Sex and age-specific mortality for cardiovascular disease among people with and without diabetes

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https://github.com/jimb0w/CCVD

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Contents

1 Data cleaning

The rationale behind the data cleaning has been explained previously (REF).

```
cd /Users/jed/Documents/CCVD/
*copy "/Users/jed/Documents/CM/Consortium COD database v6.csv" "Consortium COD database v6.csv"
set seed 1312
*Australia
import delimited "Consortium COD database v6.csv", clear
keep if substr(country,1,9)=="Australia"
drop if cal < 2005
rename sex SEX
gen sex = 0 if SEX == "F"
replace sex = 1 if SEX == "M"
replace pys_nondm = pys_totpop-pys_dm
rename (alldeath_dm alldeath_nondm alldeath_totpop) (alldeath_d_dm alldeath_d_nondm alldeath_d_pop)
foreach i in cvd chd cbd hfd {
gen max_`i´ = min(`i´_d_pop,5)
quietly replace `i´_d_dm = runiformint(0,max_`i´) if `i´_d_dm ==.
}
foreach i in cvd chd cbd hfd {
count if `i´_d_dm > `i´_d_pop
}
foreach i in cvd chd cbd hfd {
quietly replace `i´_d_nondm = `i´_d_pop-`i´_d_dm
}
keep if age_gp1!=""
replace country = substr(country,1,9)
gen age_dm = substr(age_gp1,1,2)
replace age_dm = "30" if age_dm == "0-"
destring age_dm, replace
replace age_dm = age_dm+5
gen age_nondm = substr(age_gp1,1,2)
replace age_nondm = "15" if age_nondm == "0-"
destring age_nondm, replace
replace age_nondm = age_nondm+5
keep country calendar sex age_dm age_nondm pys_dm pys_nondm cvd_d_dm chd_d_dm cbd_d_dm hfd_d_dm cvd_
> d_nondm chd_d_nondm cbd_d_nondm hfd_d_nondm
save Australia, replace
*Canada
import delimited "Consortium COD database v6.csv", clear
keep if substr(country,1,6)=="Canada"
rename sex SEX
gen sex = 0 if SEX == "F"
replace sex = 1 if SEX == "M"
replace pys_nondm = pys_totpop-pys_dm
foreach i in cvd chd cbd hfd {
gen min_`i´ = max(`i´_d_dm,1) if `i´_d_dm!=.
replace min_`i´ = 1 if `i´_d_dm==.
replace `i´_d_dm=0 if `i´_d_pop==0
replace `i´_d_pop = runiformint(min_`i´,9) if `i´_d_pop==.
gen max_`i´ = min(`i´_d_pop,9)
replace `i´_d_dm = runiformint(1,max_`i´) if `i´_d_dm ==.
}
foreach i in cvd chd cbd hfd {
count if `i´_d_dm > `i´_d_pop
}
foreach i in cvd chd cbd hfd {
quietly replace `i´_d_nondm = `i´_d_pop-`i´_d_dm
}
keep if age_gp1!=""
replace country = substr(country,1,6)
gen age_dm = substr(age_gp1,1,2)
replace age_dm = "30" if age_dm == "0-"
destring age_dm, replace
replace age_dm = age_dm+5
gen age_nondm = substr(age_gp1,1,2)
```

```
replace age_nondm = "15" if age_nondm == "0-"
destring age_nondm, replace
replace age_nondm = age_nondm+5
keep country calendar sex age_dm age_nondm pys_dm pys_nondm cvd_d_dm chd_d_dm cbd_d_dm hfd_d_dm cvd_
> d_nondm chd_d_nondm cbd_d_nondm hfd_d_nondm
save Canada, replace
*Denmark
import delimited "Consortium COD database v6.csv", clear
keep if substr(country,1,7)=="Denmark"
rename sex SEX
gen sex = 0 if SEX == "F"
replace sex = 1 if SEX == "M"
foreach i in cvd chd cbd hfd {
quietly replace `i´_d_nondm = runiformint(1,3) if `i´_d_nondm==.
quietly replace `i´_d_dm = runiformint(1,3) if `i´_d_dm ==.
}
gen age_dm = substr(age_gp1,1,2)
replace age_dm = "30" if age_dm == "0-"
destring age_dm, replace
replace age_dm = age_dm+5
gen age_nondm = substr(age_gp1,1,2)
replace age_nondm = "15" if age_nondm == "0-"
destring age_nondm, replace
replace age_nondm = age_nondm+5
replace country = "Denmark"
keep country calendar sex age_dm age_nondm pys_dm pys_nondm cvd_d_dm chd_d_dm cbd_d_dm hfd_d_dm cvd_
> d_nondm chd_d_nondm cbd_d_nondm hfd_d_nondm
save Denmark, replace
*Finland
import delimited "Consortium COD database v6.csv", clear
keep if substr(country,1,7)=="Finland"
rename sex SEX
gen sex = 0 if SEX == "F"
replace sex = 1 if SEX == "M"
foreach i in cvd chd cbd hfd {
quietly replace `i´_d_nondm = runiformint(1,5) if `i´_d_nondm==.
quietly replace `i´_d_dm = runiformint(1,5) if `i´_d_dm ==.
}
gen age_dm = substr(age_gp1,1,2)
replace age_dm = "30" if age_dm == "0-"
destring age_dm, replace
replace age_dm = age_dm+5
gen age_nondm = substr(age_gp1,1,2)
replace age_nondm = "15" if age_nondm == "0-"
destring age_nondm, replace
replace age_nondm = age_nondm+5
keep country calendar sex age_dm age_nondm pys_dm pys_nondm cvd_d_dm chd_d_dm cbd_d_dm hfd_d_dm cvd_
> d_nondm chd_d_nondm cbd_d_nondm hfd_d_nondm
save Finland, replace
*France
import delimited "Consortium COD database v6.csv", clear
keep if substr(country,1,8)=="France_1"
rename sex SEX
gen sex = 0 if SEX == "F"
replace sex = 1 if SEX == "M"
replace country = substr(country,1,6)
foreach i in cvd chd cbd hfd {
replace `i´_d_nondm = runiformint(1,4) if `i´_d_nondm==.
replace `i´_d_dm = runiformint(1,4) if `i´_d_dm ==.
}
gen age_dm = substr(age_gp1,1,2)
replace age_dm = "30" if age_dm == "0-"
destring age_dm, replace
replace age_dm = age_dm+5
gen age_nondm = substr(age_gp1,1,2)
replace age_nondm = "15" if age_nondm == "0-"
destring age_nondm, replace
replace age_nondm = age_nondm+5
```

```
keep country calendar sex age_dm age_nondm pys_dm pys_nondm cvd_d_dm chd_d_dm cbd_d_dm hfd_d_dm cvd_
> d_nondm chd_d_nondm cbd_d_nondm hfd_d_nondm
save France, replace
*Lithuania
import delimited "Consortium COD database v6.csv", clear
keep if country == "Lithuania"
rename sex SEX
gen sex = 0 if SEX == "F"
replace sex = 1 if SEX == "M"
gen age_dm = substr(age_gp1,1,2)
replace age_dm = "30" if age_dm == "0-"
destring age_dm, replace
replace age_dm = age_dm+5
gen age_nondm = substr(age_gp1,1,2)
replace age_nondm = "15" if age_nondm == "0-"
destring age_nondm, replace
replace age_nondm = age_nondm+5
recode dmd_d_nondm .=0
keep country calendar sex age_dm age_nondm pys_dm pys_nondm cvd_d_dm chd_d_dm cbd_d_dm hfd_d_dm cvd_
> d_nondm chd_d_nondm cbd_d_nondm hfd_d_nondm
save Lithuania, replace
*Scotland
import delimited "Consortium COD database v6.csv", clear
keep if country == "Scotland"
rename sex SEX
gen sex = 0 if SEX == "F"
replace sex = 1 if SEX == "M"
foreach i in cvd chd cbd hfd {
replace `i´_d_nondm = `i´_d_pop-`i´_d_dm
}
replace pys_nondm = pys_totpop-pys_dm
gen age_dm = substr(age_gp1,1,2)
replace age_dm = "30" if age_dm == "0-"
destring age_dm, replace
replace age_dm = age_dm+5
gen age_nondm = substr(age_gp1,1,2)
replace age_nondm = substr(age_gp2,1,2) if cal <= 2015
replace age_nondm = "15" if age_nondm == "0-"
destring age_nondm, replace
replace age_nondm = age_nondm+5
replace age_nondm = age_nondm+2.5 if age_nondm == 85 & cal <= 2015
replace pys_dm =. if age_dm==.
replace pys_nondm =. if age_nondm==.
foreach i in cvd chd cbd hfd {
replace `i´_d_dm = . if age_dm==.
replace `i´_d_nondm = . if age_nondm==.
}
keep country calendar sex age_dm age_nondm pys_dm pys_nondm cvd_d_dm chd_d_dm cbd_d_dm hfd_d_dm cvd_
> d_nondm chd_d_nondm cbd_d_nondm hfd_d_nondm
save Scotland, replace
*South Korea
import delimited "Consortium COD database v6.csv", clear
keep if country=="South Korea"
rename sex SEX
gen sex = 0 if SEX == "F"
replace sex = 1 if SEX == "M"
drop if age_gp4=="all ages"
drop if age_gp1 == "90+" & cal <= 2010
rename (alldeath_dm alldeath_nondm alldeath_totpop) (alldeath_d_dm alldeath_d_nondm alldeath_d_pop)
gen age_dm = substr(age_gp1,1,2)
replace age_dm = "30" if age_dm == "0-"
destring age_dm, replace
replace age_dm = age_dm+5
gen age_nondm = substr(age_gp1,1,2)
replace age_nondm = "15" if age_nondm == "0-"
destring age_nondm, replace
replace age_nondm = age_nondm+5
replace country = "SKorea"
```

```
keep country calendar sex age_dm age_nondm pys_dm pys_nondm cvd_d_dm chd_d_dm cbd_d_dm hfd_d_dm cvd_
> d_nondm chd_d_nondm cbd_d_nondm hfd_d_nondm
save SKorea, replace
clear
foreach c in Australia Canada Denmark Finland France Lithuania Scotland SKorea {
append using `c´
}
replace country = "Canada (Alberta)" if country == "Canada"
replace country = "South Korea" if country == "SKorea"
bysort country (cal) : egen lb = min(cal)
bysort country (cal) : egen ub = max(cal)
tostring lb ub, replace
gen rang = lb+ "-" + ub
collapse (sum) pys_dm pys_nondm cvd_d_dm-hfd_d_dm cvd_d_nondm-hfd_d_nondm, by(country sex rang)
expand 2
bysort country sex : gen DM = _n-1
tostring sex pys_dm-DM, replace force format(%15.0fc)
gen pys = pys_dm if DM == "1"
replace pys = pys_nondm if DM == "0"
foreach i in cvd chd cbd hfd {
gen `i´ = `i´_d_dm if DM == "1"
replace `i´ = `i´_d_nondm if DM == "0"
}
keep country-rang DM-hfd
order country rang DM sex
sort country rang DM sex
gen njm = _n
bysort country DM (njm) : replace DM ="" if _n!=1
bysort country (njm) : replace rang ="" if _n!=1
bysort country (njm) : replace country ="" if _n!=1
sort njm
replace DM = "No diabetes" if DM == "0"
replace DM = "Diabetes" if DM == "1"
replace sex = "Female" if sex == "0"
replace sex = "Male" if sex == "1"
drop njm
export delimited using T1.csv, delimiter(":") novarnames replace
```

Table 1.1: Summary of data included in the analysis.

Country	Period	Diabetes status	Sex	Person-years of follow-up	Death counts by cause of death CVD	CHD	CBD	HFD
Australia	2005-2019	No diabetes	Female	131,621,405	239,112	93,970	69,337	17,015
			Male	128,841,354	207,589	106,515	43,697	10,444
		Diabetes	Female	5,208,083	40,208	18,193	9,738	3,156
			Male	5,889,560	50,469	28,327	9,462	3,258
Canada (Alberta)	2005-2020	No diabetes	Female	31,856,052	36,495	16,486	7,612	2,588
			Male	31,998,428	35,527	21,039	5,021	1,712
		Diabetes	Female	1,749,550	15,366	7,634	2,779	1,274
			Male	2,163,971	19,685	12,198	2,748	1,143
Denmark	2002-2019	No diabetes	Female	47,999,917	116,692	35,531	34,595	9,418
			Male	46,993,523	107,745	40,735	25,865	7,629
		Diabetes	Female	1,844,344	19,316	6,881	5,224	1,672
			Male	2,071,414	24,107	10,374	5,181	2,129
Finland	2000-2017	No diabetes	Female	46,015,832	103,001	58,551	33,500	2,491
			Male	44,057,257	102,432	70,393	23,185	1,078
		Diabetes	Female	2,911,525	54,506	32,040	11,789	1,000
			Male	3,023,860	51,384	34,174	8,500	515
France	2013-2020	No diabetes	Female	248,386,875	398,245	66,025	97,982	60,806
			Male	218,181,642	313,608	88,596	63,773	37,755
		Diabetes	Female	10,932,947	75,088	18,016	16,704	10,918
			Male	12,594,448	90,925	31,894	17,082	11,089
Lithuania	2014-2021	No diabetes	Female	11,564,058	85,770	54,258	22,493	96
			Male	10,078,198	63,343	40,731	13,156	93
		Diabetes	Female	653,558	18,406	11,628	4,662	16
			Male	446,916	11,431	7,655	2,235	4
Scotland	2006-2020	No diabetes	Female	39,339,945	101,075	38,417	34,698	2,910
			Male	36,563,096	92,998	49,769	21,122	1,710
		Diabetes	Female	1,842,509	21,465	10,016	6,120	614
			Male	2,292,250	26,267	15,682	5,410	541
South Korea	2007-2019	No diabetes	Female	6,216,486	4,833	974	2,025	525
			Male	6,208,026	4,278	1,174	1,856	226
		Diabetes	Female	596,993	3,362	759	1,380	346
			Male	618,623	2,922	799	1,277	186

Abbreviations: CVD – cardiovascular disease; CHD – coronary heart disease; CBD – cerebrovascular disease; HFD – heart failure;

2 Crude rates

```
*mkdir GPH
foreach c in Australia Canada Denmark Finland France Lithuania Scotland SKorea {
use `c´, clear
if "`c´" == "Canada" {
local co = "Canada (Alberta)"
}
else if "`c´" == "SKorea" {
local co = "South Korea"
}
else {
local co = "`c´"
}
collapse (sum) pys_dm pys_nondm cvd_d_dm-hfd_d_dm cvd_d_nondm-hfd_d_nondm, by(calendar sex)
foreach i in cvd chd cbd hfd {
if "`i´" == "cvd" {
local oo = "Cardiovascular disease"
}
if "`i´" == "chd" {
local oo = "Coronary heart disease"
}
if "`i´" == "cbd" {
local oo = "Cerebrovascular disease"
}
if "`i´" == "hfd" {
local oo = "Heart failure"
}
foreach iii in dm nondm {
if "`iii´" == "dm" {
local dd = "with"
}
if "`iii´" == "nondm" {
local dd = "without"
}
gen `iii´_`i´ = 1000*`i´_d_`iii´/pys_`iii´
twoway ///
(connected `iii´_`i´ cal if sex == 0, col(red)) ///
(connected `iii´_`i´ cal if sex == 1, col(blue)) ///
, graphregion(color(white)) ///
ytitle(Mortality rate (per 1,000 person-years), margin(a+2)) ///
xtitle(Calendar year) ///
legend(order( ///
1 "Females" ///
2 "Males" ///
) cols(1) position(3) region(lcolor(none) color(none))) ///
ylabel(,angle(0) format(%9.2f)) ///
title("People `dd´ diabetes", placement(west) size(medium) col(black))
graph save GPH/cr_`i´_`iii´_`c´, replace
}
graph combine ///
GPH/cr_`i´_dm_`c´.gph ///
GPH/cr_`i´_nondm_`c´.gph ///
, graphregion(color(white)) cols(2) altshrink xsize(10)
}
}
```

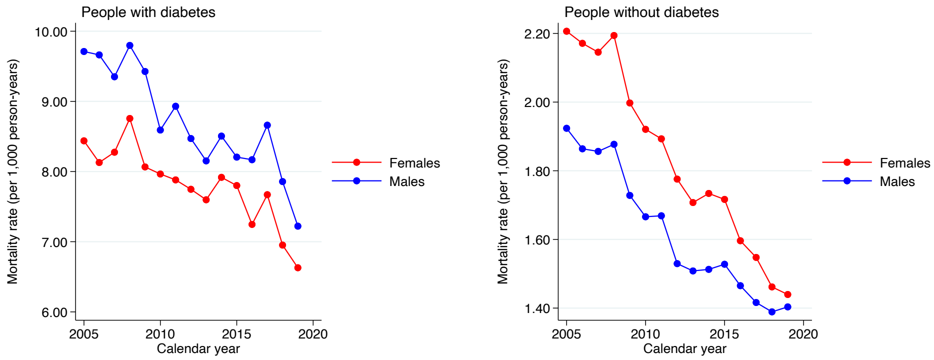


Figure 2.1: Crude mortality rate by cause of death, sex, and diabetes status. Cardiovascular disease. Australia.

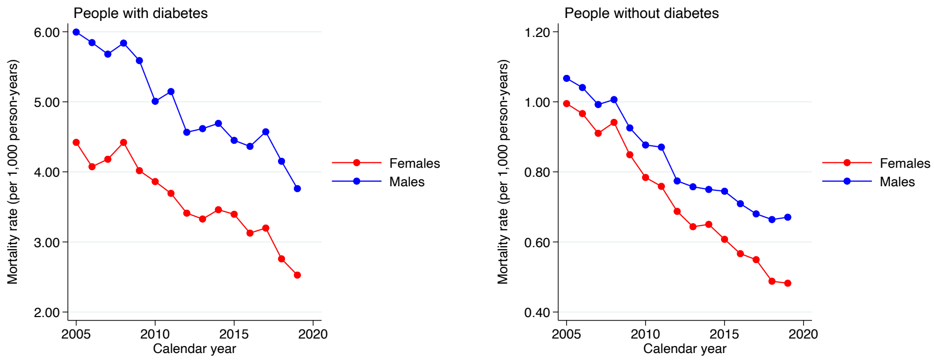


Figure 2.2: Crude mortality rate by cause of death, sex, and diabetes status. Coronary heart disease. Australia.

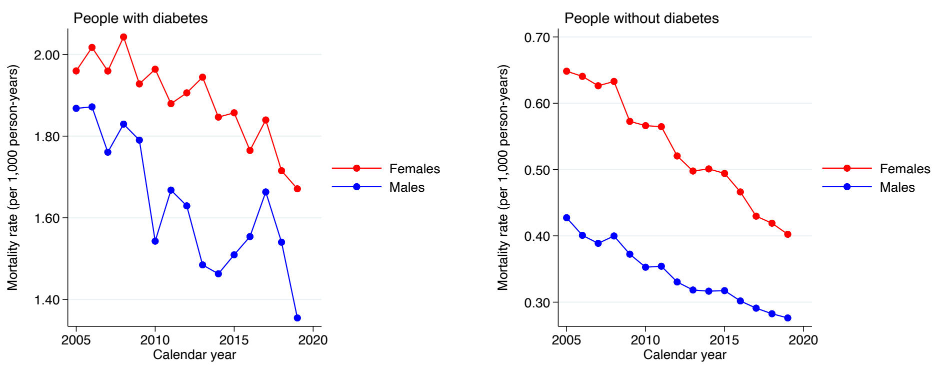


Figure 2.3: Crude mortality rate by cause of death, sex, and diabetes status. Cerebrovascular disease. Australia.

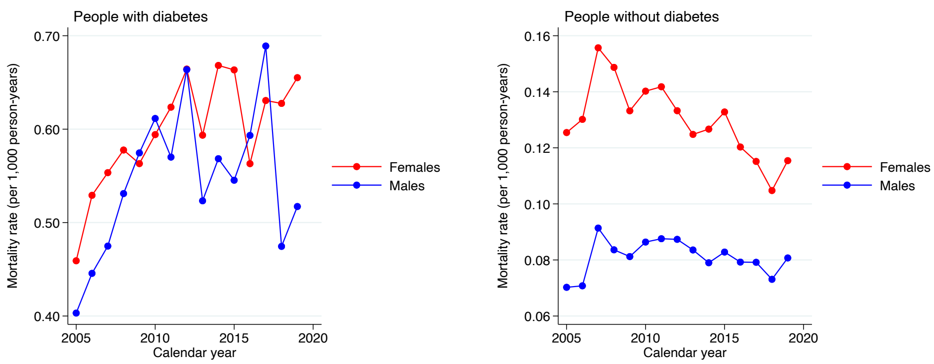


Figure 2.4: Crude mortality rate by cause of death, sex, and diabetes status. Heart failure. Australia.

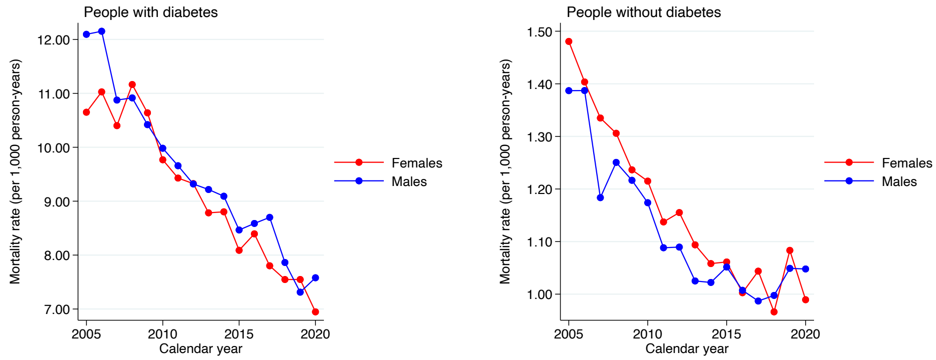


Figure 2.5: Crude mortality rate by cause of death, sex, and diabetes status. Cardiovascular disease. Canada (Alberta).

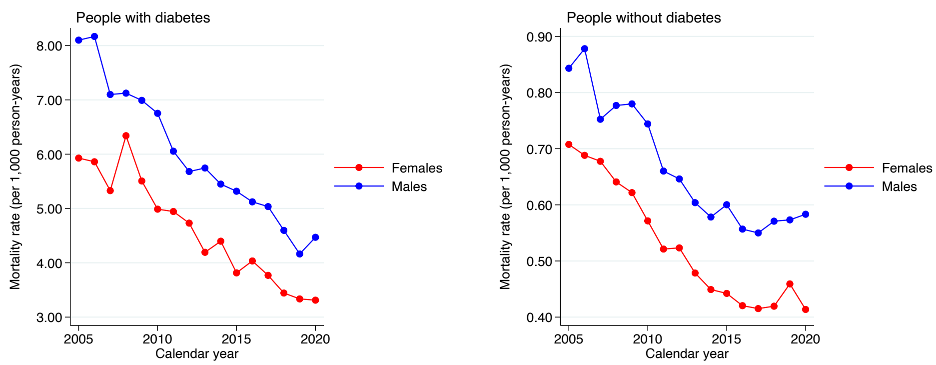


Figure 2.6: Crude mortality rate by cause of death, sex, and diabetes status. Coronary heart disease. Canada (Alberta).

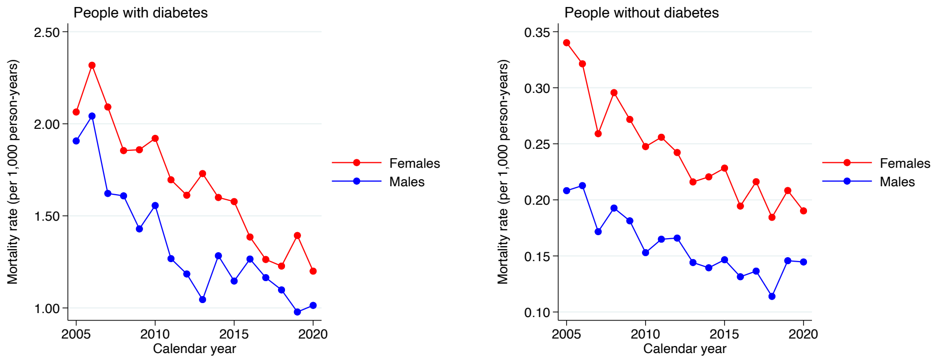


Figure 2.7: Crude mortality rate by cause of death, sex, and diabetes status. Cerebrovascular disease. Canada (Alberta).

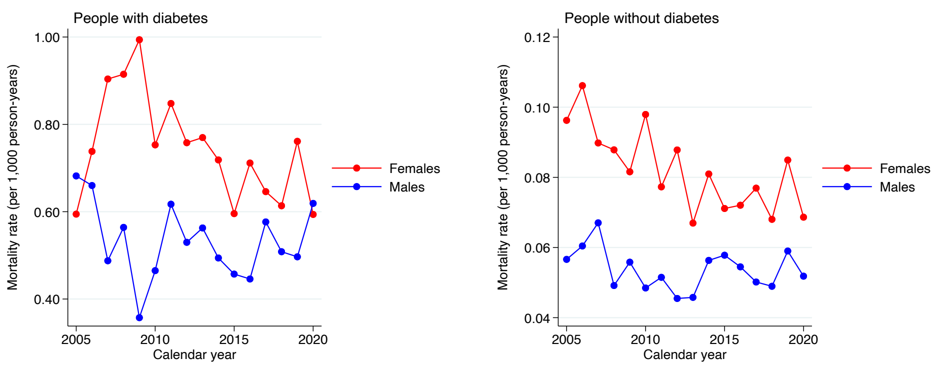


Figure 2.8: Crude mortality rate by cause of death, sex, and diabetes status. Heart failure. Canada (Alberta).

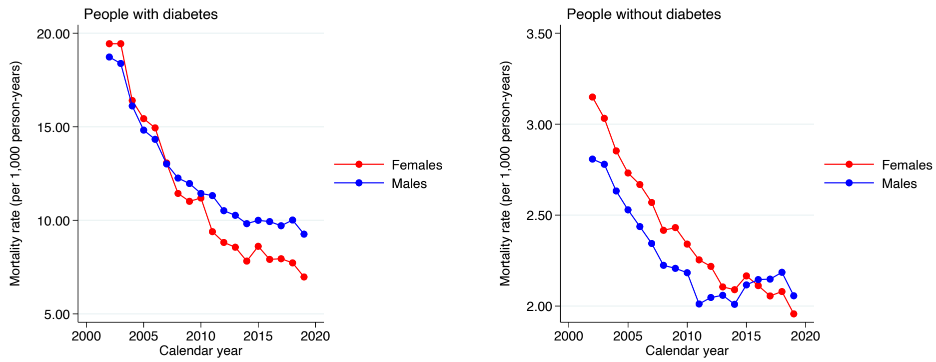


Figure 2.9: Crude mortality rate by cause of death, sex, and diabetes status. Cardiovascular disease. Denmark.

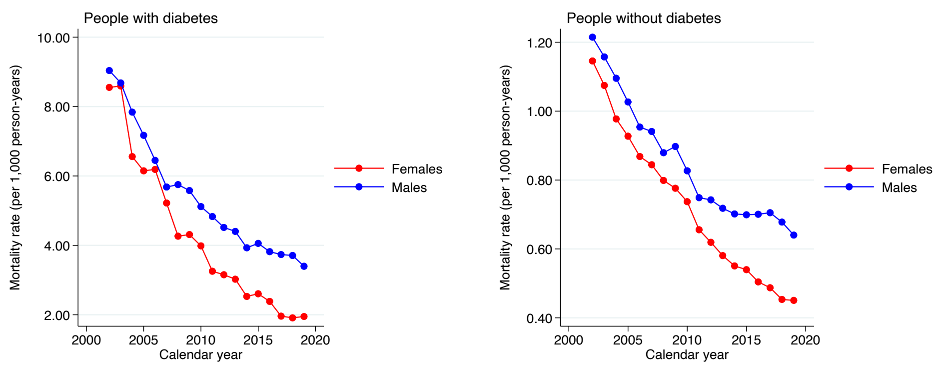


Figure 2.10: Crude mortality rate by cause of death, sex, and diabetes status. Coronary heart disease. Denmark.

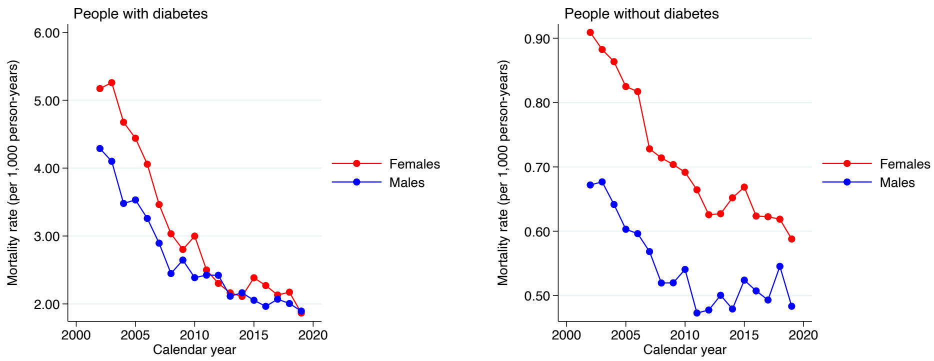


Figure 2.11: Crude mortality rate by cause of death, sex, and diabetes status. Cerebrovascular disease. Denmark.

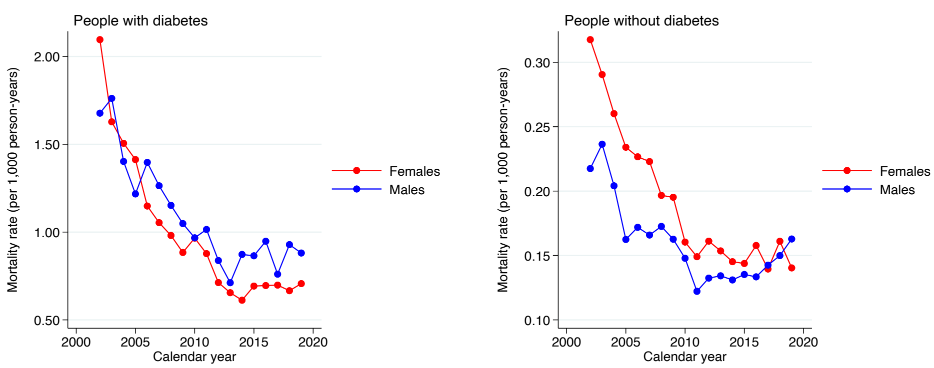


Figure 2.12: Crude mortality rate by cause of death, sex, and diabetes status. Heart failure. Denmark.

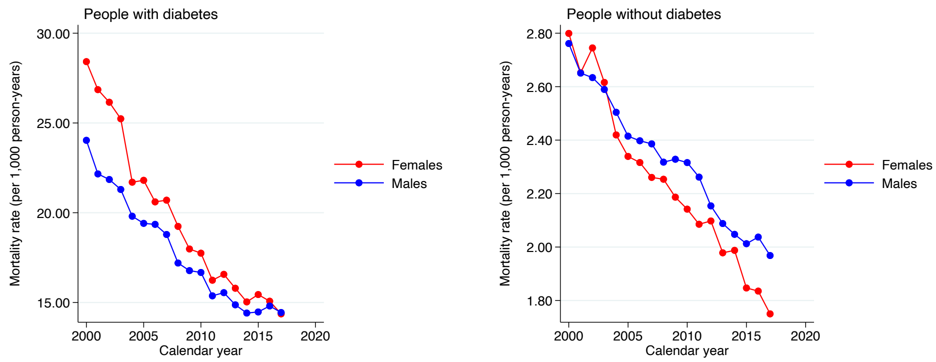


Figure 2.13: Crude mortality rate by cause of death, sex, and diabetes status. Cardiovascular disease. Finland.

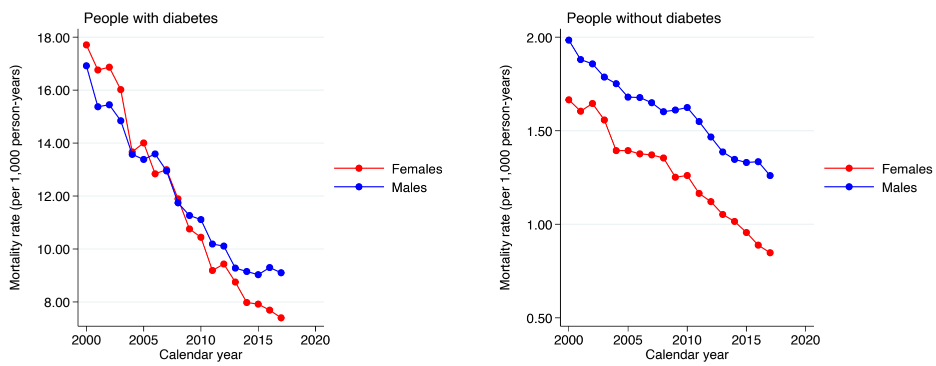


Figure 2.14: Crude mortality rate by cause of death, sex, and diabetes status. Coronary heart disease. Finland.

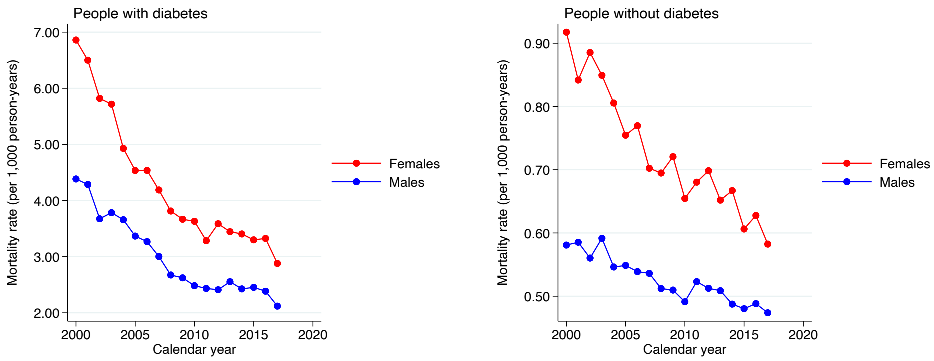


Figure 2.15: Crude mortality rate by cause of death, sex, and diabetes status. Cerebrovascular disease. Finland.

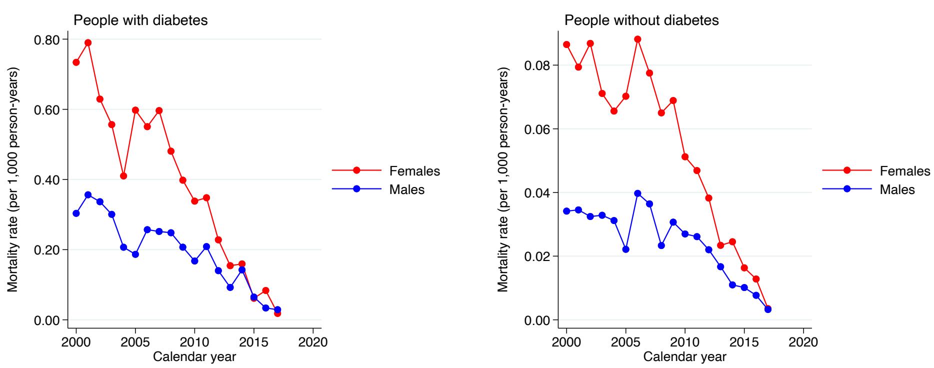


Figure 2.16: Crude mortality rate by cause of death, sex, and diabetes status. Heart failure. Finland.

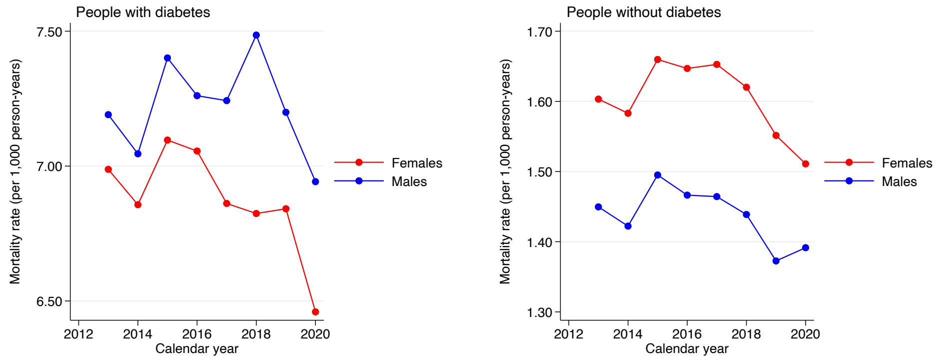


Figure 2.17: Crude mortality rate by cause of death, sex, and diabetes status. Cardiovascular disease. France.

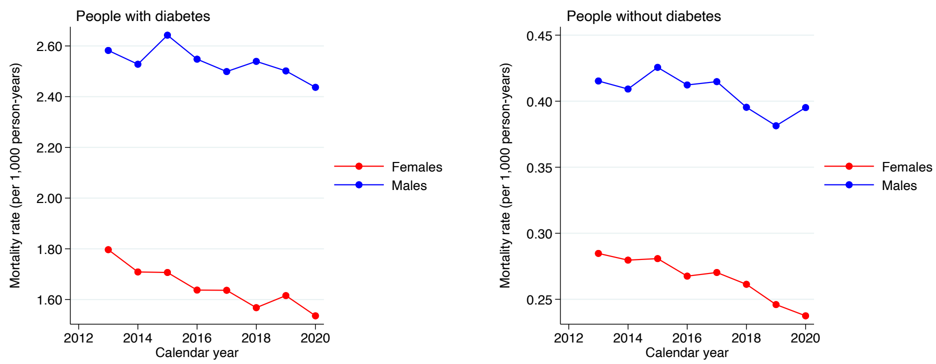


Figure 2.18: Crude mortality rate by cause of death, sex, and diabetes status. Coronary heart disease. France.

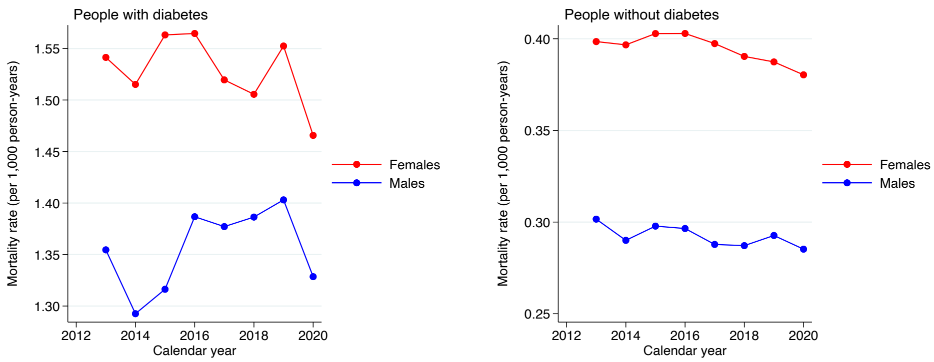


Figure 2.19: Crude mortality rate by cause of death, sex, and diabetes status. Cerebrovascular disease. France.

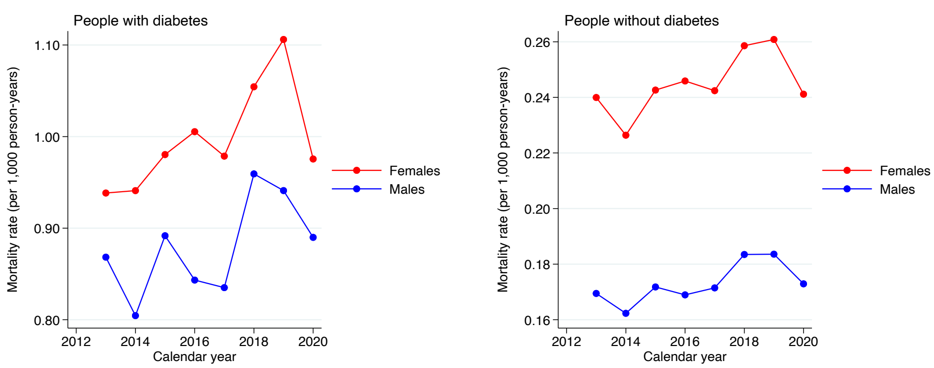


Figure 2.20: Crude mortality rate by cause of death, sex, and diabetes status. Heart failure. France.

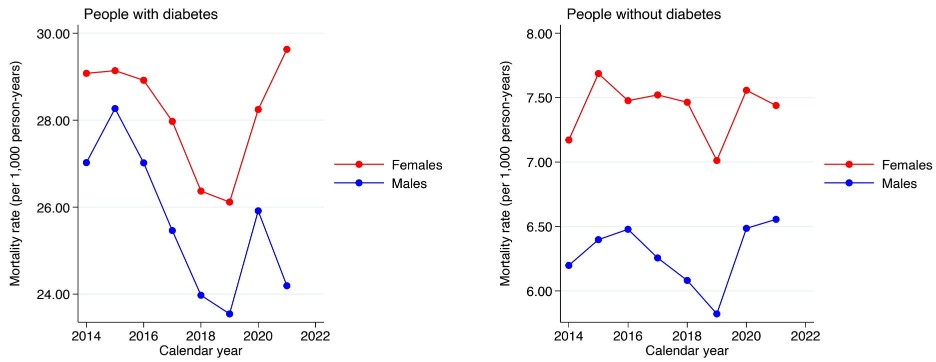


Figure 2.21: Crude mortality rate by cause of death, sex, and diabetes status. Cardiovascular disease. Lithuania.

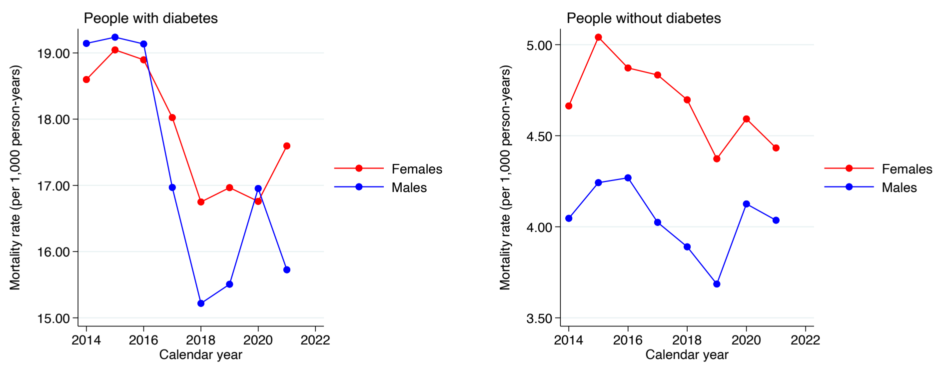


Figure 2.22: Crude mortality rate by cause of death, sex, and diabetes status. Coronary heart disease. Lithuania.

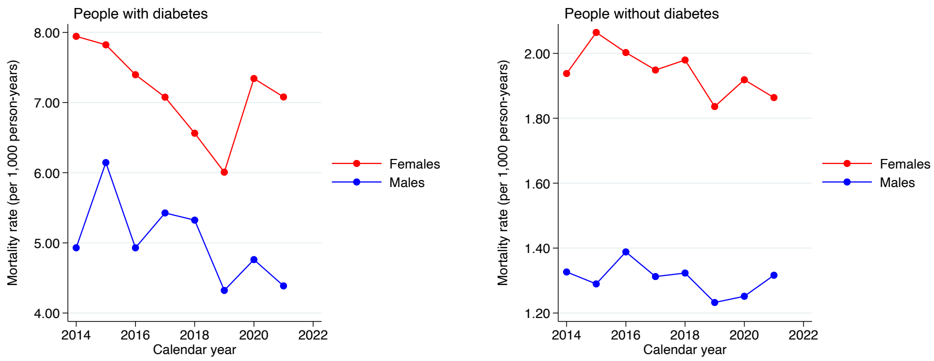


Figure 2.23: Crude mortality rate by cause of death, sex, and diabetes status. Cerebrovascular disease. Lithuania.

