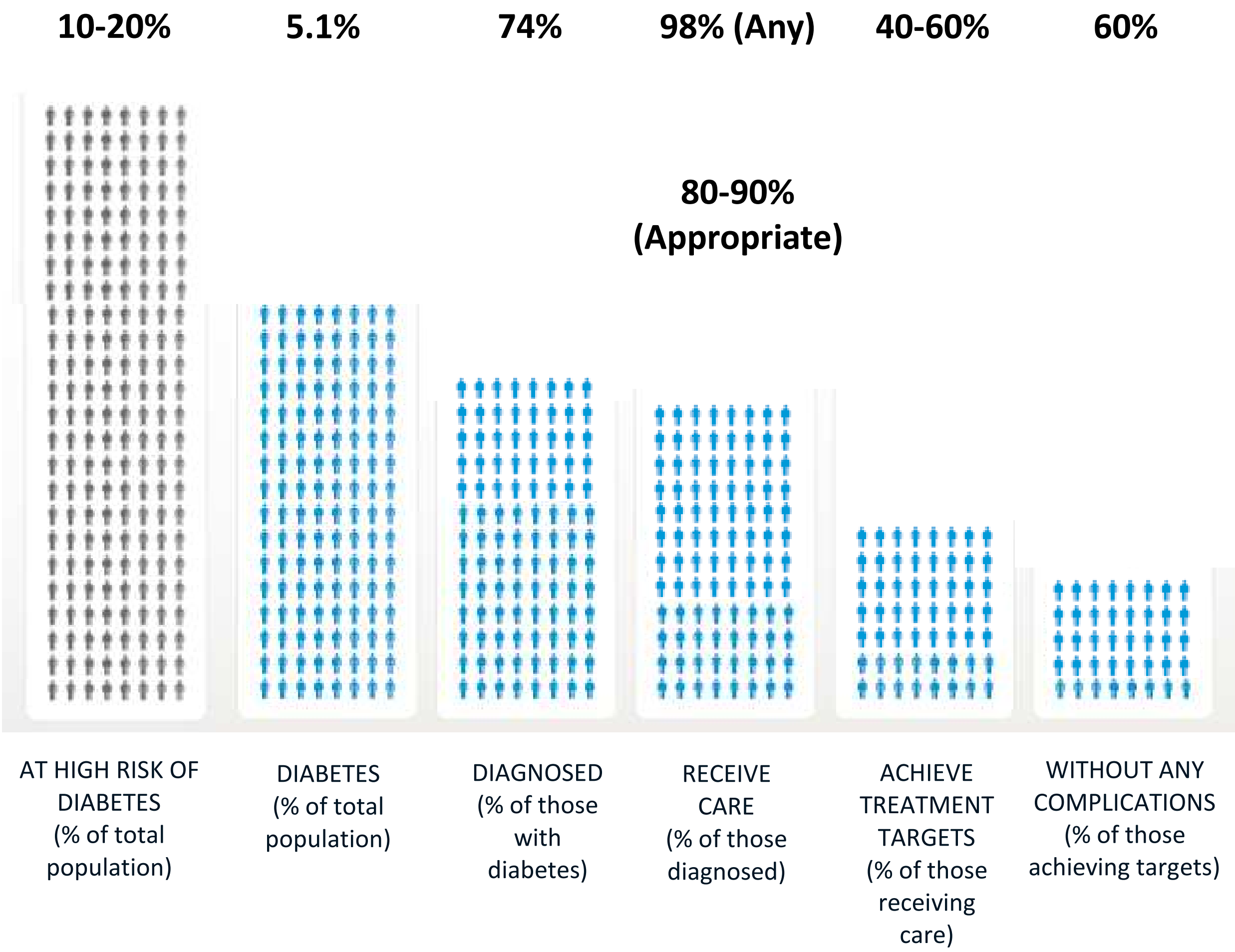


Figure 3. Rule of 'Halves' for Copenhagen with estimates of actual proportions at each analytical level and approximated ranges for population subgroups.

