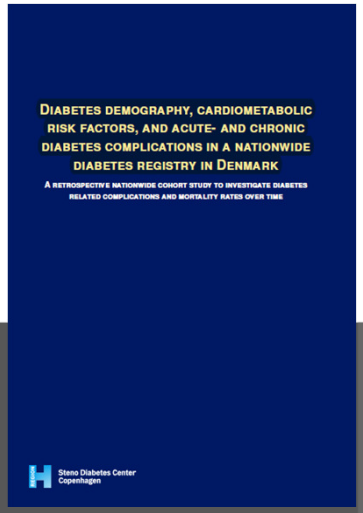
Steno Diabetes Center Copenhagen
Clinical Epidemiology



Baselinemonitorering af diabeteskvalitet og komplikationer i Danmark

Professor, overlæge PhD

Marit Eika Jørgensen

Baggrund

- Etablering af fem Steno Diabetes Centre i Danmark i 2017 med ambition om at
  - forbedre kvaliteten af diabetesbehandling og forebyggelse af senfølger til diabetes
  - "to create the conditions to reduce the number of new cases of diabetes" (https://steno.novonordiskfonden.dk/en/vision/)
- Novo Nordisk Fonden ønsker en registerbaseret analyse af baseline status for de fem regionale diabetescentre med mulighed for identisk opfølgning efter 5 og 10 år
- Baselinerapporten er finansieret af Novonordisk fonden og udarbejdet af Hanan Amadid, Bendix Carstensen og Marit Eika Jørgensen

Indhold

- **Diabetesdemografien i Danmark**
- **Centrale risikofaktorer i diabetesbehandlingen**
  - *HbA1c, lipider, blodtryk, BMI, rygning, albuminuri og nyrefunktion*
- **Prævalens og incidens af diabeteskomplikationer**
  - *Mikrovaskulære komplikationer (nyre, øjne, (nerver))*
  - *Makrovaskulære komplikationer (iskæmisk hjertesygdom, perifer karsygdom, stroke, amputationer)*
  - *Akutte komplikationer (hypoglykæmi, diabetisk ketoacidose)*

Tal for diabetes – Datakilder

Landspatientregister

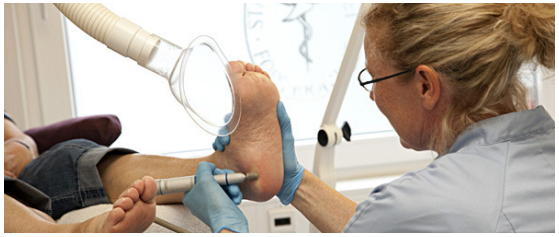
Receptregister

Danmarks Statistik

"ET NYT DIABETESREGISTER"

- Receptregister
- LPR diagnoser
- RKKP databaser
- Sygesikringsregistret (Diabetisk Foc
- Den nationale laboratoriedatabase

Sygesikringsregister (diabetisk fodterapi)



Dansk Voksendiabetesdatabase
Børnediabetesdatabasen

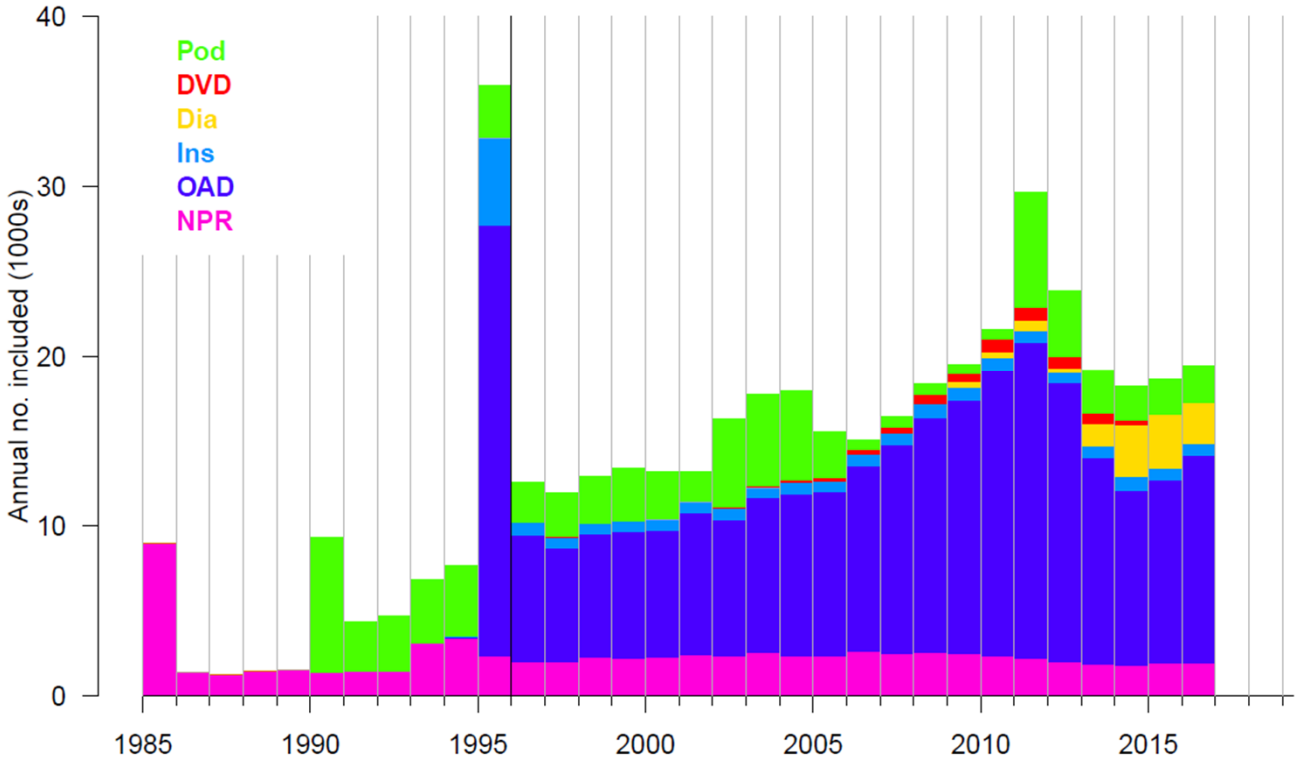
rkkp
regionernes kliniske kvalitetsudviklingsprogram

Diabasen (diabetisk øjensygdom)

Datagrundlag og klassifikation

- Inklusionskriterium: 2. registrering af et af flg. kriterier: LPR diagnose (E10/E11), Indløsning af diabetesmedicin, sygesikringsydelse for fodterapi, registrering i DVDD, Børnediabetesregistret eller Diabasen
- Defineres som type 1 diabetes ved:
  - DVDD diagnoser som type 1 diabetes
  - Hvis ikke i DVDD: indløsning af insulin < 30 år
  - Hvis ikke i DVDD: > 50% af LPR diagnoser som type 1 diabetes
  - Type 1 diabetes dog kun hvis der er indløsning af insulin
- Ellers kategoriseres som type 2 diabetes

Inklusionskriterium i registret



Datamæssige begrænsninger

- Klassifikation af T1D usikker før 2005
- Ingen registrering fra almen praksis (T2D) siden 2014
- Laboratorieinformation ikke tilgængelig fra Region Midt
- Forsinkelse på nationale registerdata (dvs. follow-up er 2017)

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Prævalens af type 1- og type 2 diabetes