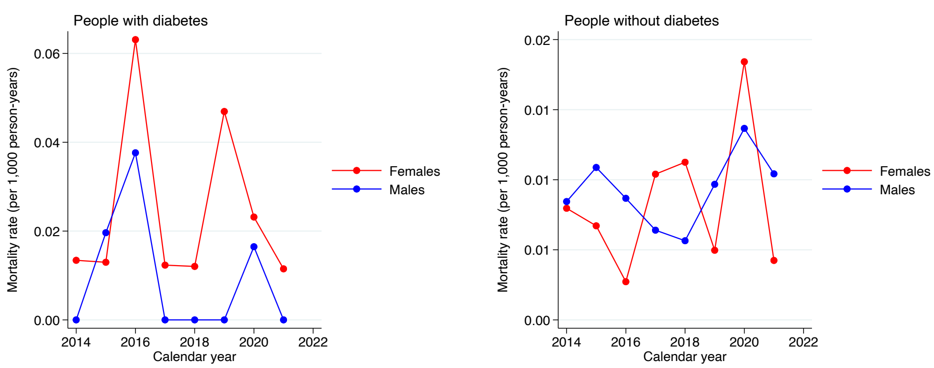


Figure 2.24: Crude mortality rate by cause of death, sex, and diabetes status. Heart failure. Lithuania.

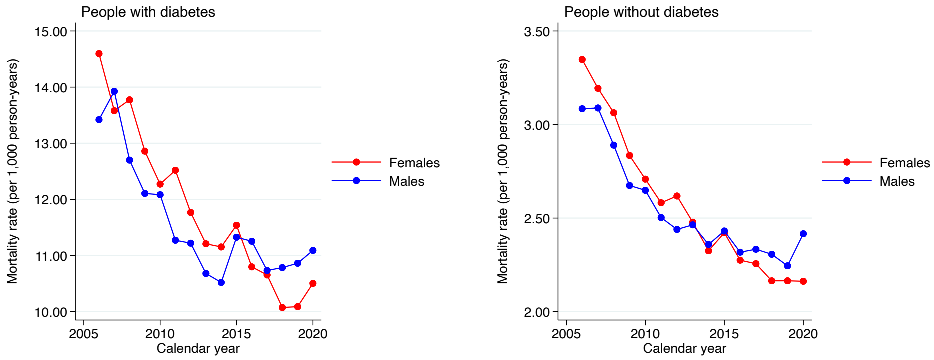


Figure 2.25: Crude mortality rate by cause of death, sex, and diabetes status. Cardiovascular disease. Scotland.

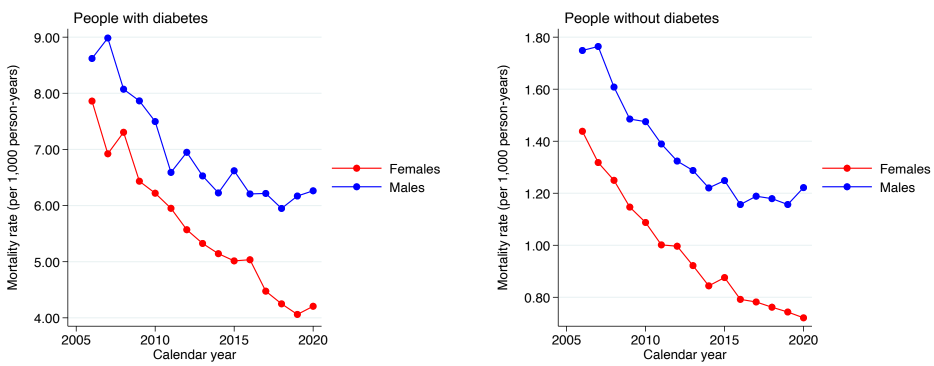


Figure 2.26: Crude mortality rate by cause of death, sex, and diabetes status. Coronary heart disease. Scotland.

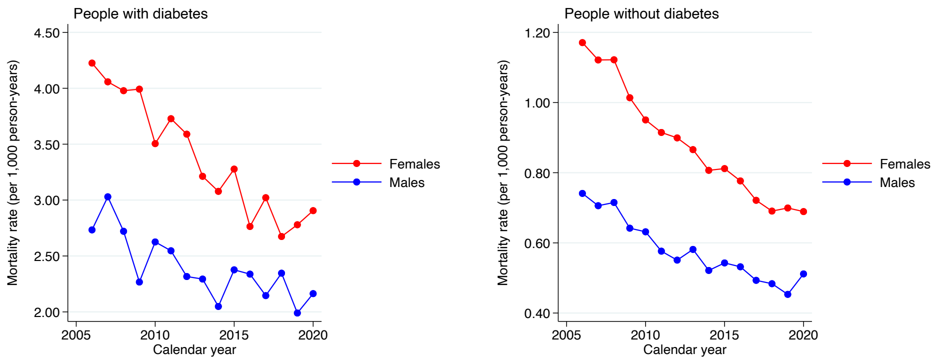


Figure 2.27: Crude mortality rate by cause of death, sex, and diabetes status. Cerebrovascular disease. Scotland.

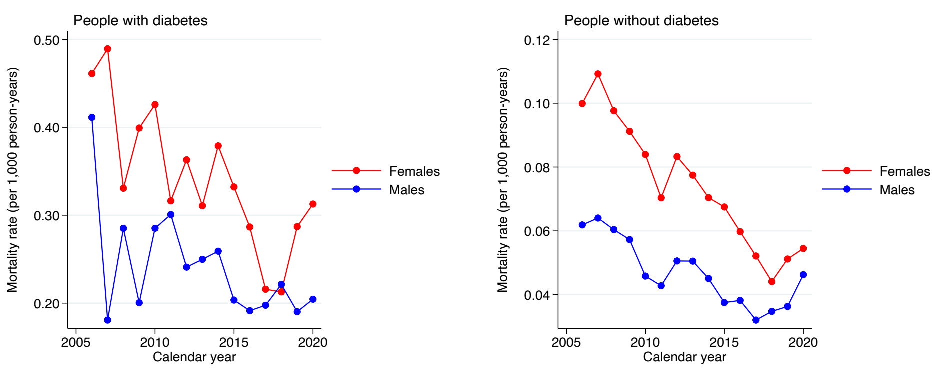


Figure 2.28: Crude mortality rate by cause of death, sex, and diabetes status. Heart failure. Scotland.

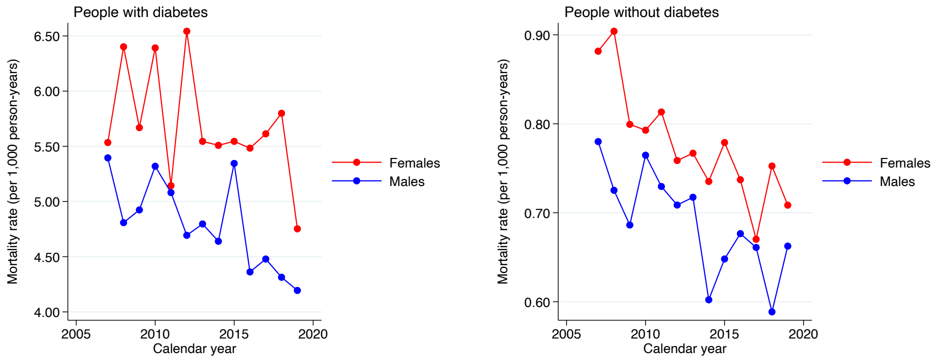


Figure 2.29: Crude mortality rate by cause of death, sex, and diabetes status. Cardiovascular disease. South Korea.

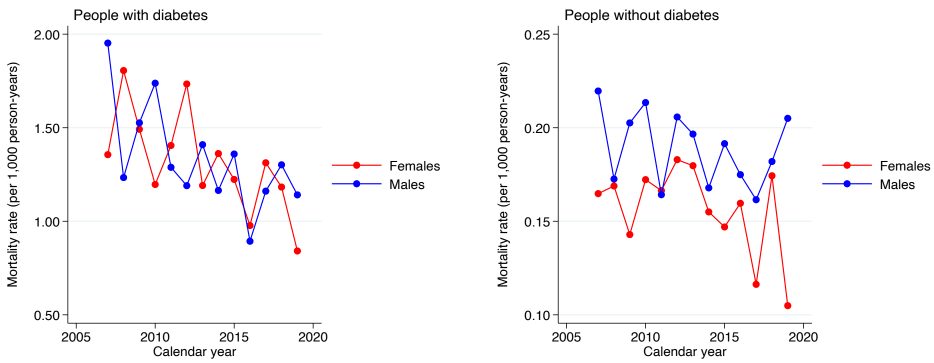


Figure 2.30: Crude mortality rate by cause of death, sex, and diabetes status. Coronary heart disease. South Korea.

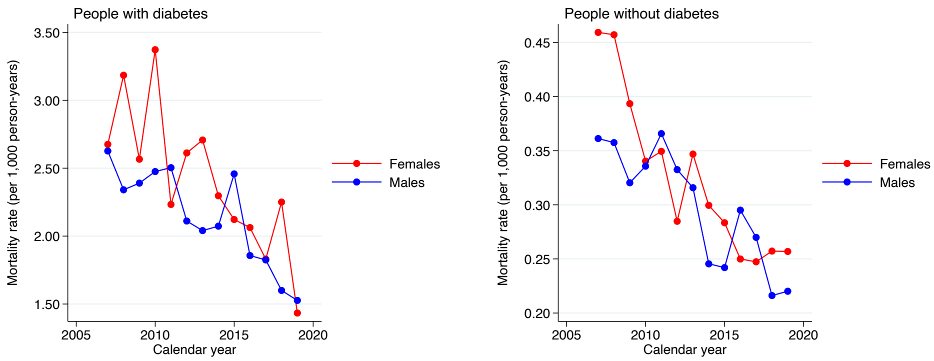


Figure 2.31: Crude mortality rate by cause of death, sex, and diabetes status. Cerebrovascular disease. South Korea.

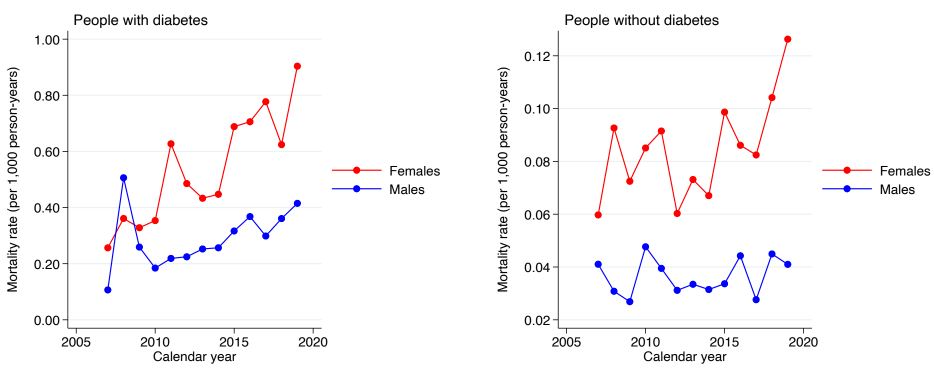


Figure 2.32: Crude mortality rate by cause of death, sex, and diabetes status. Heart failure. South Korea.

Coding issues are present for Finland and Lithuania for heart failure; deaths from heart failure in these countries will not be presented.

3 Age-specific rates and MRRs

Model fit checks have been performed in prior work (REF). Here, we just plot the age-specific mortality rates in people with and without diabetes, as well as age-specific mortality rate ratios (MRRs).

For rates, we will use age-period-cohort models. Each model will be a Poisson model, parameterised using spline effects of age, period, and cohort (period-age), with log of person-years as the offset. We will then use these models to estimate mortality rates for each country by age and sex.

For MRRs, we will use a model with spline effects of calendar time, a binary effect of sex, and an interaction between spline effects of age and diabetes status. We will then use this model to estimate the MRR for each country by age and sex.

All rates and MRRs are predicted in 2017

```
*mkdir MD
foreach i in Australia Canada Denmark Finland France Lithuania Scotland SKorea {
foreach ii in cvd chd cbd hfd {
foreach iii in dm nondm {
foreach iiii in 0 1 {
use `i´, clear
keep if sex == `iiii´
replace calendar = calendar-2009.5
gen coh = calendar-age_`iii´
centile(age_`iii´), centile(5 35 65 95)
local A1 = r(c_1)
local A2 = r(c_2)
local A3 = r(c_3)
local A4 = r(c_4)
mkspline agesp = age_`iii´, cubic knots(`A1´ `A2´ `A3´ `A4´)
su(calendar), detail
local rang = r(max)-r(min)
if `rang´ < 10 {
centile calendar, centile(25 75)
local CK1 = r(c_1)
local CK2 = r(c_2)
mkspline timesp = calendar, cubic knots(`CK1´ `CK2´)
}
else if inrange(`rang´,10,14.9) {
centile calendar, centile(10 50 90)
local CK1 = r(c_1)
local CK2 = r(c_2)
local CK3 = r(c_3)
mkspline timesp = calendar, cubic knots(`CK1´ `CK2´ `CK3´)
}
else {
centile calendar, centile(5 35 65 95)
local CK1 = r(c_1)
local CK2 = r(c_2)
local CK3 = r(c_3)
local CK4 = r(c_4)
mkspline timesp = calendar, cubic knots(`CK1´ `CK2´ `CK3´ `CK4´)
}
centile(coh), centile(5 35 65 95)
local CO1 = r(c_1)
local CO2 = r(c_2)
local CO3 = r(c_3)
local CO4 = r(c_4)
mkspline cohsp = coh, cubic knots(`CO1´ `CO2´ `CO3´ `CO4´)
poisson `ii´_d_`iii´ agesp* timesp* cohsp*, exposure(pys_`iii´)
clear
set obs 500
gen age = (_n/10)+39.9
gen calendar = 2017.5-2009.5
gen coh = calendar-age
```

```
gen pys_`iii´ = 1
mkspline agesp = age, cubic knots(`A1´ `A2´ `A3´ `A4´)
if `rang´ < 9.99 {
mkspline timesp = calendar, cubic knots(`CK1´ `CK2´)
}
else if inrange(`rang´,10,14.99) {
mkspline timesp = calendar, cubic knots(`CK1´ `CK2´ `CK3´)
}
else {
mkspline timesp = calendar, cubic knots(`CK1´ `CK2´ `CK3´ `CK4´)
}
mkspline cohsp = coh, cubic knots(`CO1´ `CO2´ `CO3´ `CO4´)
predict _Rate, ir
predict errr, stdp
replace _Rate = _Rate*1000
gen lb = exp(ln(_Rate)-1.96*errr)
gen ub = exp(ln(_Rate)+1.96*errr)
gen country = "`i´"
gen OC = "`ii´"
gen DM = "`iii´"
gen sex = `iiii´
keep age _Rate lb-sex
save MD/R_`i´_`ii´_`iii´_`iiii´, replace
}
}
}
}
foreach i in Australia Canada Denmark Finland France Lithuania Scotland SKorea {
use `i´, clear
expand 2
bysort cal age_dm sex : gen dm = _n-1
foreach ii in cvd_d chd_d cbd_d hfd_d pys age {
gen `ii´ = `ii´_dm if dm == 1
replace `ii´ = `ii´_nondm if dm == 0
drop `ii´_dm `ii´_nondm
}
drop if age==.
save `i´_long, replace
}
quietly {
foreach i in Australia Canada Denmark Finland France Lithuania Scotland SKorea {
foreach ii in cvd chd cbd hfd {
forval iii = 0/1 {
use `i´_long, clear
replace calendar = calendar-2009.5
gen coh = calendar-age
centile(age), centile(5 35 65 95)
local A1 = r(c_1)
local A2 = r(c_2)
local A3 = r(c_3)
local A4 = r(c_4)
mkspline agesp = age, cubic knots(`A1´ `A2´ `A3´ `A4´)
su(calendar), detail
local rang = r(max)-r(min)
if `rang´ < 10 {
centile calendar, centile(25 75)
local CK1 = r(c_1)
local CK2 = r(c_2)
mkspline timesp = calendar, cubic knots(`CK1´ `CK2´)
preserve
clear
set obs 500
gen age = (_n/10)+39.9
gen calendar = 2017.5-2009.5
mkspline agesp = age, cubic knots(`A1´ `A2´ `A3´ `A4´)
mkspline timesp = calendar, cubic knots(`CK1´ `CK2´)
forval a = 1/500 {
local A1`a´ = agesp1[`a´]
```

```
local A2`a´ = agesp2[`a´]
local A3`a´ = agesp3[`a´]
}
local T1 = timesp1[1]
restore
}
else if inrange(`rang´,10,14.9) {
centile calendar, centile(10 50 90)
local CK1 = r(c_1)
local CK2 = r(c_2)
local CK3 = r(c_3)
mkspline timesp = calendar, cubic knots(`CK1´ `CK2´ `CK3´)
preserve
clear
set obs 500
gen age = (_n/10)+39.9
gen calendar = 2017.5-2009.5
mkspline agesp = age, cubic knots(`A1´ `A2´ `A3´ `A4´)
mkspline timesp = calendar, cubic knots(`CK1´ `CK2´ `CK3´)
forval a = 1/500 {
local A1`a´ = agesp1[`a´]
local A2`a´ = agesp2[`a´]
local A3`a´ = agesp3[`a´]
}
local T1 = timesp1[1]
local T2 = timesp2[1]
restore
}
else {
centile calendar, centile(5 35 65 95)
local CK1 = r(c_1)
local CK2 = r(c_2)
local CK3 = r(c_3)
local CK4 = r(c_4)
mkspline timesp = calendar, cubic knots(`CK1´ `CK2´ `CK3´ `CK4´)
preserve
clear
set obs 500
gen age = (_n/10)+39.9
gen calendar = 2017.5-2009.5
mkspline agesp = age, cubic knots(`A1´ `A2´ `A3´ `A4´)
mkspline timesp = calendar, cubic knots(`CK1´ `CK2´ `CK3´ `CK4´)
forval a = 1/500 {
local A1`a´ = agesp1[`a´]
local A2`a´ = agesp2[`a´]
local A3`a´ = agesp3[`a´]
}
local T1 = timesp1[1]
local T2 = timesp2[1]
local T3 = timesp3[1]
restore
}
keep if sex == `iii´
poisson `ii´_d timesp* c.agesp*##i.dm, exposure(pys)
matrix A = (.,.,.)
if `rang´ < 10 {
forval a = 1/500 {
margins, dydx(dm) at(timesp1==`T1´ agesp1==`A1`a´´ agesp2==`A2`a´´ agesp3==`A3`a´´) predict(xb) atme
> ans
matrix A = (A\r(table)[1,2],r(table)[5,2],r(table)[6,2])
}
}
else if inrange(`rang´,10,14.9) {
forval a = 1/500 {
margins, dydx(dm) at(timesp1==`T1´ timesp2==`T2´ agesp1==`A1`a´´ agesp2==`A2`a´´ agesp3==`A3`a´´) pr
> edict(xb) atmeans
matrix A = (A\r(table)[1,2],r(table)[5,2],r(table)[6,2])
}
```

```
}
else {
forval a = 1/500 {
margins, dydx(dm) at(timesp1==`T1´ timesp2==`T2´ timesp3==`T3´ agesp1==`A1`a´´ agesp2==`A2`a´´ agesp
> 3==`A3`a´´) predict(xb) atmeans
matrix A = (A\r(table)[1,2],r(table)[5,2],r(table)[6,2])
}
}
clear
svmat A
replace A1 = exp(A1)
replace A2 = exp(A2)
replace A3 = exp(A3)
drop if A1==.
gen age = (_n/10)+39.9
gen sex = `iii´
gen OC = "`ii´"
gen country = "`i´"
save MD/SMRa_`i´_`ii´_`iii´, replace
}
}
}
}
foreach ii in cvd chd cbd hfd {
forval iiii = 0/1 {
foreach iii in dm nondm {
if `iiii´ == 0 {
local s = "Females"
}
if `iiii´ == 1 {
local s = "Males"
}
if "`iii´" == "dm" {
local w = "with"
}
if "`iii´" == "nondm" {
local w = "without"
}
clear
foreach i in Australia Canada Denmark Finland France Lithuania Scotland SKorea {
append using MD/R_`i´_`ii´_`iii´_`iiii´
}
keep if sex == `iiii´
local col1 = "0 0 255"
local col2 = "75 0 130"
local col3 = "255 0 255"
local col4 = "255 0 0"
local col5 = "255 125 0"
local col6 = "0 125 0"
local col7 = "0 175 255"
local col8 = "0 0 0"
replace country = "Canada (Alberta)" if country == "Canada"
replace country = "South Korea" if country == "SKorea"
preserve
bysort country : keep if _n == 1
forval i = 1/8 {
local C`i´ = country[`i´]
}
restore
if "`ii´" == "hfd" {
twoway ///
(rarea ub lb age if country == "`C1´", color("`col1´%30") fintensity(inten80) lwidth(none)) ///
(line _Rate age if country == "`C1´", color("`col1´") lpattern(solid)) ///
(rarea ub lb age if country == "`C2´", color("`col2´%30") fintensity(inten80) lwidth(none)) ///
(line _Rate age if country == "`C2´", color("`col2´") lpattern(solid)) ///
(rarea ub lb age if country == "`C3´", color("`col3´%30") fintensity(inten80) lwidth(none)) ///
(line _Rate age if country == "`C3´", color("`col3´") lpattern(solid)) ///
(rarea ub lb age if country == "`C5´", color("`col5´%30") fintensity(inten80) lwidth(none)) ///
```

```
(line _Rate age if country == "`C5´", color("`col5´") lpattern(solid)) ///
(rarea ub lb age if country == "`C7´", color("`col7´%30") fintensity(inten80) lwidth(none)) ///
(line _Rate age if country == "`C7´", color("`col7´") lpattern(solid)) ///
(rarea ub lb age if country == "`C8´", color("`col8´%30") fintensity(inten80) lwidth(none)) ///
(line _Rate age if country == "`C8´", color("`col8´") lpattern(solid)) ///
, legend(symxsize(0.13cm) position(3) region(lcolor(white) color(none)) ///
order(2 "`C1´" ///
4 "`C2´" ///
6 "`C3´" ///
8 "`C5´" ///
10 "`C7´" ///
12 "`C8´") ///
cols(1)) ///
graphregion(color(white)) ///
ylabel(0.0001 "0.0001" 0.001 "0.001" 0.01 "0.01" 0.1 "0.1" 1 10 100, grid angle(0)) ///
xscale(range(40 90)) ///
xlabel(40(10)90, nogrid) ///
yscale(log range(0.00007 120)) ///
ytitle("Mortality rate (per 1,000 person-years)", margin(a+2)) ///
xtitle("Age") ///
title("`s´ `w´ diabetes", placement(west) color(black) size(medium))
}
else {
twoway ///
(rarea ub lb age if country == "`C1´", color("`col1´%30") fintensity(inten80) lwidth(none)) ///
(line _Rate age if country == "`C1´", color("`col1´") lpattern(solid)) ///
(rarea ub lb age if country == "`C2´", color("`col2´%30") fintensity(inten80) lwidth(none)) ///
(line _Rate age if country == "`C2´", color("`col2´") lpattern(solid)) ///
(rarea ub lb age if country == "`C3´", color("`col3´%30") fintensity(inten80) lwidth(none)) ///
(line _Rate age if country == "`C3´", color("`col3´") lpattern(solid)) ///
(rarea ub lb age if country == "`C4´", color("`col4´%30") fintensity(inten80) lwidth(none)) ///
(line _Rate age if country == "`C4´", color("`col4´") lpattern(solid)) ///
(rarea ub lb age if country == "`C5´", color("`col5´%30") fintensity(inten80) lwidth(none)) ///
(line _Rate age if country == "`C5´", color("`col5´") lpattern(solid)) ///
(rarea ub lb age if country == "`C6´", color("`col6´%30") fintensity(inten80) lwidth(none)) ///
(line _Rate age if country == "`C6´", color("`col6´") lpattern(solid)) ///
(rarea ub lb age if country == "`C7´", color("`col7´%30") fintensity(inten80) lwidth(none)) ///
(line _Rate age if country == "`C7´", color("`col7´") lpattern(solid)) ///
(rarea ub lb age if country == "`C8´", color("`col8´%30") fintensity(inten80) lwidth(none)) ///
(line _Rate age if country == "`C8´", color("`col8´") lpattern(solid)) ///
, legend(symxsize(0.13cm) position(3) region(lcolor(white) color(none)) ///
order(2 "`C1´" ///
4 "`C2´" ///
6 "`C3´" ///
8 "`C4´" ///
10 "`C5´" ///
12 "`C6´" ///
14 "`C7´" ///
16 "`C8´") ///
cols(1)) ///
graphregion(color(white)) ///
ylabel(0.0001 "0.0001" 0.001 "0.001" 0.01 "0.01" 0.1 "0.1" 1 10 100, grid angle(0)) ///
xscale(range(40 90)) ///
xlabel(40(10)90, nogrid) ///
yscale(log range(0.00007 120)) ///
ytitle("Mortality rate (per 1,000 person-years)", margin(a+2)) ///
xtitle("Age") ///
title("`s´ `w´ diabetes", placement(west) color(black) size(medium))
}
graph save GPH/MD_`ii´_`iii´_`iiii´, replace
}
clear
foreach i in Australia Canada Denmark Finland France Lithuania Scotland SKorea {
append using MD/SMRa_`i´_`ii´_`iiii´
}
replace country = "Canada (Alberta)" if country == "Canada"
replace country = "South Korea" if country == "SKorea"
if "`ii´" == "hfd" {
```

```
twoway ///
(rarea A3 A2 age if country == "`C1´", color("`col1´%30") fintensity(inten80) lwidth(none)) ///
(line A1 age if country == "`C1´", color("`col1´") lpattern(solid)) ///
(rarea A3 A2 age if country == "`C2´", color("`col2´%30") fintensity(inten80) lwidth(none)) ///
(line A1 age if country == "`C2´", color("`col2´") lpattern(solid)) ///
(rarea A3 A2 age if country == "`C3´", color("`col3´%30") fintensity(inten80) lwidth(none)) ///
(line A1 age if country == "`C3´", color("`col3´") lpattern(solid)) ///
(rarea A3 A2 age if country == "`C5´", color("`col5´%30") fintensity(inten80) lwidth(none)) ///
(line A1 age if country == "`C5´", color("`col5´") lpattern(solid)) ///
(rarea A3 A2 age if country == "`C7´", color("`col7´%30") fintensity(inten80) lwidth(none)) ///
(line A1 age if country == "`C7´", color("`col7´") lpattern(solid)) ///
(rarea A3 A2 age if country == "`C8´", color("`col8´%30") fintensity(inten80) lwidth(none)) ///
(line A1 age if country == "`C8´", color("`col8´") lpattern(solid)) ///
, legend(symxsize(0.13cm) position(3) region(lcolor(white) color(none)) ///
order(2 "`C1´" ///
4 "`C2´" ///
6 "`C3´" ///
8 "`C5´" ///
10 "`C7´" ///
12 "`C8´") ///
cols(1)) ///
graphregion(color(white)) ///
ylabel(0.2 "0.2" 0.5 "0.5" 1 2 5 10 20 50 100 200 500, grid angle(0)) ///
xscale(range(40 90)) ///
xlabel(40(10)90, nogrid) ///
yline(1, lcol(black)) yscale(log range(0.08 700)) ///
ytitle("Mortality rate ratio", margin(a+2)) ///
xtitle("Age") ///
title("`s´", placement(west) color(black) size(medium))
}
else {
twoway ///
(rarea A3 A2 age if country == "`C1´", color("`col1´%30") fintensity(inten80) lwidth(none)) ///
(line A1 age if country == "`C1´", color("`col1´") lpattern(solid)) ///
(rarea A3 A2 age if country == "`C2´", color("`col2´%30") fintensity(inten80) lwidth(none)) ///
(line A1 age if country == "`C2´", color("`col2´") lpattern(solid)) ///
(rarea A3 A2 age if country == "`C3´", color("`col3´%30") fintensity(inten80) lwidth(none)) ///
(line A1 age if country == "`C3´", color("`col3´") lpattern(solid)) ///
(rarea A3 A2 age if country == "`C4´", color("`col4´%30") fintensity(inten80) lwidth(none)) ///
(line A1 age if country == "`C4´", color("`col4´") lpattern(solid)) ///
(rarea A3 A2 age if country == "`C5´", color("`col5´%30") fintensity(inten80) lwidth(none)) ///
(line A1 age if country == "`C5´", color("`col5´") lpattern(solid)) ///
(rarea A3 A2 age if country == "`C6´", color("`col6´%30") fintensity(inten80) lwidth(none)) ///
(line A1 age if country == "`C6´", color("`col6´") lpattern(solid)) ///
(rarea A3 A2 age if country == "`C7´", color("`col7´%30") fintensity(inten80) lwidth(none)) ///
(line A1 age if country == "`C7´", color("`col7´") lpattern(solid)) ///
(rarea A3 A2 age if country == "`C8´", color("`col8´%30") fintensity(inten80) lwidth(none)) ///
(line A1 age if country == "`C8´", color("`col8´") lpattern(solid)) ///
, legend(symxsize(0.13cm) position(3) region(lcolor(white) color(none)) ///
order(2 "`C1´" ///
4 "`C2´" ///
6 "`C3´" ///
8 "`C4´" ///
10 "`C5´" ///
12 "`C6´" ///
14 "`C7´" ///
16 "`C8´") ///
cols(1)) ///
graphregion(color(white)) ///
ylabel(0.2 "0.2" 0.5 "0.5" 1 2 5 10 20 50 100 200 500, grid angle(0)) ///
xscale(range(40 90)) ///
xlabel(40(10)90, nogrid) ///
yline(1, lcol(black)) yscale(log range(0.08 700)) ///
ytitle("Mortality rate ratio", margin(a+2)) ///
xtitle("Age") ///
title("`s´", placement(west) color(black) size(medium))
}
graph save GPH/SMRa_`ii´_`iiii´, replace
```

```
}
}
```

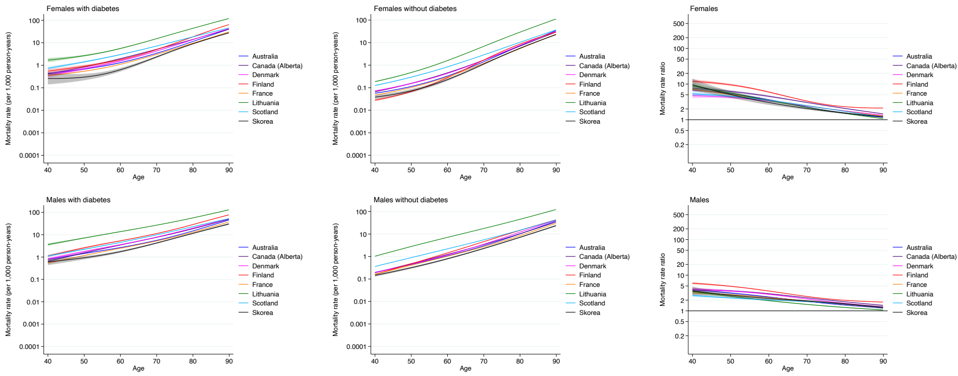


Figure 3.1: Mortality rate in people with and without diabetes and mortality rate ratio by age. Heart failure.

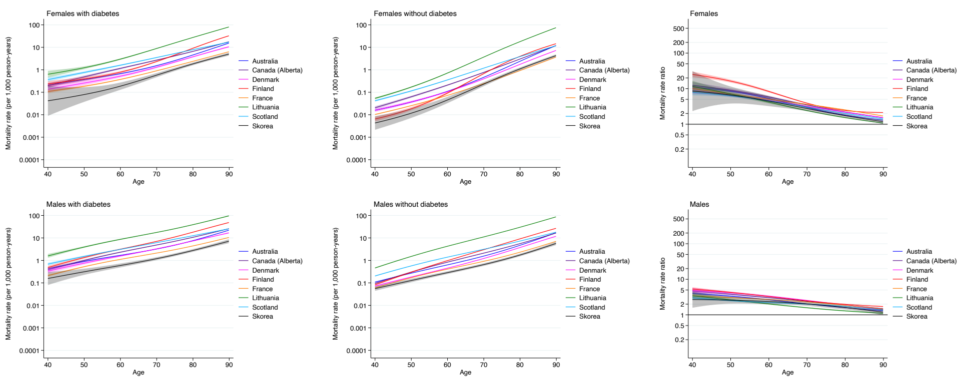


Figure 3.2: Mortality rate in people with and without diabetes and mortality rate ratio by age. Coronary heart disease.

```
foreach ii in cvd chd cbd hfd {
if "`i´" == "cvd" {
local oo = "Cardiovascular disease"
}
if "`ii´" == "chd" {
local oo = "Coronary heart disease"
}
if "`ii´" == "cbd" {
local oo = "Cerebrovascular disease"
}
if "`ii´" == "hfd" {
local oo = "Heart failure"
}
graph combine ///
GPH/MD_`ii´_dm_0.gph ///
GPH/MD_`ii´_nondm_0.gph ///
GPH/SMRa_`ii´_0.gph ///
GPH/MD_`ii´_dm_1.gph ///
GPH/MD_`ii´_nondm_1.gph ///
GPH/SMRa_`ii´_1.gph ///
, graphregion(color(white)) cols(3) altshrink xsize(10)
}
```

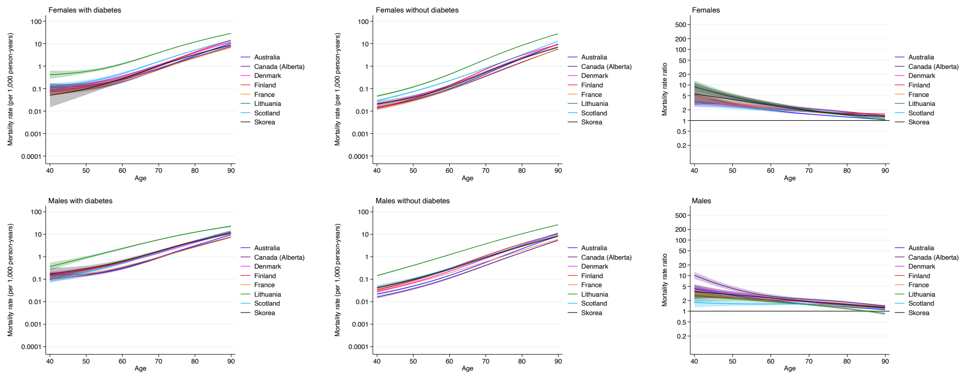


Figure 3.3: Mortality rate in people with and without diabetes and mortality rate ratio by age. Cerebrovascular disease.

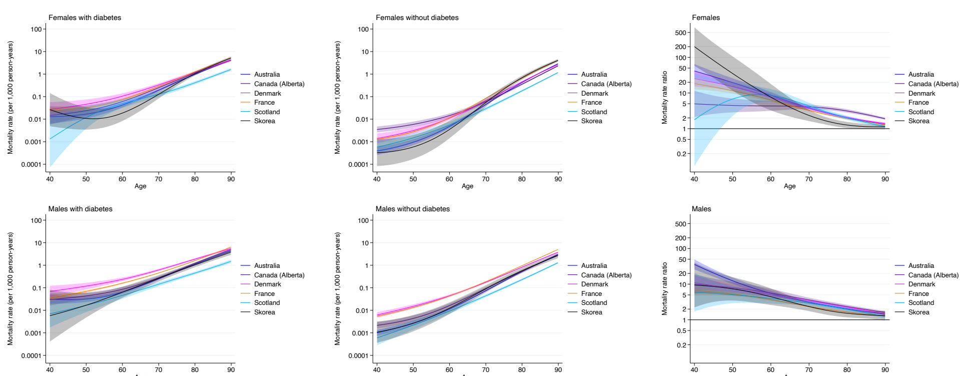


Figure 3.4: Mortality rate in people with and without diabetes and mortality rate ratio by age. Heart failure.

4 Age-specific rates over time

Same models as above, just presented differently.

```
foreach i in Australia Canada Denmark Finland France Lithuania Scotland SKorea {
foreach ii in cvd chd cbd hfd {
foreach iii in dm nondm {
foreach iiii in 0 1 {
use `i´, clear
keep if sex == `iiii´
replace calendar = calendar-2009.5
gen coh = calendar-age_`iii´
centile(age_`iii´), centile(5 35 65 95)
local A1 = r(c_1)
local A2 = r(c_2)
local A3 = r(c_3)
local A4 = r(c_4)
mkspline agesp = age_`iii´, cubic knots(`A1´ `A2´ `A3´ `A4´)
su(calendar), detail
local rang = r(max)-r(min)
if `rang´ < 10 {
centile calendar, centile(25 75)
local CK1 = r(c_1)
local CK2 = r(c_2)
mkspline timesp = calendar, cubic knots(`CK1´ `CK2´)
}
else if inrange(`rang´,10,14.9) {
centile calendar, centile(10 50 90)
local CK1 = r(c_1)
local CK2 = r(c_2)
local CK3 = r(c_3)
mkspline timesp = calendar, cubic knots(`CK1´ `CK2´ `CK3´)
}
else {
centile calendar, centile(5 35 65 95)
local CK1 = r(c_1)
local CK2 = r(c_2)
local CK3 = r(c_3)
local CK4 = r(c_4)
mkspline timesp = calendar, cubic knots(`CK1´ `CK2´ `CK3´ `CK4´)
}
centile(coh), centile(5 35 65 95)
local CO1 = r(c_1)
local CO2 = r(c_2)
local CO3 = r(c_3)
local CO4 = r(c_4)
mkspline cohsp = coh, cubic knots(`CO1´ `CO2´ `CO3´ `CO4´)
poisson `ii´_d_`iii´ agesp* timesp* cohsp*, exposure(pys_`iii´)
keep calendar
bysort cal : keep if _n == 1
expand 10
bysort cal : replace cal = cal+((_n-6)/10)
expand 6
bysort cal : gen age = (_n*10)+30
gen coh = calendar-age
gen pys_`iii´ = 1
mkspline agesp = age, cubic knots(`A1´ `A2´ `A3´ `A4´)
if `rang´ < 9.99 {
mkspline timesp = calendar, cubic knots(`CK1´ `CK2´)
}
else if inrange(`rang´,10,14.99) {
mkspline timesp = calendar, cubic knots(`CK1´ `CK2´ `CK3´)
}
else {
mkspline timesp = calendar, cubic knots(`CK1´ `CK2´ `CK3´ `CK4´)
}
mkspline cohsp = coh, cubic knots(`CO1´ `CO2´ `CO3´ `CO4´)
```

```
predict _Rate, ir
predict errr, stdp
replace _Rate = _Rate*1000
gen lb = exp(ln(_Rate)-1.96*errr)
gen ub = exp(ln(_Rate)+1.96*errr)
gen country = "`i´"
gen OC = "`ii´"
gen DM = "`iii´"
gen sex = `iiii´
keep age _Rate lb-sex cal
replace cal = cal+2009.5
save MD/R2_`i´_`ii´_`iii´_`iiii´, replace
}
}
}
}
foreach i in Australia Canada Denmark Finland France Lithuania Scotland SKorea {
foreach ii in cvd chd cbd hfd {
foreach iii in dm nondm {
foreach iiii in 0 1 {
if `iiii´ == 0 {
local s = "Females"
}
if `iiii´ == 1 {
local s = "Males"
}
if "`iii´" == "dm" {
local w = "with"
}
if "`iii´" == "nondm" {
local w = "without"
}
use inferno, clear
local col1 = var7[7]
local col2 = var7[6]
local col3 = var7[5]
local col4 = var7[4]
local col5 = var7[3]
local col6 = var7[2]
use MD/R2_`i´_`ii´_`iii´_`iiii´, clear
sort age cal
twoway ///
(rarea ub lb cal if age == 40, color("`col1´%30") fintensity(inten80) lwidth(none)) ///
(line _Rate cal if age == 40, color("`col1´") lpattern(solid)) ///
(rarea ub lb cal if age == 50, color("`col2´%30") fintensity(inten80) lwidth(none)) ///
(line _Rate cal if age == 50, color("`col2´") lpattern(solid)) ///
(rarea ub lb cal if age == 60, color("`col3´%30") fintensity(inten80) lwidth(none)) ///
(line _Rate cal if age == 60, color("`col3´") lpattern(solid)) ///
(rarea ub lb cal if age == 70, color("`col4´%30") fintensity(inten80) lwidth(none)) ///
(line _Rate cal if age == 70, color("`col4´") lpattern(solid)) ///
(rarea ub lb cal if age == 80, color("`col5´%30") fintensity(inten80) lwidth(none)) ///
(line _Rate cal if age == 80, color("`col5´") lpattern(solid)) ///
(rarea ub lb cal if age == 90, color("`col6´%30") fintensity(inten80) lwidth(none)) ///
(line _Rate cal if age == 90, color("`col6´") lpattern(solid)) ///
, legend(symxsize(0.13cm) position(3) region(lcolor(white) color(none)) ///
order(12 "90" ///
10 "80" ///
8 "70" ///
6 "60" ///
4 "50" ///
2 "40") ///
cols(1)) ///
graphregion(color(white)) ///
ylabel(0.00001 "0.00001" 0.0001 "0.0001" 0.001 "0.001" 0.01 "0.01" 0.1 "0.1" 1 "1" 10 "10" 100 "100"
> , grid angle(0)) ///
xlabel(, nogrid) ///
yscale(log range(0.00001 100)) ///
ytitle("Mortality rate (per 1,000 person-years)", margin(a+2)) ///
```

```
xtitle("Age") ///
title("`s´ `w´ diabetes", placement(west) color(black) size(medium))
graph save GPH/MD2_`i´_`ii´_`iii´_`iiii´, replace
}
}
}
}

foreach i in Australia Canada Denmark Finland France Lithuania Scotland SKorea {
if "`i´" == "Canada" {
local co = "Canada (Alberta)"
}
else if "`i´" == "SKorea" {
local co = "South Korea"
}
else {
local co = "`i´"
}
foreach ii in cvd chd cbd hfd {
if "`i´" == "cvd" {
local oo = "Cardiovascular disease"
}
if "`ii´" == "chd" {
local oo = "Coronary heart disease"
}
if "`ii´" == "cbd" {
local oo = "Cerebrovascular disease"
}
if "`ii´" == "hfd" {
local oo = "Heart failure"
}
if ("`i´" == "Finland" | "`i´" == "Lithuania") & "`ii´" == "hfd" {
}
else {
graph combine ///
GPH/MD2_`i´_`ii´_dm_0.gph ///
GPH/MD2_`i´_`ii´_nondm_0.gph ///
GPH/MD2_`i´_`ii´_dm_1.gph ///
GPH/MD2_`i´_`ii´_nondm_1.gph ///
, graphregion(color(white)) cols(2) altshrink xsize(5)
}
}
}
```

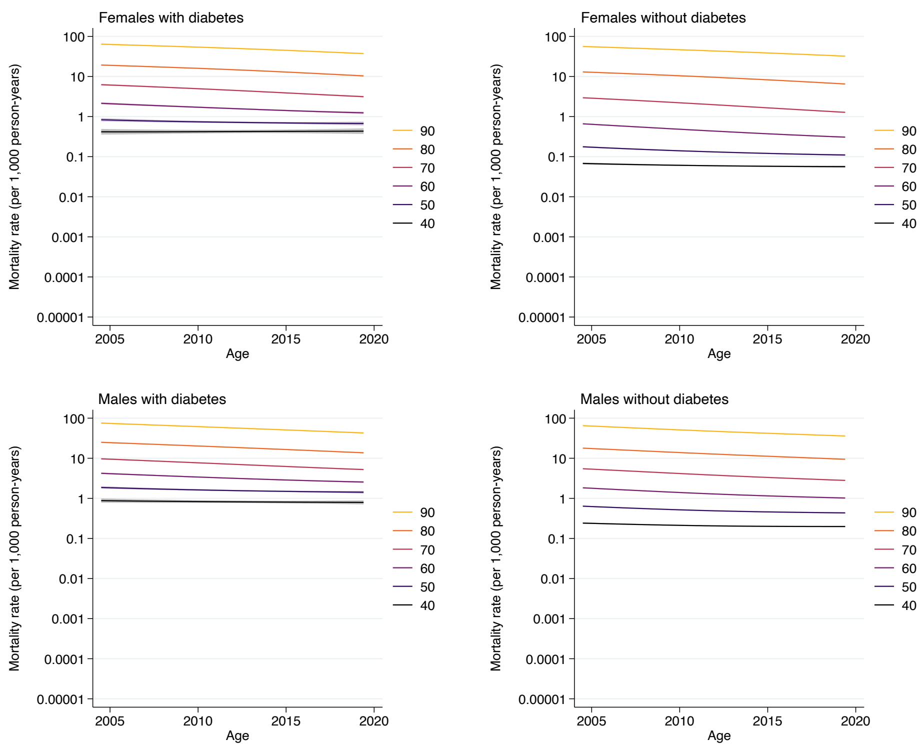


Figure 4.1: Mortality rate in people with and without diabetes by age and calendar time. Australia. Heart failure.