The results of the RoH-analyses conducted as part of the quantitative mapping-phase of the Cities Changing Diabetes project in Copenhagen, as described above, are summarized in figure 3. As it can be seen from the figure, the 'Halves' rule does not generally apply for Copenhagen. On most of the levels, the analyses show that Copenhagen is doing better than simple halves. For example, almost the same proportion of the population receives diabetes related care (either medicine or hospital based) as the proportion that has diagnosed diabetes. This indicates that almost all persons with diagnosed diabetes are receiving some form of care. The results also indicate that only about 1% in the middleaged population have undetected diabetes, meaning that less than 75% of the total diabetes population are diagnosed.

Although the RoH analysis indicates that Copenhagen is doing better than the Rule of Halves when it comes to diabetes treatment, there is still room for improvement. The proportion achieving treatment targets for HbA1c, cholesterol and blodd pressure are 40-60%. Furthermore, although 98% receive some form of care, that does not necessarily reflect appropriate and timely care, and our results show that the proportion of patients receiving complications screening and clinical assessment according to national guidelines is lower and ranging between 80% and 90%. The propotion of those who are within their treatment targets that have some typ cardiovascular complications is appr. 40%.

Further, the results show that there are major socioeconomic differences in the prevalence of risk factors and occurrence of diabetes. Low educated have twice the prevalence of high risk score and diabetes compared to high educated. Not employed have 40 to 80% higher rates than employed in the same age. Populations with non-western background also have twice the risk compared to others. Measured with biomarkers such as HbA1c>6.5% these inequalities are even larger. The clinical data concerning the quality of treatment have no socioeconomic data, and the ethnic differences are often not large enough to be verified due to lack of statistical power. We have however found that older people and migrants form the Middle East and Africa were less likely to have received foot examinations and to have well regulated HbA1c. Women with diabetes had less well regulated LDL cholesterol and men less well regulated blood pressure. People out of work had a clearly elevated risk of macro-vascular complications and some immigrant groups scored high on microvascular complications. However, the results also indicate that people with short education and no employment more often had received information regarding preventive services and accepted offer of preventive services.

When drawing conclusions based on the RoH results, some methodological aspects of the analyses must be noted, as they might have affected the results. First and foremost, it is important to note that the analyses of the different levels of the RoH have not been performed using the same data sources. This means that the results from each level are not directly comparable, since the population being analysed is not the same in age dsitribution for example – although there will be an overlap between sources. Furthermore, due to lack of optimal data, a number of assumptions were made within each level of analysis, to allow estimation of proportions and rates. Therefore, the suggested figures should be interpreted as general indicators of the size of the RoH pillars rather than exact figures. It should also be noted that only some of the data (RoH level #0-#8) are from Copenhagen, the rest are national data with special reference to the Capital region in some tables. In the capital region 58% of the patients in DVDD are treated in the outpatient clinic. This is only the case for 44% of the patients in rest of Denmark. Further, it is not possible to adjust for crucial socioeconomic differences in analyses based on the DVDD. It is likely that the reported differences between the capital region and the rest of Denmark are affected by differences in the background population, and by differences in treatment procedures and treatment quality between outpatient clinics and GPs. Therefore, no firm conclusions can be drawn from the findings related to differences between the capital region and the rest of Denmark.

Identification of high risk groups and areas for Vulnerability Assessment

The recruitment of citizens and patients for the Vulnerability Assessment for Copenhagen was guided by the results of the Rule of Halves analysis for Copenhagen, as well as the case filters (vulnerability identifiers) agreed for all project cities. For this purpose, the results from the analysis described above were combined to point out a number of socio-demographic factors affecting the prevalence of diabetes, diabetes risk factors and risk of having developed macro-vascular complications among patients already diagnosed with diabetes. As shown above, these factors were: age, BMI, hypertension, education, employment status, gender, ethnicity, physical activity level and whether the person had children living at home. The recruitment of interview persons for the vulnerability assessment in Copenhagen therefore focused on (but were not be limited to) citizens at risk of developing diabetes and patients with diabetes with a combination of the following factors: male gender, older than 45 years, short education, not being employed, BMI >30, non-western background and no children living at home; and with a specific focus on the two city districts Brønshøj-Husum and Valby.

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