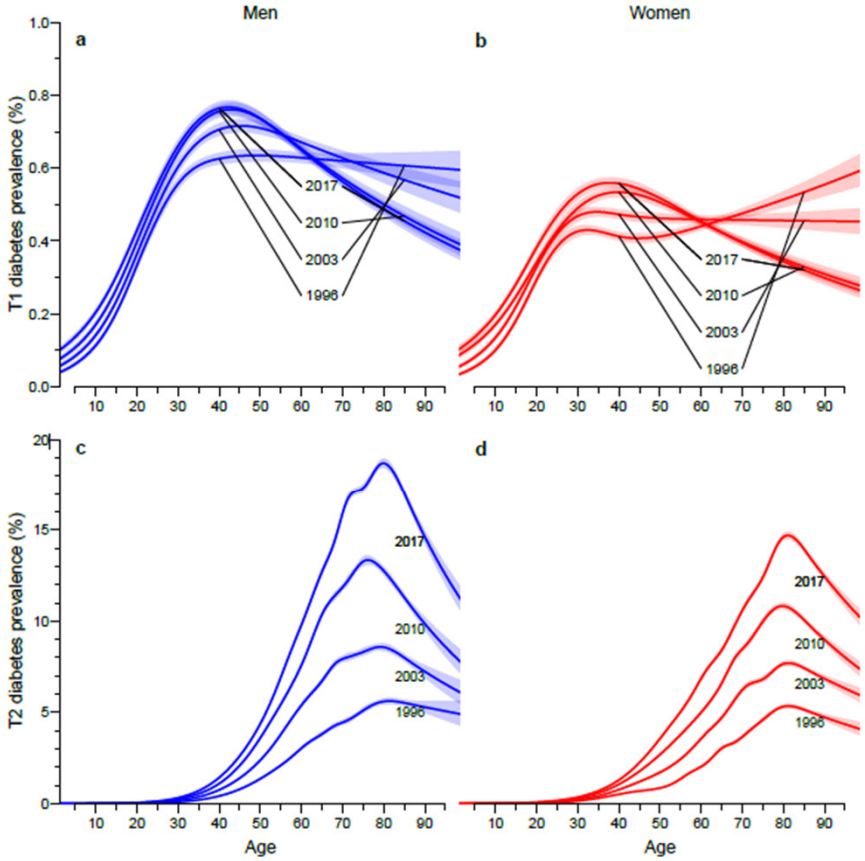

FIGURE 6.1: Age-specific prevalence of T1D (a and b) and T2D (c and d) in Denmark as of 1st January 1996,2003,...,2017. Note the different y-axes in the upper and lower panels. Shaded areas represent 95% confidence intervals. a: T1D men. b: T1D women. c: T2D men. d: T2D women

Incidens af type 1- og type 2 diabetes

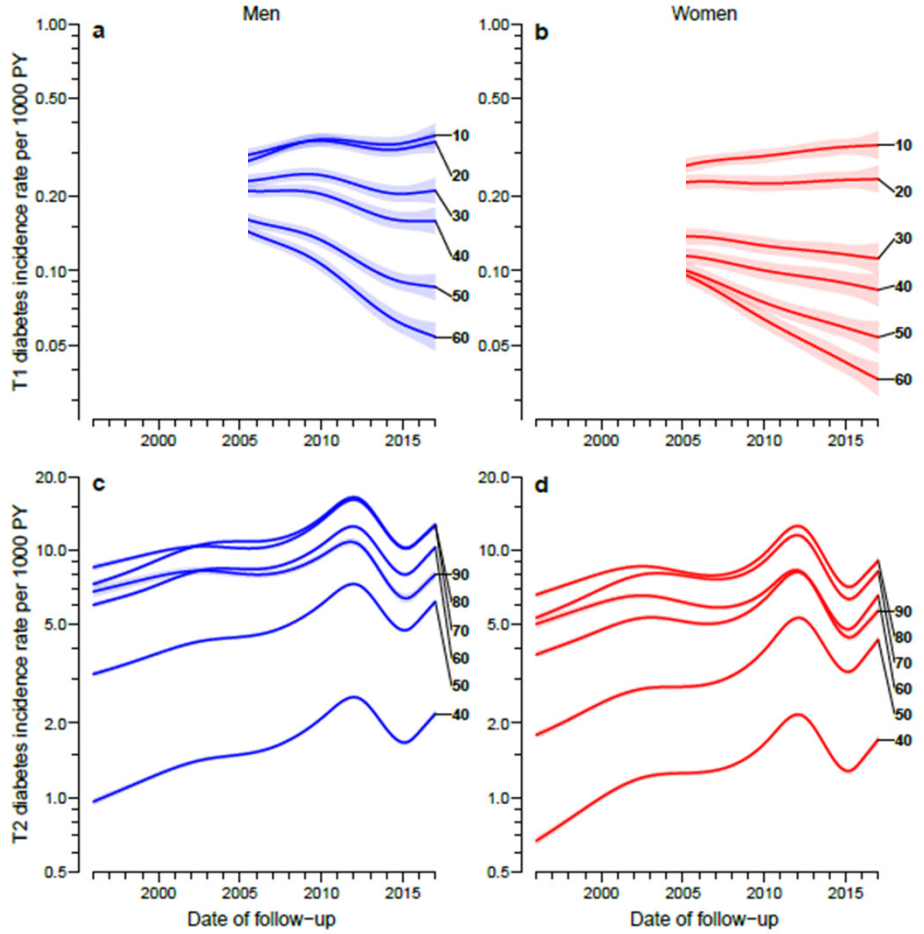

FIGURE 6.2: Age-specific incidence rates in different ages as of 1st January 2015 from Age-Period-Cohort models. Note the different y-axes in the upper and lower panels but that the

Mortalitet og tabte leveår

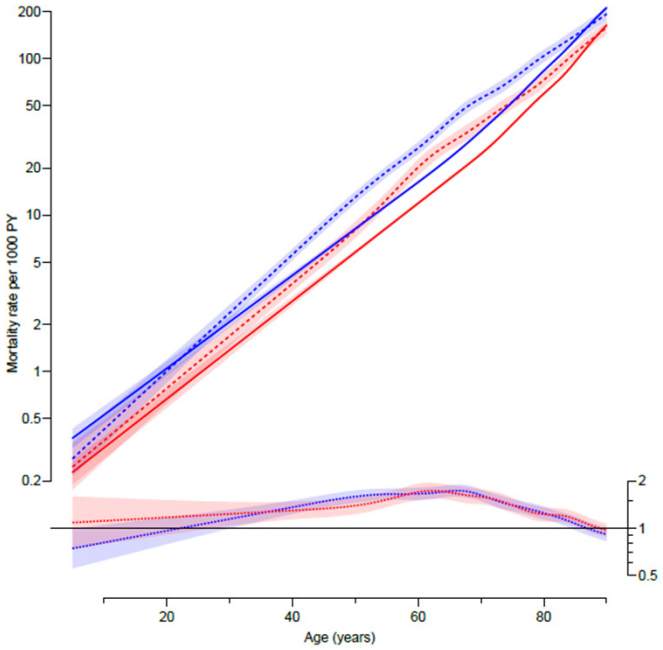

FIGURE 6.3: Age-specific mortality rates as of 1st January 2015 for T1D patients (broken lines) and T2D patients (fill lines). The dotted line at the bottom shows the age-specific mortality rate-ratio between T1D and T2D patients, with the scale on the right. Women shown in red, men in blue.

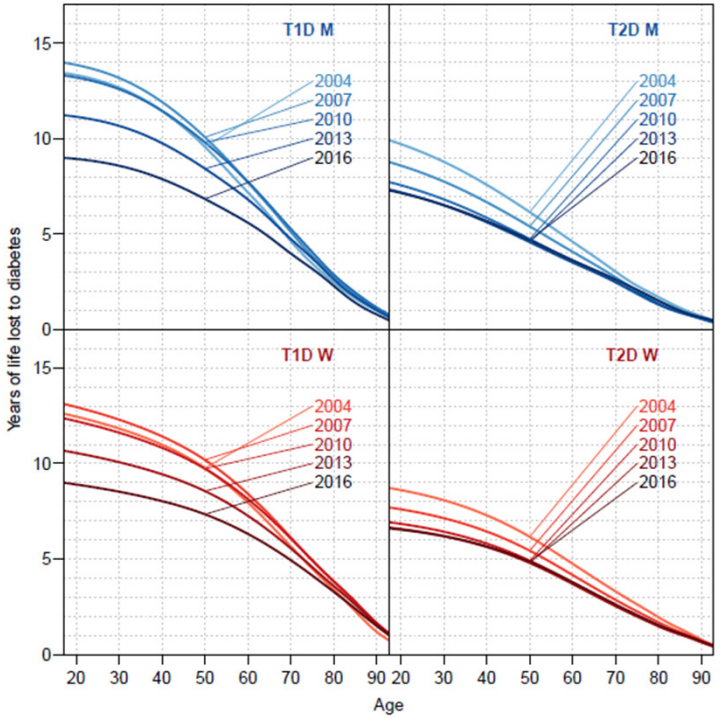

FIGURE 6.4: Years of life lost to T1D and T2D at 1 January 2004,2007,...,2017 by sex and type of diabetes. The calculations are based on estimated cross-sectional rates from age-period-cohort models for incidence and mortality for persons without diabetes and persons with T1D and T2D.