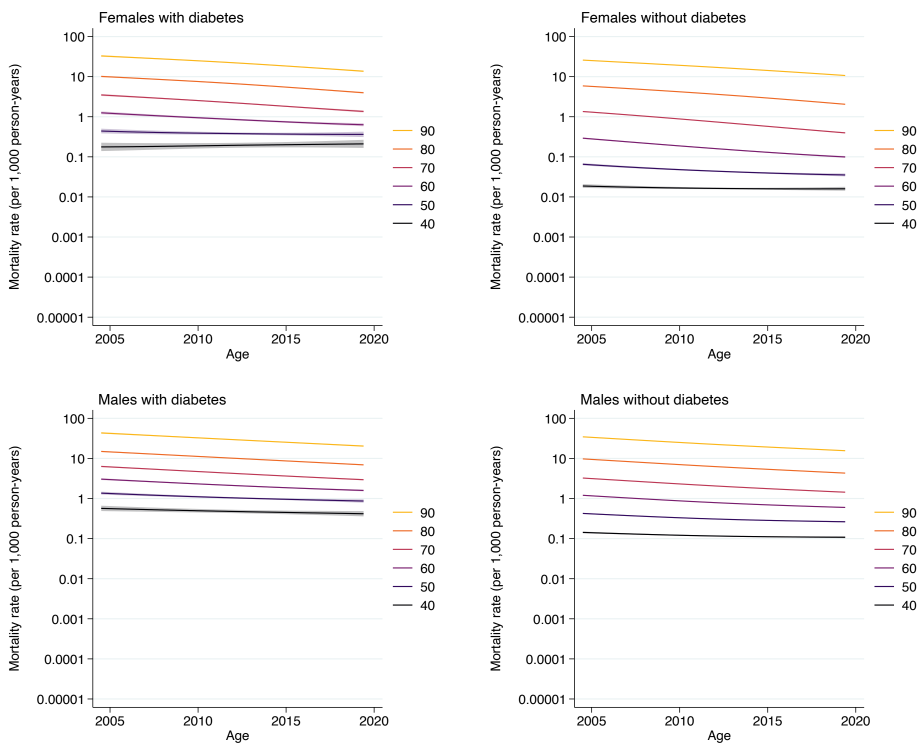


Figure 4.2: Mortality rate in people with and without diabetes by age and calendar time. Australia. Coronary heart disease.

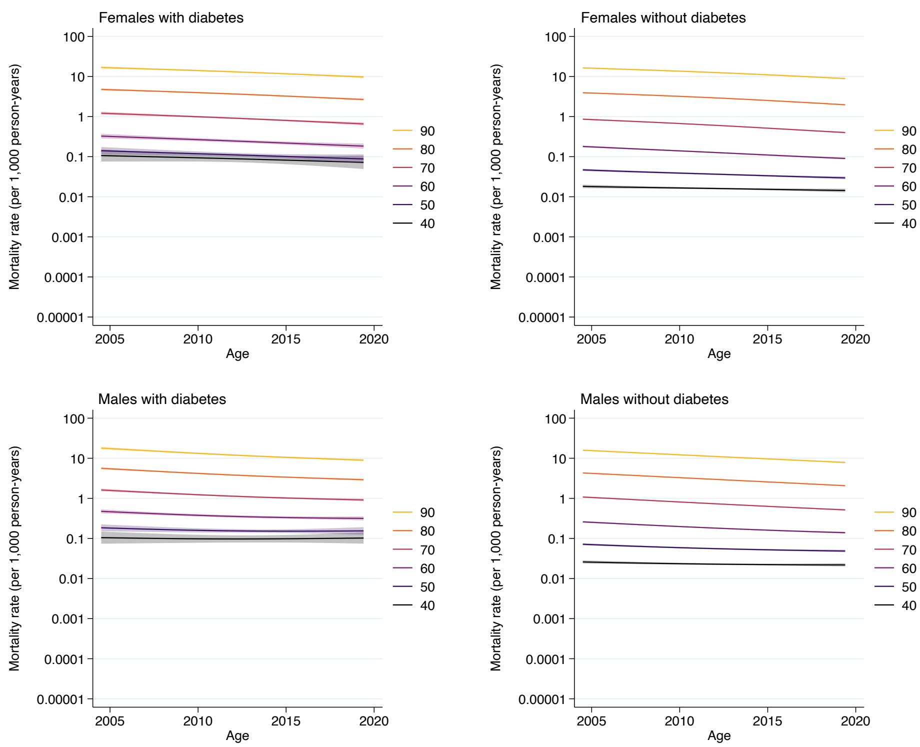


Figure 4.3: Mortality rate in people with and without diabetes by age and calendar time. Australia. Cerebrovascular disease.

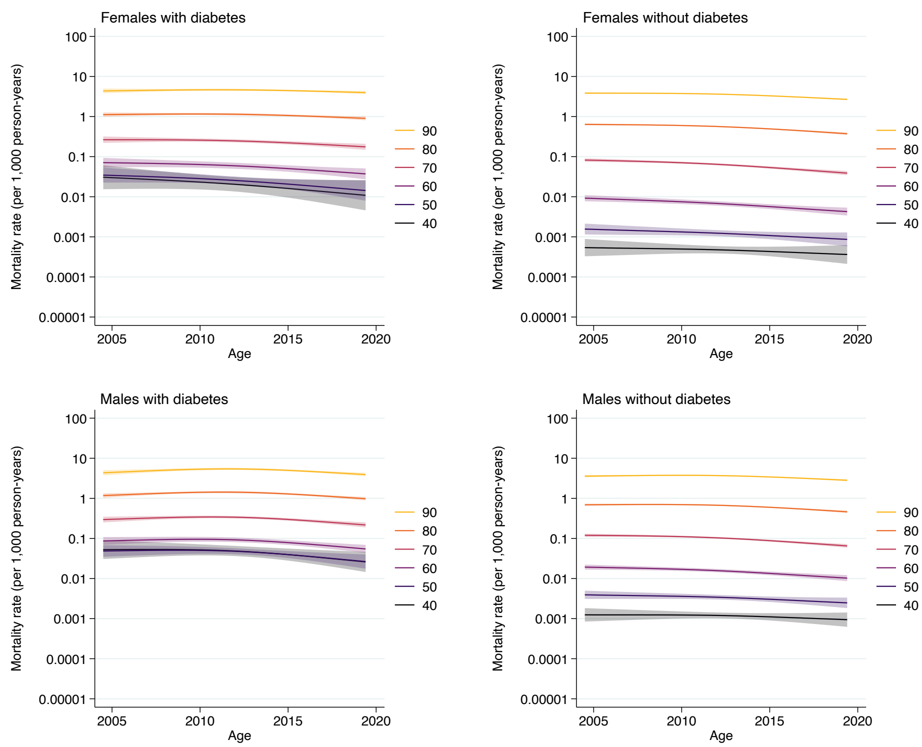


Figure 4.4: Mortality rate in people with and without diabetes by age and calendar time. Australia. Heart failure.

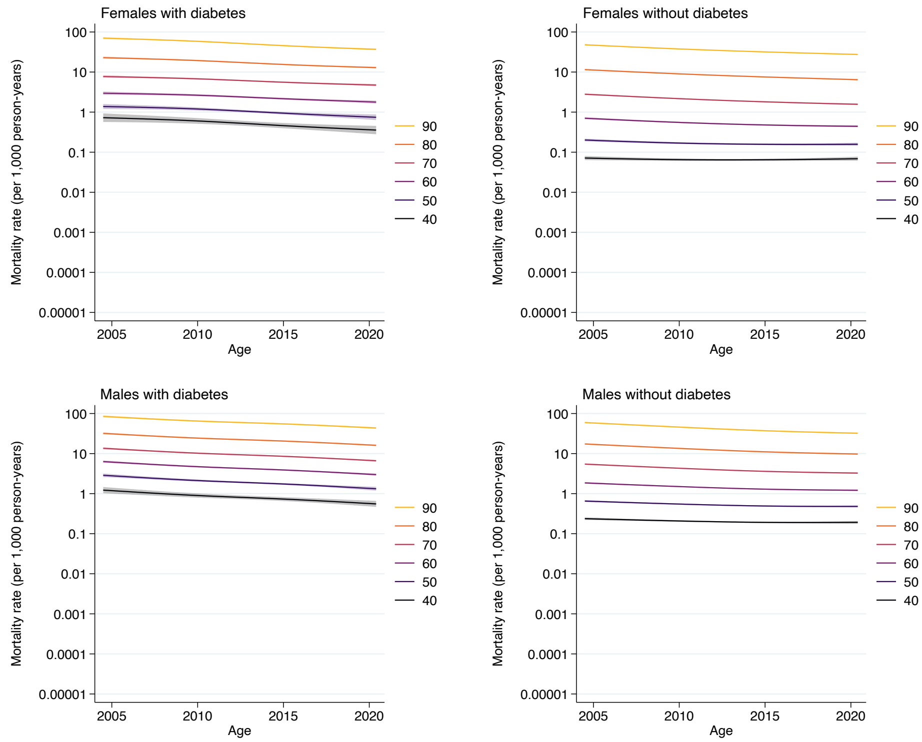


Figure 4.5: Mortality rate in people with and without diabetes by age and calendar time. Canada (Alberta). Heart failure.

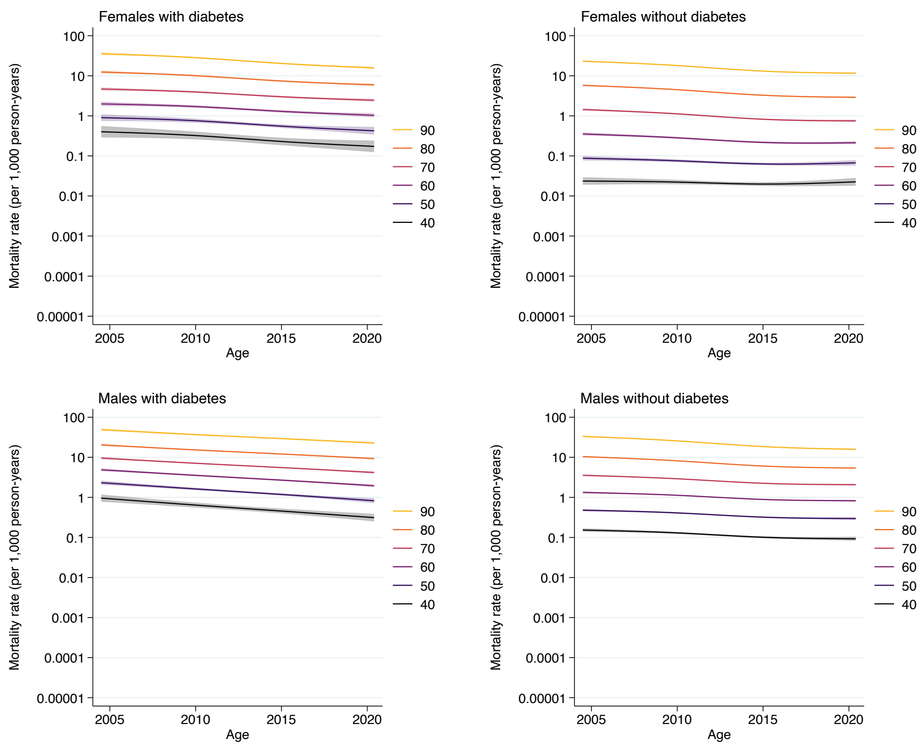


Figure 4.6: Mortality rate in people with and without diabetes by age and calendar time. Canada (Alberta). Coronary heart disease.

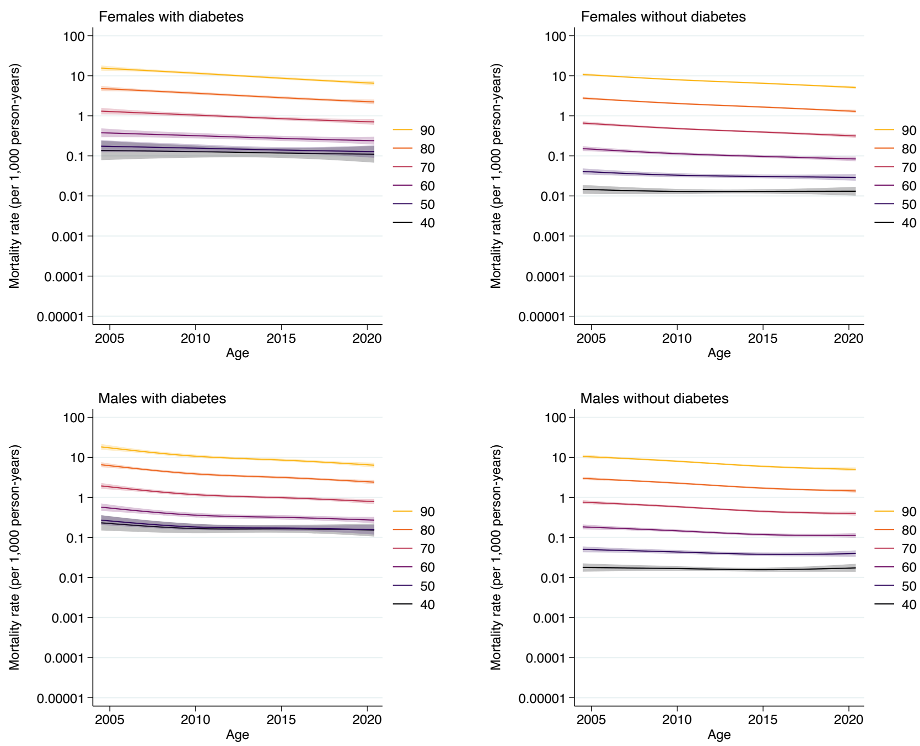


Figure 4.7: Mortality rate in people with and without diabetes by age and calendar time. Canada (Alberta). Cerebrovascular disease.

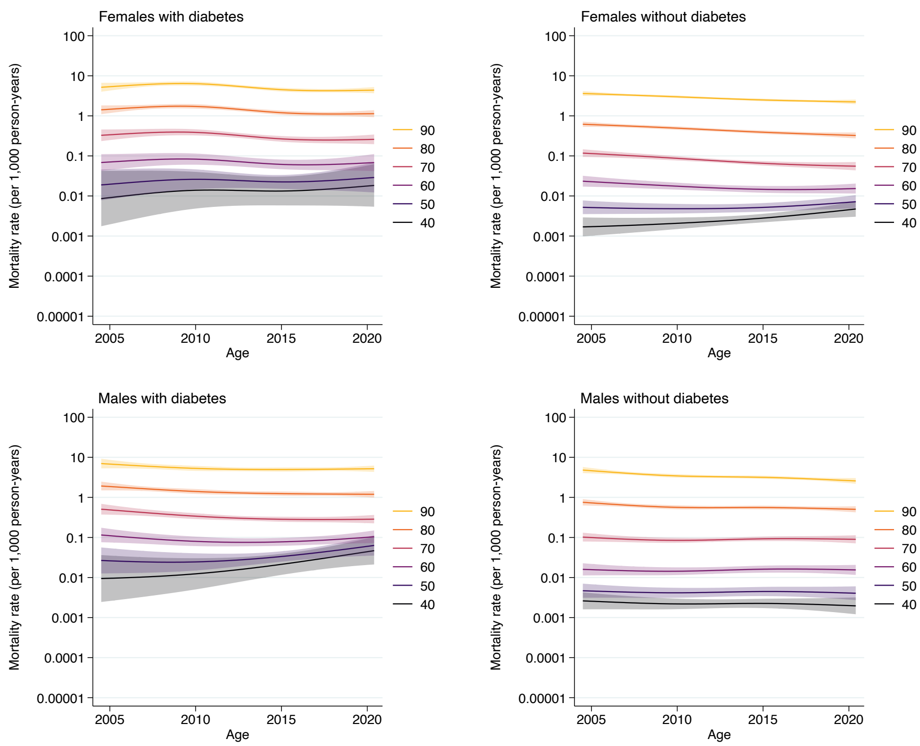


Figure 4.8: Mortality rate in people with and without diabetes by age and calendar time. Canada (Alberta). Heart failure.

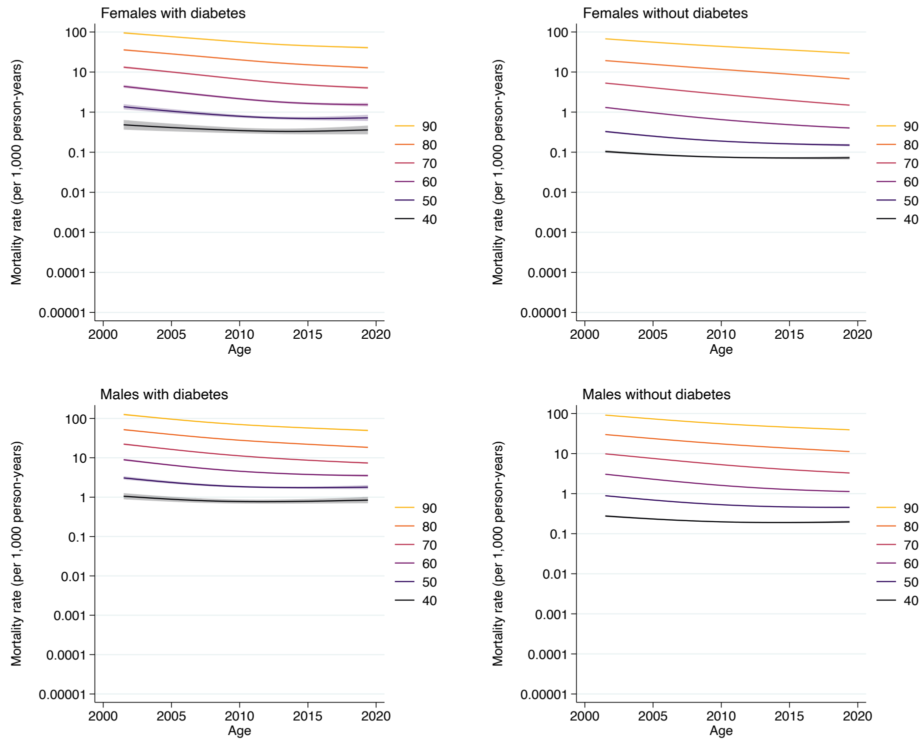


Figure 4.9: Mortality rate in people with and without diabetes by age and calendar time. Denmark. Heart failure.

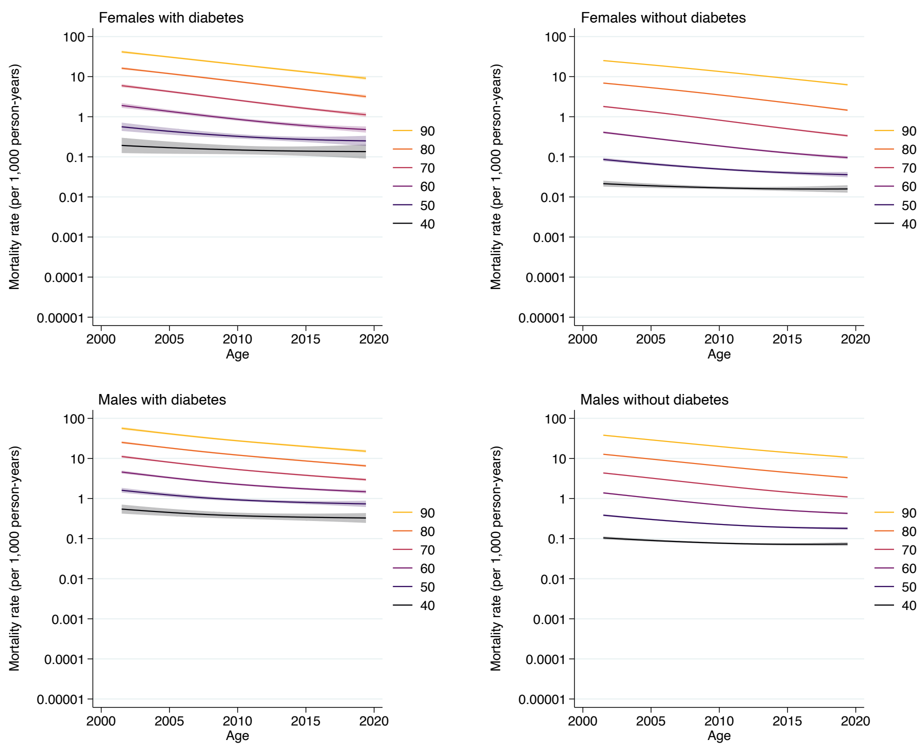


Figure 4.10: Mortality rate in people with and without diabetes by age and calendar time. Denmark. Coronary heart disease.

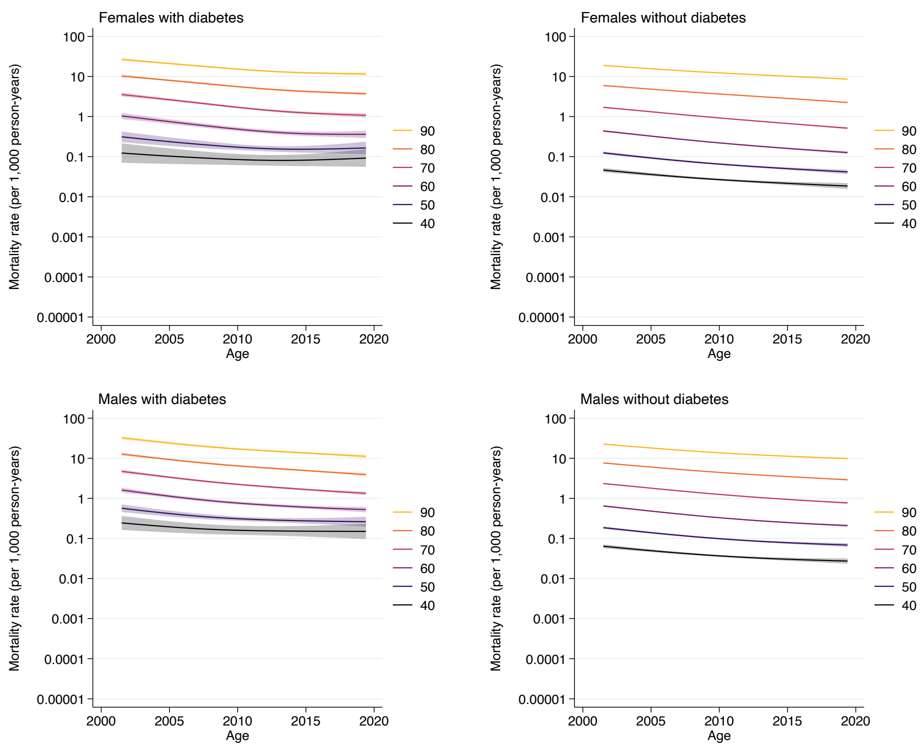


Figure 4.11: Mortality rate in people with and without diabetes by age and calendar time. Denmark. Cerebrovascular disease.

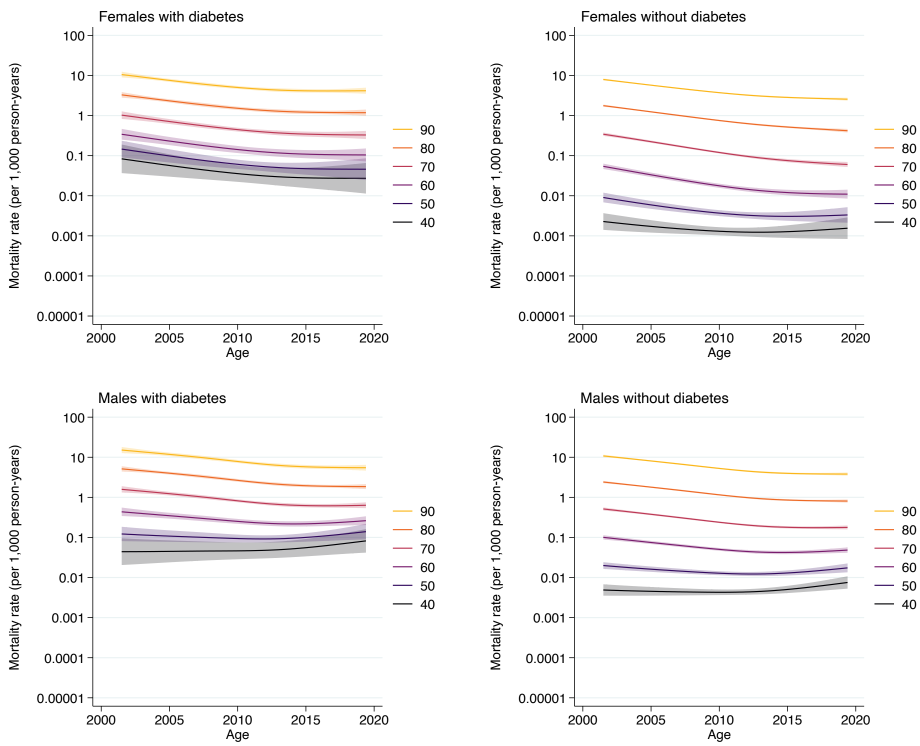


Figure 4.12: Mortality rate in people with and without diabetes by age and calendar time. Denmark. Heart failure.

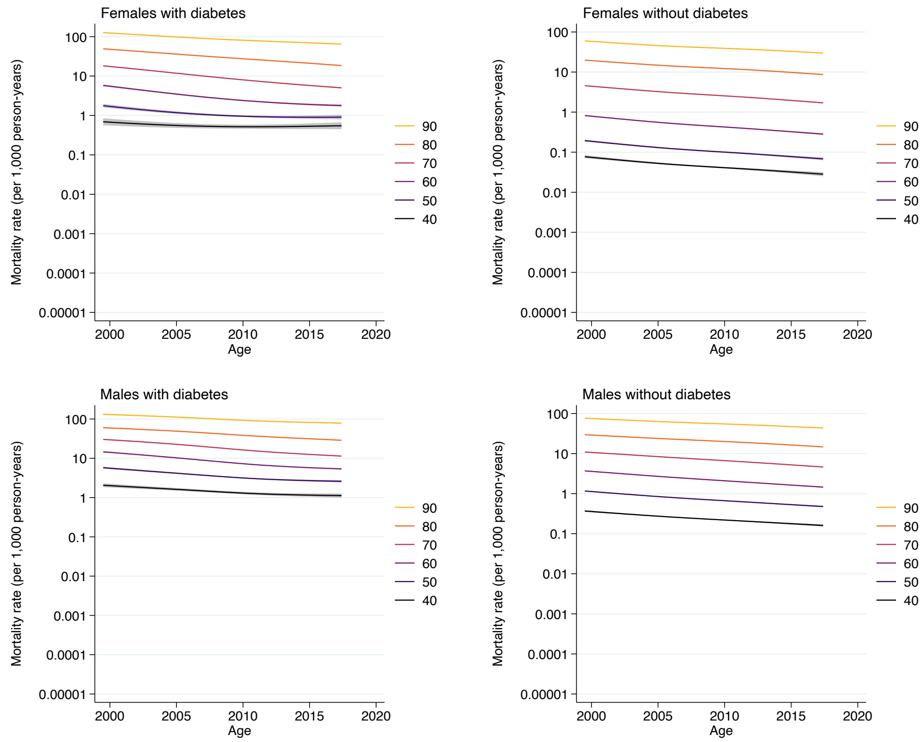


Figure 4.13: Mortality rate in people with and without diabetes by age and calendar time. Finland. Heart failure.

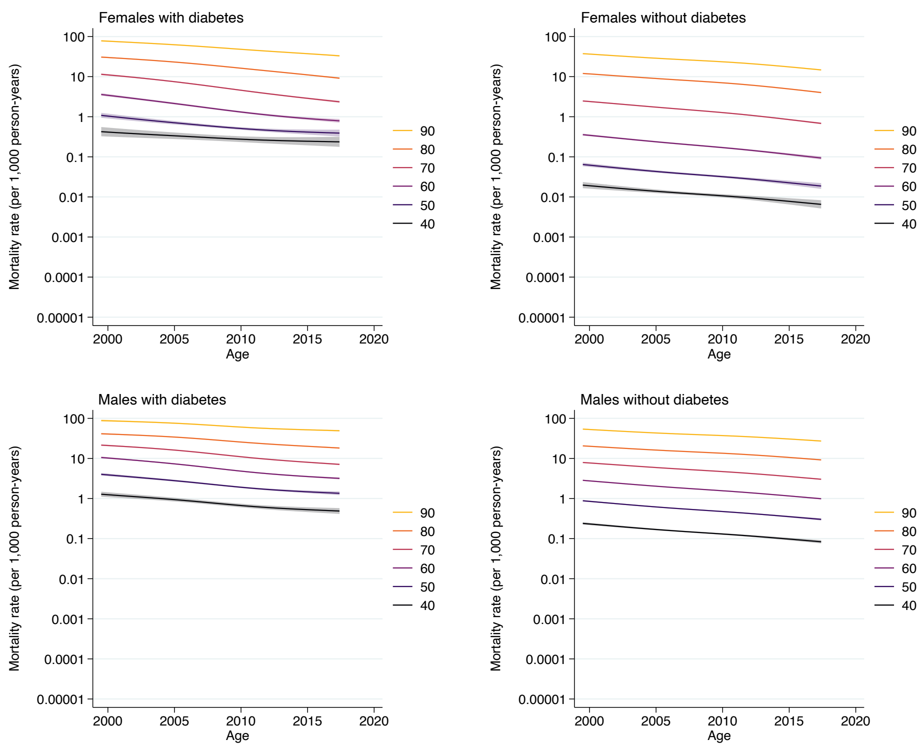


Figure 4.14: Mortality rate in people with and without diabetes by age and calendar time. Finland. Coronary heart disease.

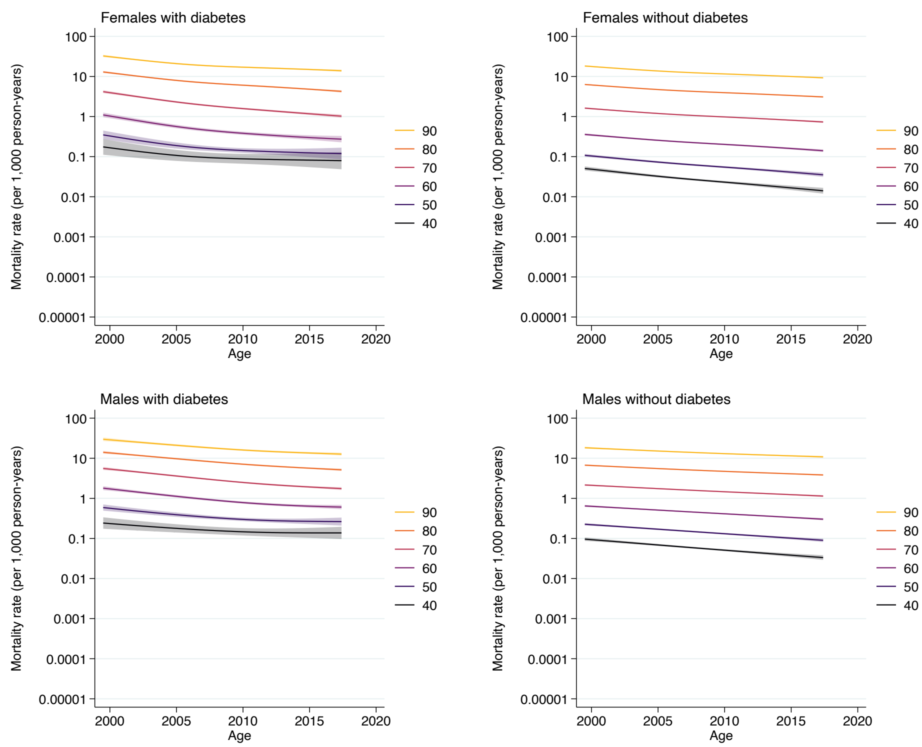


Figure 4.15: Mortality rate in people with and without diabetes by age and calendar time. Finland. Cerebrovascular disease.

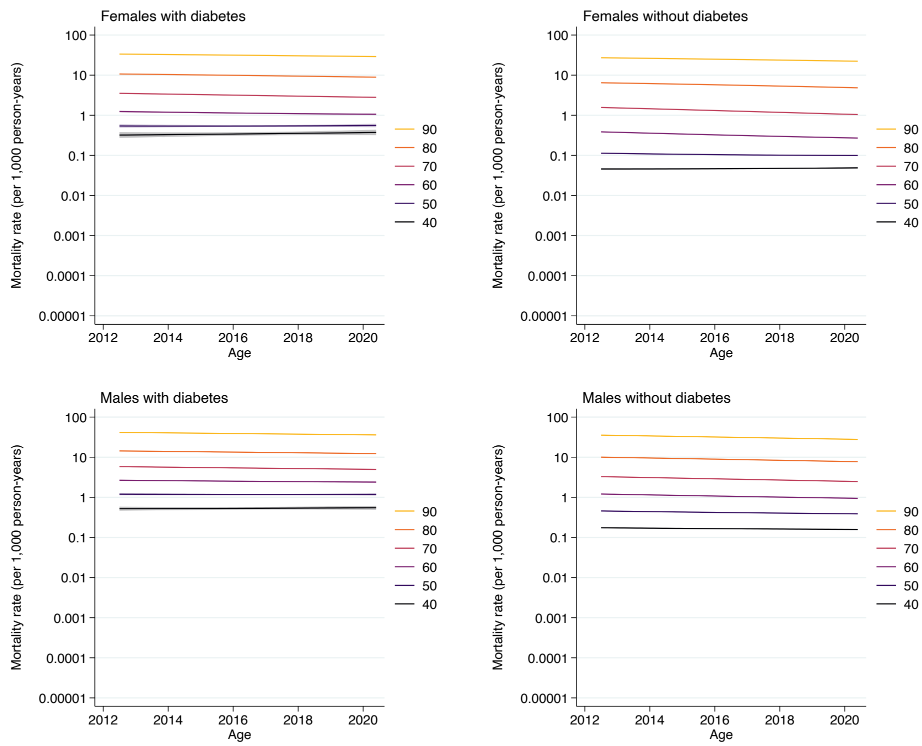


Figure 4.16: Mortality rate in people with and without diabetes by age and calendar time. France. Heart failure.

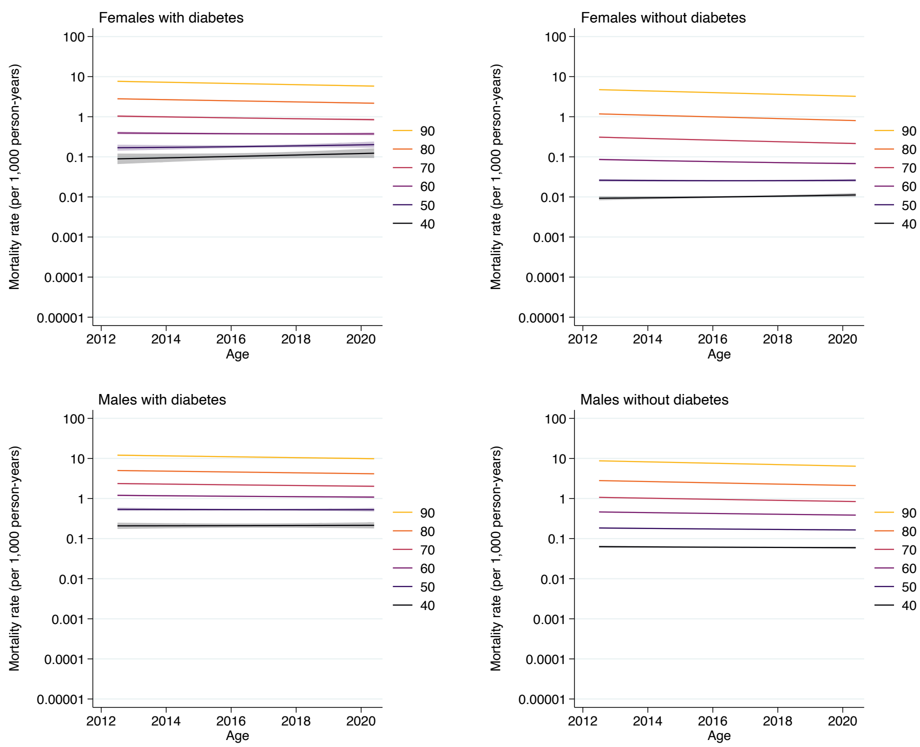


Figure 4.17: Mortality rate in people with and without diabetes by age and calendar time. France. Coronary heart disease.

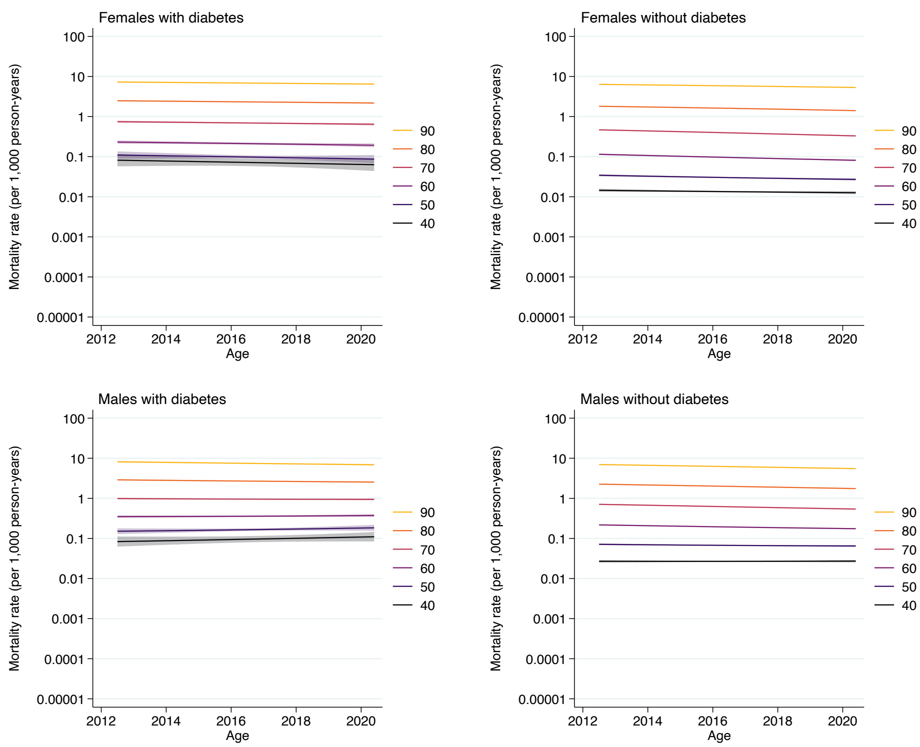


Figure 4.18: Mortality rate in people with and without diabetes by age and calendar time. France. Cerebrovascular disease.

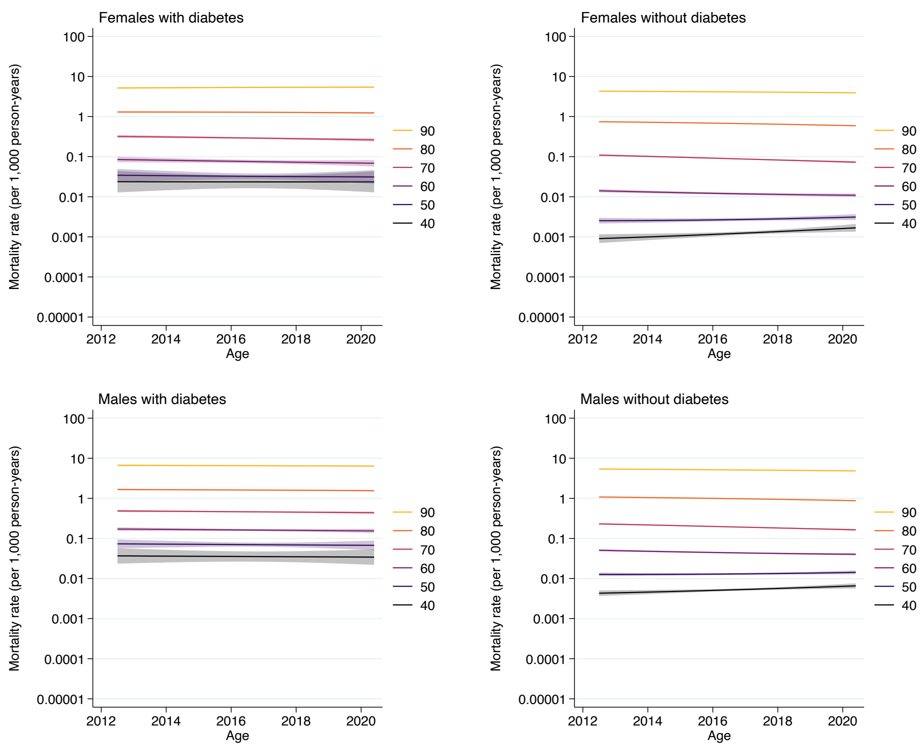


Figure 4.19: Mortality rate in people with and without diabetes by age and calendar time. France. Heart failure.

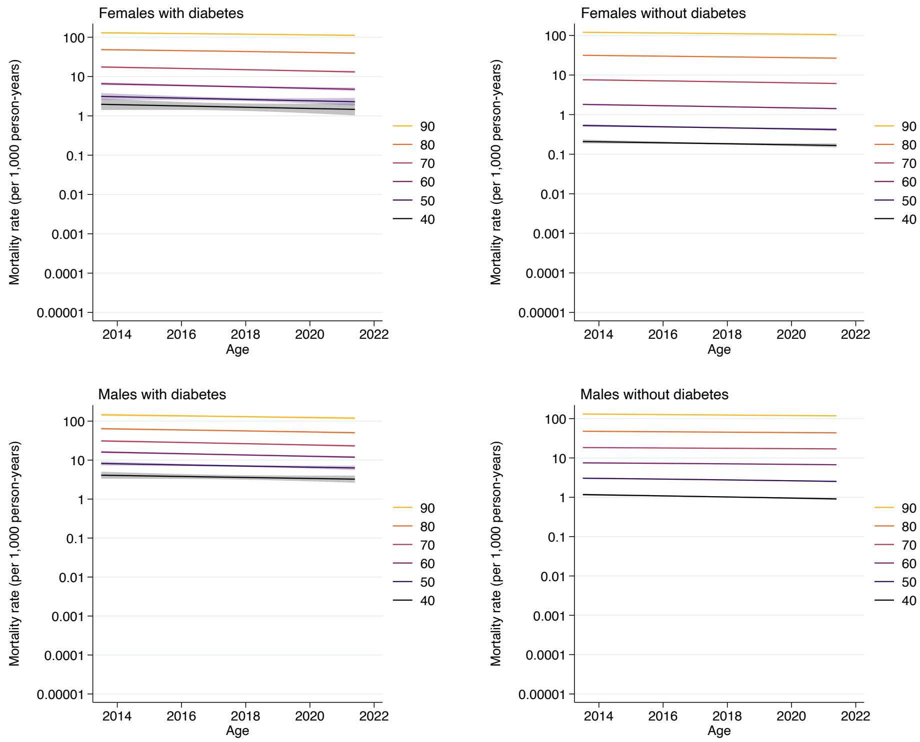


Figure 4.20: Mortality rate in people with and without diabetes by age and calendar time. Lithuania. Heart failure.

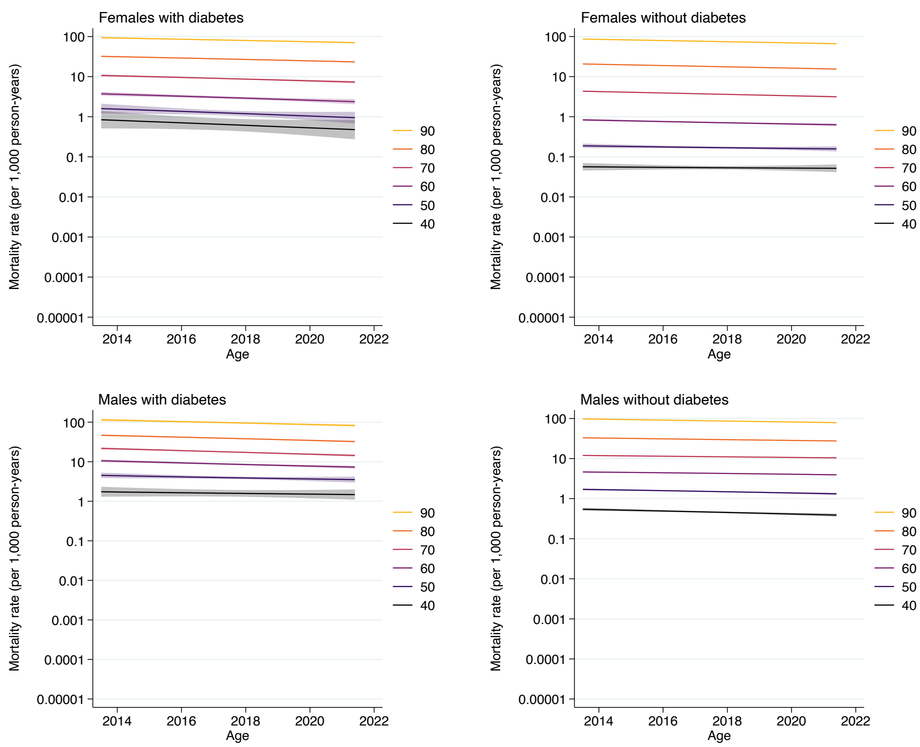


Figure 4.21: Mortality rate in people with and without diabetes by age and calendar time. Lithuania. Coronary heart disease.

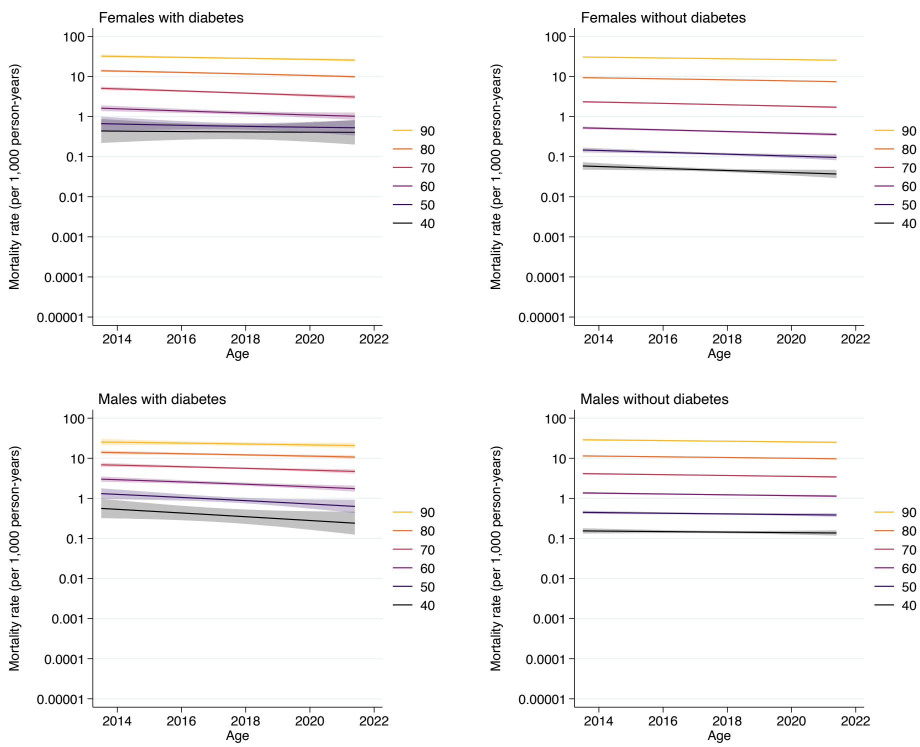


Figure 4.22: Mortality rate in people with and without diabetes by age and calendar time. Lithuania. Cerebrovascular disease.

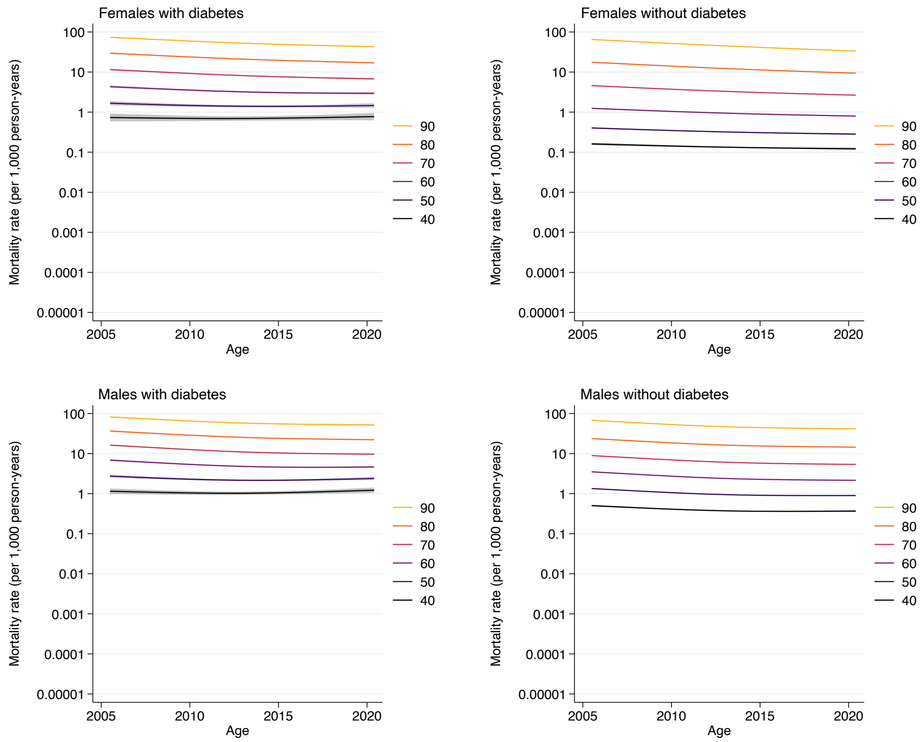


Figure 4.23: Mortality rate in people with and without diabetes by age and calendar time. Scotland. Heart failure.

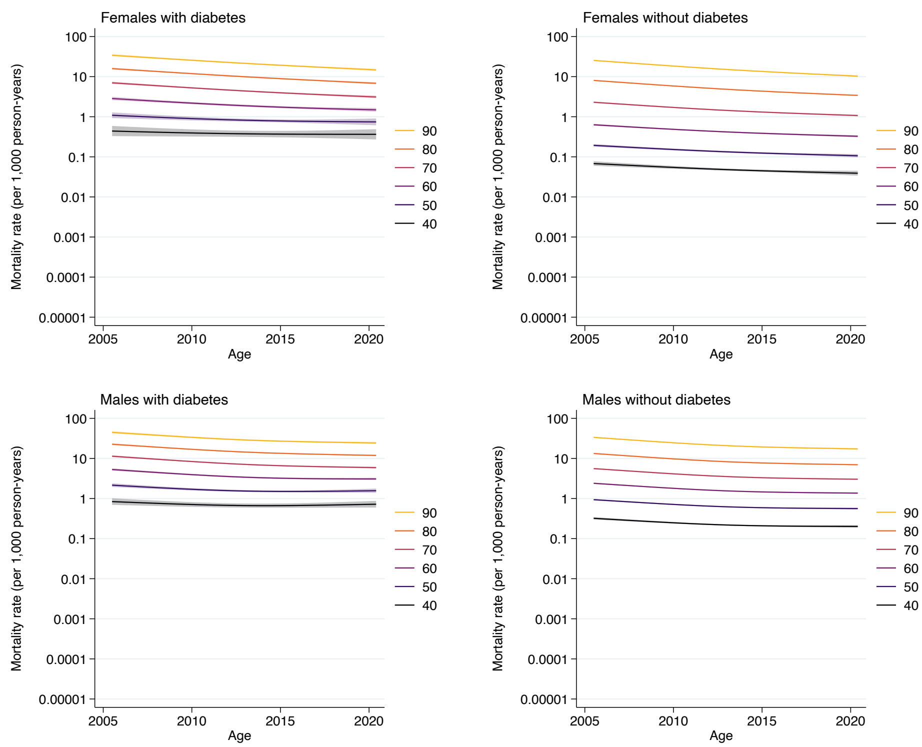


Figure 4.24: Mortality rate in people with and without diabetes by age and calendar time. Scotland. Coronary heart disease.

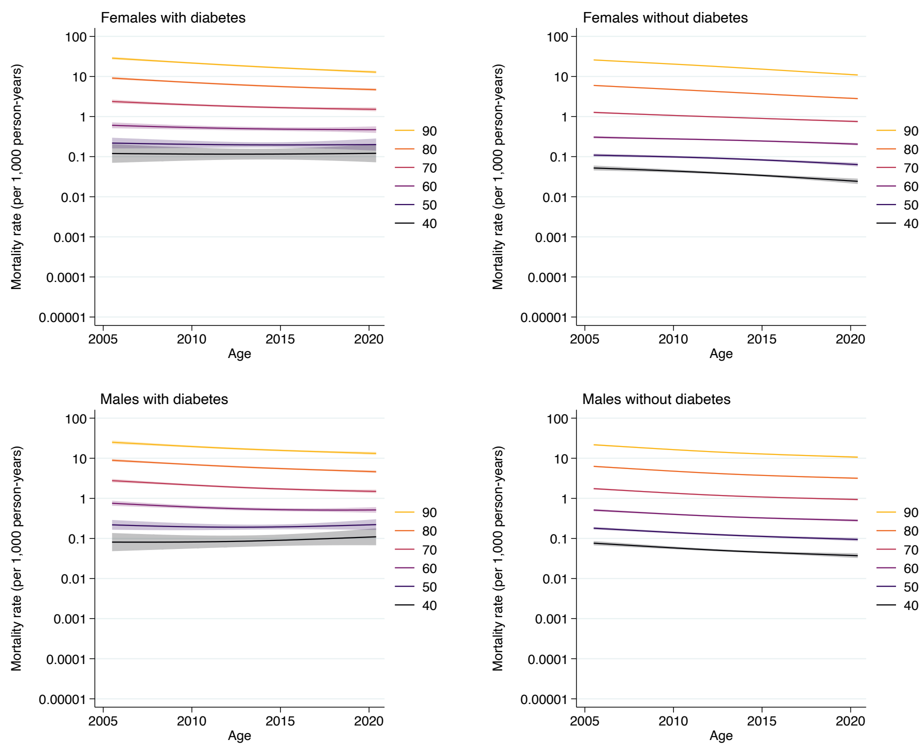


Figure 4.25: Mortality rate in people with and without diabetes by age and calendar time. Scotland. Cerebrovascular disease.

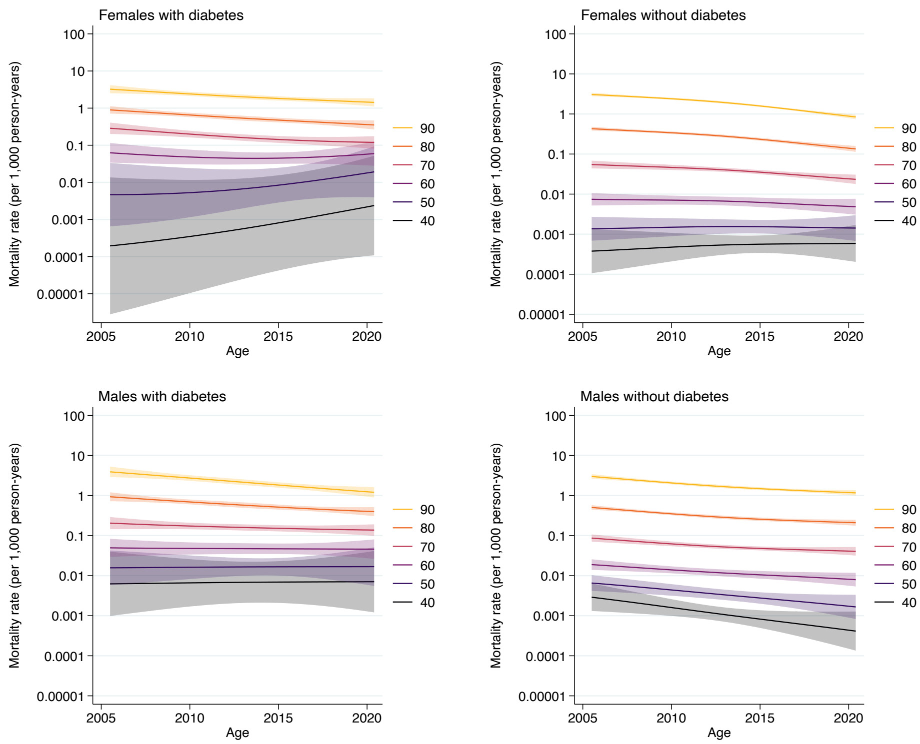


Figure 4.26: Mortality rate in people with and without diabetes by age and calendar time. Scotland. Heart failure.

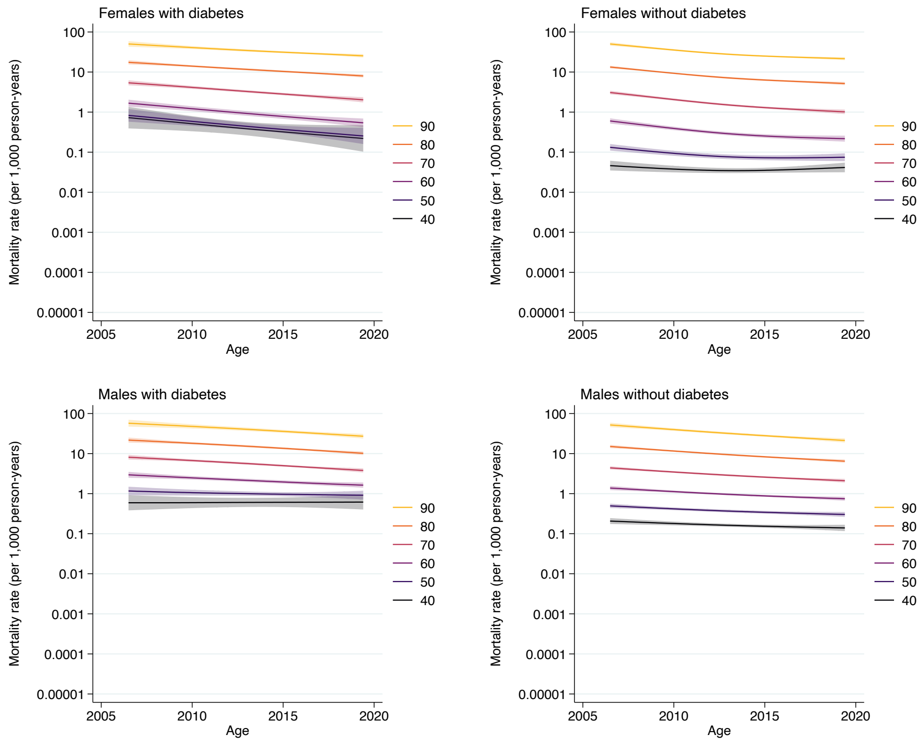


Figure 4.27: Mortality rate in people with and without diabetes by age and calendar time. South Korea. Heart failure.

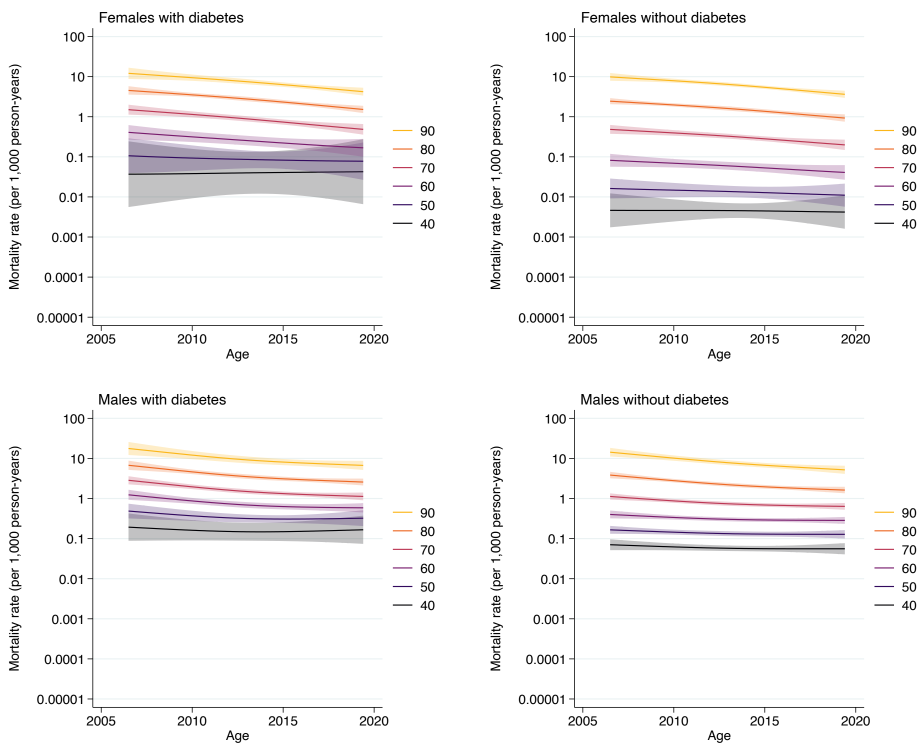


Figure 4.28: Mortality rate in people with and without diabetes by age and calendar time. South Korea. Coronary heart disease.

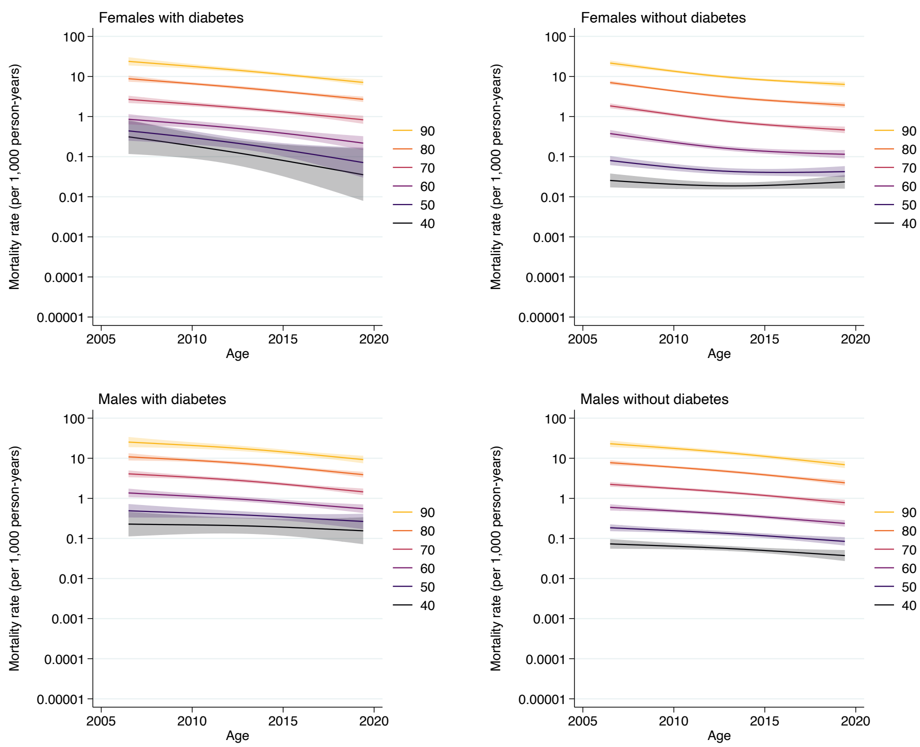


Figure 4.29: Mortality rate in people with and without diabetes by age and calendar time. South Korea. Cerebrovascular disease.

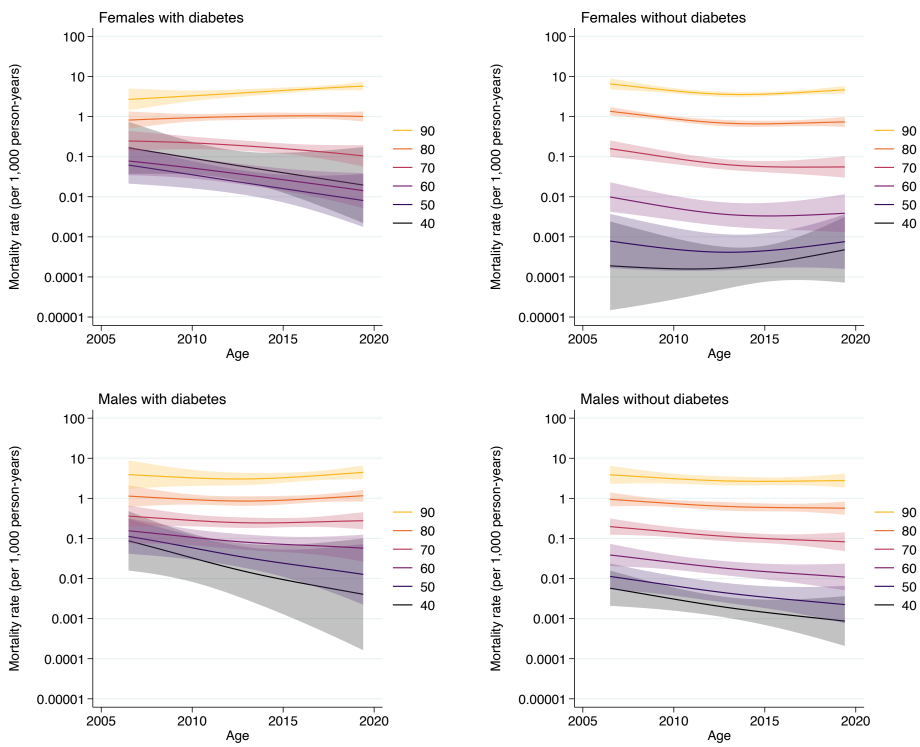


Figure 4.30: Mortality rate in people with and without diabetes by age and calendar time. South Korea. Heart failure.

5 Annual percent changes

```
quietly {
foreach i in Australia Canada Denmark Finland France Lithuania Scotland SKorea {
foreach ii in cvd chd cbd hfd {
foreach iii in dm nondm {
use `i´, clear
replace calendar = calendar-2009.5
gen coh = calendar-age_`iii´
centile(age_`iii´), centile(5 35 65 95)
local A1 = r(c_1)
local A2 = r(c_2)
local A3 = r(c_3)
local A4 = r(c_4)
mkspline agesp = age_`iii´, cubic knots(`A1´ `A2´ `A3´ `A4´)
poisson `ii´_d_`iii´ cal c.agesp*##sex, exposure(pys_`iii´)
matrix A_`i´_`ii´_`iii´ = (r(table)[1,1], r(table)[5,1], r(table)[6,1], r(table)[4,1])
foreach iiii in 0 1 {
use `i´, clear
keep if sex == `iiii´
replace calendar = calendar-2009.5
gen coh = calendar-age_`iii´
centile(age_`iii´), centile(5 35 65 95)
local A1 = r(c_1)
local A2 = r(c_2)
local A3 = r(c_3)
local A4 = r(c_4)
mkspline agesp = age_`iii´, cubic knots(`A1´ `A2´ `A3´ `A4´)
poisson `ii´_d_`iii´ cal c.agesp*, exposure(pys_`iii´)
matrix A_`i´_`ii´_`iii´_`iiii´ = (r(table)[1,1], r(table)[5,1], r(table)[6,1], r(table)[4,1])
}
}
}
}
}
matrix A = (.,.,.,.,.,.,.,.)
local a1 = 0
foreach i in Australia Canada Denmark Finland France Lithuania Scotland SKorea {
local a1 = `a1´+1
local a2 = 0
foreach ii in cvd chd cbd hfd {
local a2 = `a2´+1
local a3 = 0
foreach iii in dm nondm {
local a3 = `a3´+1
matrix A = (A\0`a1´,`a2´,`a3´,2,A_`i´_`ii´_`iii´)
foreach iiii in 0 1 {
matrix A = (A\0`a1´,`a2´,`a3´,`iiii´,A_`i´_`ii´_`iii´_`iiii´)
}
}
}
}
clear
svmat A
sort A1 A2 A3 A4
drop if A1==.
tostring A2-A3, replace format(%9.0f) force
gen country=""
local a1 = 0
foreach i in Australia Canada Denmark Finland France Lithuania Scotland SKorea {
local a1 = `a1´+1
replace country = "`i´" if A1 == `a1´
local a2 = 0
foreach ii in cvd chd cbd hfd {
local a2 = `a2´+1
replace A2 = "`ii´" if A2 == "`a2´"
local a3 = 0
foreach iii in dm nondm {
```

```
local a3 = `a3´+1
replace A3 = "`iii´" if A3 == "`a3´"
}
}
}
replace A5 = 100*(exp(A5)-1)
replace A6 = 100*(exp(A6)-1)
replace A7 = 100*(exp(A7)-1)
save APCs, replace
foreach i in Australia Canada Denmark Finland France Lithuania Scotland SKorea {
foreach ii in cvd chd cbd hfd {
use `i´_long, clear
replace calendar = calendar-2009.5
centile(age), centile(5 35 65 95)
local A1 = r(c_1)
local A2 = r(c_2)
local A3 = r(c_3)
local A4 = r(c_4)
mkspline agesp = age, cubic knots(`A1´ `A2´ `A3´ `A4´)
poisson `ii´_d agesp* sex c.cal*##i.dm, exposure(pys)
matrix A_`i´_`ii´ = (r(table)[1,9], r(table)[5,9], r(table)[6,9], r(table)[4,9])
foreach iii in 0 1 {
use `i´_long, clear
keep if sex == `iii´
replace calendar = calendar-2009.5
centile(age), centile(5 35 65 95)
local A1 = r(c_1)
local A2 = r(c_2)
local A3 = r(c_3)
local A4 = r(c_4)
mkspline agesp = age, cubic knots(`A1´ `A2´ `A3´ `A4´)
poisson `ii´_d agesp* sex c.cal*##i.dm, exposure(pys)
matrix A_`i´_`ii´_`iii´ = (r(table)[1,9], r(table)[5,9], r(table)[6,9], r(table)[4,9])
}
}
}
matrix A = (.,.,.,.,.,.,.)
local a1 = 0
foreach i in Australia Canada Denmark Finland France Lithuania Scotland SKorea {
local a1 = `a1´+1
local a2 = 0
foreach ii in cvd chd cbd hfd {
local a2 = `a2´+1
matrix A = (A\0`a1´,`a2´,2,A_`i´_`ii´)
foreach iii in 0 1 {
matrix A = (A\0`a1´,`a2´,`iii´,A_`i´_`ii´_`iii´)
}
}
}
clear
svmat A
sort A1 A2 A3
drop if A1==.
tostring A2, replace format(%9.0f) force
gen country=""
local a1 = 0
foreach i in Australia Canada Denmark Finland France Lithuania Scotland SKorea {
local a1 = `a1´+1
replace country = "`i´" if A1 == `a1´
local a2 = 0
foreach ii in cvd chd cbd hfd {
local a2 = `a2´+1
replace A2 = "`ii´" if A2 == "`a2´"
}
}
replace A4 = 100*(exp(A4)-1)
replace A5 = 100*(exp(A5)-1)
replace A6 = 100*(exp(A6)-1)
```

```
save SMR_APCs, replace
}
use APCs, clear
replace country = "Canada (Alberta)" if country == "Canada"
replace country = "South Korea" if country == "SKorea"
tostring A5-A7, force format(%9.2f) replace
gen APC = A5 + " (" + A6 + ", " + A7 + ")"
drop A5-A8
reshape wide APC, i(A1 country A3 A4) j(A2) string
drop A1
tostring A4, replace force
replace A4 = "Female" if A4 == "0"
replace A4 = "Male" if A4 == "1"
replace A4 = "Overall" if A4 == "2"
replace A3 = "No diabetes" if A3 == "nondm"
replace A3 = "Diabetes" if A3 == "dm"
replace APChfd = "" if country == "Finland" | country == "Lithuania"
gen njm = _n
preserve
keep if A4 == "Overall"
bysort country (njm) : replace country ="" if _n!=1
drop A4
order country A3 APCcvd APCchd APCcbd APChfd
drop njm
export delimited using APC.csv, delimiter(":") novarnames replace
restore
drop if A4 == "Overall"
bysort country A3 (njm) : replace A3 ="" if _n!=1
bysort country (njm) : replace country ="" if _n!=1
order country A3 A4 APCcvd APCchd APCcbd APChfd
drop njm
export delimited using APCS.csv, delimiter(":") novarnames replace

use SMR_APCs, clear
replace country = "Canada (Alberta)" if country == "Canada"
replace country = "South Korea" if country == "SKorea"
tostring A4-A6, force format(%9.2f) replace
gen APC = A4 + " (" + A5 + ", " + A6 + ")"
drop A4-A7
reshape wide APC, i(A1 country A3) j(A2) string
drop A1
tostring A3, replace force
replace A3 = "Female" if A3 == "0"
replace A3 = "Male" if A3 == "1"
replace A3 = "Overall" if A3 == "2"
replace APChfd = "" if country == "Finland" | country == "Lithuania"

preserve
keep if A3 == "Overall"
drop A3
order country APCcvd APCchd APCcbd APChfd
export delimited using SMR_APC.csv, delimiter(":") novarnames replace
restore
gen njm = _n
drop if A3 == "Overall"
bysort country (njm) : replace country ="" if _n!=1
order country A3 APCcvd APCchd APCcbd APChfd
drop njm
export delimited using SMR_APCS.csv, delimiter(":") novarnames replace
```

Table 5.1: Annual percent change in cause-specific mortality rates by country and diabetes status.

Country	Diabetes status	Cause of death: CVD	CHD	CBD	HFD
Australia	Diabetes	-3.81 (-3.96, -3.66)	-5.19 (-5.40, -4.99)	-3.90 (-4.23, -3.58)	-1.63 (-2.21, -1.05)
	No diabetes	-3.94 (-4.01, -3.87)	-5.52 (-5.61, -5.42)	-4.32 (-4.45, -4.19)	-2.45 (-2.71, -2.18)
Canada (Alberta)	Diabetes	-3.98 (-4.21, -3.76)	-5.01 (-5.31, -4.72)	-4.95 (-5.50, -4.40)	-2.51 (-3.38, -1.64)
	No diabetes	-3.35 (-3.50, -3.19)	-4.51 (-4.71, -4.30)	-4.34 (-4.70, -3.98)	-2.84 (-3.47, -2.21)
Denmark	Diabetes	-5.38 (-5.55, -5.21)	-7.51 (-7.78, -7.24)	-5.76 (-6.11, -5.41)	-5.68 (-6.26, -5.10)
	No diabetes	-5.14 (-5.21, -5.06)	-7.38 (-7.51, -7.25)	-5.10 (-5.24, -4.95)	-6.80 (-7.07, -6.52)
Finland	Diabetes	-4.64 (-4.75, -4.53)	-5.71 (-5.84, -5.57)	-5.37 (-5.63, -5.12)	
	No diabetes	-4.04 (-4.12, -3.96)	-4.84 (-4.94, -4.74)	-3.65 (-3.80, -3.49)	
France	Diabetes	-1.93 (-2.14, -1.73)	-2.41 (-2.79, -2.04)	-1.46 (-1.92, -1.00)	-0.44 (-1.02, 0.13)
	No diabetes	-2.97 (-3.07, -2.88)	-3.79 (-4.00, -3.58)	-2.78 (-2.99, -2.57)	-1.62 (-1.88, -1.35)
Lithuania	Diabetes	-2.82 (-3.30, -2.34)	-4.20 (-4.79, -3.61)	-4.19 (-5.18, -3.19)	
	No diabetes	-1.71 (-1.93, -1.49)	-2.96 (-3.23, -2.69)	-2.52 (-2.96, -2.08)	
Scotland	Diabetes	-3.21 (-3.42, -3.01)	-4.50 (-4.77, -4.22)	-4.24 (-4.65, -3.82)	-5.44 (-6.72, -4.15)
	No diabetes	-3.69 (-3.79, -3.60)	-4.78 (-4.93, -4.64)	-4.88 (-5.07, -4.70)	-7.02 (-7.67, -6.37)
Skorea	Diabetes	-5.70 (-6.36, -5.04)	-7.16 (-8.44, -5.86)	-8.24 (-9.21, -7.26)	0.80 (-1.76, 3.44)
	No diabetes	-6.16 (-6.69, -5.63)	-5.72 (-6.81, -4.61)	-8.53 (-9.32, -7.73)	-3.59 (-5.53, -1.61)

Abbreviations: CVD – cardiovascular disease; CHD – coronary heart disease; CBD – cerebrovascular disease; HFD – heart failure;

Table 5.2: Annual percent change in cause-specific mortality rate ratios by country and diabetes status.

Country	Cause of death: CVD	CHD	CBD	HFD
Australia	-0.37 (-0.54, -0.21)	-0.23 (-0.46, 0.01)	0.09 (-0.27, 0.45)	0.13 (-0.52, 0.78)
Canada (Alberta)	-1.00 (-1.28, -0.73)	-0.87 (-1.24, -0.50)	-0.92 (-1.60, -0.23)	-0.23 (-1.32, 0.87)
Denmark	-0.30 (-0.50, -0.10)	-0.20 (-0.52, 0.13)	-0.72 (-1.12, -0.32)	1.27 (0.58, 1.96)
Finland	-0.86 (-1.00, -0.72)	-1.17 (-1.35, -0.99)	-1.90 (-2.20, -1.59)	
France	0.67 (0.44, 0.91)	0.97 (0.52, 1.41)	1.12 (0.61, 1.64)	0.76 (0.12, 1.40)
Lithuania	-1.57 (-2.11, -1.04)	-1.71 (-2.37, -1.04)	-2.13 (-3.23, -1.02)	
Scotland	0.04 (-0.19, 0.28)	-0.10 (-0.43, 0.22)	0.30 (-0.17, 0.77)	0.77 (-0.74, 2.30)
Skorea	-0.62 (-1.49, 0.26)	-2.87 (-4.59, -1.13)	-0.48 (-1.81, 0.88)	3.37 (0.11, 6.73)

Abbreviations: CVD – cardiovascular disease; CHD – coronary heart disease; CBD – cerebrovascular disease; HFD – heart failure;

Table 5.3: Annual percent change in cause-specific mortality rates by country, sex, and diabetes status.

Country	Diabetes status	Sex	Cause of death CVD	CHD	CBD	HFD
Australia	Diabetes	Female	-3.86 (-4.08, -3.63)	-5.76 (-6.09, -5.44)	-3.75 (-4.20, -3.29)	-1.44 (-2.26, -0.60)
		Male	-3.78 (-3.98, -3.58)	-4.83 (-5.09, -4.56)	-4.06 (-4.52, -3.60)	-1.81 (-2.62, -1.00)
	No diabetes	Female	-3.95 (-4.03, -3.86)	-6.07 (-6.21, -5.93)	-4.16 (-4.33, -3.99)	-2.62 (-2.95, -2.28)
		Male	-3.93 (-4.03, -3.84)	-5.03 (-5.16, -4.90)	-4.56 (-4.77, -4.35)	-2.17 (-2.61, -1.73)
Canada (Alberta)	Diabetes	Female	-3.94 (-4.27, -3.60)	-5.06 (-5.53, -4.59)	-4.83 (-5.61, -4.04)	-3.13 (-4.31, -1.93)
		Male	-4.02 (-4.32, -3.72)	-4.99 (-5.36, -4.61)	-5.08 (-5.86, -4.29)	-1.81 (-3.09, -0.52)
	No diabetes	Female	-3.34 (-3.55, -3.12)	-4.72 (-5.03, -4.40)	-4.29 (-4.75, -3.82)	-3.13 (-3.94, -2.32)
		Male	-3.35 (-3.57, -3.13)	-4.34 (-4.62, -4.06)	-4.43 (-5.00, -3.85)	-2.41 (-3.40, -1.40)
Denmark	Diabetes	Female	-5.46 (-5.72, -5.20)	-8.42 (-8.84, -7.99)	-5.46 (-5.95, -4.96)	-5.68 (-6.55, -4.80)
		Male	-5.32 (-5.55, -5.08)	-6.90 (-7.25, -6.55)	-6.06 (-6.56, -5.56)	-5.68 (-6.45, -4.90)
	No diabetes	Female	-5.08 (-5.18, -4.97)	-7.79 (-7.99, -7.60)	-4.93 (-5.13, -4.74)	-7.21 (-7.58, -6.84)
		Male	-5.20 (-5.31, -5.09)	-7.03 (-7.20, -6.85)	-5.31 (-5.53, -5.09)	-6.31 (-6.72, -5.90)
Finland	Diabetes	Female	-4.70 (-4.85, -4.54)	-6.06 (-6.25, -5.86)	-5.23 (-5.56, -4.89)	
		Male	-4.58 (-4.74, -4.42)	-5.37 (-5.56, -5.17)	-5.59 (-5.98, -5.19)	
	No diabetes	Female	-4.09 (-4.21, -3.98)	-5.27 (-5.42, -5.12)	-3.83 (-4.03, -3.63)	
		Male	-3.99 (-4.11, -3.88)	-4.48 (-4.62, -4.34)	-3.38 (-3.62, -3.14)	
France	Diabetes	Female	-2.08 (-2.39, -1.78)	-2.97 (-3.58, -2.35)	-1.63 (-2.28, -0.97)	-0.07 (-0.89, 0.75)
		Male	-1.81 (-2.09, -1.53)	-2.10 (-2.57, -1.63)	-1.30 (-1.95, -0.65)	-0.81 (-1.61, 0.00)
	No diabetes	Female	-2.89 (-3.02, -2.75)	-4.54 (-4.86, -4.22)	-2.67 (-2.94, -2.41)	-1.45 (-1.80, -1.11)
		Male	-3.09 (-3.23, -2.94)	-3.23 (-3.51, -2.95)	-2.94 (-3.27, -2.61)	-1.87 (-2.30, -1.44)
Lithuania	Diabetes	Female	-2.58 (-3.19, -1.96)	-3.98 (-4.74, -3.21)	-4.14 (-5.34, -2.92)	
		Male	-3.21 (-3.98, -2.43)	-4.54 (-5.47, -3.60)	-4.30 (-6.02, -2.55)	
	No diabetes	Female	-1.98 (-2.27, -1.70)	-3.45 (-3.81, -3.09)	-2.78 (-3.34, -2.22)	
		Male	-1.34 (-1.67, -1.00)	-2.32 (-2.73, -1.91)	-2.09 (-2.81, -1.35)	
Scotland	Diabetes	Female	-3.44 (-3.75, -3.14)	-5.30 (-5.73, -4.86)	-4.43 (-4.99, -3.86)	-5.45 (-7.19, -3.67)
		Male	-3.02 (-3.30, -2.74)	-3.98 (-4.33, -3.63)	-4.02 (-4.62, -3.41)	-5.44 (-7.30, -3.55)
	No diabetes	Female	-4.12 (-4.25, -3.98)	-5.62 (-5.84, -5.40)	-5.12 (-5.35, -4.88)	-7.60 (-8.42, -6.77)
		Male	-3.24 (-3.39, -3.10)	-4.14 (-4.34, -3.95)	-4.50 (-4.80, -4.20)	-6.09 (-7.14, -5.03)
Skorea	Diabetes	Female	-6.04 (-6.94, -5.12)	-8.03 (-9.87, -6.16)	-8.97 (-10.31, -7.60)	1.67 (-1.60, 5.05)
		Male	-5.33 (-6.28, -4.37)	-6.35 (-8.13, -4.53)	-7.49 (-8.88, -6.08)	-0.63 (-4.71, 3.63)
	No diabetes	Female	-6.75 (-7.49, -6.00)	-7.04 (-8.68, -5.37)	-9.25 (-10.36, -8.13)	-3.08 (-5.44, -0.66)
		Male	-5.54 (-6.31, -4.77)	-4.70 (-6.16, -3.21)	-7.78 (-8.91, -6.63)	-4.64 (-8.00, -1.16)

Abbreviations: CVD – cardiovascular disease; CHD – coronary heart disease; CBD – cerebrovascular disease; HFD – heart failure;

Table 5.4: Annual percent change in cause-specific mortality rate ratios by country, sex, and diabetes status.