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Populationsbeskrivelse 2017

	Type 1	Type 2
Personer (N)	28.401	255.856
Mænd	16.179	141.404
Alder (år)	45	67
Diabetesvarighed (år)	18	8,5

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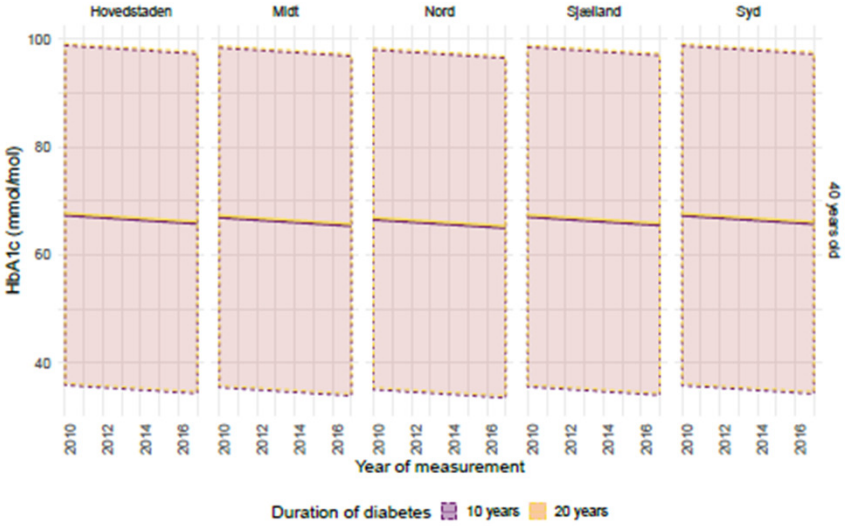
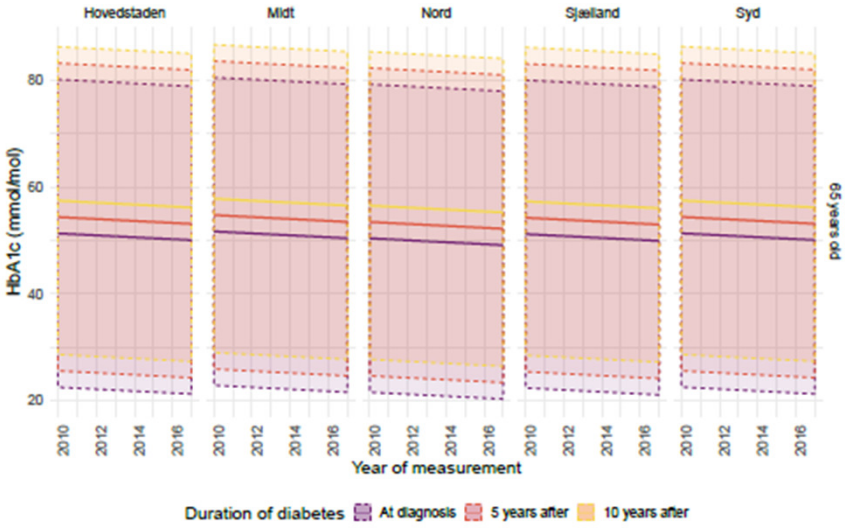
HbA1C

Type 1 Diabetes



Type 2 Diabetes



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HbA1C

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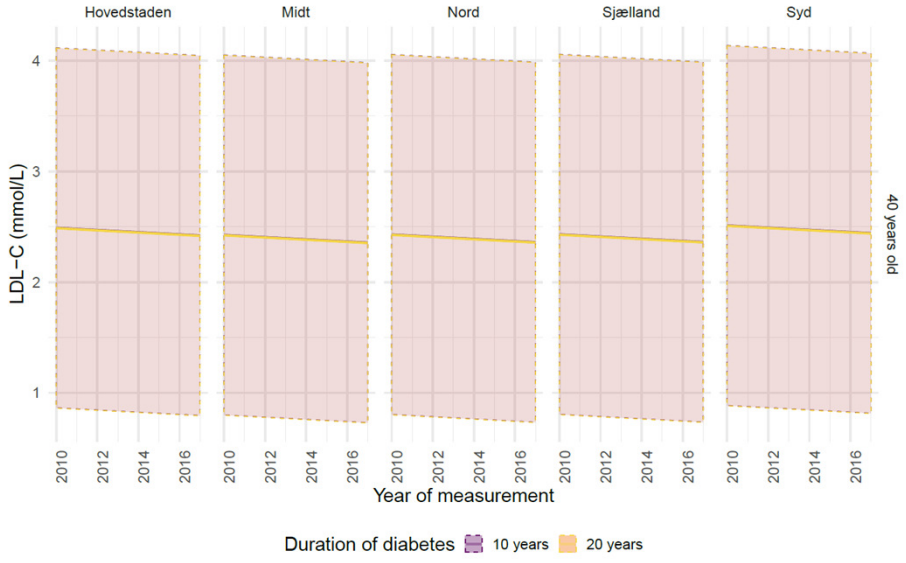
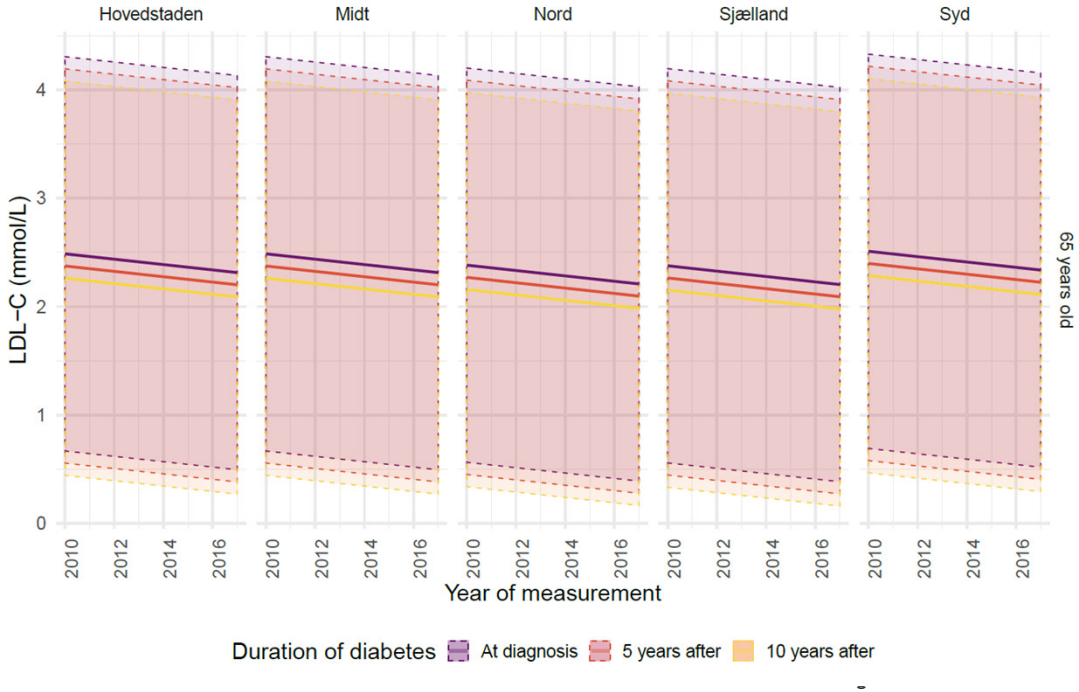
LDL-Cholesterol

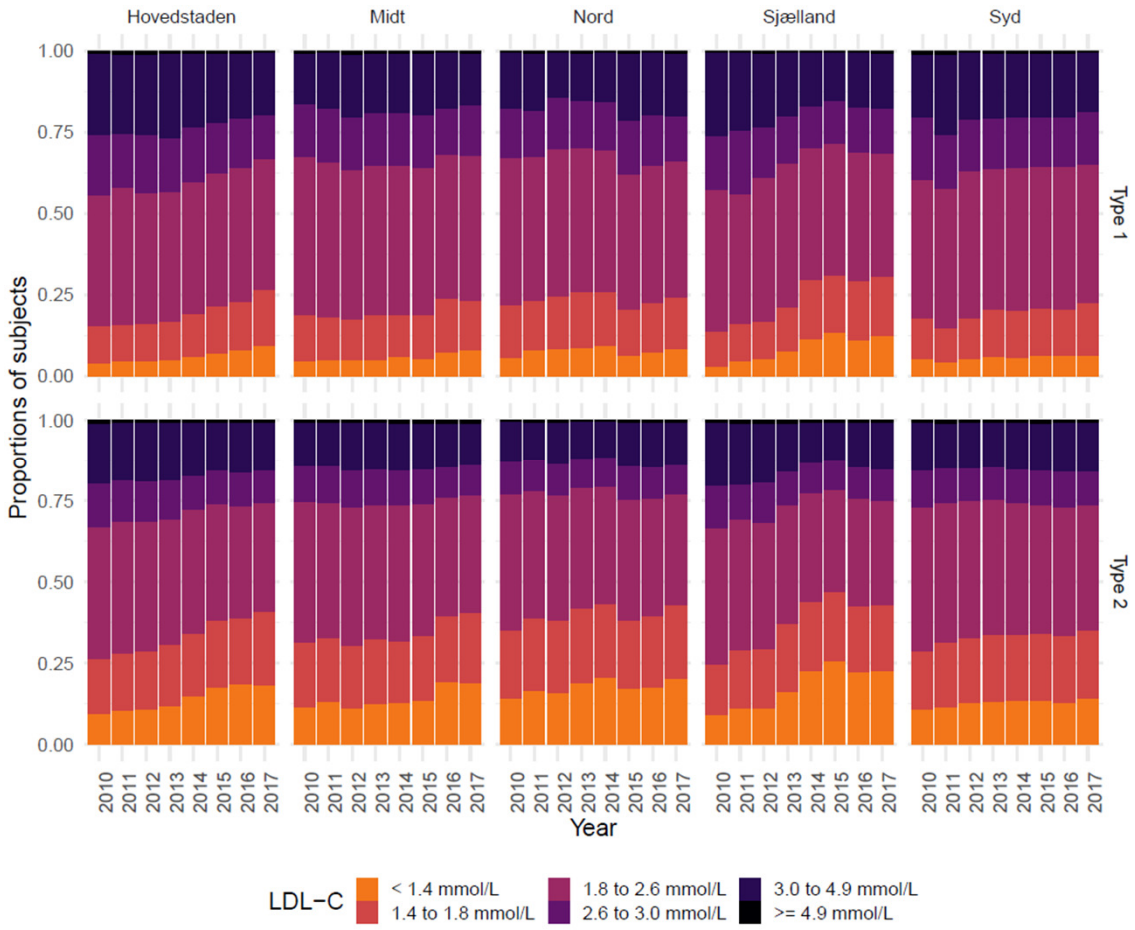
Type 1 Diabetes



Type 2 Diabetes



LDL-Cholesterol



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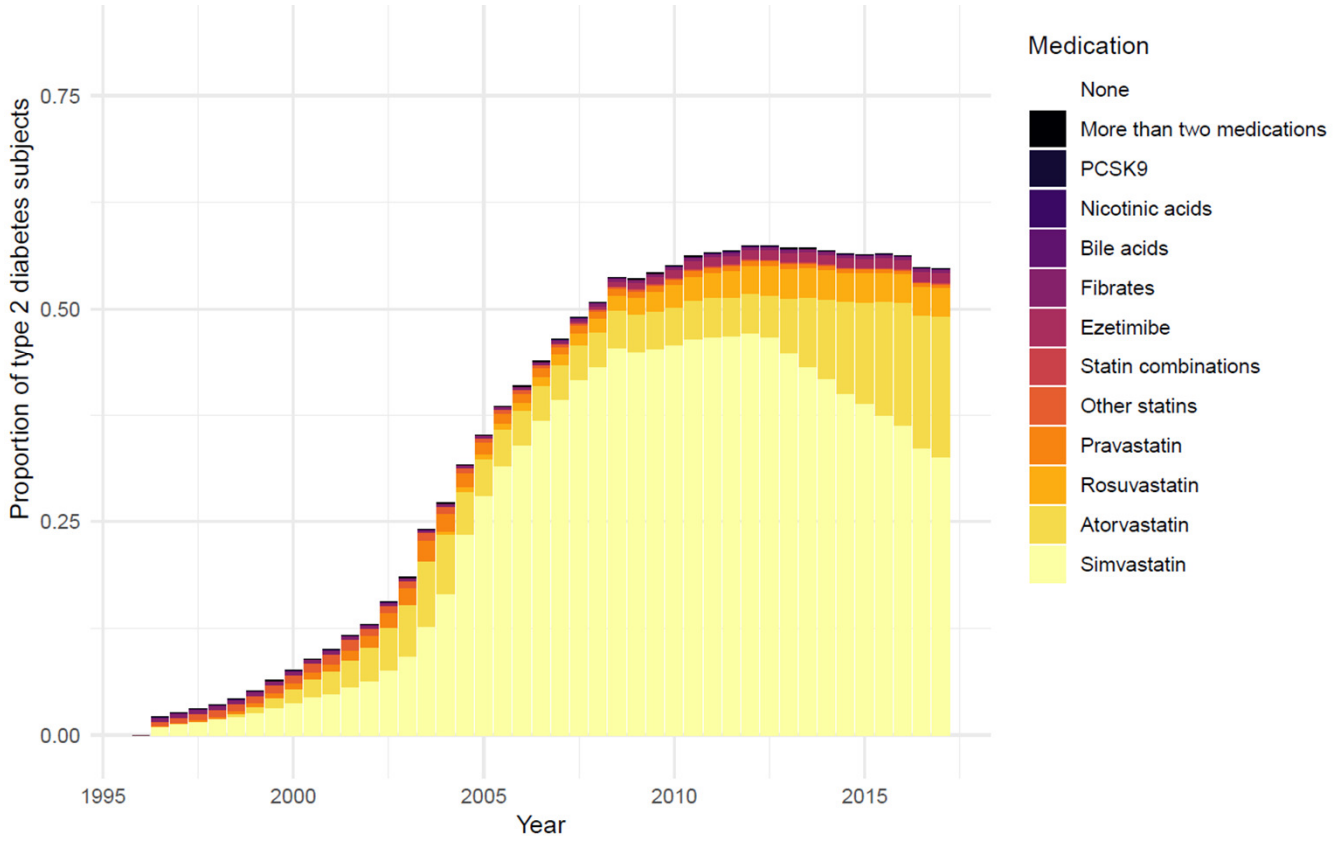
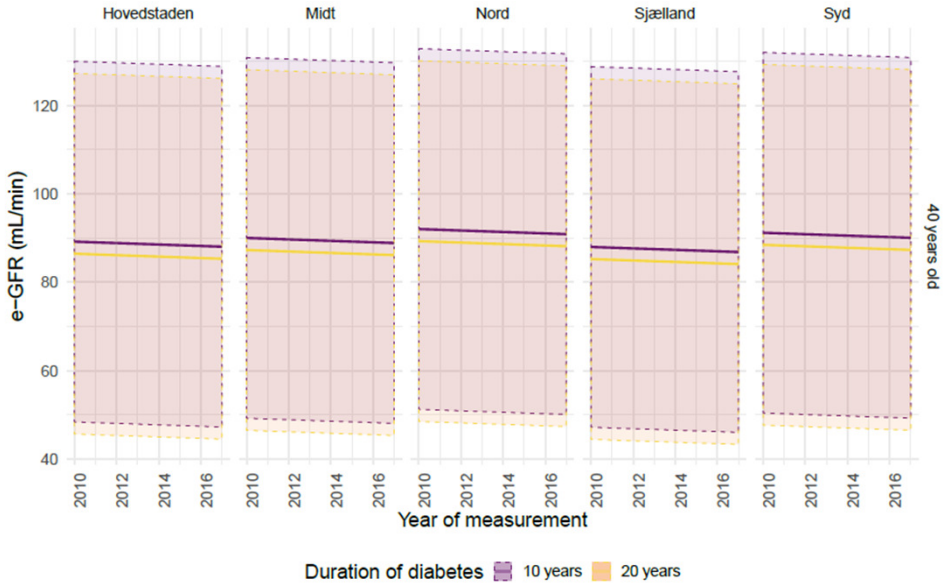
Lipidsænkende behandling (T2D)