		Cause of death			
Country	Sex	CVD	CHD	CBD	HFD
Australia	Female	-0.46 (-0.71, -0.21)	-0.35 (-0.72, 0.03)	0.08 (-0.42, 0.58)	0.46 (-0.45, 1.38)
	Male	-0.32 (-0.55, -0.09)	-0.29 (-0.59, 0.02)	0.16 (-0.36, 0.68)	-0.37 (-1.30, 0.57)
Canada (Alberta)	Female	-1.00 (-1.41, -0.59)	-0.75 (-1.33, -0.15)	-0.84 (-1.79, 0.11)	-0.59 (-2.06, 0.89)
	Male	-0.99 (-1.37, -0.61)	-0.96 (-1.44, -0.47)	-1.00 (-2.00, 0.02)	0.06 (-1.58, 1.74)
Denmark	Female	-0.33 (-0.63, -0.04)	-0.58 (-1.08, -0.07)	-0.51 (-1.07, 0.05)	1.74 (0.72, 2.77)
	Male	-0.30 (-0.57, -0.02)	-0.05 (-0.47, 0.37)	-0.92 (-1.49, -0.35)	0.53 (-0.40, 1.47)
Finland	Female	-0.71 (-0.91, -0.51)	-0.94 (-1.20, -0.68)	-1.49 (-1.89, -1.09)	
	Male	-0.92 (-1.13, -0.72)	-1.20 (-1.45, -0.95)	-2.46 (-2.93, -1.98)	
France	Female	0.44 (0.10, 0.78)	1.17 (0.45, 1.91)	0.84 (0.12, 1.56)	0.95 (0.05, 1.86)
	Male	0.96 (0.63, 1.28)	0.81 (0.24, 1.37)	1.48 (0.74, 2.23)	0.66 (-0.27, 1.59)
Lithuania	Female	-1.27 (-1.96, -0.58)	-1.24 (-2.10, -0.37)	-1.96 (-3.31, -0.60)	
	Male	-2.19 (-3.04, -1.34)	-2.55 (-3.59, -1.51)	-2.58 (-4.47, -0.65)	
Scotland	Female	0.20 (-0.15, 0.54)	-0.10 (-0.62, 0.42)	0.28 (-0.36, 0.92)	1.31 (-0.75, 3.40)
	Male	-0.08 (-0.40, 0.24)	-0.10 (-0.52, 0.32)	0.28 (-0.42, 0.98)	-0.20 (-2.43, 2.09)
Skorea	Female	-0.57 (-1.77, 0.65)	-3.00 (-5.50, -0.45)	-0.48 (-2.34, 1.40)	3.88 (-0.17, 8.09)
	Male	-0.63 (-1.90, 0.65)	-2.64 (-4.99, -0.23)	-0.47 (-2.38, 1.48)	2.83 (-2.61, 8.57)

Abbreviations: CVD – cardiovascular disease; CHD – coronary heart disease; CBD – cerebrovascular disease; HFD – heart failure;

It's also worth looking at variation in mortality rate trends by age. For this, we will use two models: the first includes the interaction between a spline effect of age and a log-linear effect of calendar time (plotted in the left panels of the combined figures); the second includes a spline effect of age and the product of log-linear effects of age and calendar time (plotted on the right in the figures).

```
quietly {
foreach i in Australia Canada Denmark Finland France Lithuania Scotland SKorea {
foreach ii in cvd chd cbd hfd {
noisily di "`i´ `ii´"
foreach iii in dm nondm {
use `i´, clear
replace calendar = calendar-2009.5
gen coh = calendar-age_`iii´
centile(age_`iii´), centile(5 35 65 95)
local A1 = r(c_1)
local A2 = r(c_2)
local A3 = r(c_3)
local A4 = r(c_4)
mkspline agesp = age_`iii´, cubic knots(`A1´ `A2´ `A3´ `A4´)
preserve
clear
set obs 51
gen age = (_n)+39
mkspline agesp = age, cubic knots(`A1´ `A2´ `A3´ `A4´)
forval a = 1/51 {
local A1`a´ = agesp1[`a´]
local A2`a´ = agesp2[`a´]
local A3`a´ = agesp3[`a´]
}
restore
poisson `ii´_d_`iii´ c.agesp*##c.cal, exposure(pys_`iii´)
matrix A = (.,.,.,.)
forval a = 1/51 {
margins, dydx(cal) at(agesp1==`A1`a´´ agesp2==`A2`a´´ agesp3==`A3`a´´) atmeans predict(xb)
matrix A = (A\(`a´)+39,r(table)[1,1],r(table)[5,1],r(table)[6,1])
}
matrix A_`i´_`ii´_`iii´_1 = A
poisson `ii´_d_`iii´ c.agesp* c.age_`iii´##c.cal, exposure(pys_`iii´)
matrix A = (.,.,.,.)
forval a = 1/51 {
margins, dydx(cal) at(age_`iii´==`A1`a´´ agesp1==`A1`a´´ agesp2==`A2`a´´ agesp3==`A3`a´´) atmeans pr
> edict(xb)
matrix A = (A\(`a´)+39,r(table)[1,1],r(table)[5,1],r(table)[6,1])
}
matrix A_`i´_`ii´_`iii´_2 = A
forval iiii = 0/1 {
preserve
keep if sex == `iiii´
poisson `ii´_d_`iii´ c.agesp*##c.cal, exposure(pys_`iii´)
matrix A = (.,.,.,.)
forval a = 1/51 {
margins, dydx(cal) at(agesp1==`A1`a´´ agesp2==`A2`a´´ agesp3==`A3`a´´) atmeans predict(xb)
matrix A = (A\(`a´)+39,r(table)[1,1],r(table)[5,1],r(table)[6,1])
}
matrix A_`i´_`ii´_`iii´_`iiii´_1 = A
poisson `ii´_d_`iii´ c.agesp* c.age_`iii´##c.cal, exposure(pys_`iii´)
matrix A = (.,.,.,.)
forval a = 1/51 {
margins, dydx(cal) at(age_`iii´==`A1`a´´ agesp1==`A1`a´´ agesp2==`A2`a´´ agesp3==`A3`a´´) atmeans pr
> edict(xb)
matrix A = (A\(`a´)+39,r(table)[1,1],r(table)[5,1],r(table)[6,1])
}
matrix A_`i´_`ii´_`iii´_`iiii´_2 = A
restore
}
```

```
forval a = 1/2 {
clear
svmat A_`i´_`ii´_`iii´_`a´
rename (A_`i´_`ii´_`iii´_`a´1 A_`i´_`ii´_`iii´_`a´2 A_`i´_`ii´_`iii´_`a´3 A_`i´_`ii´_`iii´_`a´4) (ag
> e apc lb ub)
drop if age==.
replace apc = 100*(exp(apc)-1)
replace lb = 100*(exp(lb)-1)
replace ub = 100*(exp(ub)-1)
gen country = "`i´"
gen oc = "`ii´"
gen dm = "`iii´"
save MD/APCage_`i´_`ii´_`iii´_`a´, replace
forval iiii = 0/1 {
clear
svmat A_`i´_`ii´_`iii´_`iiii´_`a´
rename (A_`i´_`ii´_`iii´_`iiii´_`a´1 A_`i´_`ii´_`iii´_`iiii´_`a´2 A_`i´_`ii´_`iii´_`iiii´_`a´3 A_`i´
> _`ii´_`iii´_`iiii´_`a´4) (age apc lb ub)
drop if age==.
replace apc = 100*(exp(apc)-1)
replace lb = 100*(exp(lb)-1)
replace ub = 100*(exp(ub)-1)
gen country = "`i´"
gen oc = "`ii´"
gen dm = "`iii´"
gen sex = `iiii´
save MD/APCage_`i´_`ii´_`iii´_`iiii´_`a´, replace
}
}
clear all
}
}
}
}
foreach i in Australia Canada Denmark Finland France Lithuania Scotland SKorea {
foreach ii in cvd chd cbd hfd {
forval a = 1/2 {
clear
foreach iii in dm nondm {
append using MD/APCage_`i´_`ii´_`iii´_`a´
}
twoway ///
(rarea ub lb age if dm == "dm", color("dknavy%30") fintensity(inten80) lwidth(none)) ///
(line apc age if dm == "dm", color("dknavy") lpattern(solid)) ///
(rarea ub lb age if dm == "nondm", color("magenta%30") fintensity(inten80) lwidth(none)) ///
(line apc age if dm == "nondm", color("magenta") lpattern(solid)) ///
,legend(ring(0) symxsize(0.13cm) position(2) region(lcolor(white) color(none)) ///
order(2 "Diabetes" ///
4 "No diabetes") ///
cols(1)) ///
bgcolor(white) graphregion(color(white)) ///
ytitle("Annual change in incidence rates (%)", xoffset(-1)) ///
yline(0, lcolor(gs0)) ///
ylabel(-10(5)10, angle(0)) yscale(range(-10 10)) ///
xtitle("Age (years)") ///
xlabel(40(10)90) ///
title("Overall", placement(west) size(medium) color(gs0))
graph save "Graph" GPH/APCage_`i´_`ii´_`a´, replace
forval iiii = 0/1 {
clear
foreach iii in dm nondm {
append using MD/APCage_`i´_`ii´_`iii´_`iiii´_`a´
}
if `iiii´ == 0 {
local s = "Females"
}
else {
local s = "Males"
```

```
}
twoway ///
(rarea ub lb age if dm == "dm", color("dknavy%30") fintensity(inten80) lwidth(none)) ///
(line apc age if dm == "dm", color("dknavy") lpattern(solid)) ///
(rarea ub lb age if dm == "nondm", color("magenta%30") fintensity(inten80) lwidth(none)) ///
(line apc age if dm == "nondm", color("magenta") lpattern(solid)) ///
,legend(ring(0) symxsize(0.13cm) position(2) region(lcolor(white) color(none)) ///
order(2 "Diabetes" ///
4 "No diabetes") ///
cols(1)) ///
bgcolor(white) graphregion(color(white)) ///
ytitle("Annual change in incidence rates (%)", xoffset(-1)) ///
yline(0, lcolor(gs0)) ///
ylabel(-10(5)10, angle(0)) yscale(range(-10 10)) ///
xtitle("Age (years)") ///
xlabel(40(10)90) ///
title("`s´", placement(west) size(medium) color(gs0))
graph save "Graph" GPH/APCage_`i´_`ii´_`iiii´_`a´, replace
}
}
}
}

foreach i in Australia Canada Denmark Finland France Lithuania Scotland SKorea {
if "`i´" == "Canada" {
local co = "Canada (Alberta)"
}
else if "`i´" == "SKorea" {
local co = "South Korea"
}
else {
local co = "`i´"
}
foreach ii in cvd chd cbd hfd {
if "`ii´" == "cvd" {
local oo = "Cardiovascular disease"
}
if "`ii´" == "chd" {
local oo = "Coronary heart disease"
}
if "`ii´" == "cbd" {
local oo = "Cerebrovascular disease"
}
if "`ii´" == "hfd" {
local oo = "Heart failure"
}
if ("`i´" == "Finland" | "`i´" == "Lithuania") & "`ii´" == "hfd" {
}
else {
graph combine ///
GPH/APCage_`i´_`ii´_1.gph ///
GPH/APCage_`i´_`ii´_2.gph ///
GPH/APCage_`i´_`ii´_0_1.gph ///
GPH/APCage_`i´_`ii´_0_2.gph ///
GPH/APCage_`i´_`ii´_1_1.gph ///
GPH/APCage_`i´_`ii´_1_2.gph ///
, altshrink rows(3) xsize(3.5) graphregion(color(white))
}
}
}
```

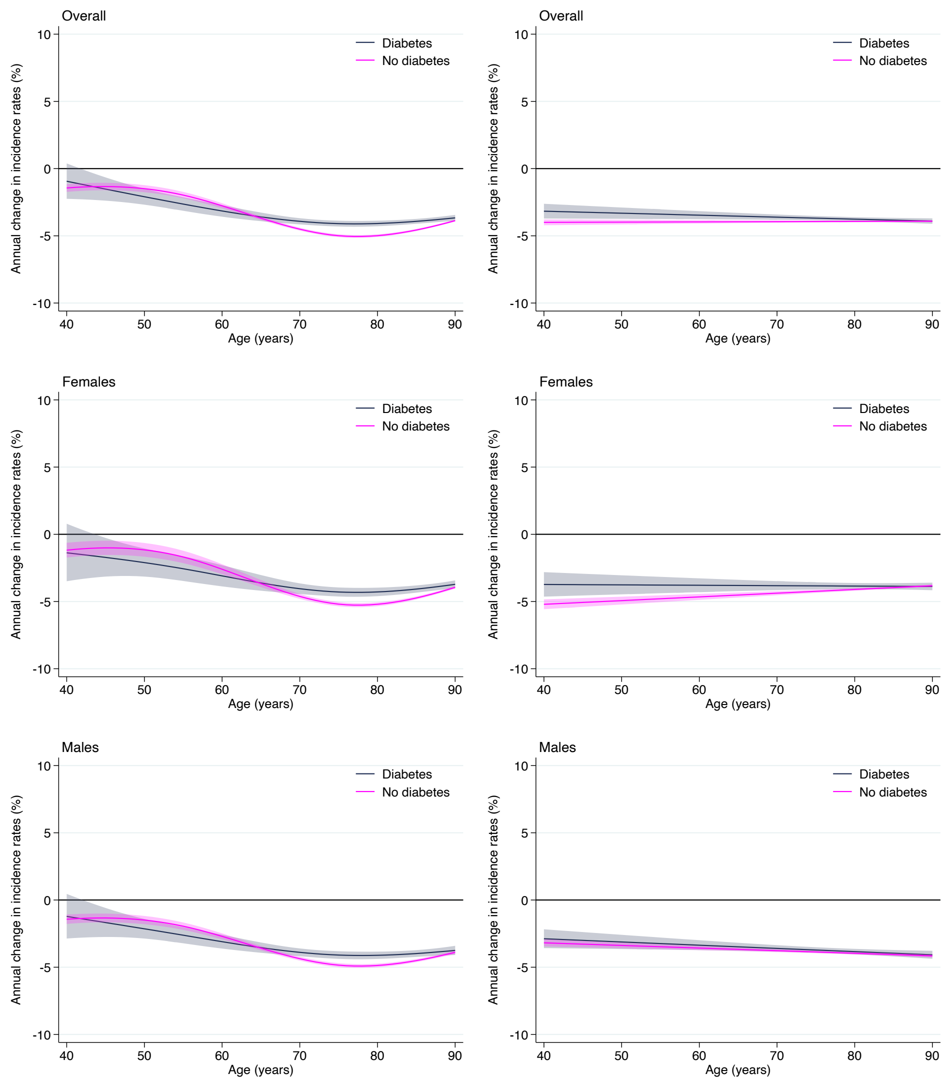


Figure 5.1: Annual percent change in mortality rates by diabetes status and sex. Australia. Cardiovascular disease. Values are predicted from a Poisson model with a spline effect of attained age, a log-linear effect of calendar time, and an interaction between age and calendar time. The left panels use a spline term for age in the interaction, the right panels use the product of age and calendar time in the interaction.

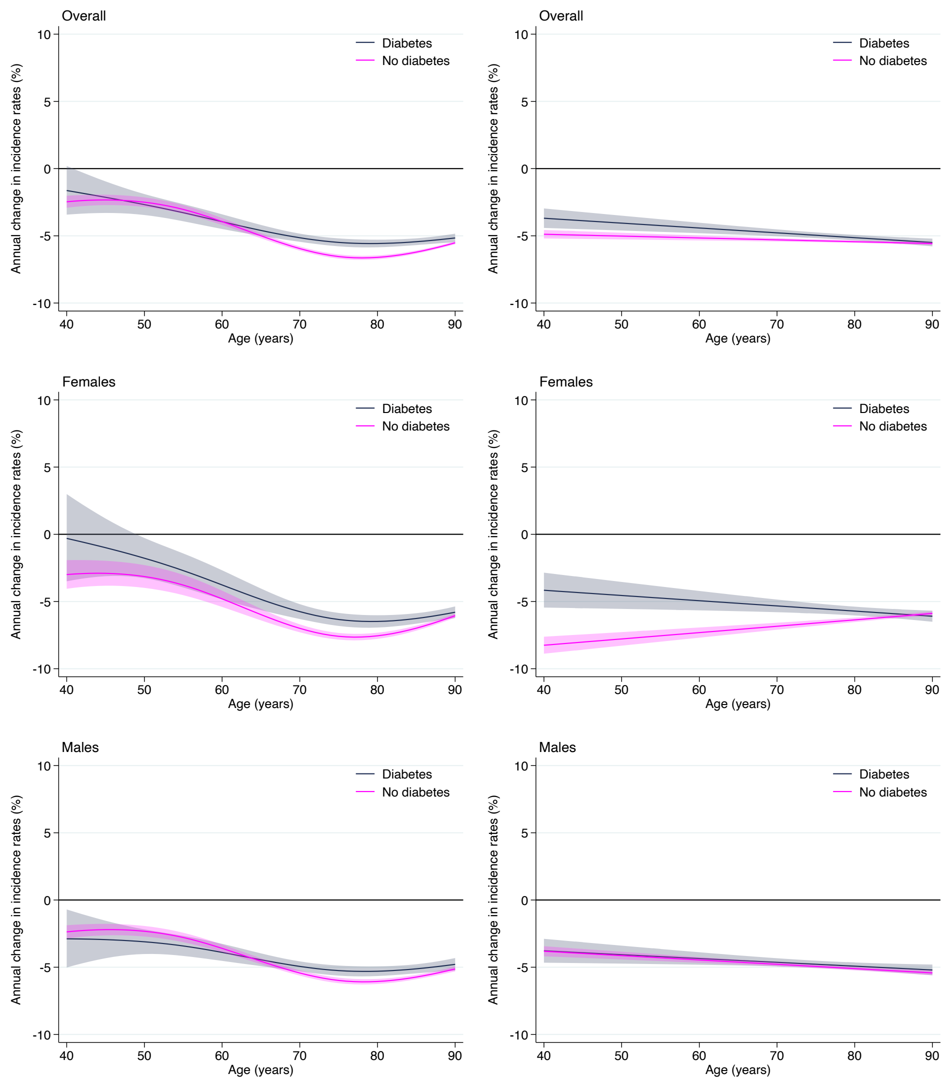


Figure 5.2: Annual percent change in mortality rates by diabetes status and sex. Australia. Coronary heart disease. Values are predicted from a Poisson model with a spline effect of attained age, a log-linear effect of calendar time, and an interaction between age and calendar time. The left panels use a spline term for age in the interaction, the right panels use the product of age and calendar time in the interaction.

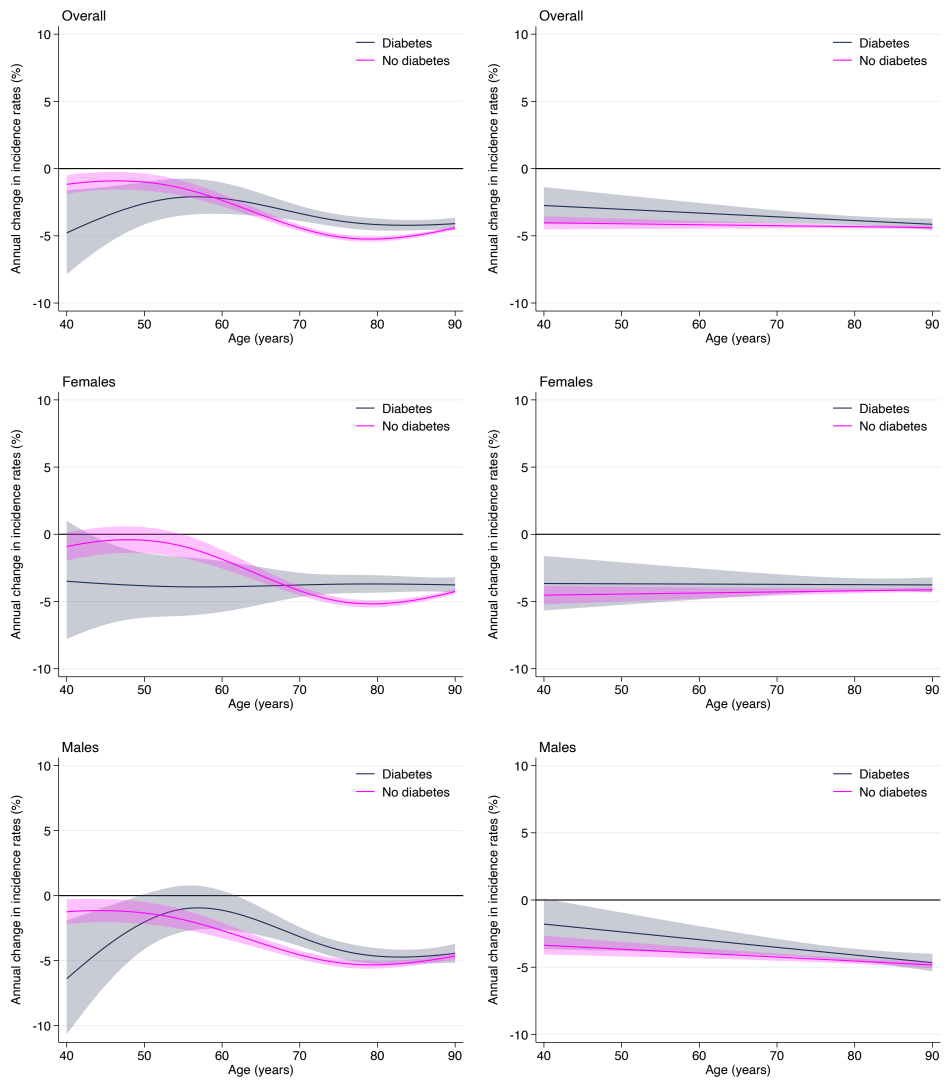


Figure 5.3: Annual percent change in mortality rates by diabetes status and sex. Australia. Cerebrovascular disease. Values are predicted from a Poisson model with a spline effect of attained age, a log-linear effect of calendar time, and an interaction between age and calendar time. The left panels use a spline term for age in the interaction, the right panels use the product of age and calendar time in the interaction.

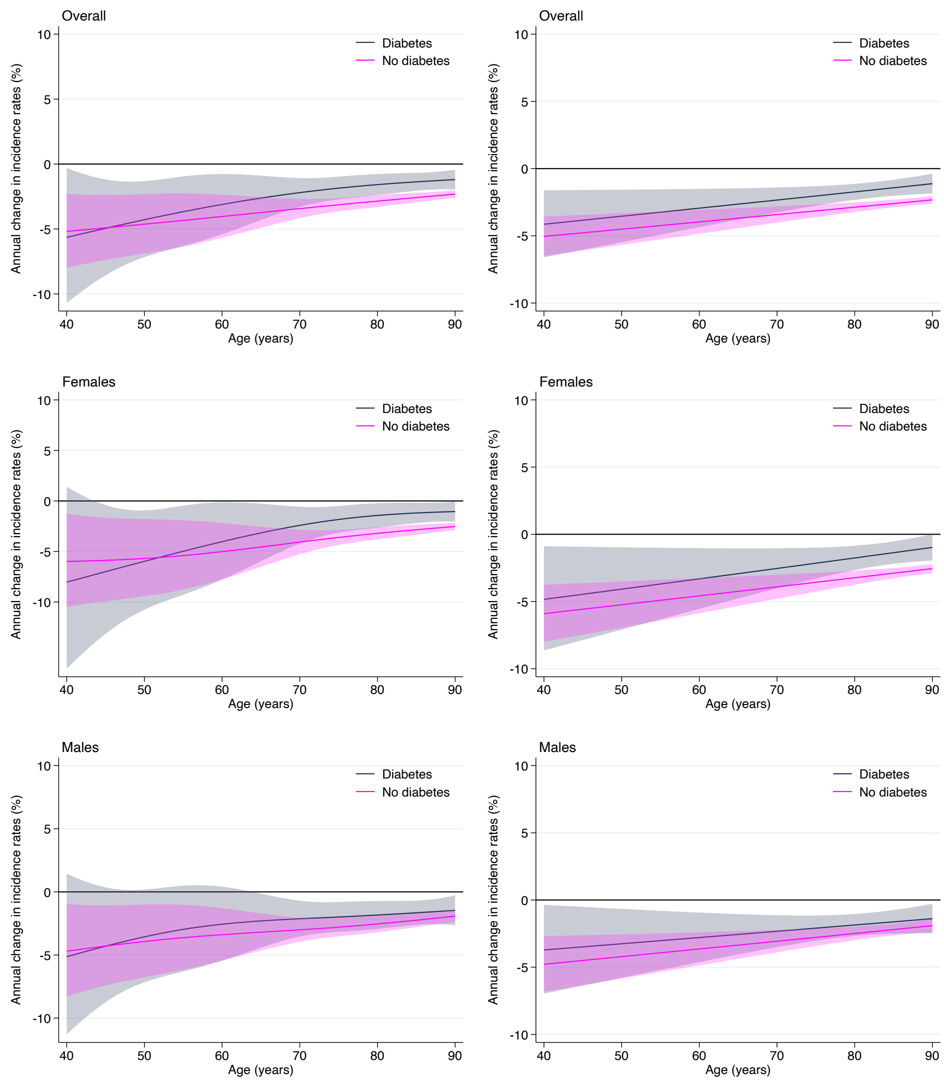


Figure 5.4: Annual percent change in mortality rates by diabetes status and sex. Australia. Heart failure. Values are predicted from a Poisson model with a spline effect of attained age, a log-linear effect of calendar time, and an interaction between age and calendar time. The left panels use a spline term for age in the interaction, the right panels use the product of age and calendar time in the interaction.

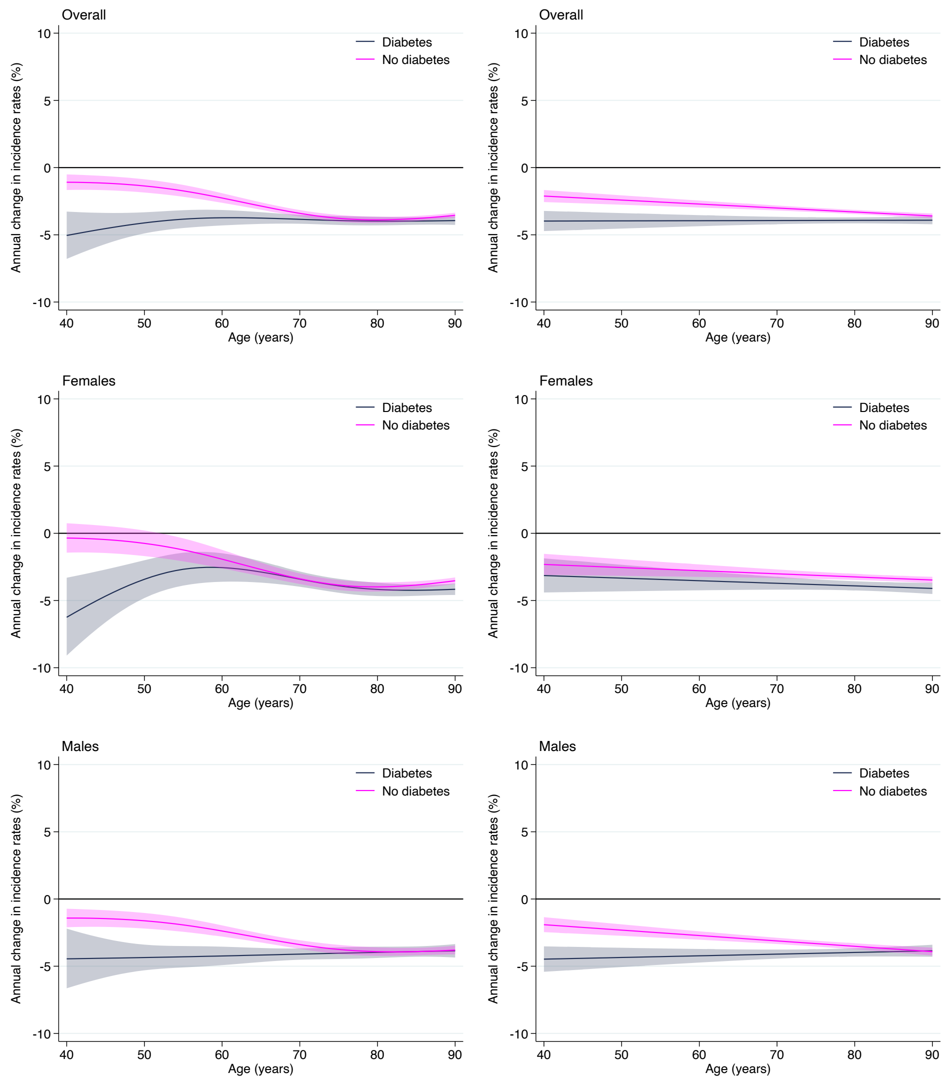


Figure 5.5: Annual percent change in mortality rates by diabetes status and sex. Canada (Alberta). Cardiovascular disease. Values are predicted from a Poisson model with a spline effect of attained age, a log-linear effect of calendar time, and an interaction between age and calendar time. The left panels use a spline term for age in the interaction, the right panels use the product of age and calendar time in the interaction.

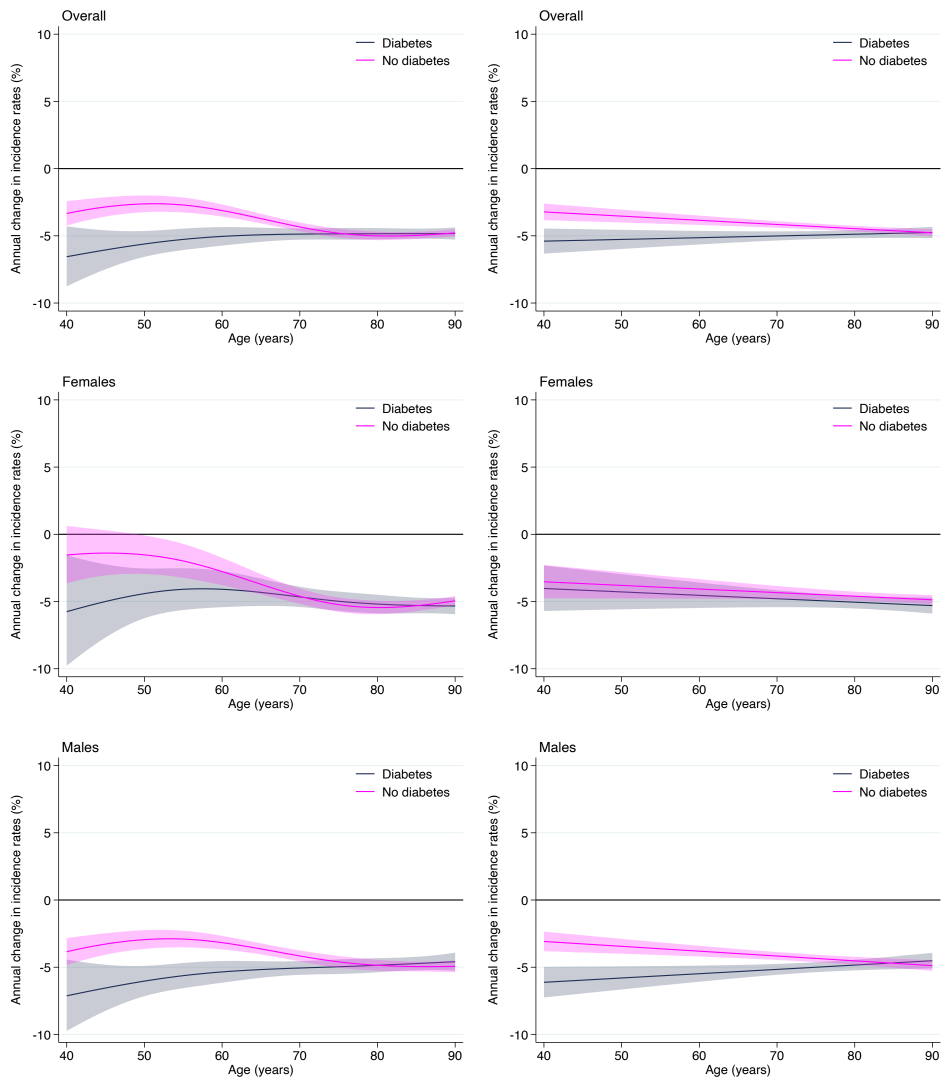


Figure 5.6: Annual percent change in mortality rates by diabetes status and sex. Canada (Alberta). Coronary heart disease. Values are predicted from a Poisson model with a spline effect of attained age, a log-linear effect of calendar time, and an interaction between age and calendar time. The left panels use a spline term for age in the interaction, the right panels use the product of age and calendar time in the interaction.

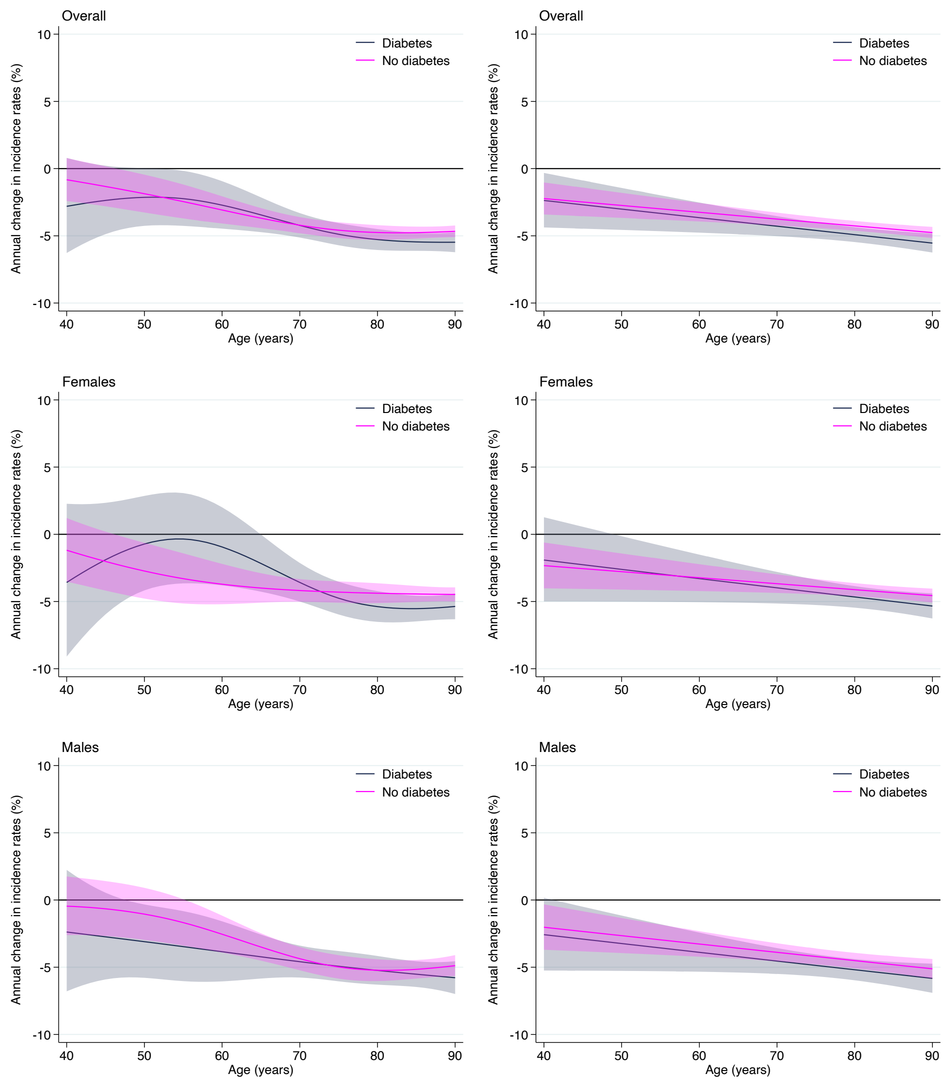


Figure 5.7: Annual percent change in mortality rates by diabetes status and sex. Canada (Alberta). Cerebrovascular disease. Values are predicted from a Poisson model with a spline effect of attained age, a log-linear effect of calendar time, and an interaction between age and calendar time. The left panels use a spline term for age in the interaction, the right panels use the product of age and calendar time in the interaction.

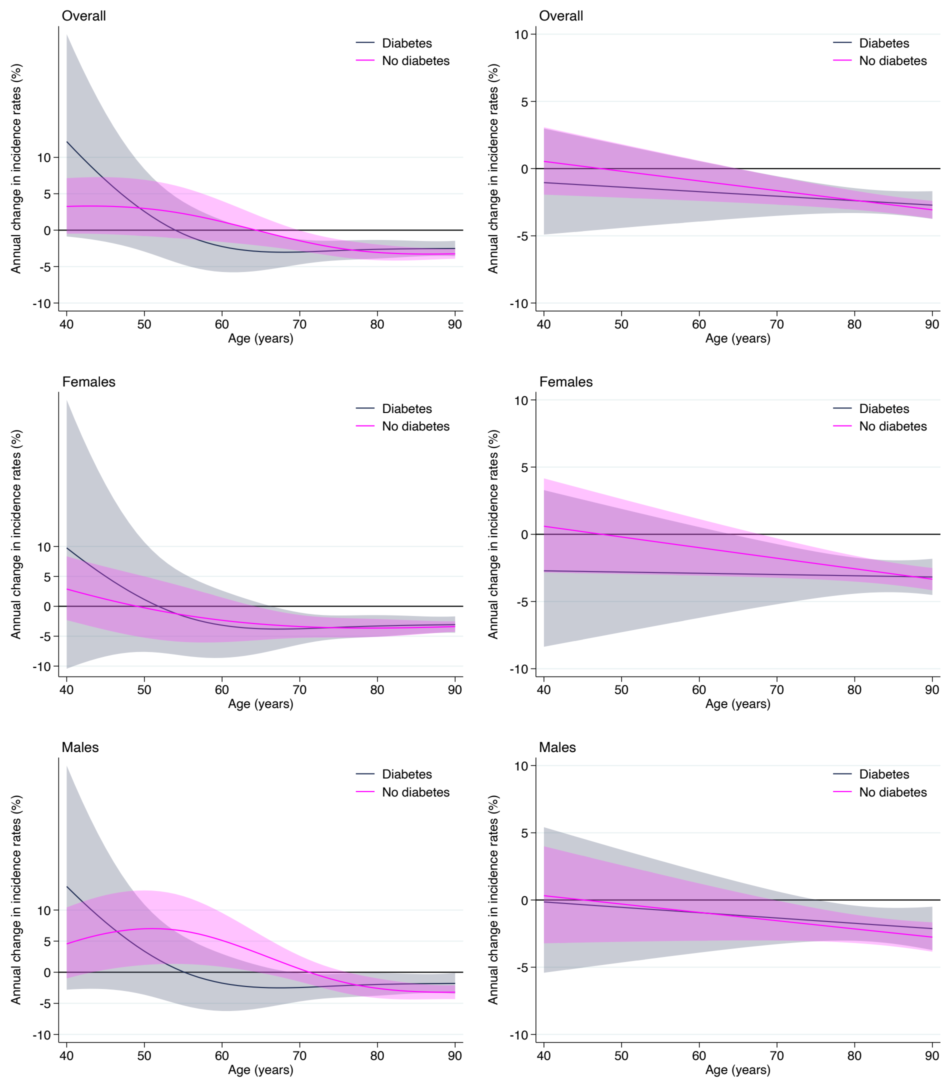


Figure 5.8: Annual percent change in mortality rates by diabetes status and sex. Canada (Alberta). Heart failure. Values are predicted from a Poisson model with a spline effect of attained age, a log-linear effect of calendar time, and an interaction between age and calendar time. The left panels use a spline term for age in the interaction, the right panels use the product of age and calendar time in the interaction.

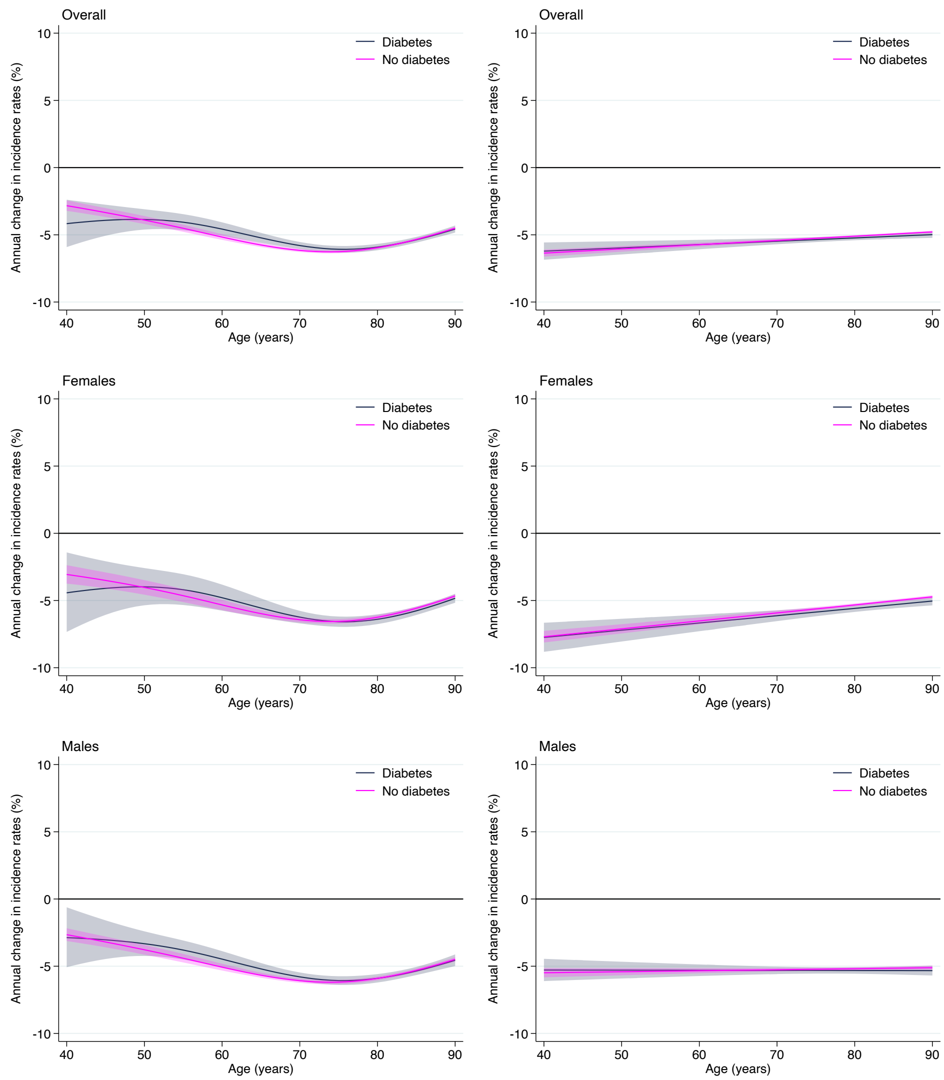


Figure 5.9: Annual percent change in mortality rates by diabetes status and sex. Denmark. Cardiovascular disease. Values are predicted from a Poisson model with a spline effect of attained age, a log-linear effect of calendar time, and an interaction between age and calendar time. The left panels use a spline term for age in the interaction, the right panels use the product of age and calendar time in the interaction.

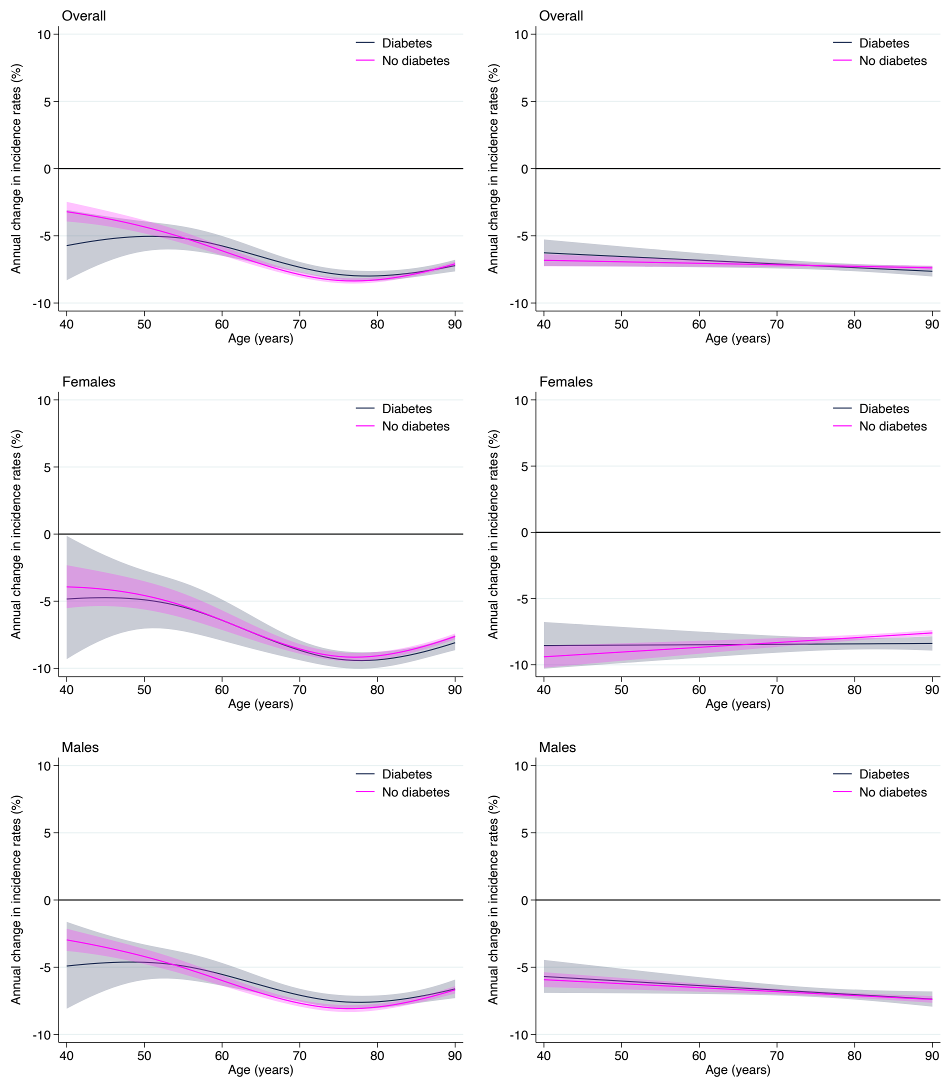


Figure 5.10: Annual percent change in mortality rates by diabetes status and sex. Denmark. Coronary heart disease. Values are predicted from a Poisson model with a spline effect of attained age, a log-linear effect of calendar time, and an interaction between age and calendar time. The left panels use a spline term for age in the interaction, the right panels use the product of age and calendar time in the interaction.