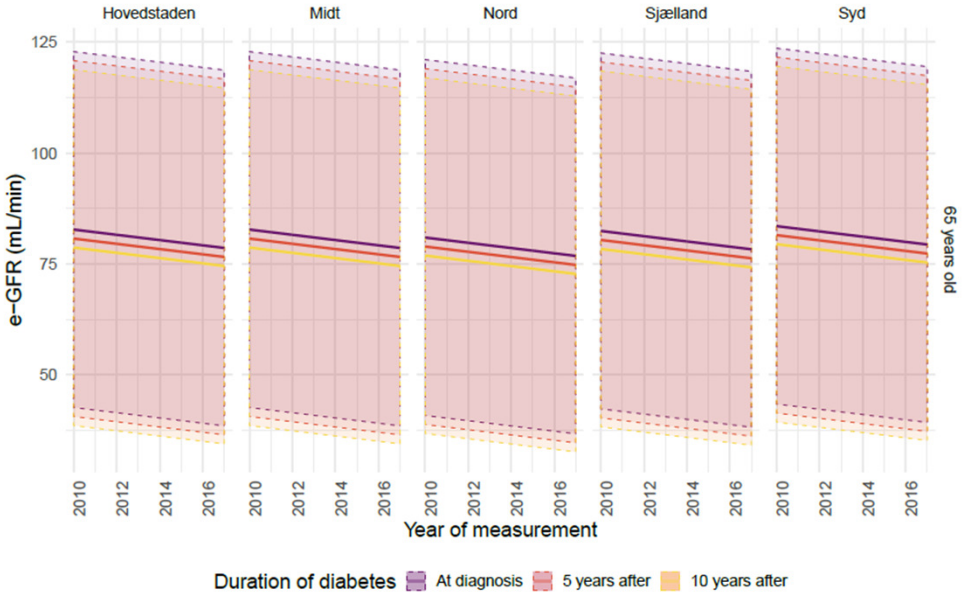


eGFR

Type 1 Diabetes



Type 2 Diabetes



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CVD incidens

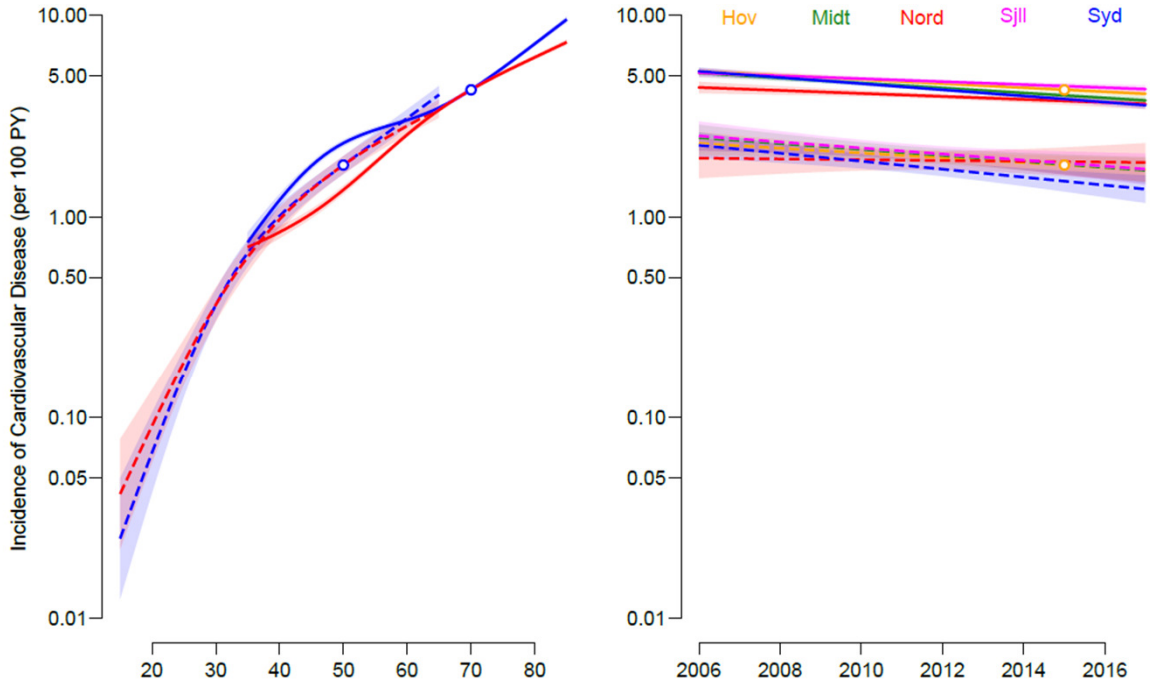

FIGURE 6.58: Left: Incidence rates of CVD complications by age in region H for T1D (broken lines) and T2D (full lines) for men (blue) and women (red).

TABLE 6.50: Newly recorded CVD complications by region and calendar year. The line with "SDC" is for the persons reported to DVDD during 2016 from a Steno Center, i.e. a department considered to have patients from the centre.

	No. complications						Incidence per 100 PY					
	Hov	Midt	Nord	Sjll	Syd	Sum	Hov	Midt	Nord	Sjll	Syd	Sum
Type 1												
2006	121	83	37	67	110	418	2.0	1.8	1.7	2.1	2.3	2.0
2007	102	96	32	75	89	394	1.7	2.0	1.4	2.3	1.8	1.9
2008	105	94	29	69	109	406	1.7	2.0	1.3	2.2	2.2	1.9
2009	117	84	40	56	87	384	1.9	1.7	1.7	1.7	1.7	1.8
2010	125	81	36	68	66	376	2.0	1.6	1.5	2.1	1.3	1.7
2011	121	86	40	70	95	412	1.9	1.7	1.7	2.2	1.9	1.9
2012	110	80	37	51	75	353	1.7	1.6	1.5	1.6	1.5	1.6
2013	95	84	41	67	84	371	1.4	1.6	1.7	2.1	1.6	1.6
2014	104	74	38	69	58	343	1.6	1.4	1.6	2.1	1.1	1.5
2015	123	85	36	49	85	378	1.8	1.6	1.5	1.5	1.6	1.6
2016	80	81	35	55	70	321	1.2	1.5	1.4	1.6	1.3	1.4
SDC	36	25	18	40	15	134	1.3	1.8	1.5	2.0	1.3	1.6
Type 2												
2006	1,276	783	387	671	934	4,051	4.4	4.4	4.0	4.3	4.8	4.4
2007	1,240	809	381	641	911	3,982	4.2	4.3	3.7	3.9	4.4	4.2
2008	1,312	767	413	721	880	4,093	4.2	3.8	3.8	4.2	4.0	4.0
2009	1,402	817	442	751	945	4,357	4.3	3.8	3.8	4.1	4.1	4.0
2010	1,406	975	412	815	993	4,601	4.0	4.2	3.4	4.2	4.0	4.0
2011	1,469	998	480	830	1,026	4,803	3.9	3.8	3.6	4.0	3.8	3.8
2012	1,545	1,082	459	868	1,010	4,964	3.8	3.8	3.1	3.8	3.5	3.6
2013	1,650	1,074	551	960	1,129	5,364	3.9	3.6	3.6	4.0	3.7	3.7
2014	1,745	1,123	575	954	1,063	5,460	4.0	3.6	3.6	3.9	3.3	3.7
2015	1,627	1,109	557	941	1,136	5,370	3.6	3.5	3.4	3.7	3.5	3.6
2016	1,593	1,091	547	1,016	1,112	5,359	3.5	3.3	3.2	3.9	3.3	3.4
SDC	47	40	31	107	29	254	3.8	3.4	4.6	5.6	4.2	4.4

Incidens af Stroke

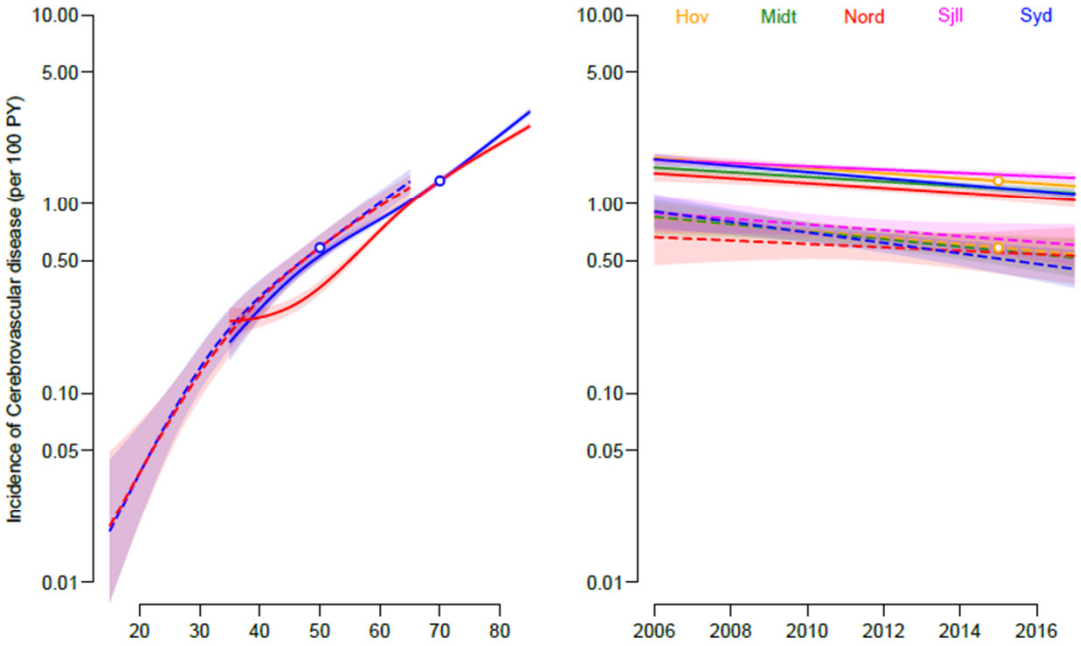

FIGURE 6.6o: Left: Incidence rates of cerebrovascular disease by age in region H for T1D (broken lines) and T2D (full lines) for men (blue) and women (red).
Right: Incidence rates of cerebrovascular disease by date of follow-up for 50 year old T1D (broken lines) and 70 year old T2D (full lines) men for each region.

TABLE 6.54: Newly recorded cerebrovascular disease complications by region and calendar year. The line with "SDC" is for the persons reported to DVDD during 2016 from a Steno Center, i.e. a department considered to have patients from the centre.

	No. complications						Incidence per 100 PY					
	Hov	Midt	Nord	Sjll	Syd	Sum	Hov	Midt	Nord	Sjll	Syd	Sum
Type 1												
2006	62	46	11	29	50	198	0.9	0.9	0.4	0.8	0.9	0.8
2007	65	53	17	39	58	232	1.0	1.0	0.7	1.0	1.1	1.0
2008	52	47	11	41	47	198	0.8	0.9	0.4	1.1	0.8	0.8
2009	45	33	17	28	39	162	0.7	0.6	0.6	0.7	0.7	0.7
2010	62	36	19	35	41	193	0.9	0.6	0.7	0.9	0.7	0.8
2011	42	37	17	31	44	171	0.6	0.6	0.6	0.8	0.8	0.7
2012	52	32	15	26	41	166	0.7	0.6	0.6	0.7	0.7	0.7
2013	47	45	17	33	46	188	0.6	0.8	0.6	0.9	0.8	0.7
2014	39	23	18	44	25	149	0.5	0.4	0.7	1.2	0.4	0.6
2015	51	39	11	22	40	163	0.7	0.6	0.4	0.6	0.7	0.6
2016	50	38	15	25	29	157	0.6	0.6	0.5	0.6	0.5	0.6
SDC	25	6	8	18	5	62	0.8	0.4	0.6	0.8	0.4	0.6
Type 2												
2006	661	368	195	337	444	2,005	1.7	1.5	1.5	1.6	1.7	1.6
2007	622	359	171	296	433	1,881	1.5	1.4	1.2	1.3	1.5	1.4
2008	644	375	200	347	427	1,993	1.5	1.3	1.3	1.5	1.4	1.4
2009	686	368	208	375	470	2,107	1.5	1.2	1.3	1.5	1.4	1.4
2010	645	442	186	387	524	2,184	1.4	1.3	1.1	1.4	1.5	1.4
2011	667	467	246	382	517	2,279	1.3	1.3	1.3	1.3	1.4	1.3
2012	696	501	236	455	461	2,349	1.2	1.2	1.2	1.4	1.1	1.2
2013	735	490	245	439	530	2,439	1.2	1.2	1.1	1.3	1.2	1.2
2014	770	526	258	476	539	2,569	1.3	1.2	1.2	1.4	1.2	1.2
2015	840	532	226	478	571	2,647	1.3	1.2	1.0	1.3	1.2	1.2
2016	787	532	255	486	533	2,593	1.2	1.1	1.1	1.3	1.1	1.2
SDC	33	15	12	54	11	125	1.6	0.9	1.2	1.8	1.0	1.4

Incidens af amputationer

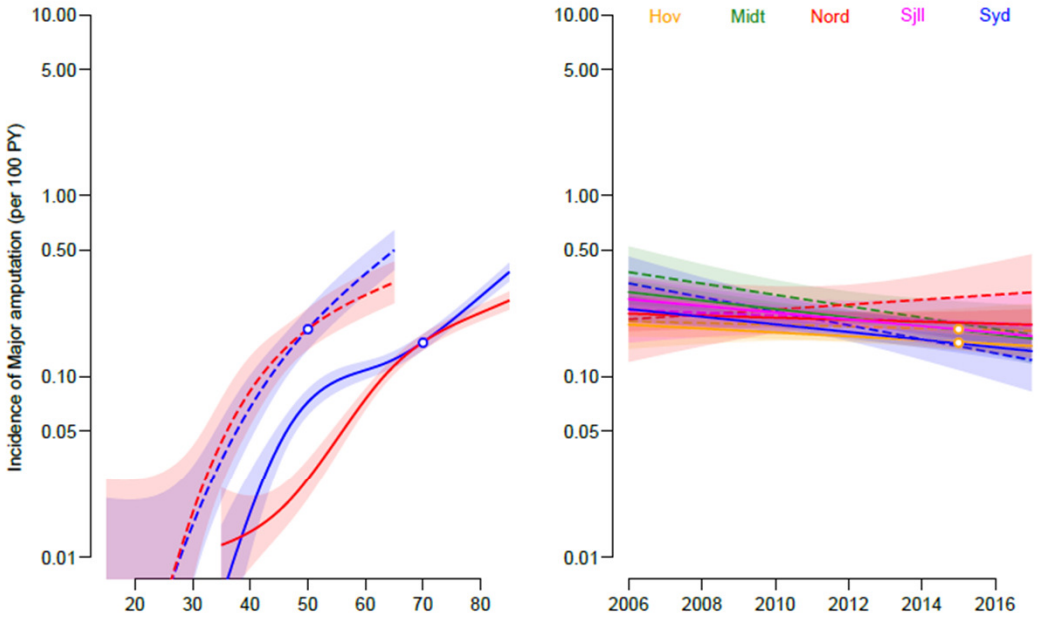

FIGURE 6.76: Left: Incidence rates of major amputations by age in region H for T1D (broken lines) and T2D (full lines) for men (blue) and women (red).
Right: Incidence rates of major amputations by date of follow-up for 50 year old T1D (broken lines) and 70 year old T2D (full lines) men for each region.