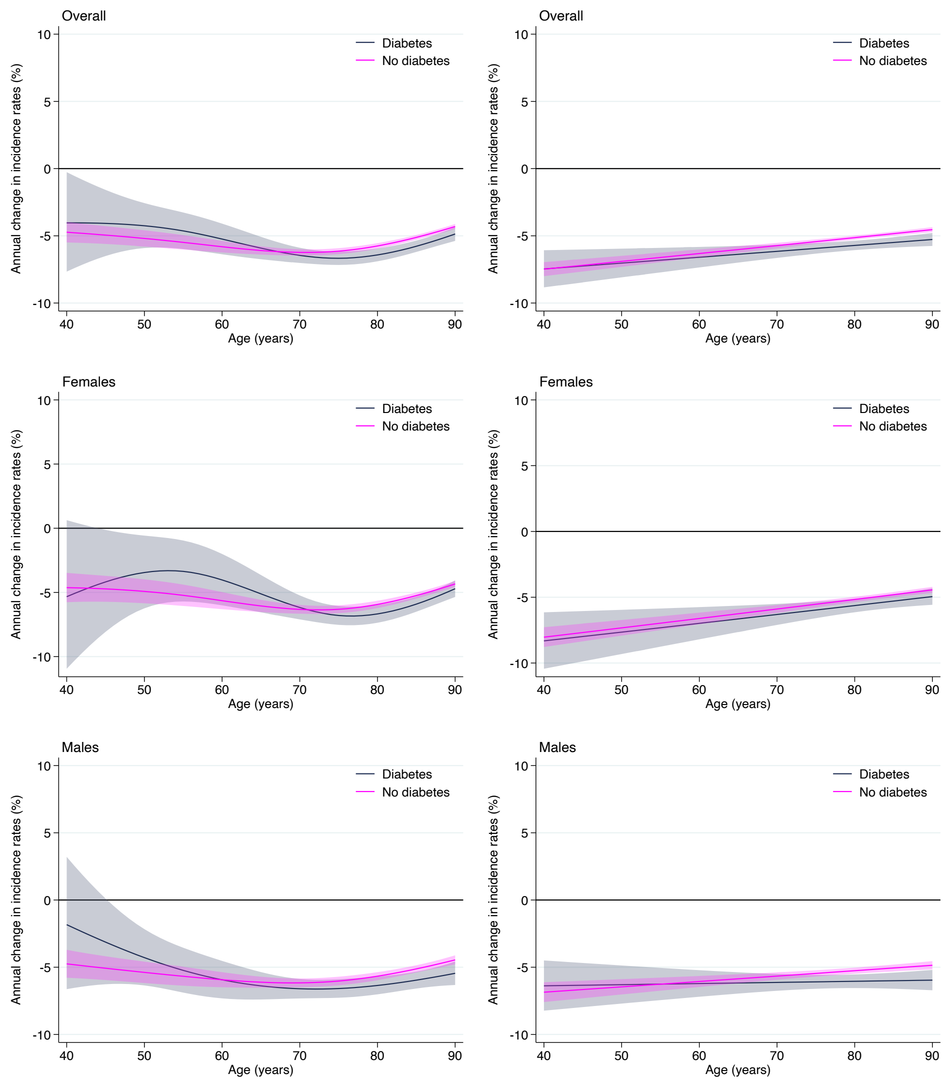


Figure 5.11: Annual percent change in mortality rates by diabetes status and sex. Denmark. Cerebrovascular disease. Values are predicted from a Poisson model with a spline effect of attained age, a log-linear effect of calendar time, and an interaction between age and calendar time. The left panels use a spline term for age in the interaction, the right panels use the product of age and calendar time in the interaction.

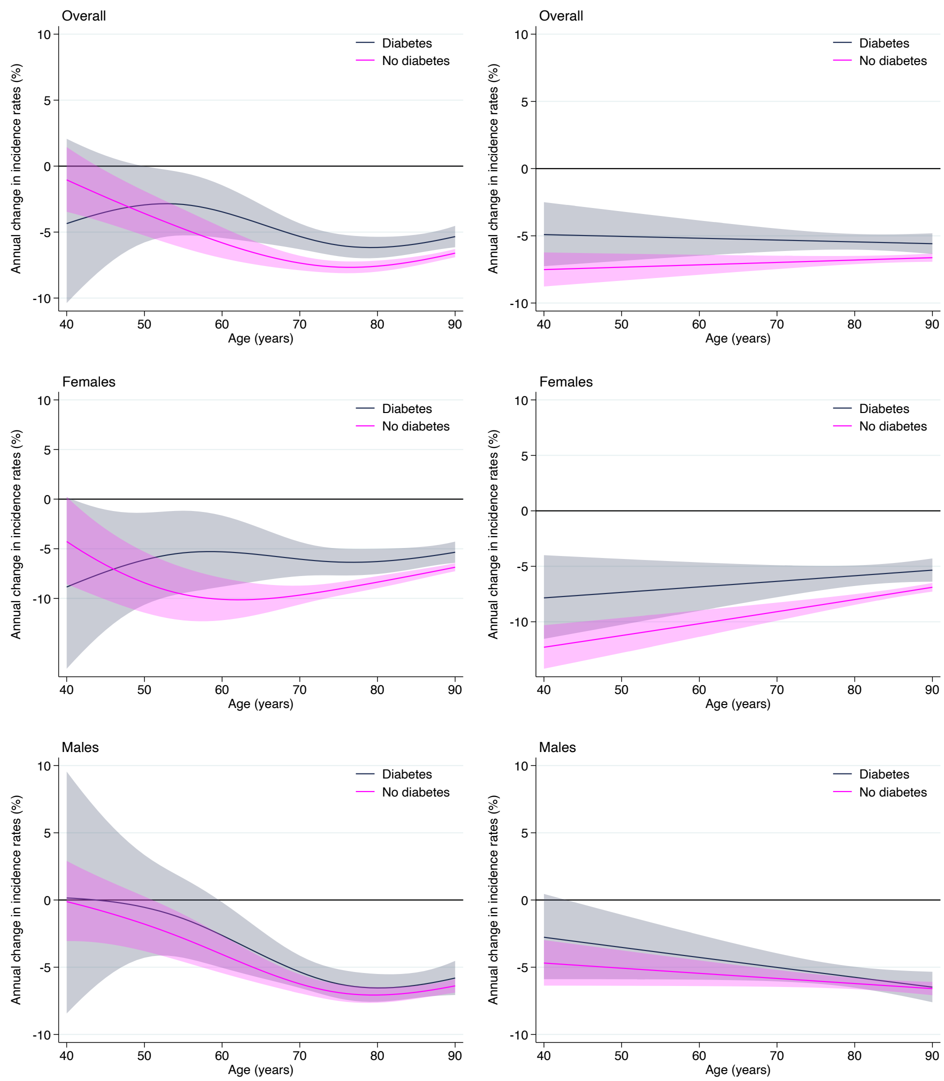


Figure 5.12: Annual percent change in mortality rates by diabetes status and sex. Denmark. Heart failure. Values are predicted from a Poisson model with a spline effect of attained age, a log-linear effect of calendar time, and an interaction between age and calendar time. The left panels use a spline term for age in the interaction, the right panels use the product of age and calendar time in the interaction.

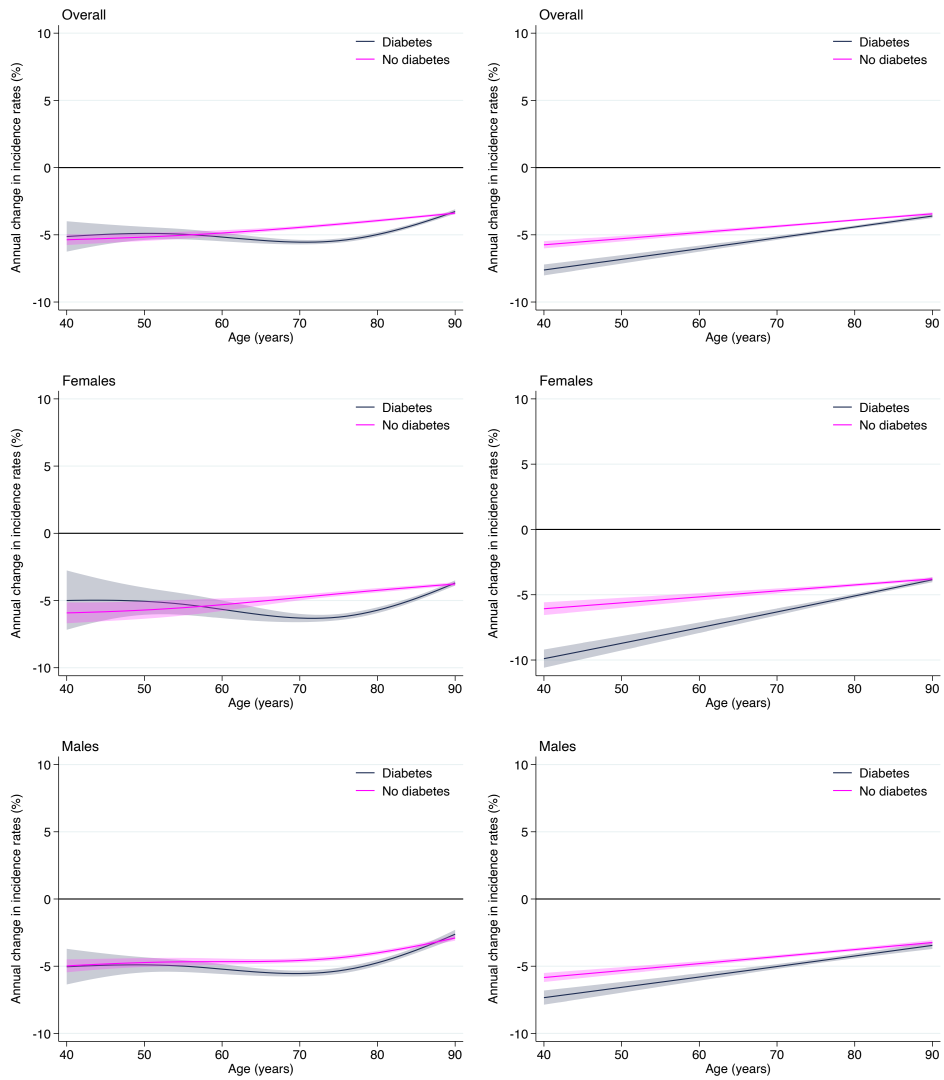


Figure 5.13: Annual percent change in mortality rates by diabetes status and sex. Finland. Cardiovascular disease. Values are predicted from a Poisson model with a spline effect of attained age, a log-linear effect of calendar time, and an interaction between age and calendar time. The left panels use a spline term for age in the interaction, the right panels use the product of age and calendar time in the interaction.

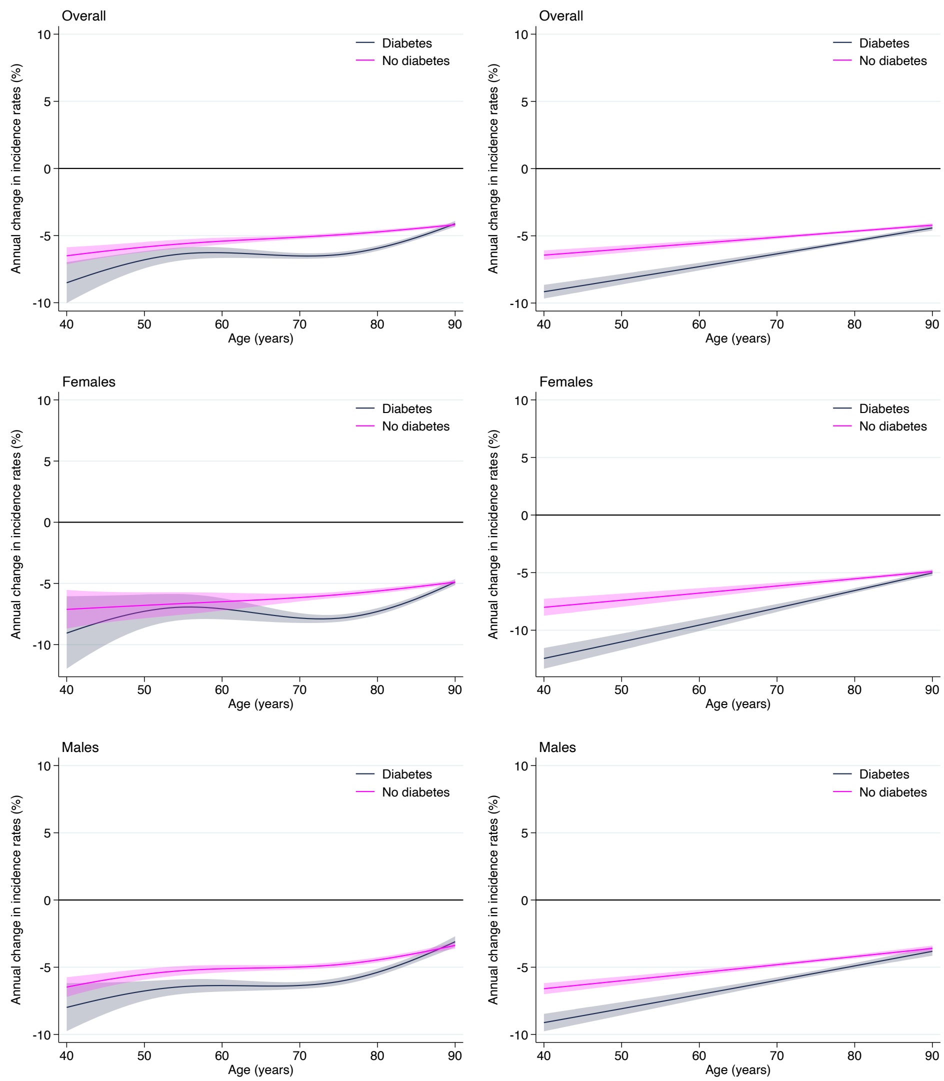


Figure 5.14: Annual percent change in mortality rates by diabetes status and sex. Finland. Coronary heart disease. Values are predicted from a Poisson model with a spline effect of attained age, a log-linear effect of calendar time, and an interaction between age and calendar time. The left panels use a spline term for age in the interaction, the right panels use the product of age and calendar time in the interaction.

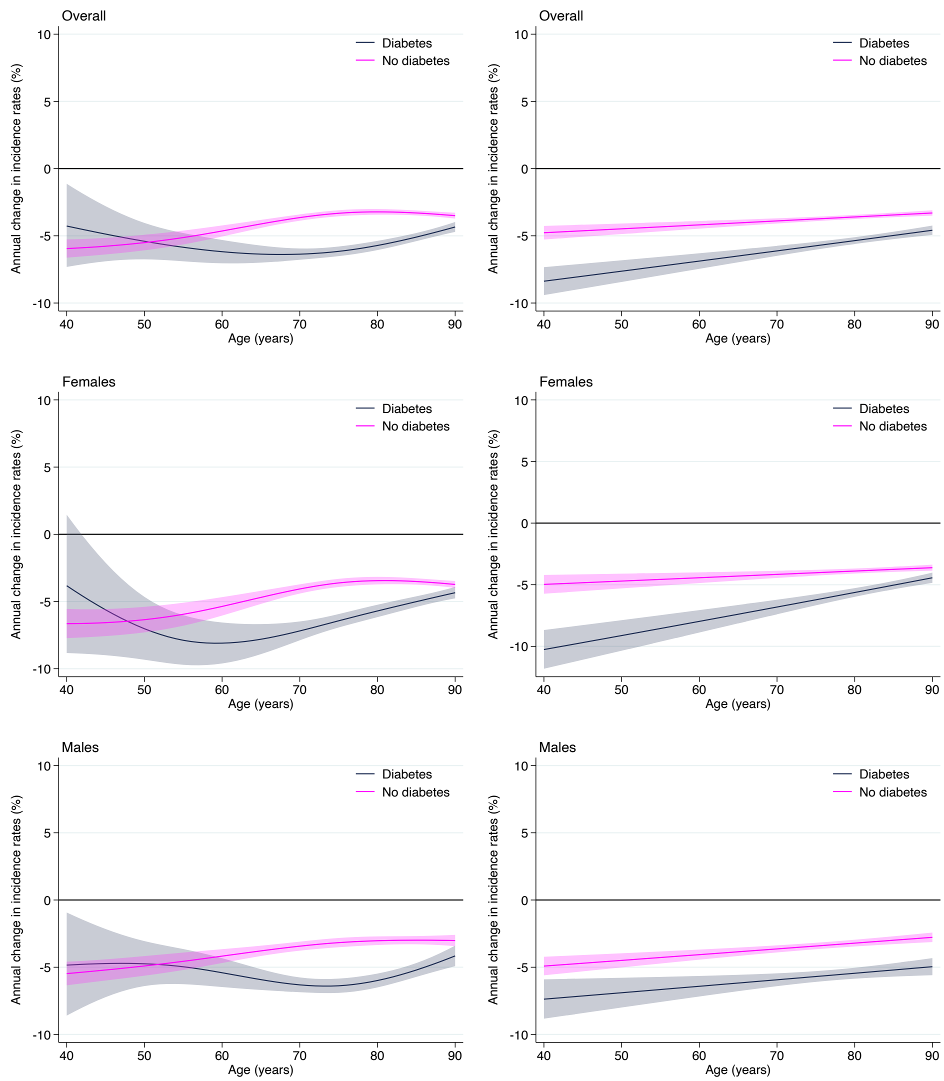


Figure 5.15: Annual percent change in mortality rates by diabetes status and sex. Finland. Cerebrovascular disease. Values are predicted from a Poisson model with a spline effect of attained age, a log-linear effect of calendar time, and an interaction between age and calendar time. The left panels use a spline term for age in the interaction, the right panels use the product of age and calendar time in the interaction.

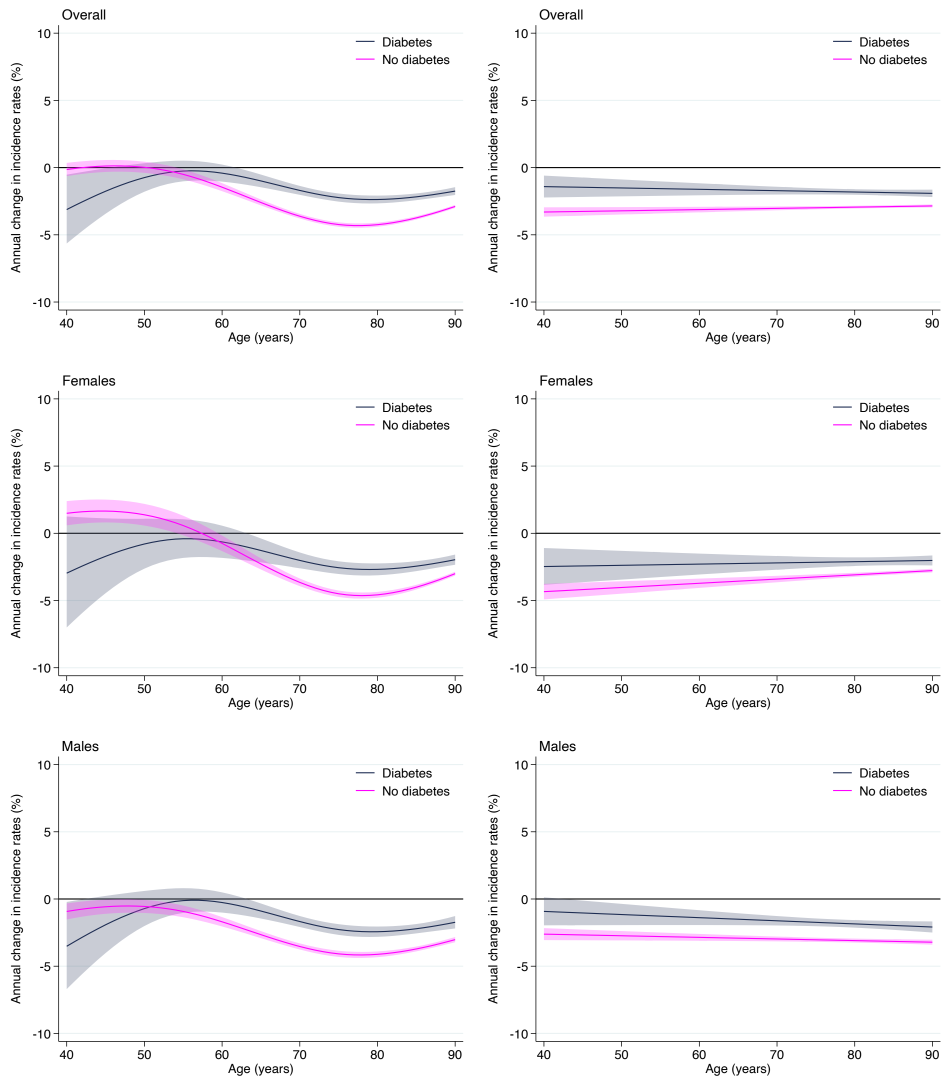


Figure 5.16: Annual percent change in mortality rates by diabetes status and sex. France. Cardiovascular disease. Values are predicted from a Poisson model with a spline effect of attained age, a log-linear effect of calendar time, and an interaction between age and calendar time. The left panels use a spline term for age in the interaction, the right panels use the product of age and calendar time in the interaction.

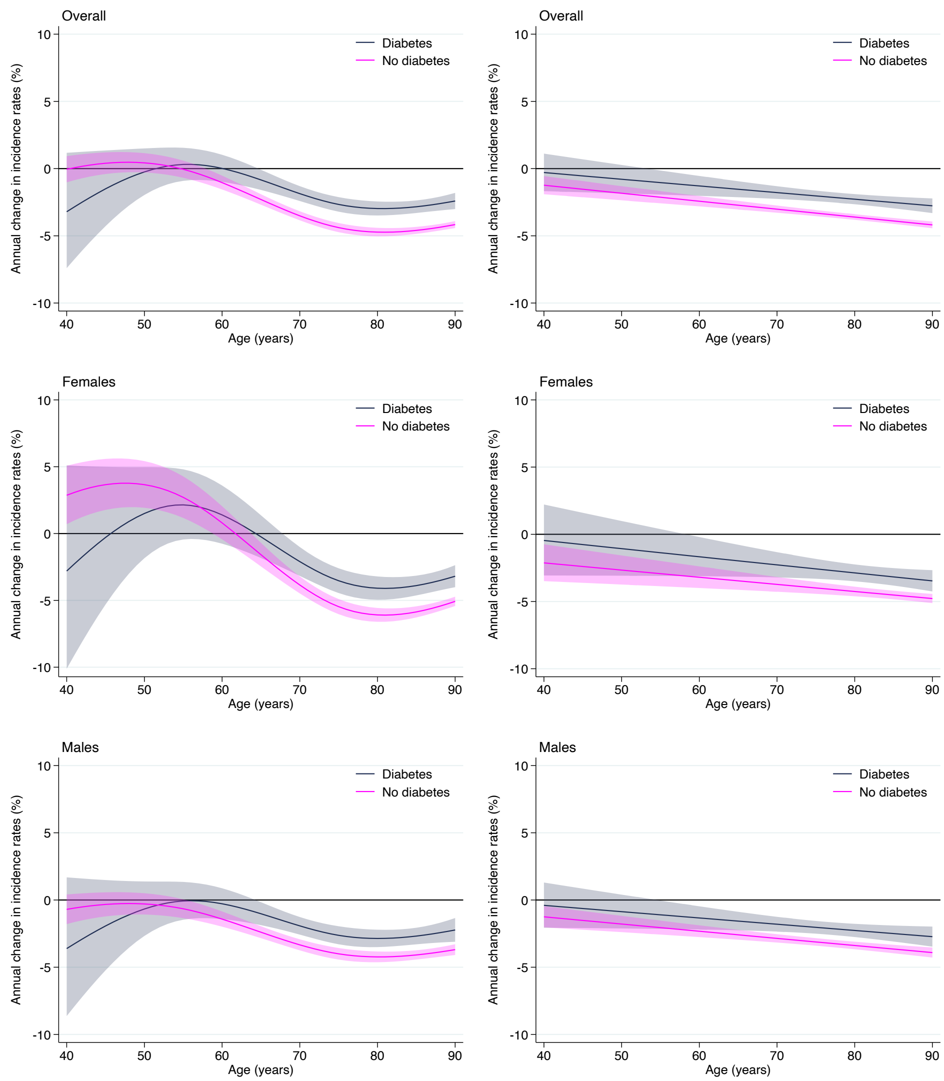


Figure 5.17: Annual percent change in mortality rates by diabetes status and sex. France. Coronary heart disease. Values are predicted from a Poisson model with a spline effect of attained age, a log-linear effect of calendar time, and an interaction between age and calendar time. The left panels use a spline term for age in the interaction, the right panels use the product of age and calendar time in the interaction.

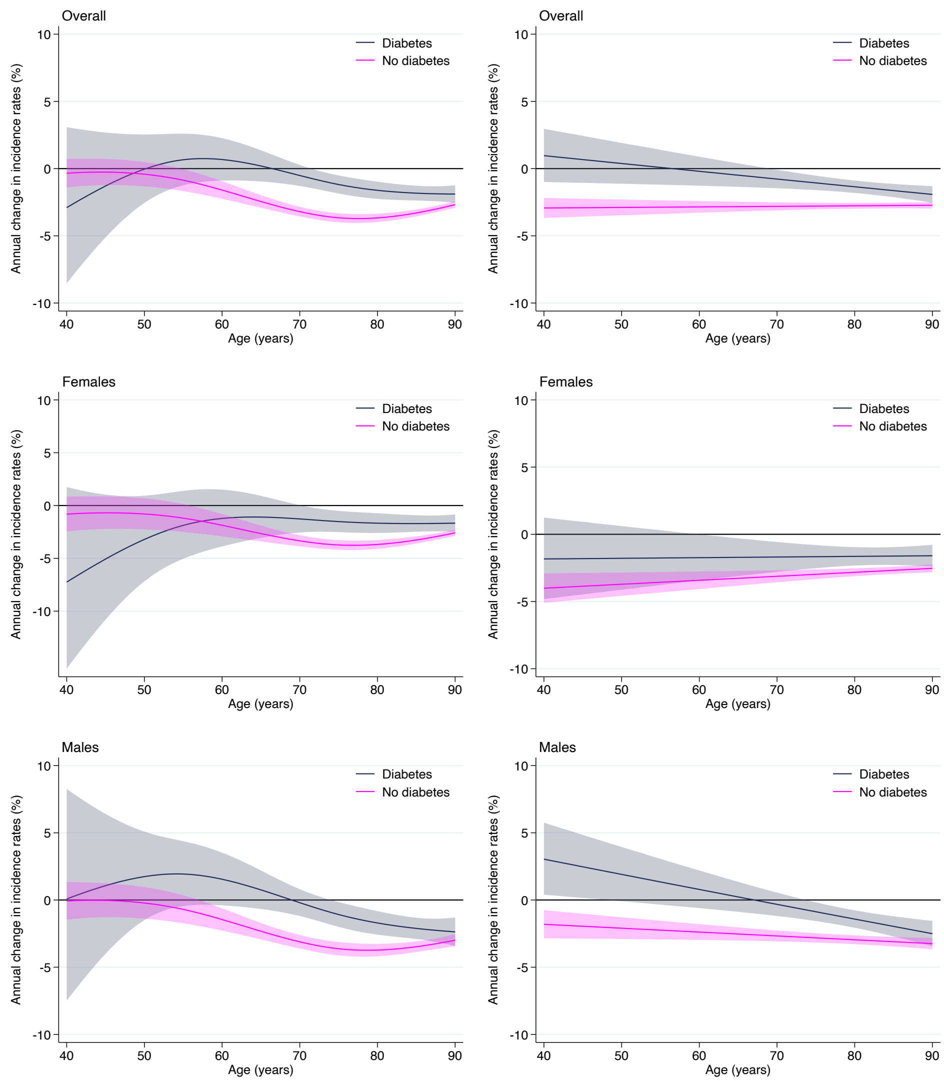


Figure 5.18: Annual percent change in mortality rates by diabetes status and sex. France. Cerebrovascular disease. Values are predicted from a Poisson model with a spline effect of attained age, a log-linear effect of calendar time, and an interaction between age and calendar time. The left panels use a spline term for age in the interaction, the right panels use the product of age and calendar time in the interaction.

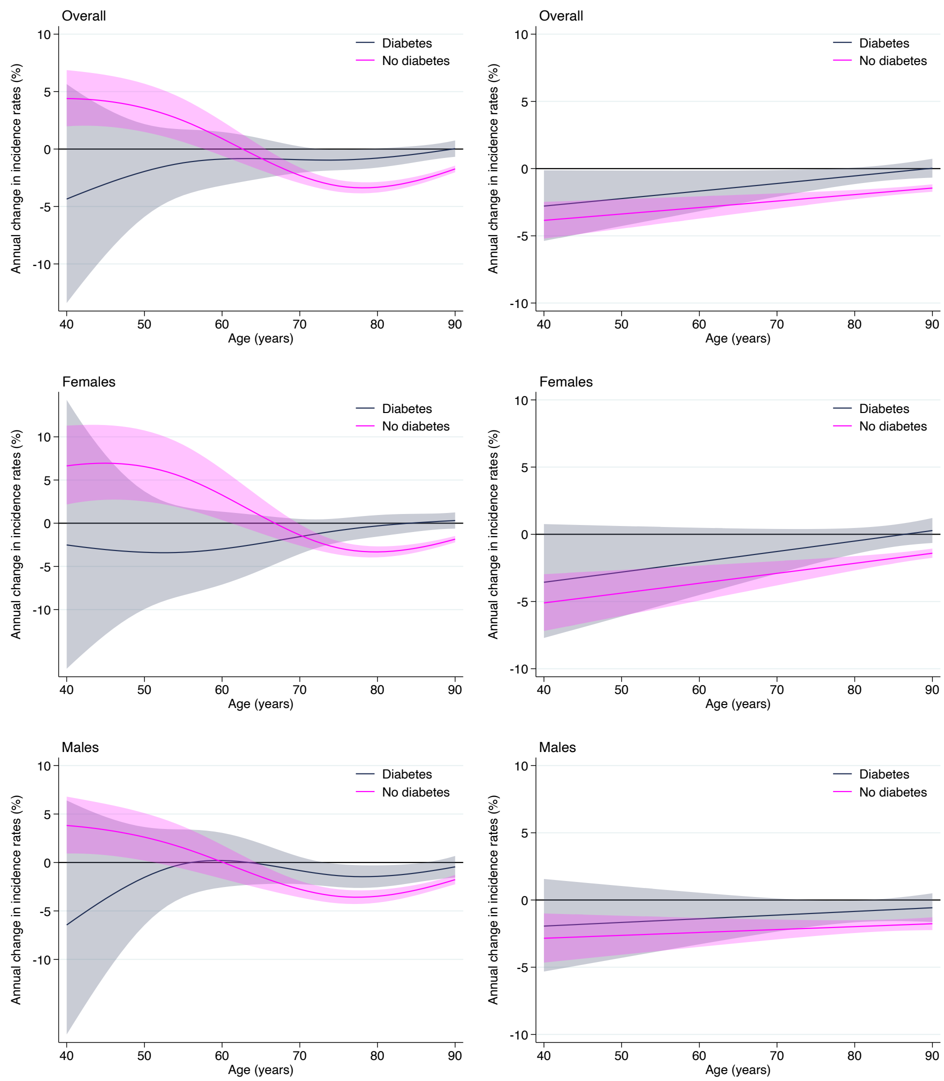


Figure 5.19: Annual percent change in mortality rates by diabetes status and sex. France. Heart failure. Values are predicted from a Poisson model with a spline effect of attained age, a log-linear effect of calendar time, and an interaction between age and calendar time. The left panels use a spline term for age in the interaction, the right panels use the product of age and calendar time in the interaction.

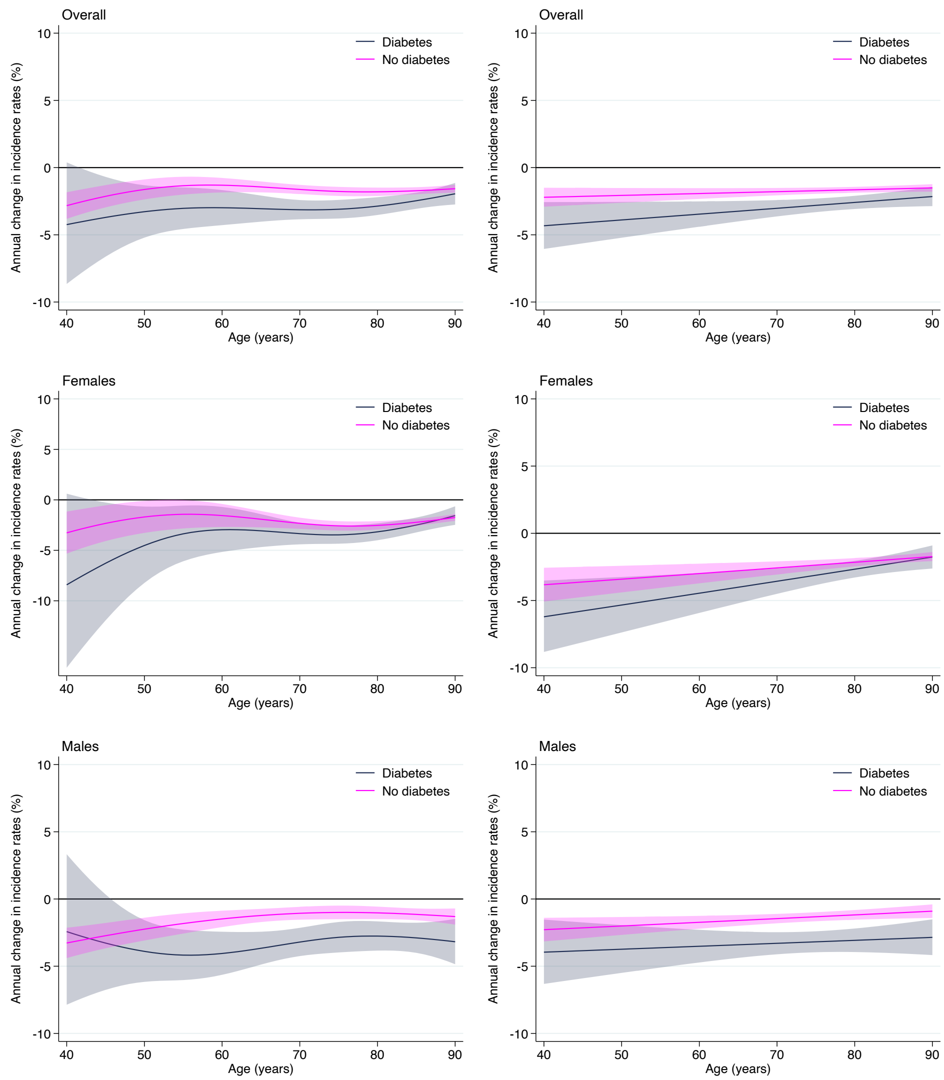


Figure 5.20: Annual percent change in mortality rates by diabetes status and sex. Lithuania. Cardiovascular disease. Values are predicted from a Poisson model with a spline effect of attained age, a log-linear effect of calendar time, and an interaction between age and calendar time. The left panels use a spline term for age in the interaction, the right panels use the product of age and calendar time in the interaction.

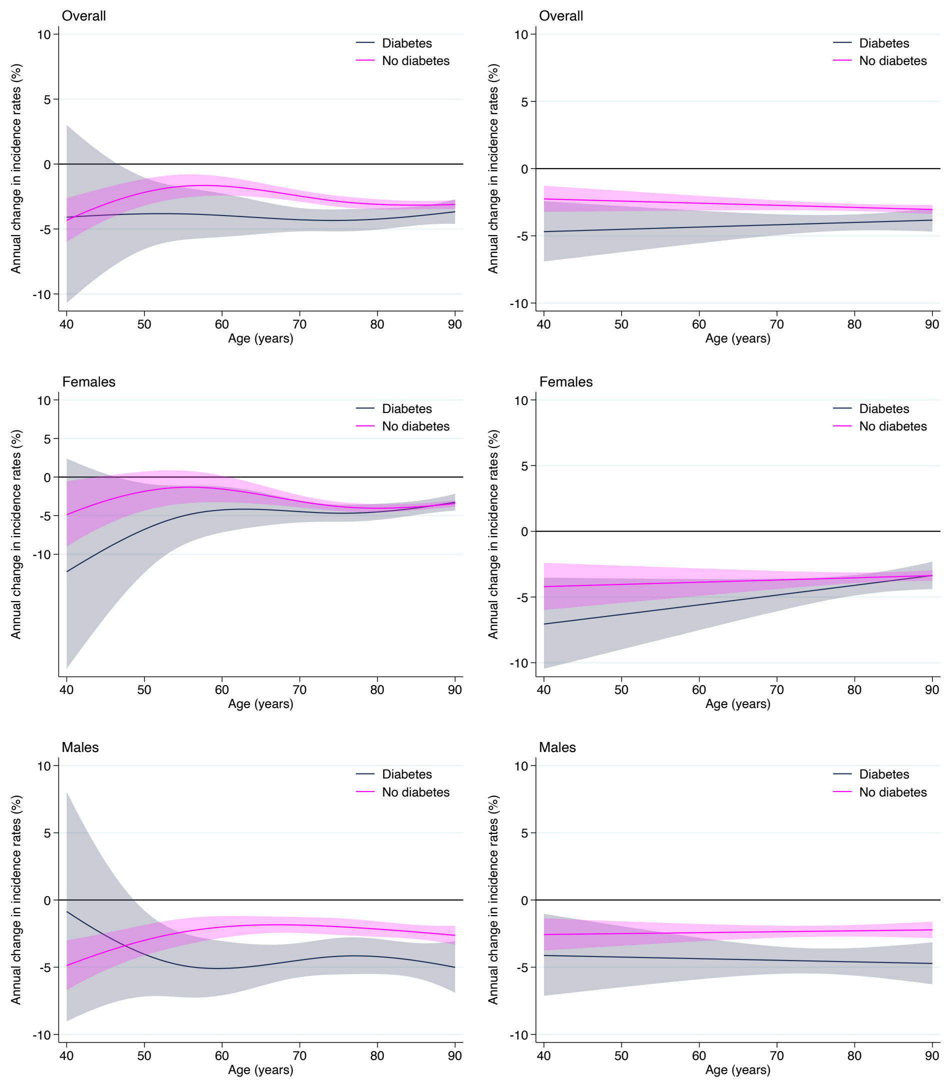


Figure 5.21: Annual percent change in mortality rates by diabetes status and sex. Lithuania. Coronary heart disease. Values are predicted from a Poisson model with a spline effect of attained age, a log-linear effect of calendar time, and an interaction between age and calendar time. The left panels use a spline term for age in the interaction, the right panels use the product of age and calendar time in the interaction.

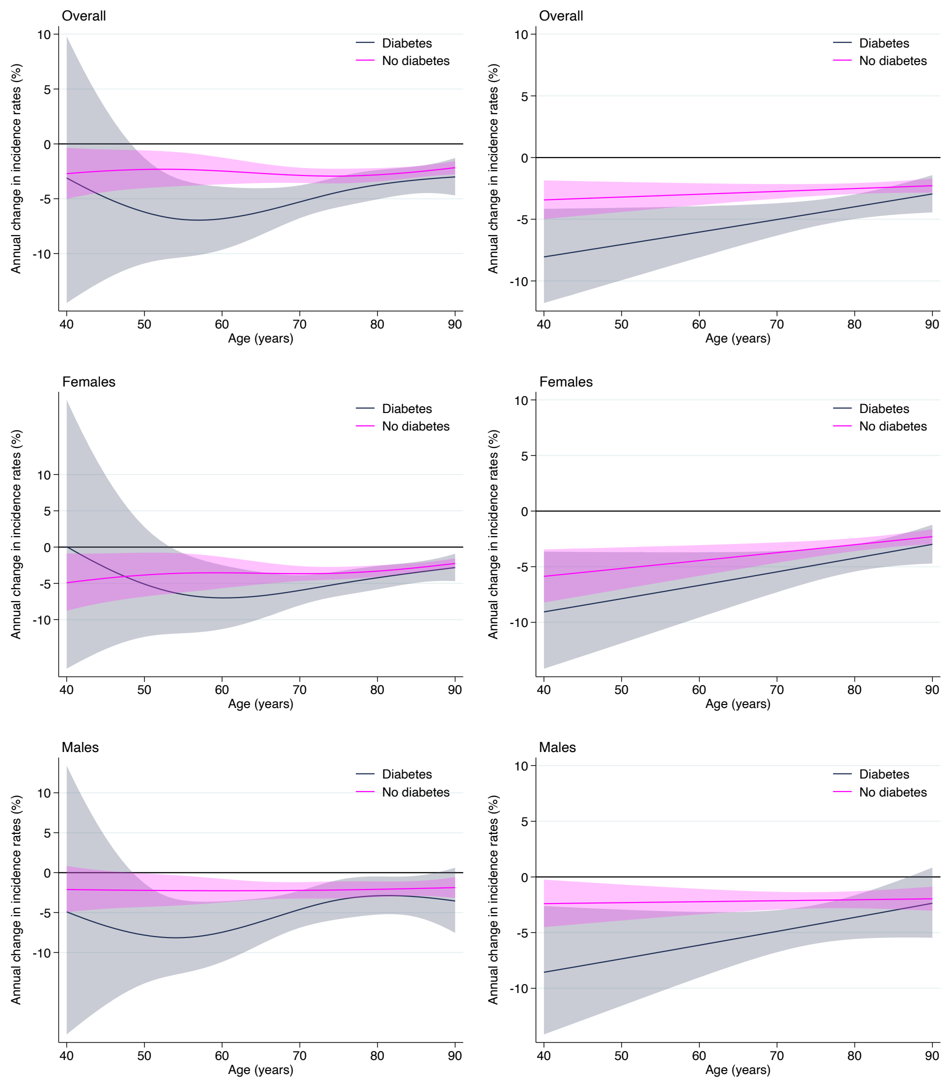


Figure 5.22: Annual percent change in mortality rates by diabetes status and sex. Lithuania. Cerebrovascular disease. Values are predicted from a Poisson model with a spline effect of attained age, a log-linear effect of calendar time, and an interaction between age and calendar time. The left panels use a spline term for age in the interaction, the right panels use the product of age and calendar time in the interaction.