TABLE 6.86: Newly recorded major amputations by region and calendar year.
The line with "SDC" is for the persons reported to DVDD during 2016 from a Steno Center, i.e. a department considered to have patients from the centre.

	No. complications						Incidence per 100 PY					
	Hov	Midt	Nord	Sjll	Syd	Sum	Hov	Midt	Nord	Sjll	Syd	Sum
Type 1												
2006	18	30	8	15	19	90	0.3	0.5	0.3	0.4	0.3	0.4
2007	19	19	*	13	19	72	0.3	0.3	0.1	0.3	0.3	0.3
2008	14	24	8	9	21	76	0.2	0.4	0.3	0.2	0.4	0.3
2009	16	19	8	9	20	72	0.2	0.3	0.3	0.2	0.3	0.3
2010	11	15	5	17	16	64	0.1	0.3	0.2	0.4	0.3	0.2
2011	16	13	10	11	12	62	0.2	0.2	0.4	0.3	0.2	0.2
2012	16	11	8	6	10	51	0.2	0.2	0.3	0.2	0.2	0.2
2013	16	15	9	10	9	59	0.2	0.2	0.3	0.3	0.1	0.2
2014	16	16	4	8	10	54	0.2	0.3	0.1	0.2	0.2	0.2
2015	20	13	7	11	15	66	0.2	0.2	0.2	0.3	0.2	0.2
2016	14	13	10	11	12	60	0.2	0.2	0.3	0.3	0.2	0.2
SDC	6	*	4	7	*	19	0.2	0.1	0.3	0.3	0.1	0.2
Type 2												
2006	74	70	35	57	70	306	0.2	0.3	0.2	0.2	0.2	0.2
2007	89	74	27	62	60	312	0.2	0.3	0.2	0.3	0.2	0.2
2008	80	81	47	58	70	336	0.2	0.3	0.3	0.2	0.2	0.2
2009	87	77	37	69	75	345	0.2	0.2	0.2	0.2	0.2	0.2
2010	81	84	30	65	84	344	0.2	0.2	0.2	0.2	0.2	0.2
2011	72	82	54	43	81	332	0.1	0.2	0.3	0.1	0.2	0.2
2012	93	79	39	57	65	333	0.1	0.2	0.2	0.2	0.1	0.2
2013	122	112	40	61	73	408	0.2	0.2	0.2	0.2	0.1	0.2
2014	88	84	45	77	78	372	0.1	0.2	0.2	0.2	0.2	0.2
2015	104	91	51	76	73	395	0.1	0.2	0.2	0.2	0.1	0.2
2016	119	90	60	78	85	432	0.2	0.2	0.2	0.2	0.2	0.2
SDC	7	5	10	17	6	45	0.3	0.3	0.9	0.5	0.5	0.4

Incidens af diabetisk nyresygdom

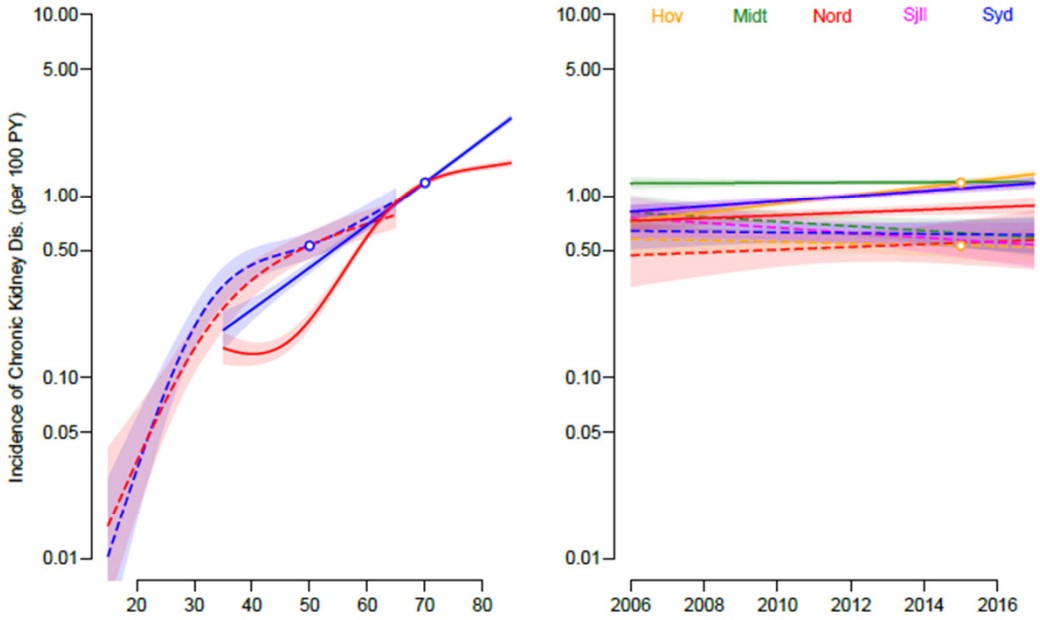

FIGURE 6.70: Left: Incidence rates of Chronic kidney disease by age in region H for T1D (broken lines) and T2D (full lines) for men (blue) and women (red).
Right: Incidence rates of Chronic kidney disease by date of follow-up for 50 year old T1D (broken lines) and 70 year old T2D (full lines) men for each region.

TABLE 6.74: Newly recorded Chronic kidney disease by region and calendar year. The line with "SDC" is for the persons reported to DVDD during 2016 from a Steno Center, i.e. a department considered to have patients from the centre.

	No. complications						Incidence per 100 PY					
	Hov	Midt	Nord	Sjll	Syd	Sum	Hov	Midt	Nord	Sjll	Syd	Sum
Type 1												
2006	28	39	6	23	31	127	0.4	0.7	0.2	0.6	0.5	0.5
2007	38	31	10	33	26	138	0.5	0.6	0.4	0.8	0.5	0.6
2008	31	39	10	21	34	135	0.4	0.7	0.4	0.5	0.6	0.5
2009	50	31	12	22	43	158	0.7	0.6	0.4	0.6	0.7	0.6
2010	36	40	15	30	36	157	0.5	0.7	0.6	0.8	0.6	0.6
2011	43	56	15	28	28	170	0.6	1.0	0.6	0.7	0.5	0.7
2012	30	31	9	28	24	122	0.4	0.5	0.3	0.7	0.4	0.5
2013	31	35	13	30	68	177	0.4	0.6	0.5	0.8	1.1	0.7
2014	35	36	11	14	43	139	0.4	0.6	0.4	0.4	0.7	0.5
2015	34	28	12	22	29	125	0.4	0.5	0.4	0.6	0.5	0.5
2016	50	28	17	20	21	136	0.6	0.5	0.6	0.5	0.3	0.5
SDC	27	4	10	15	*	58	0.8	0.3	0.7	0.6	0.2	0.6
Type 2												
2006	234	171	72	125	197	799	0.5	0.6	0.5	0.5	0.7	0.6
2007	287	224	92	174	215	992	0.6	0.8	0.6	0.7	0.7	0.7
2008	304	243	94	188	248	1,077	0.6	0.8	0.6	0.7	0.7	0.7
2009	362	292	118	181	284	1,237	0.7	0.9	0.7	0.7	0.8	0.8
2010	427	386	118	197	295	1,423	0.8	1.1	0.6	0.7	0.8	0.8
2011	470	617	172	269	357	1,885	0.8	1.5	0.9	0.8	0.9	1.0
2012	494	507	183	321	349	1,854	0.8	1.2	0.8	0.9	0.8	0.9
2013	621	495	155	344	510	2,125	1.0	1.1	0.7	0.9	1.1	1.0
2014	624	484	173	378	466	2,125	0.9	1.0	0.7	1.0	0.9	0.9
2015	591	490	201	370	542	2,194	0.9	1.0	0.8	0.9	1.1	0.9
2016	882	457	190	382	464	2,375	1.3	0.9	0.7	0.9	0.9	1.0
SDC	53	24	16	88	13	194	2.4	1.3	1.6	2.8	1.1	2.1