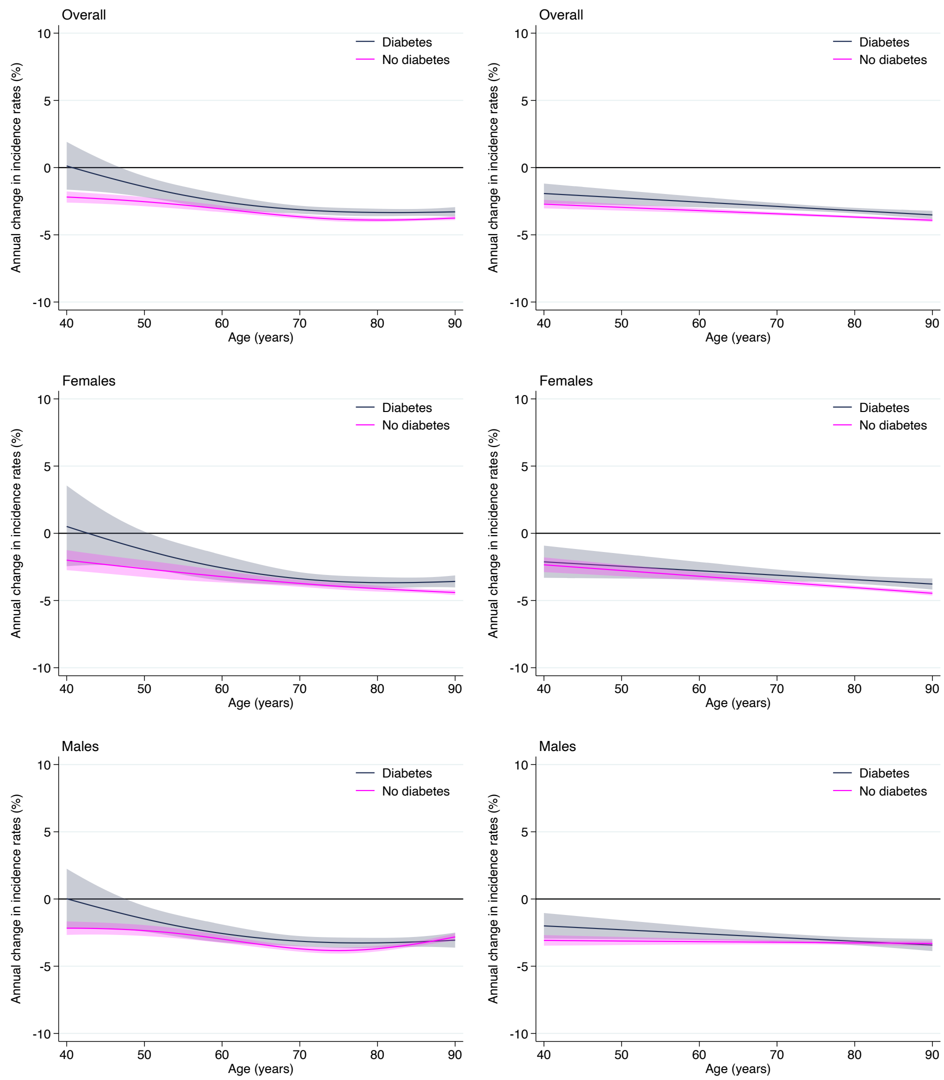


Figure 5.23: Annual percent change in mortality rates by diabetes status and sex. Scotland. Cardiovascular disease. Values are predicted from a Poisson model with a spline effect of attained age, a log-linear effect of calendar time, and an interaction between age and calendar time. The left panels use a spline term for age in the interaction, the right panels use the product of age and calendar time in the interaction.

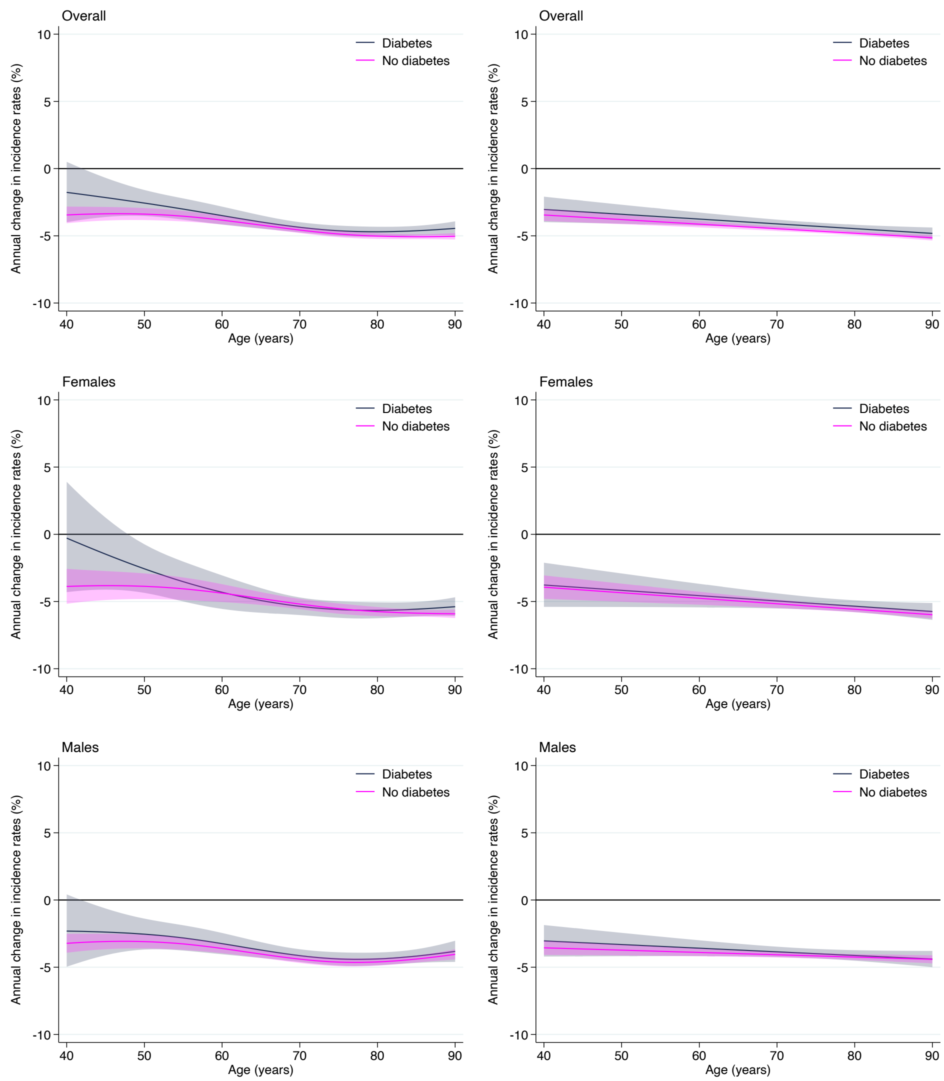


Figure 5.24: Annual percent change in mortality rates by diabetes status and sex. Scotland. Coronary heart disease. Values are predicted from a Poisson model with a spline effect of attained age, a log-linear effect of calendar time, and an interaction between age and calendar time. The left panels use a spline term for age in the interaction, the right panels use the product of age and calendar time in the interaction.

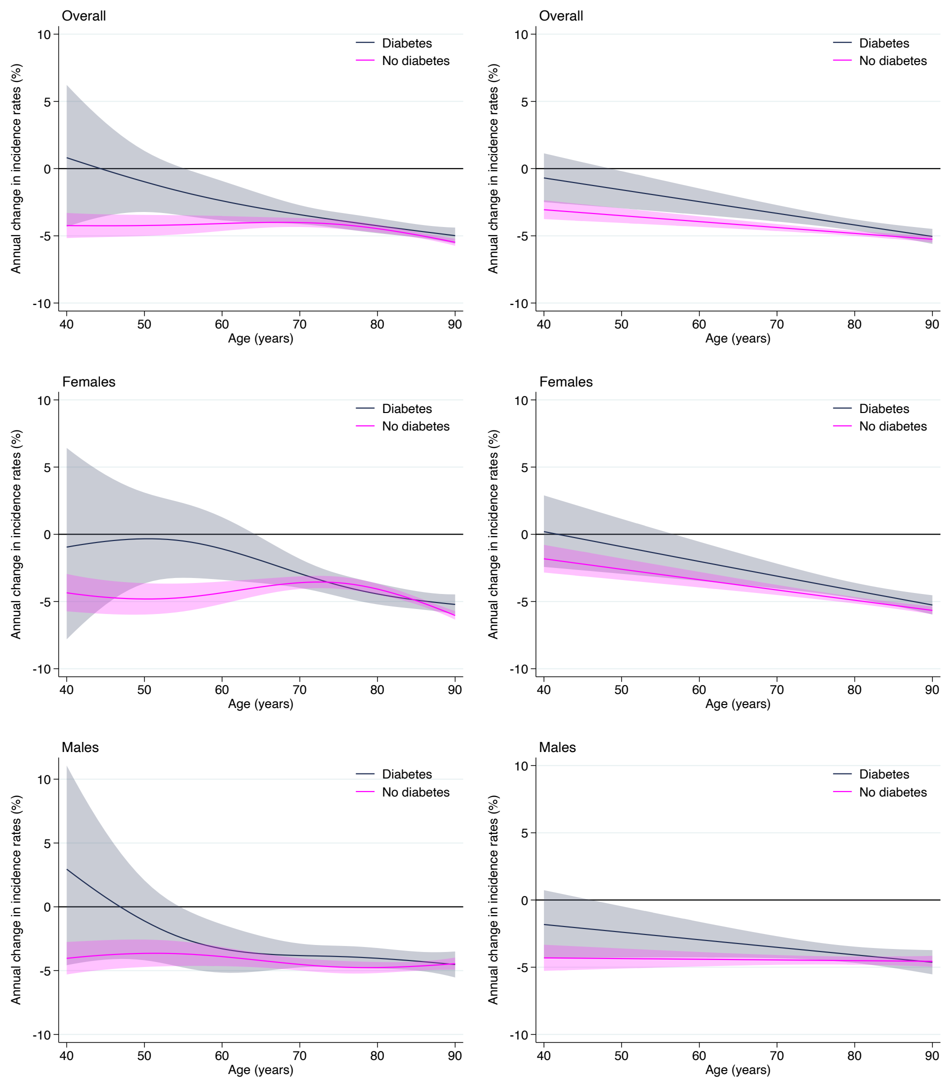


Figure 5.25: Annual percent change in mortality rates by diabetes status and sex. Scotland. Cerebrovascular disease. Values are predicted from a Poisson model with a spline effect of attained age, a log-linear effect of calendar time, and an interaction between age and calendar time. The left panels use a spline term for age in the interaction, the right panels use the product of age and calendar time in the interaction.

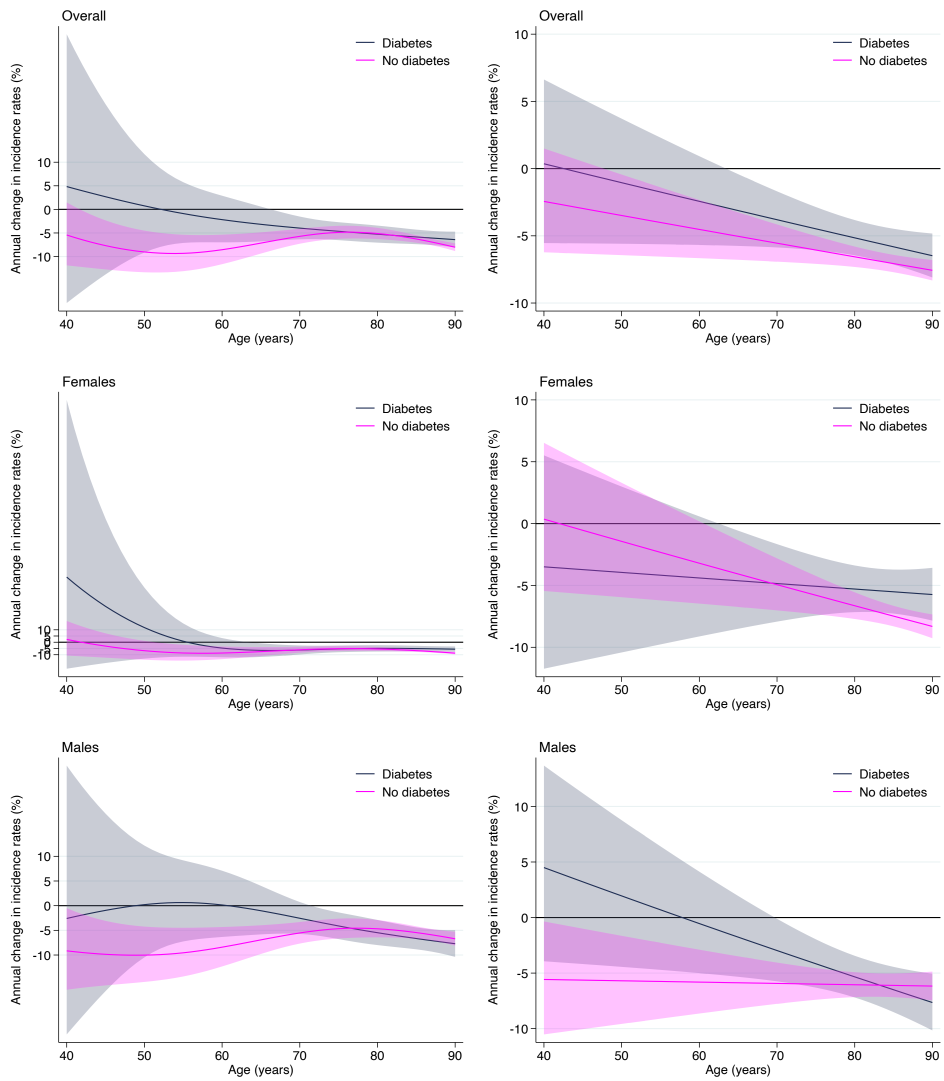


Figure 5.26: Annual percent change in mortality rates by diabetes status and sex. Scotland. Heart failure. Values are predicted from a Poisson model with a spline effect of attained age, a log-linear effect of calendar time, and an interaction between age and calendar time. The left panels use a spline term for age in the interaction, the right panels use the product of age and calendar time in the interaction.

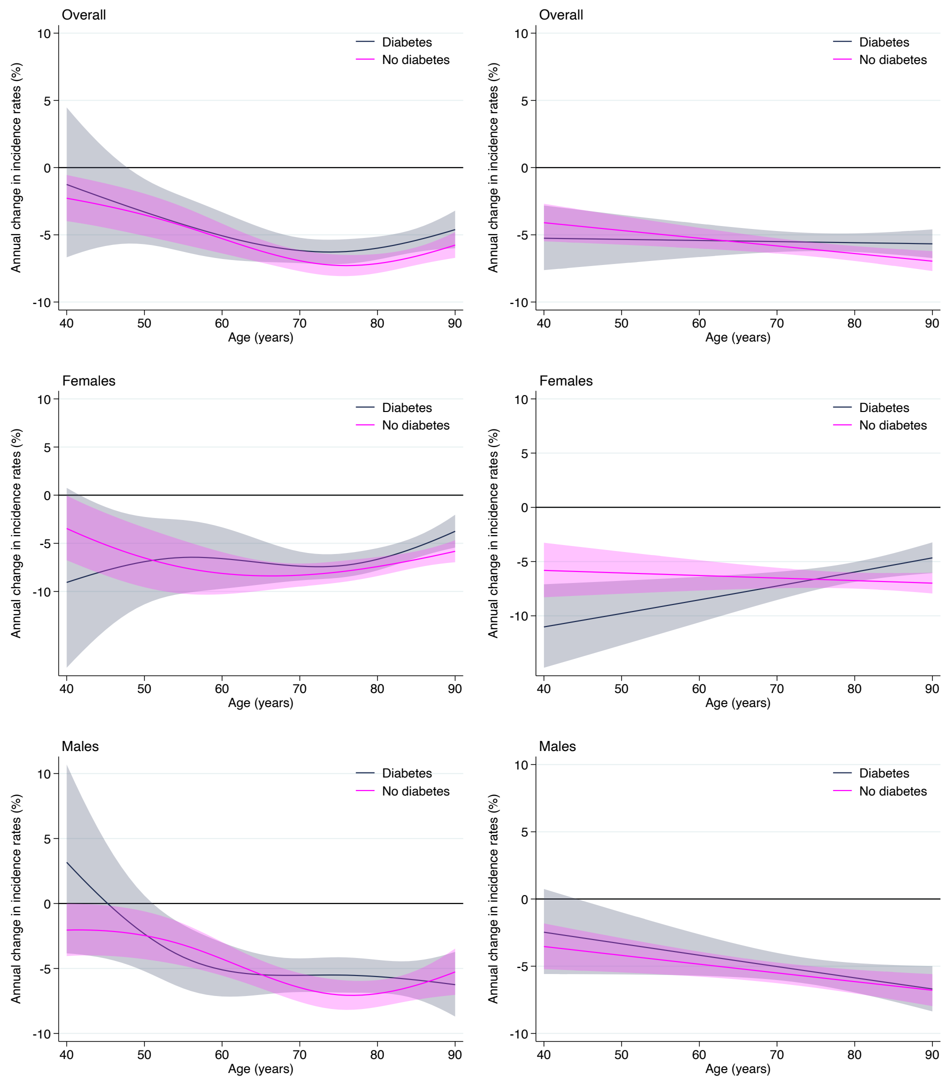


Figure 5.27: Annual percent change in mortality rates by diabetes status and sex. South Korea. Cardiovascular disease. Values are predicted from a Poisson model with a spline effect of attained age, a log-linear effect of calendar time, and an interaction between age and calendar time. The left panels use a spline term for age in the interaction, the right panels use the product of age and calendar time in the interaction.

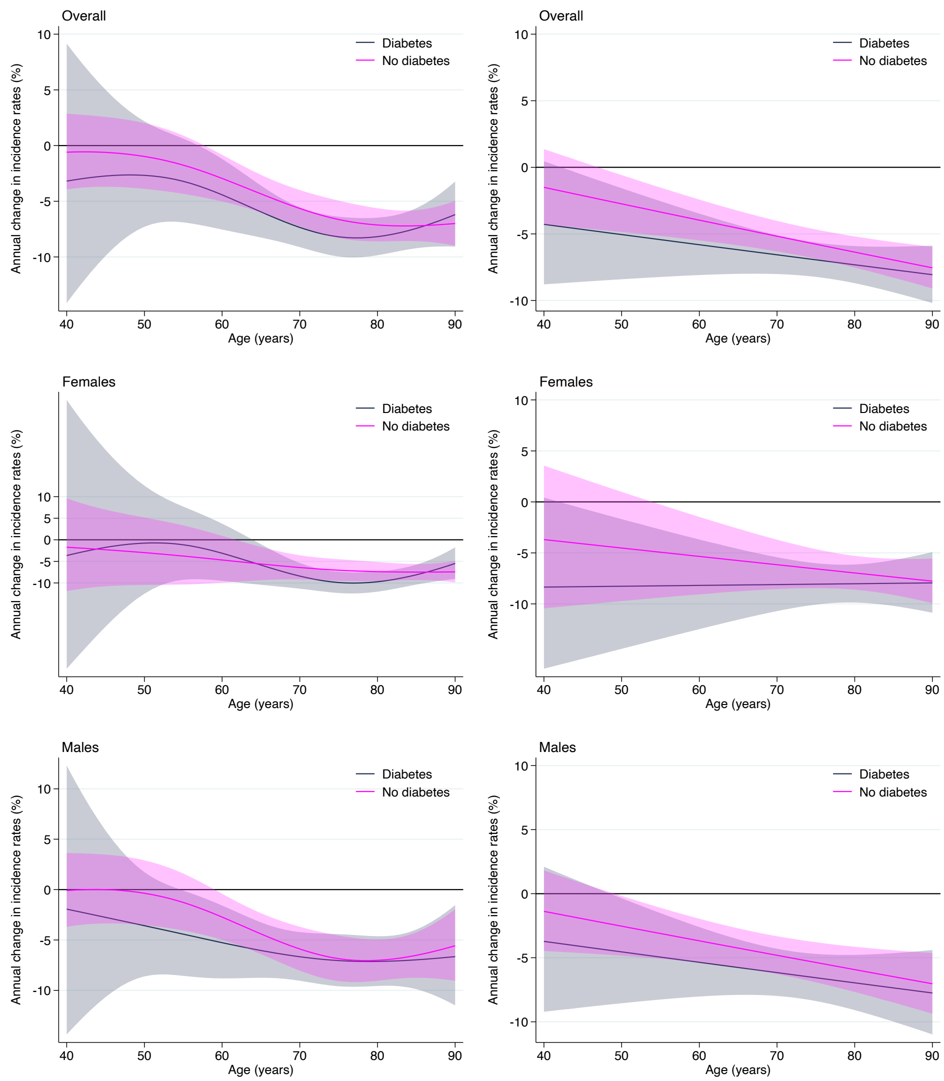


Figure 5.28: Annual percent change in mortality rates by diabetes status and sex. South Korea. Coronary heart disease. Values are predicted from a Poisson model with a spline effect of attained age, a log-linear effect of calendar time, and an interaction between age and calendar time. The left panels use a spline term for age in the interaction, the right panels use the product of age and calendar time in the interaction.

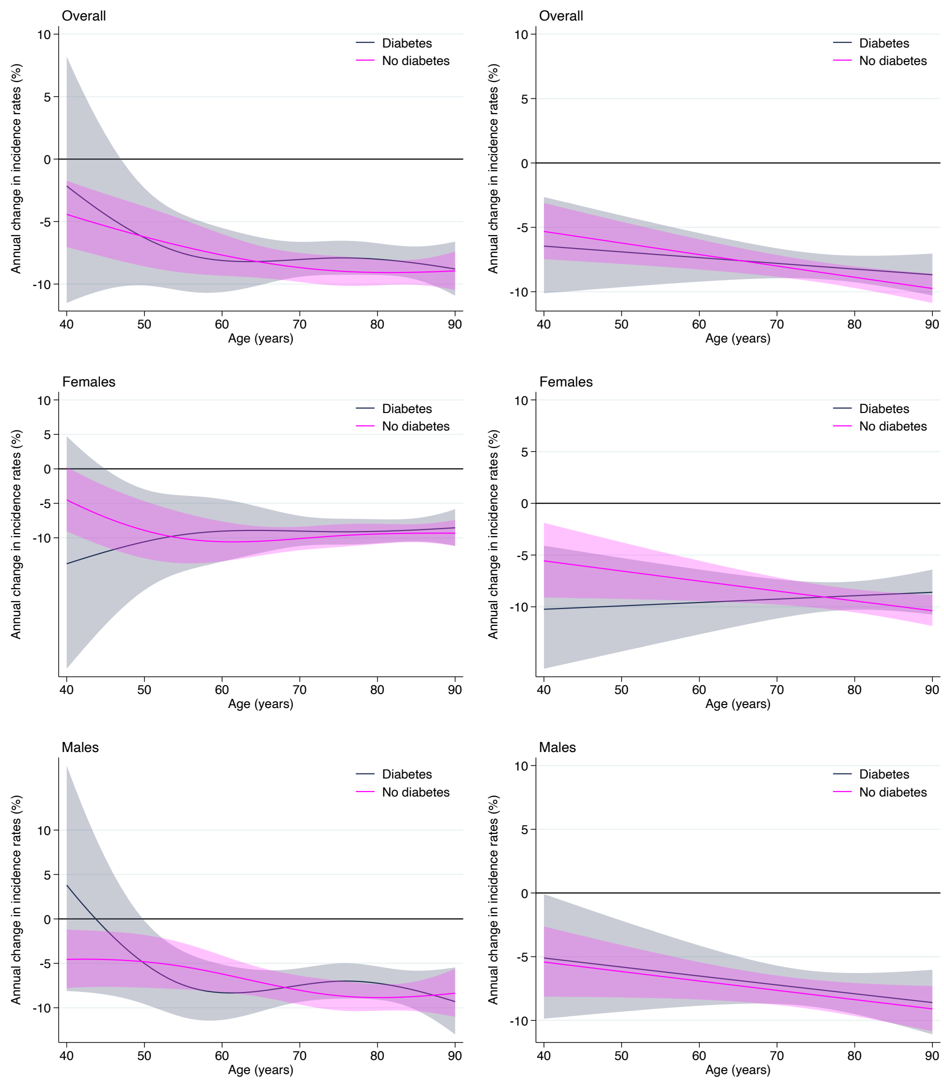


Figure 5.29: Annual percent change in mortality rates by diabetes status and sex. South Korea. Cerebrovascular disease. Values are predicted from a Poisson model with a spline effect of attained age, a log-linear effect of calendar time, and an interaction between age and calendar time. The left panels use a spline term for age in the interaction, the right panels use the product of age and calendar time in the interaction.

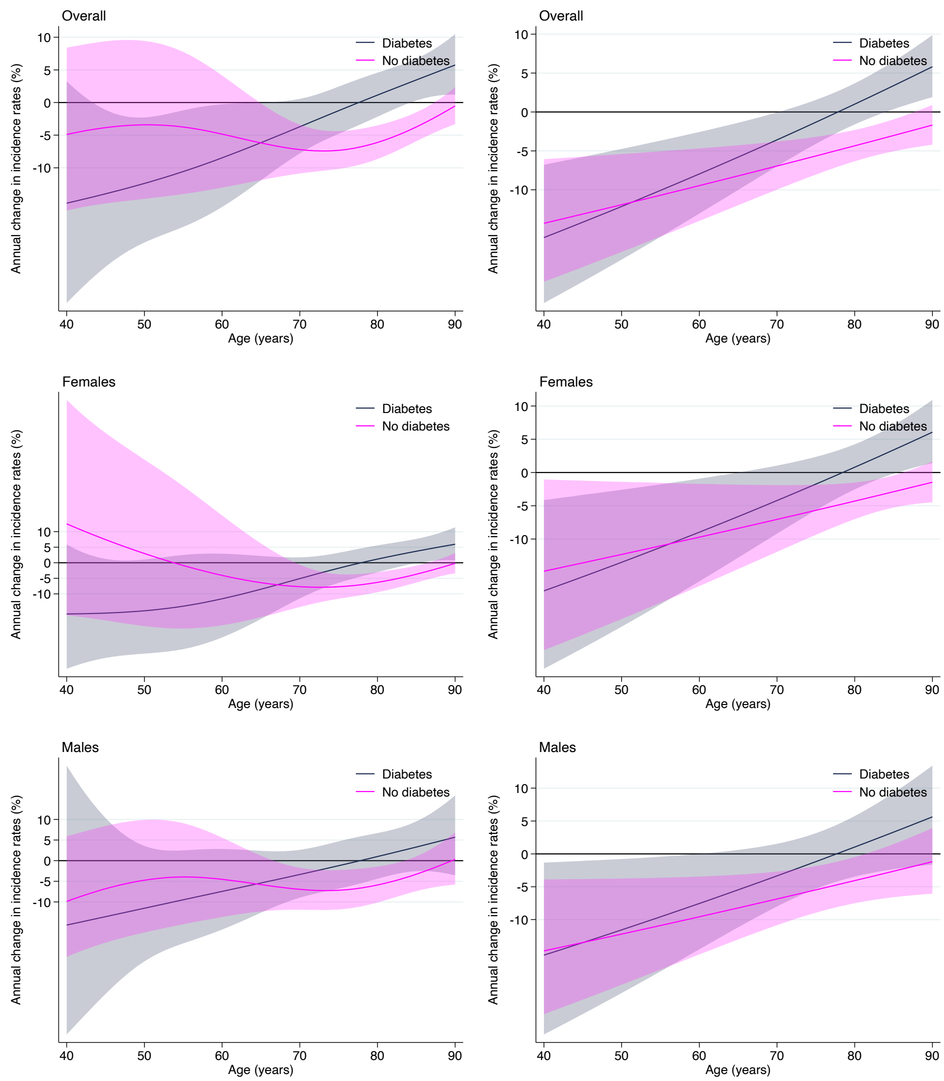


Figure 5.30: Annual percent change in mortality rates by diabetes status and sex. South Korea. Heart failure. Values are predicted from a Poisson model with a spline effect of attained age, a log-linear effect of calendar time, and an interaction between age and calendar time. The left panels use a spline term for age in the interaction, the right panels use the product of age and calendar time in the interaction.

6 Age- and sex-standardised rates

```
*copy "/Users/jed/Documents/CM/refpop.dta" "refpop.dta"
*copy "/Users/jed/Documents/CM/refpops.dta" "refpops.dta"
quietly {
foreach i in Australia Canada Denmark Finland France Lithuania Scotland SKorea {
foreach ii in cvd chd cbd hfd {
foreach iii in dm nondm {
foreach iiii in 0 1 {
use `i´, clear
keep if sex == `iiii´
replace calendar = calendar-2009.5
gen coh = calendar-age_`iii´
centile(age_`iii´), centile(5 35 65 95)
local A1 = r(c_1)
local A2 = r(c_2)
local A3 = r(c_3)
local A4 = r(c_4)
mkspline agesp = age_`iii´, cubic knots(`A1´ `A2´ `A3´ `A4´)
su(calendar), detail
local rang = r(max)-r(min)
if `rang´ < 10 {
centile calendar, centile(25 75)
local CK1 = r(c_1)
local CK2 = r(c_2)
mkspline timesp = calendar, cubic knots(`CK1´ `CK2´)
}
else if inrange(`rang´,10,14.9) {
centile calendar, centile(10 50 90)
local CK1 = r(c_1)
local CK2 = r(c_2)
local CK3 = r(c_3)
mkspline timesp = calendar, cubic knots(`CK1´ `CK2´ `CK3´)
}
else {
centile calendar, centile(5 35 65 95)
local CK1 = r(c_1)
local CK2 = r(c_2)
local CK3 = r(c_3)
local CK4 = r(c_4)
mkspline timesp = calendar, cubic knots(`CK1´ `CK2´ `CK3´ `CK4´)
}
centile(coh), centile(5 35 65 95)
local CO1 = r(c_1)
local CO2 = r(c_2)
local CO3 = r(c_3)
local CO4 = r(c_4)
mkspline cohsp = coh, cubic knots(`CO1´ `CO2´ `CO3´ `CO4´)
poisson `ii´_d_`iii´ agesp* timesp* cohsp*, exposure(pys_`iii´)
keep sex calendar pys_`iii´ age_`iii´
if "`i´" == "Scotland" & "`iii´" == "nondm" {
keep if inrange(age_`iii´,40,89)
expand 10 if age_`iii´!=87.5
expand 20 if age_`iii´==87.5
replace pys = pys/10 if age_`iii´!=87.5
replace pys = pys/20 if age_`iii´==87.5
bysort cal age : replace age = age+_n-6 if age_`iii´!=87.5
bysort cal age : replace age = age+_n-8.5 if age_`iii´==87.5
drop if age_`iii´ >= 90
}
else {
keep if inrange(age_`iii´,40,89)
expand 10
replace pys = pys/10
bysort cal age : replace age = age+_n-6
}
gen coh = calendar-age
```

```
mkspline agesp = age, cubic knots(`A1´ `A2´ `A3´ `A4´)
if `rang´ < 9.99 {
mkspline timesp = calendar, cubic knots(`CK1´ `CK2´)
}
else if inrange(`rang´,10,14.99) {
mkspline timesp = calendar, cubic knots(`CK1´ `CK2´ `CK3´)
}
else {
mkspline timesp = calendar, cubic knots(`CK1´ `CK2´ `CK3´ `CK4´)
}
mkspline cohsp = coh, cubic knots(`CO1´ `CO2´ `CO3´ `CO4´)
predict _Rate, ir
save MD/STDi_`i´_`ii´_`iii´_`iiii´, replace
rename age_`iii´ age
merge m:1 age using refpop
drop _merge
gen double expdeath = _Rate*B
bysort cal : egen double expdeath1 = sum(expdeath)
gen stdrate = 1000*expdeath1
gen SEC1 = ((B^2)*(_Rate*(1-_Rate)))/pys_`iii´
bysort cal : egen double SEC2 = sum(SEC1)
gen double SE = sqrt(SEC2)
gen lb = 1000*(expdeath1-1.96*SE)
gen ub = 1000*(expdeath1+1.96*SE)
bysort cal (age) : keep if _n == 1
count if lb < 0
if r(N) != 0 {
noisily di "`i´" " " "`ii´" " " "`iii´" " " "`iiii´"
}
keep cal stdrate lb ub sex
gen country = "`i´"
gen OC = "`ii´"
gen DM = "`iii´"
replace cal = cal+2009.5
save MD/STD_`i´_`ii´_`iii´_`iiii´, replace
}
clear
append using MD/STDi_`i´_`ii´_`iii´_0 MD/STDi_`i´_`ii´_`iii´_1
rename age_`iii´ age
merge m:1 sex age using refpops
drop _merge
gen double expdeath = _Rate*B
bysort cal : egen double expdeath1 = sum(expdeath)
gen stdrate = 1000*expdeath1
gen SEC1 = ((B^2)*(_Rate*(1-_Rate)))/pys_`iii´
bysort cal : egen double SEC2 = sum(SEC1)
gen double SE = sqrt(SEC2)
gen lb = 1000*(expdeath1-1.96*SE)
gen ub = 1000*(expdeath1+1.96*SE)
bysort cal (age) : keep if _n == 1
count if lb < 0
if r(N) != 0 {
noisily di "`i´" " " "`ii´" " " "`iii´"
replace lb = 0.001 if lb < 0
}
keep cal stdrate lb ub
gen country = "`i´"
gen OC = "`ii´"
gen DM = "`iii´"
replace cal = cal+2009.5
save MD/STD_`i´_`ii´_`iii´, replace
}
}
}
}

. quietly {
Lithuania hfd dm 0
```

```
Lithuania hfd dm 1
Lithuania hfd dm


foreach ii in cvd chd cbd hfd {
foreach iii in dm nondm {
if "`ii´" == "cvd" {
local oo = "Cardiovascular disease"
}
if "`ii´" == "chd" {
local oo = "Coronary heart disease"
}
if "`ii´" == "cbd" {
local oo = "Cerebrovascular disease"
}
if "`ii´" == "hfd" {
local oo = "Heart failure"
}
if "`iii´" == "dm" {
local w = "with"
}
if "`iii´" == "nondm" {
local w = "without"
}
clear
foreach i in Australia Canada Denmark Finland France Lithuania Scotland SKorea {
append using MD/STD_`i´_`ii´_`iii´
}
replace country = "Canada (Alberta)" if country == "Canada"
replace country = "South Korea" if country == "SKorea"
preserve
bysort country : keep if _n == 1
forval i = 1/8 {
local C`i´ = country[`i´]
}
restore
local col1 = "0 0 255"
local col2 = "75 0 130"
local col3 = "255 0 255"
local col4 = "255 0 0"
local col5 = "255 125 0"
local col6 = "0 125 0"
local col7 = "0 175 255"
local col8 = "0 0 0"
if "`ii´" == "hfd" {
replace stdrate=. if country == "Finland" | country == "Lithuania"
replace lb =. if country == "Finland" | country == "Lithuania"
replace ub =. if country == "Finland" | country == "Lithuania"
}
twoway ///
(rarea ub lb calendar if country == "`C1´", color("`col1´%30") fintensity(inten80) lwidth(none)) ///
(line stdrate calendar if country == "`C1´", color("`col1´") lpattern(solid)) ///
(rarea ub lb calendar if country == "`C2´", color("`col2´%30") fintensity(inten80) lwidth(none)) ///
(line stdrate calendar if country == "`C2´", color("`col2´") lpattern(solid)) ///
(rarea ub lb calendar if country == "`C3´", color("`col3´%30") fintensity(inten80) lwidth(none)) ///
(line stdrate calendar if country == "`C3´", color("`col3´") lpattern(solid)) ///
(rarea ub lb calendar if country == "`C4´", color("`col4´%30") fintensity(inten80) lwidth(none)) ///
(line stdrate calendar if country == "`C4´", color("`col4´") lpattern(solid)) ///
(rarea ub lb calendar if country == "`C5´", color("`col5´%30") fintensity(inten80) lwidth(none)) ///
(line stdrate calendar if country == "`C5´", color("`col5´") lpattern(solid)) ///
(rarea ub lb calendar if country == "`C6´", color("`col6´%30") fintensity(inten80) lwidth(none)) ///
(line stdrate calendar if country == "`C6´", color("`col6´") lpattern(solid)) ///
(rarea ub lb calendar if country == "`C7´", color("`col7´%30") fintensity(inten80) lwidth(none)) ///
(line stdrate calendar if country == "`C7´", color("`col7´") lpattern(solid)) ///
(rarea ub lb calendar if country == "`C8´", color("`col8´%30") fintensity(inten80) lwidth(none)) ///
(line stdrate calendar if country == "`C8´", color("`col8´") lpattern(solid)) ///
, legend(symxsize(0.13cm) position(3) region(lcolor(white) color(none)) ///
order(2 "`C1´" ///
```

```
4 "`C2´" ///
6 "`C3´" ///
8 "`C4´" ///
10 "`C5´" ///
12 "`C6´" ///
14 "`C7´" ///
16 "`C8´") ///
cols(1)) ///
graphregion(color(white)) ///
ylabel(0.01 "0.01"0.1 1 10 100, grid angle(0)) ///
yscale(log range(0.01 100)) ///
xscale(range(2000 2020)) ///
xlabel(2000(5)2020, nogrid) ///
ytitle("Mortality rate (per 1,000 person-years)", margin(a+2)) ///
xtitle("Calendar year") ///
title("`oo´, people `w´ diabetes", placement(west) color(black) size(medium))
graph save GPH/STD_GPH_`ii´_`iii´, replace
forval iiii = 0/1 {
if `iiii´ == 0 {
local s = "females"
}
if `iiii´ == 1 {
local s = "males"
}
clear
foreach i in Australia Canada Denmark Finland France Lithuania Scotland SKorea {
append using MD/STD_`i´_`ii´_`iii´_`iiii´
}
replace country = "Canada (Alberta)" if country == "Canada"
replace country = "South Korea" if country == "SKorea"
preserve
bysort country : keep if _n == 1
forval i = 1/8 {
local C`i´ = country[`i´]
}
restore
local col1 = "0 0 255"
local col2 = "75 0 130"
local col3 = "255 0 255"
local col4 = "255 0 0"
local col5 = "255 125 0"
local col6 = "0 125 0"
local col7 = "0 175 255"
local col8 = "0 0 0"
if "`ii´" == "hfd" {
replace stdrate=. if country == "Finland" | country == "Lithuania"
replace lb =. if country == "Finland" | country == "Lithuania"
replace ub =. if country == "Finland" | country == "Lithuania"
}
twoway ///
(rarea ub lb calendar if country == "`C1´", color("`col1´%30") fintensity(inten80) lwidth(none)) ///
(line stdrate calendar if country == "`C1´", color("`col1´") lpattern(solid)) ///
(rarea ub lb calendar if country == "`C2´", color("`col2´%30") fintensity(inten80) lwidth(none)) ///
(line stdrate calendar if country == "`C2´", color("`col2´") lpattern(solid)) ///
(rarea ub lb calendar if country == "`C3´", color("`col3´%30") fintensity(inten80) lwidth(none)) ///
(line stdrate calendar if country == "`C3´", color("`col3´") lpattern(solid)) ///
(rarea ub lb calendar if country == "`C4´", color("`col4´%30") fintensity(inten80) lwidth(none)) ///
(line stdrate calendar if country == "`C4´", color("`col4´") lpattern(solid)) ///
(rarea ub lb calendar if country == "`C5´", color("`col5´%30") fintensity(inten80) lwidth(none)) ///
(line stdrate calendar if country == "`C5´", color("`col5´") lpattern(solid)) ///
(rarea ub lb calendar if country == "`C6´", color("`col6´%30") fintensity(inten80) lwidth(none)) ///
(line stdrate calendar if country == "`C6´", color("`col6´") lpattern(solid)) ///
(rarea ub lb calendar if country == "`C7´", color("`col7´%30") fintensity(inten80) lwidth(none)) ///
(line stdrate calendar if country == "`C7´", color("`col7´") lpattern(solid)) ///
(rarea ub lb calendar if country == "`C8´", color("`col8´%30") fintensity(inten80) lwidth(none)) ///
(line stdrate calendar if country == "`C8´", color("`col8´") lpattern(solid)) ///
, legend(symxsize(0.13cm) position(3) region(lcolor(white) color(none)) ///
order(2 "`C1´" ///
```

```
4 "`C2´" ///
6 "`C3´" ///
8 "`C4´" ///
10 "`C5´" ///
12 "`C6´" ///
14 "`C7´" ///
16 "`C8´") ///
cols(1)) ///
graphregion(color(white)) ///
ylabel(0.01 "0.01"0.1 1 10 100, grid angle(0)) ///
yscale(log range(0.01 100)) ///
xscale(range(2000 2020)) ///
xlabel(2000(5)2020, nogrid) ///
ytitle("Mortality rate (per 1,000 person-years)", margin(a+2)) ///
xtitle("Calendar year") ///
title("`oo´, `s´ `w´ diabetes", placement(west) color(black) size(medium))
graph save GPH/STD_GPH_`ii´_`iii´_`iiii´, replace
}
}
}
```

Figure 6.1: Age-standardised mortality rate by cause of death, people aged 40-89. Cardiovascular disease.