Incidens af diabetisk ketoacidose

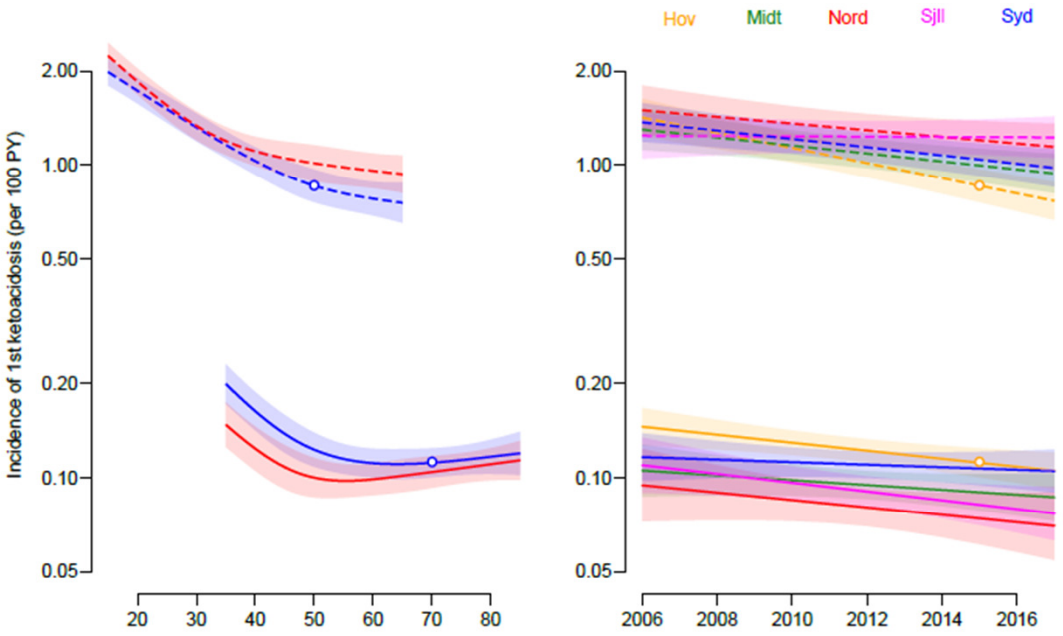

FIGURE 6.81: Left: Incidence rates of diabetic ketoacidosis by age in region Hovedstaden for T1D (broken lines) and T2D (full lines) for men (blue) and women (red).
Right: Incidence rates of diabetic ketoacidosis by date of follow-up for 50 year old T1D (broken lines) and 70 year old T2D (full lines) men for each region.

TABLE 6.96: Newly recorded events of diabetic ketoacidosis by region and calendar year. The line with "SDC" is for the persons reported to DVDD during 2016 from a Steno Center, i.e. a department considered to have patients from the centre.

	No. ketoacidosis events						Incidence per 100 PY					
	Hov	Midt	Nord	Sjll	Syd	Sum	Hov	Midt	Nord	Sjll	Syd	Sum
Type 1												
2006	98	68	44	48	79	337	3.7	3.2	5.0	3.4	3.6	3.6
2007	111	75	54	52	91	383	3.9	3.4	5.6	3.5	3.8	3.9
2008	95	82	61	69	140	447	3.1	3.4	5.8	4.4	5.5	4.2
2009	160	127	45	56	126	514	4.9	5.0	4.0	3.4	4.6	4.5
2010	121	99	62	75	134	491	3.5	3.6	5.2	4.3	4.7	4.1
2011	146	103	60	97	122	528	3.9	3.6	4.8	5.4	4.1	4.2
2012	127	132	75	82	96	512	3.2	4.3	5.7	4.4	3.1	3.9
2013	152	140	75	124	150	641	3.6	4.4	5.4	6.4	4.6	4.6
2014	160	104	80	141	185	670	3.7	3.1	5.5	7.0	5.4	4.6
2015	147	128	75	108	157	615	3.2	3.7	4.9	5.1	4.4	4.0
2016	119	122	83	93	147	564	2.5	3.4	5.2	4.2	4.0	3.5
SDC	33	19	39	37	23	151	2.0	2.2	5.6	3.2	3.3	3.0
Type 2												
2006	70	32	15	16	29	162	0.2	0.1	0.1	0.1	0.1	0.1
2007	73	44	21	31	45	214	0.2	0.2	0.2	0.2	0.2	0.2
2008	91	35	13	46	54	239	0.2	0.1	0.1	0.2	0.2	0.2
2009	94	41	21	52	44	252	0.2	0.1	0.1	0.2	0.1	0.2
2010	98	60	18	35	68	279	0.2	0.2	0.1	0.1	0.2	0.2
2011	85	41	26	42	68	262	0.2	0.1	0.1	0.1	0.2	0.1
2012	117	42	31	30	48	268	0.2	0.1	0.2	0.1	0.1	0.1
2013	103	47	27	47	93	317	0.2	0.1	0.1	0.1	0.2	0.2
2014	98	42	25	55	80	300	0.2	0.1	0.1	0.1	0.2	0.1
2015	120	56	23	40	77	316	0.2	0.1	0.1	0.1	0.2	0.1
2016	130	94	36	50	75	385	0.2	0.2	0.1	0.1	0.1	0.2
SDC	6	4	6	15	*	33	0.3	0.2	0.6	0.5	0.2	0.4

Hovedkonklusioner

- Kvaliteten af diabetesbehandling i Danmark er generelt høj, og betydelige forbedringer er sket i løbet af de sidste 15-20 år i niveauet af risikofaktorer.
- Der har varet et konstant fald i adskillige akutte, mikro- og makrovaskulare komplikationer.
- Dødeligheden er faldende både for type 1 og type 2 diabetes
- Der er ikke forskelle mellem regioner eller centre

Der er også rum for forbedring…

- Type 1 vs type 2 diabetes:
  - 70% højere dødelighed
  - Højere HbA1c, LDL kolesterol og mindre aggressiv behandling af CVD risikofaktorer
  - Højere aldersspecifikke incidensrater af akutte og mikrovaskulære komplikationer (inkl. amputationer)
- Der er stigende incidens af diabetisk nyresygdom
  - Kan skyldes ”healthy survivor effekt” og øget brug af RAS blokade/SGLT2i
- En utilstrækkelig (og stagnerende) andel af diabetespatienter er i lipidsænkende behandling
- Trods faldende incidens af diabetisk ketoacidose bør fremtidig incidens monitoreres med øget brug af insulinpumpe (T1D) og SGLT2i (T2D)

Perspektiver

- Bidrag til skabelon for fremtidig kvalitetsmonitorering og identifikation af indsatsområder
- Ønske om ensartede definitioner
  - Identifikation af populationen
  - Klassifikation af diabetes
- Niveau for afrapportering: små tal, tværgående indsatser
- Potentiale for forbedrede (og tidstro?) data med:
  - Indberetning fra region Midt
  - Indberetning fra almen praksis, herunder ydelseskode for diabetes
  - Data fra fodterapeuter
  - Adgang til data for præhospitalsbehandling (hypoglykæmi)
  - Adgang til yderligere data (PRO, neuropati, komorbiditet, livsstilsfaktorer, sensor/pumpe upload)