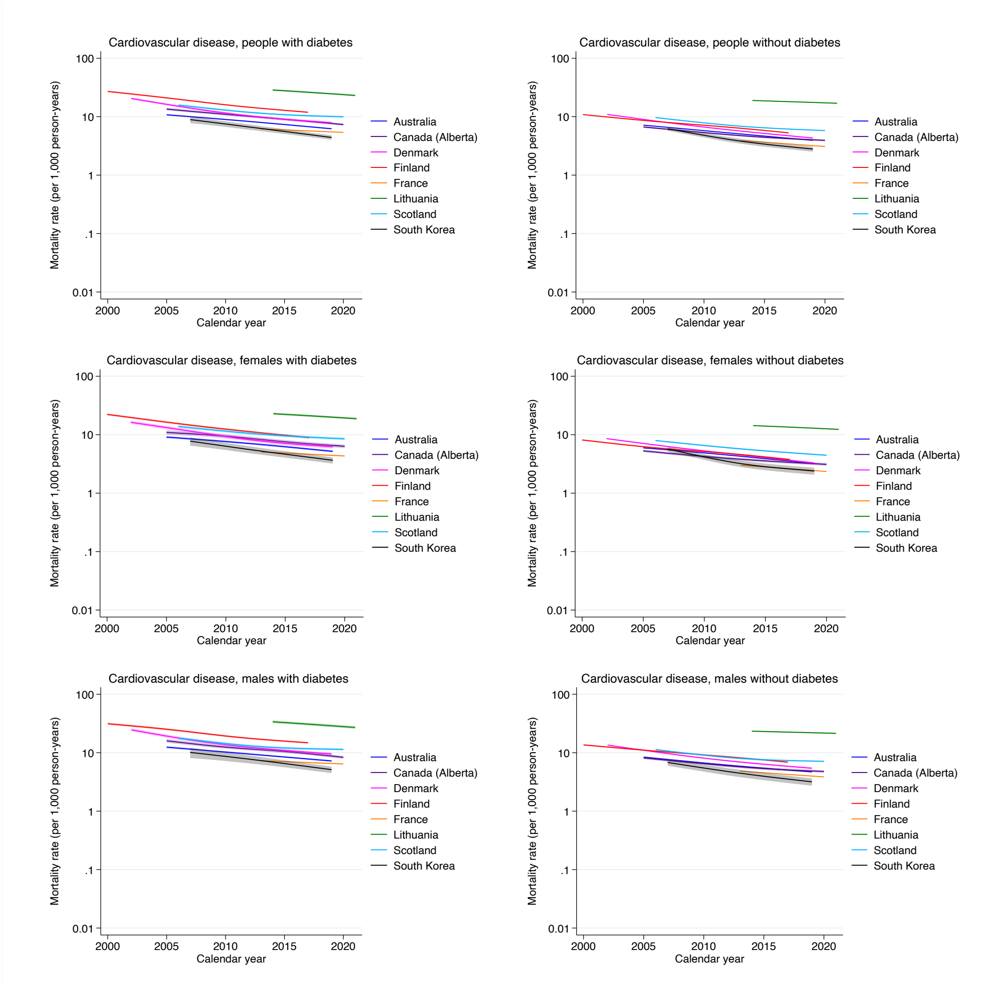
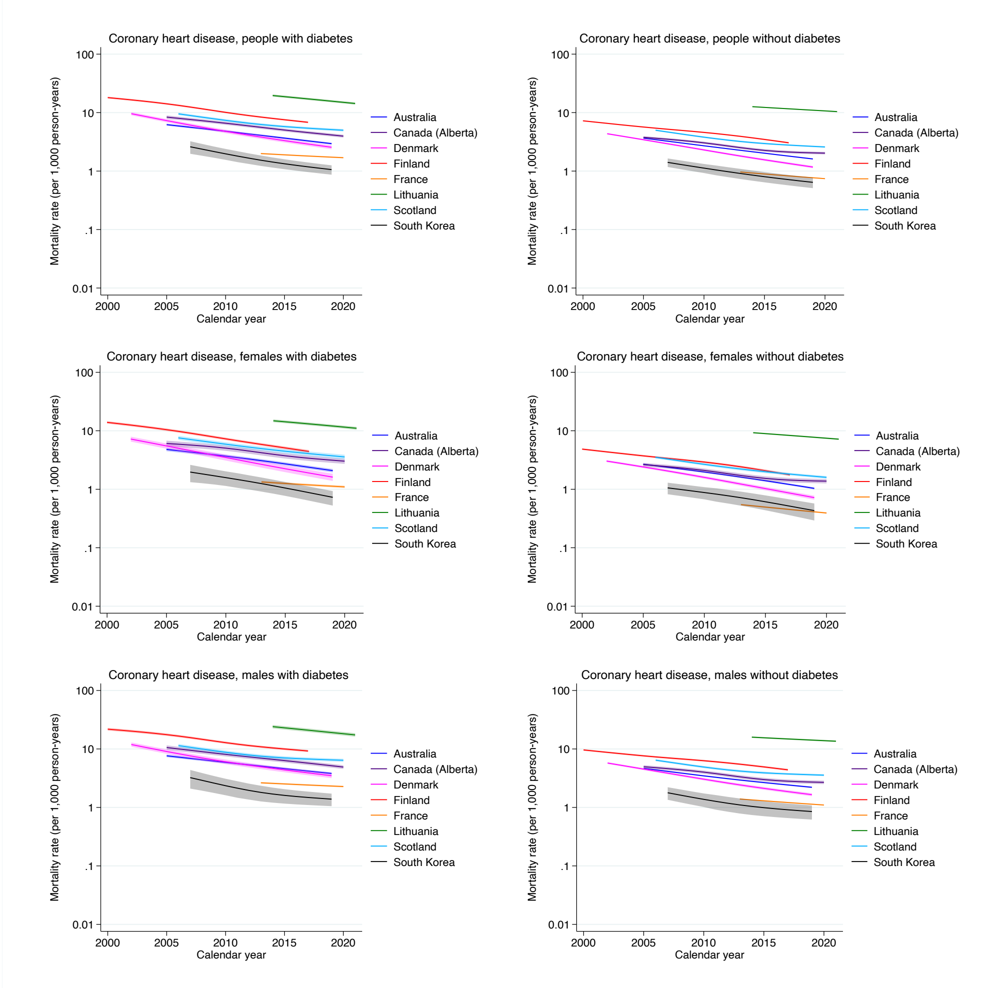
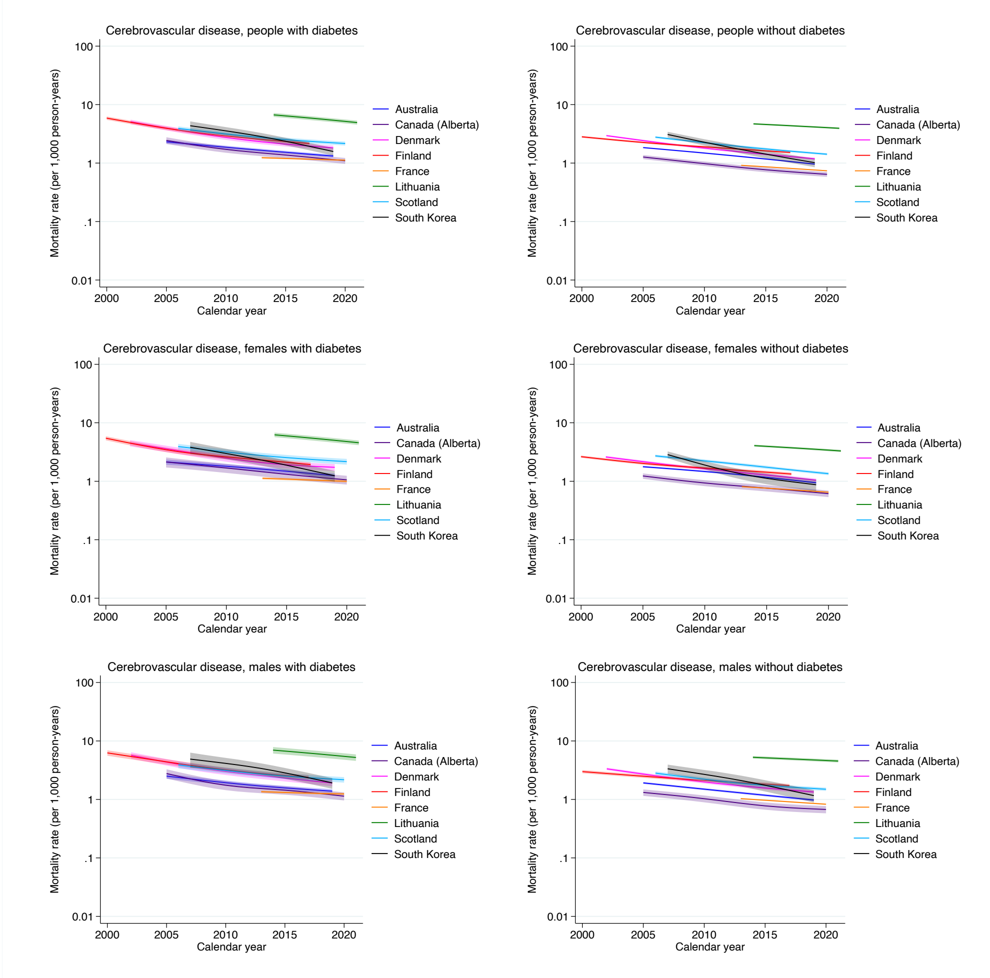


Figure 6.2: Age-standardised mortality rate by cause of death, people aged 40-89. Coronary heart disease.




```
foreach ii in cvd chd cbd hfd {
if "`ii´" == "cvd" {
local oo = "Cardiovascular disease"
}
if "`ii´" == "chd" {
local oo = "Coronary heart disease"
}
if "`ii´" == "cbd" {
local oo = "Cerebrovascular disease"
}
if "`ii´" == "hfd" {
local oo = "Heart failure"
}
graph combine ///
GPH/STD_GPH_`ii´_dm.gph ///
GPH/STD_GPH_`ii´_nondm.gph ///
GPH/STD_GPH_`ii´_dm_0.gph ///
GPH/STD_GPH_`ii´_nondm_0.gph ///
GPH/STD_GPH_`ii´_dm_1.gph ///
GPH/STD_GPH_`ii´_nondm_1.gph ///
, graphregion(color(white)) cols(2) altshrink xsize(4)
```

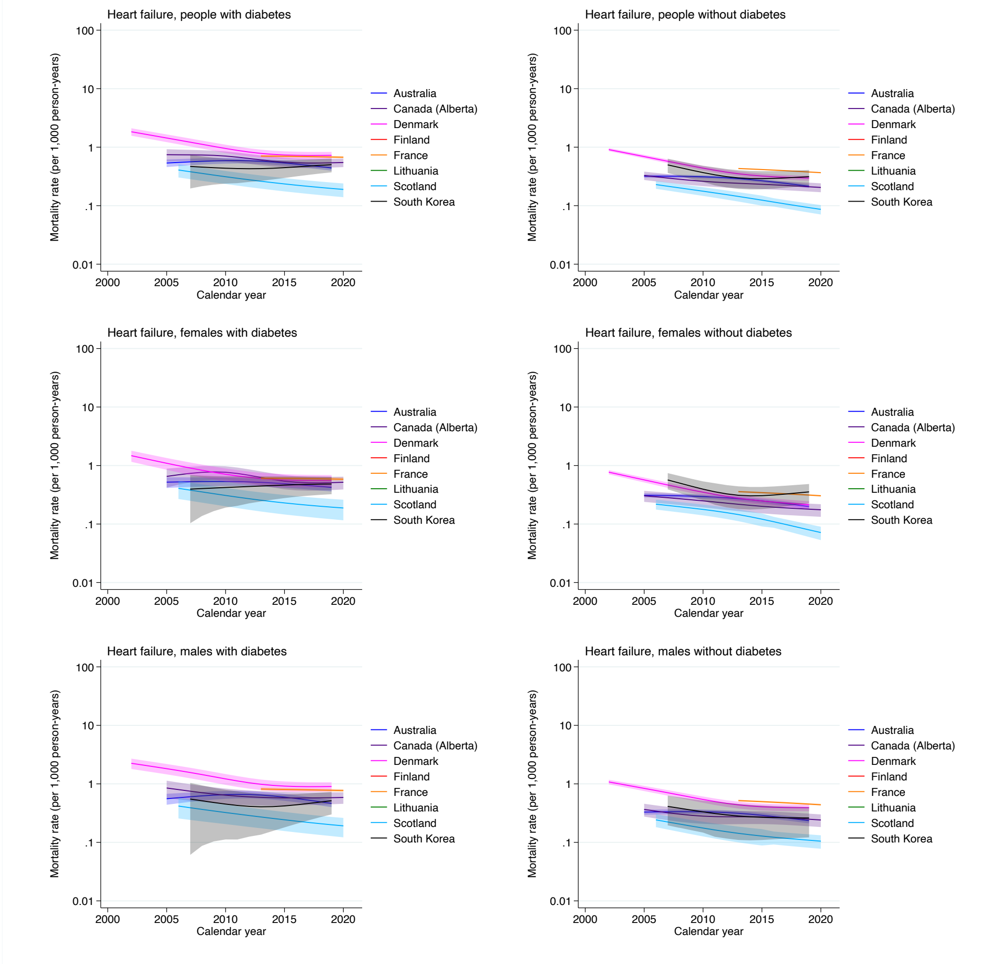
Figure 6.3: Age-standardised mortality rate by cause of death, people aged 40-89. Cerebrovascular disease.




```
}

foreach i in Australia Canada Denmark Finland France Lithuania Scotland SKorea {
if "`i´" == "Canada" {
local co = "Canada (Alberta)"
}
else if "`i´" == "SKorea" {
local co = "South Korea"
}
else {
local co = "`i´"
}
foreach iii in dm nondm {
if "`iii´" == "dm" {
local w = "with"
}
if "`iii´" == "nondm" {
local w = "without"
}
clear
```

Figure 6.4: Age-standardised mortality rate by cause of death, people aged 40-89. Heart failure.

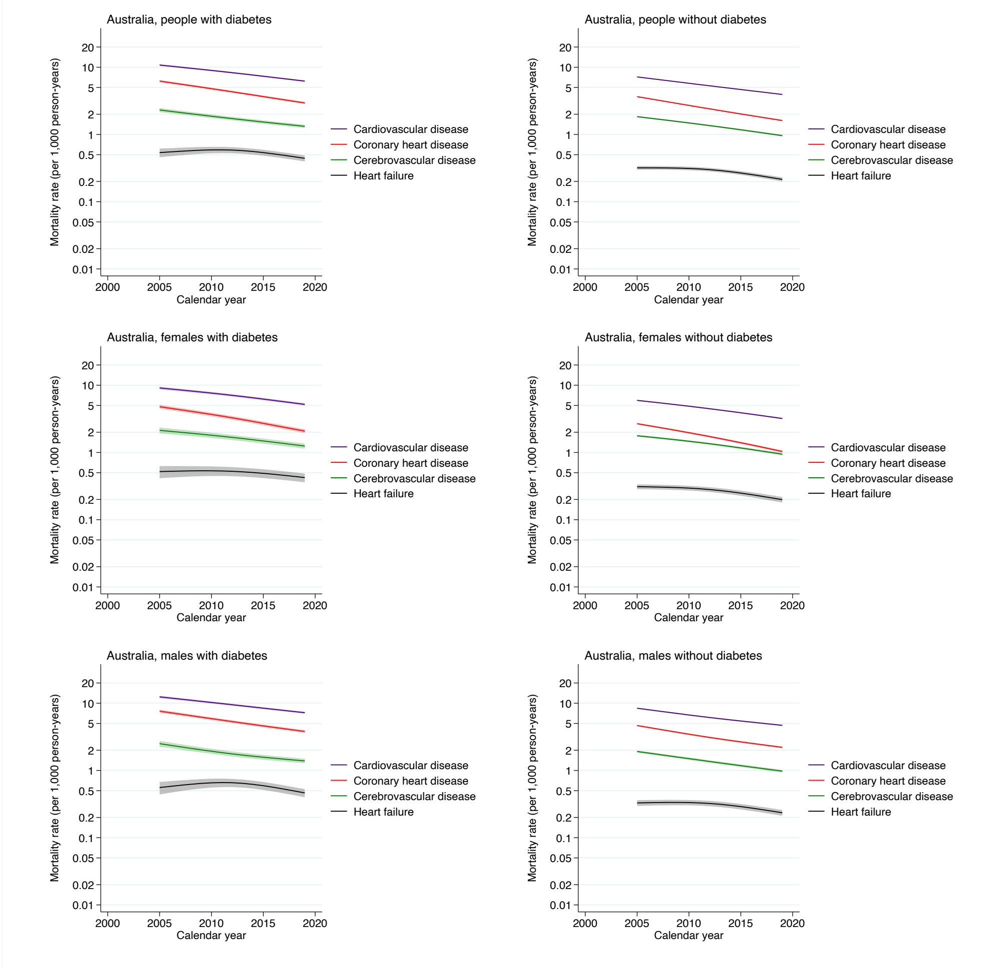



```
foreach ii in cvd chd cbd hfd {
append using MD/STD_`i´_`ii´_`iii´
}
if "`i´" == "Finland" | "`i´" == "Lithuania" {
replace stdrate=. if OC == "hfd"
replace lb =. if OC == "hfd"
replace ub =. if OC == "hfd"
}
local col1 = "75 0 130"
local col2 = "255 0 0"
local col3 = "0 125 0"
local col4 = "0 0 0"
twoway ///
(rarea ub lb calendar if OC == "cvd", color("`col1´%30") fintensity(inten80) lwidth(none)) ///
(line stdrate calendar if OC == "cvd", color("`col1´") lpattern(solid)) ///
(rarea ub lb calendar if OC == "chd", color("`col2´%30") fintensity(inten80) lwidth(none)) ///
(line stdrate calendar if OC == "chd", color("`col2´") lpattern(solid)) ///
(rarea ub lb calendar if OC == "cbd", color("`col3´%30") fintensity(inten80) lwidth(none)) ///
(line stdrate calendar if OC == "cbd", color("`col3´") lpattern(solid)) ///
(rarea ub lb calendar if OC == "hfd", color("`col4´%30") fintensity(inten80) lwidth(none)) ///
(line stdrate calendar if OC == "hfd", color("`col4´") lpattern(solid)) ///
, legend(symxsize(0.13cm) position(3) region(lcolor(white) color(none)) ///
```

```
order(2 "Cardiovascular disease" ///
4 "Coronary heart disease" ///
6 "Cerebrovascular disease" ///
8 "Heart failure") ///
cols(1)) ///
graphregion(color(white)) ///
ylabel(0.01 "0.01" 0.02 "0.02" 0.05 "0.05" 0.1 "0.1" 0.2 "0.2" 0.5 "0.5" 1 2 5 10 20, grid angle(0))
>  ///
yscale(log range(0.01 30)) ///
xscale(range(2000 2020)) ///
xlabel(2000(5)2020, nogrid) ///
ytitle("Mortality rate (per 1,000 person-years)", margin(a+2)) ///
xtitle("Calendar year") ///
title("`co´, people `w´ diabetes", placement(west) color(black) size(medium))
graph save GPH/STDcvd_GPH_`i´_`iii´, replace
forval iiii = 0/1 {
if `iiii´ == 0 {
local s = "females"
}
if `iiii´ == 1 {
local s = "males"
}
clear
foreach ii in cvd chd cbd hfd {
append using MD/STD_`i´_`ii´_`iii´_`iiii´
}
if "`i´" == "Finland" | "`i´" == "Lithuania" {
replace stdrate=. if OC == "hfd"
replace lb =. if OC == "hfd"
replace ub =. if OC == "hfd"
}
local col1 = "75 0 130"
local col2 = "255 0 0"
local col3 = "0 125 0"
local col4 = "0 0 0"
twoway ///
(rarea ub lb calendar if OC == "cvd", color("`col1´%30") fintensity(inten80) lwidth(none)) ///
(line stdrate calendar if OC == "cvd", color("`col1´") lpattern(solid)) ///
(rarea ub lb calendar if OC == "chd", color("`col2´%30") fintensity(inten80) lwidth(none)) ///
(line stdrate calendar if OC == "chd", color("`col2´") lpattern(solid)) ///
(rarea ub lb calendar if OC == "cbd", color("`col3´%30") fintensity(inten80) lwidth(none)) ///
(line stdrate calendar if OC == "cbd", color("`col3´") lpattern(solid)) ///
(rarea ub lb calendar if OC == "hfd", color("`col4´%30") fintensity(inten80) lwidth(none)) ///
(line stdrate calendar if OC == "hfd", color("`col4´") lpattern(solid)) ///
, legend(symxsize(0.13cm) position(3) region(lcolor(white) color(none)) ///
order(2 "Cardiovascular disease" ///
4 "Coronary heart disease" ///
6 "Cerebrovascular disease" ///
8 "Heart failure") ///
cols(1)) ///
graphregion(color(white)) ///
ylabel(0.01 "0.01" 0.02 "0.02" 0.05 "0.05" 0.1 "0.1" 0.2 "0.2" 0.5 "0.5" 1 2 5 10 20, grid angle(0))
>  ///
yscale(log range(0.01 30)) ///
xscale(range(2000 2020)) ///
xlabel(2000(5)2020, nogrid) ///
ytitle("Mortality rate (per 1,000 person-years)", margin(a+2)) ///
xtitle("Calendar year") ///
title("`co´, `s´ `w´ diabetes", placement(west) color(black) size(medium))
graph save GPH/STDcvd_GPH_`i´_`iii´_`iiii´, replace
}
}
}


foreach i in Australia Canada Denmark Finland France Lithuania Scotland SKorea {
if "`i´" == "Canada" {
local co = "Canada (Alberta)"
}
```

Figure 6.5: Age-standardised mortality rate by cause of death, people aged 40-89. Australia.




```
else if "`i´" == "SKorea" {
local co = "South Korea"
}
else {
local co = "`i´"
}
graph combine ///
GPH/STDcvd_GPH_`i´_dm.gph ///
GPH/STDcvd_GPH_`i´_nondm.gph ///
GPH/STDcvd_GPH_`i´_dm_0.gph ///
GPH/STDcvd_GPH_`i´_nondm_0.gph ///
GPH/STDcvd_GPH_`i´_dm_1.gph ///
GPH/STDcvd_GPH_`i´_nondm_1.gph ///
, graphregion(color(white)) cols(2) altshrink xsize(4)
}
```

Figure 6.6: Age-standardised mortality rate by cause of death, people aged 40-89. Canada (Alberta).

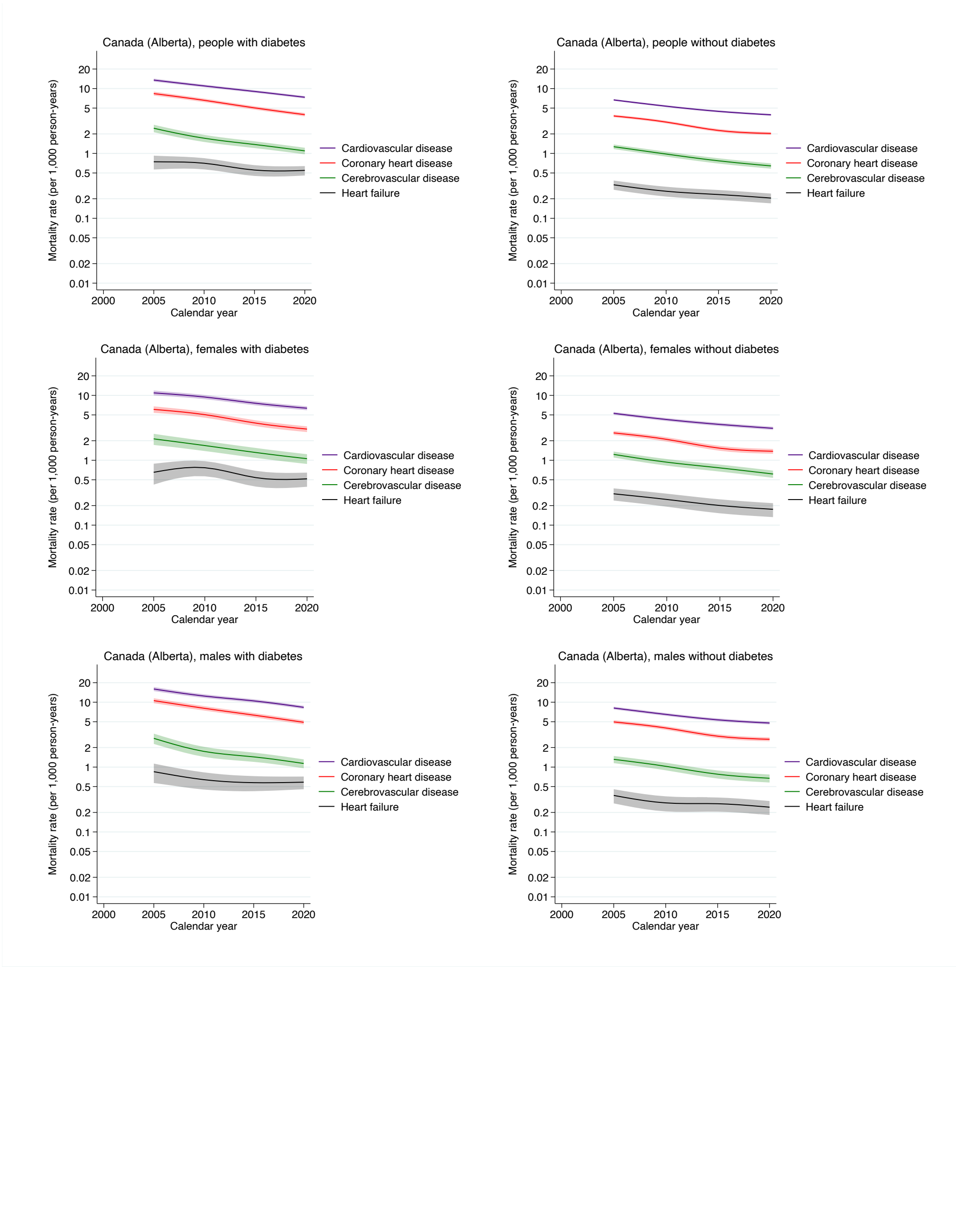


Figure 6.7: Age-standardised mortality rate by cause of death, people aged 40-89. Denmark.

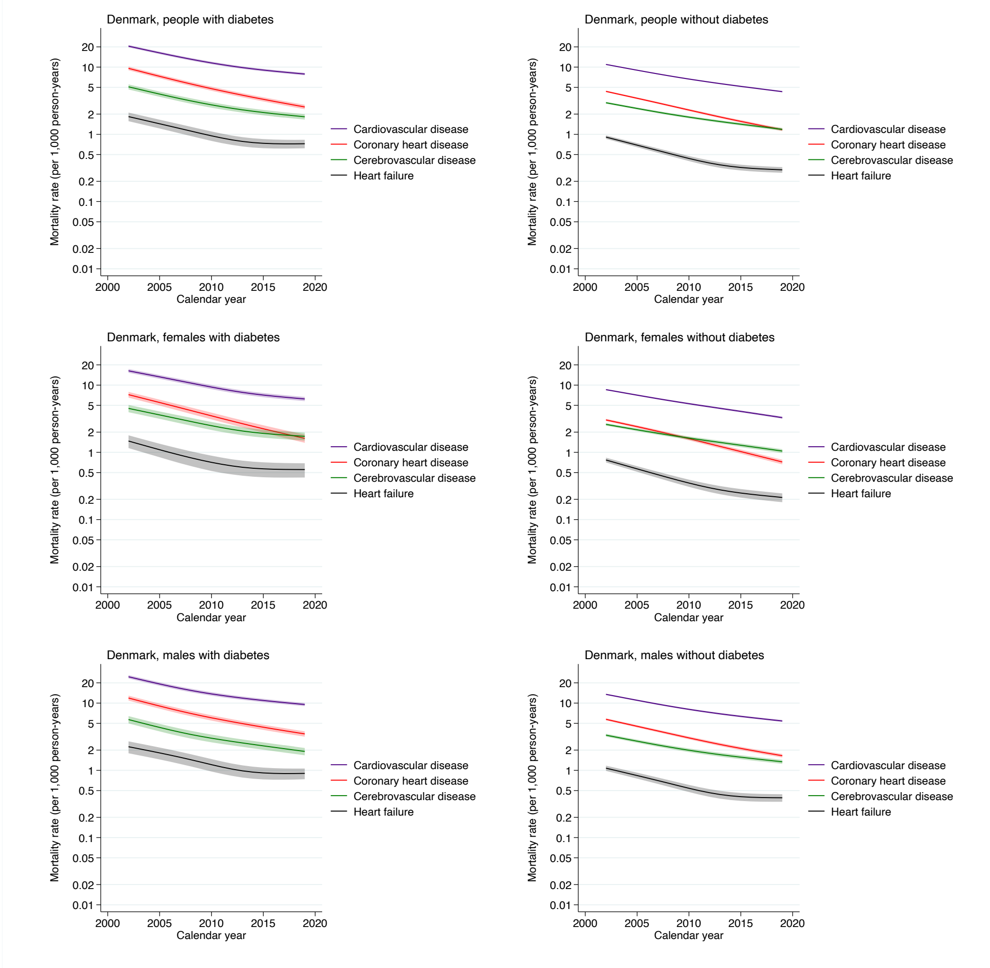


Figure 6.8: Age-standardised mortality rate by cause of death, people aged 40-89. Finland.

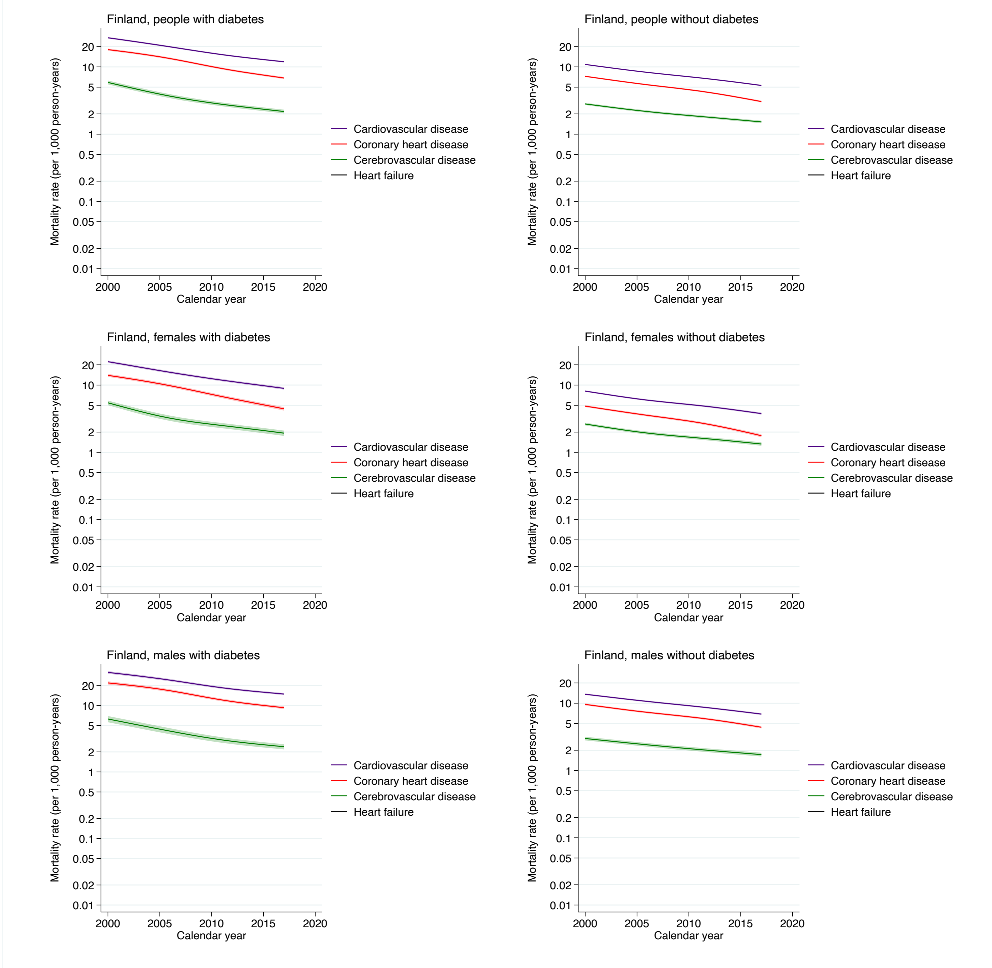


Figure 6.9: Age-standardised mortality rate by cause of death, people aged 40-89. France.

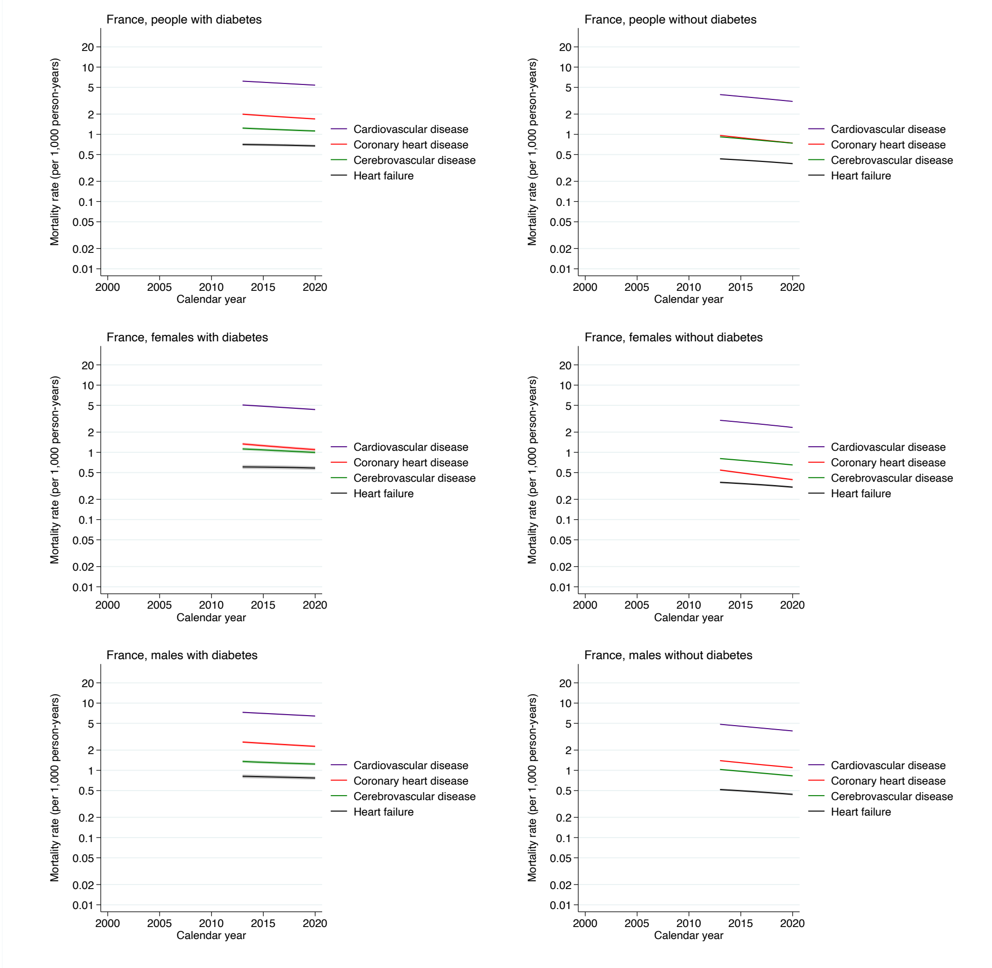


Figure 6.10: Age-standardised mortality rate by cause of death, people aged 40-89. Lithuania.

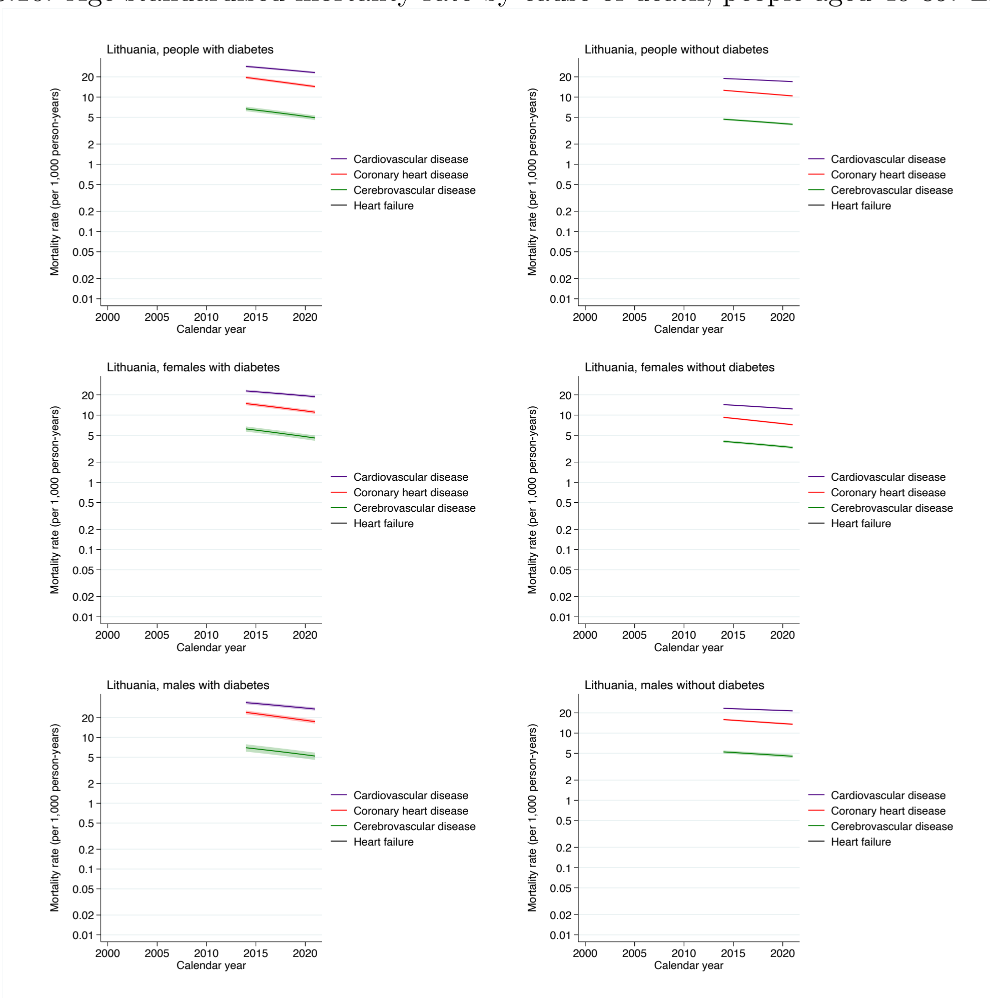


Figure 6.11: Age-standardised mortality rate by cause of death, people aged 40-89. Scotland.

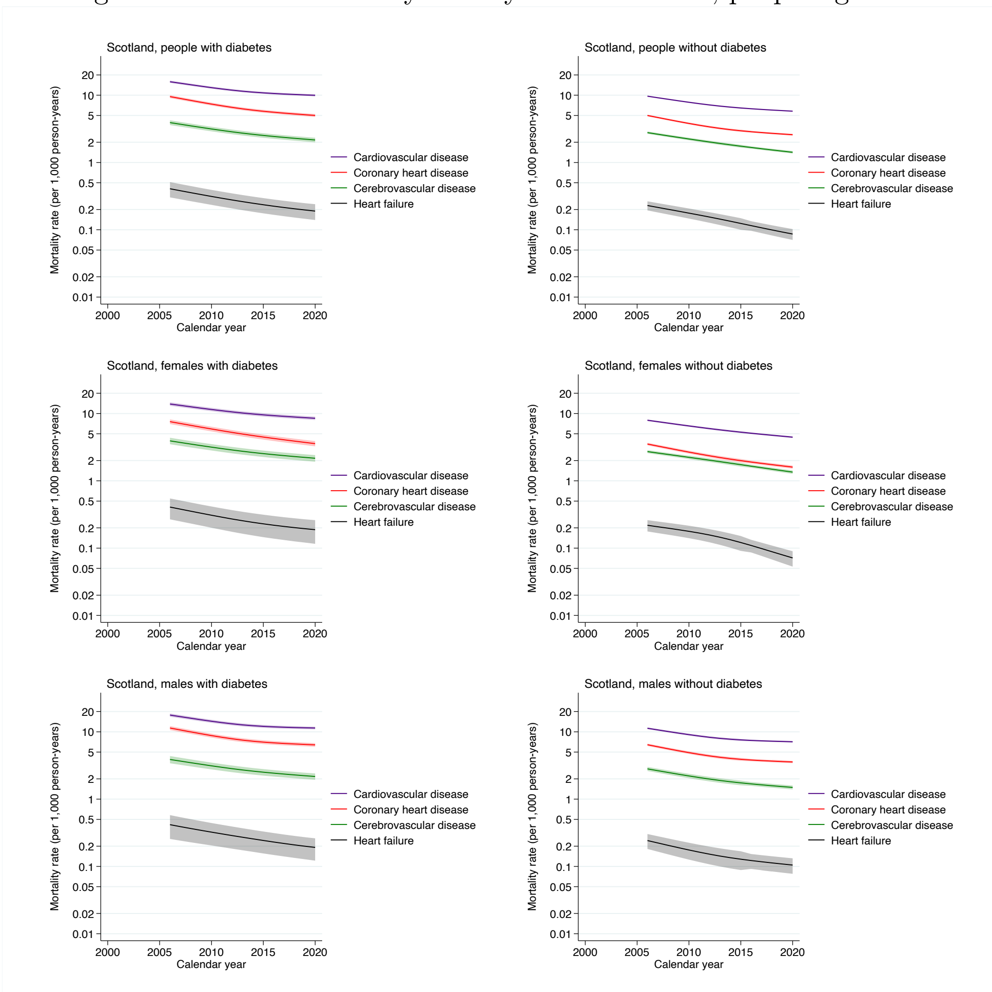
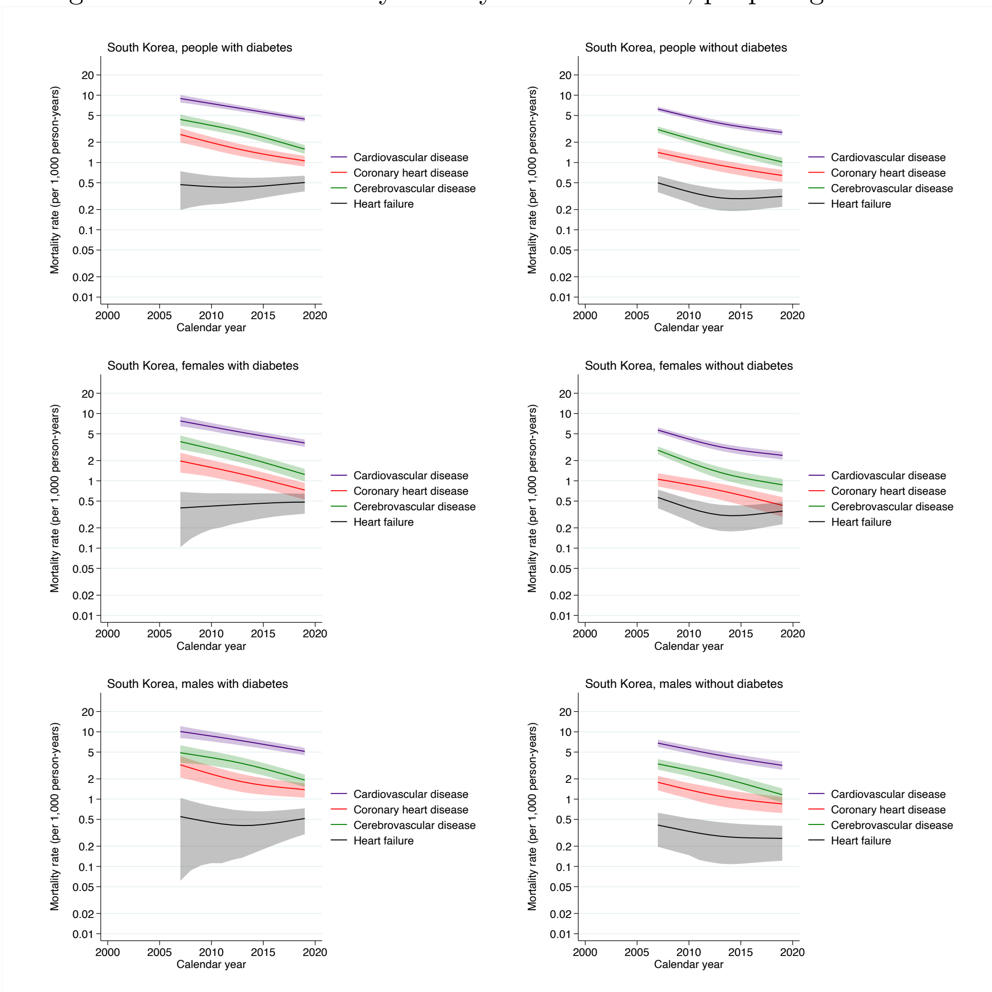


Figure 6.12: Age-standardised mortality rate by cause of death, people aged 40-89. South Korea.



7 Cause-specific mortality rate ratios

```
quietly {
foreach i in Australia Canada Denmark Finland France Lithuania Scotland SKorea {
foreach ii in cvd chd cbd hfd {
use `i´_long, clear
replace calendar = calendar-2009.5
gen coh = calendar-age
centile(age), centile(5 35 65 95)
local A1 = r(c_1)
local A2 = r(c_2)
local A3 = r(c_3)
local A4 = r(c_4)
mkspline agesp = age, cubic knots(`A1´ `A2´ `A3´ `A4´)
su(calendar), detail
local rang = r(max)-r(min)
local minn = r(min)
if `rang´ < 10 {
centile calendar, centile(25 75)
local CK1 = r(c_1)
local CK2 = r(c_2)
mkspline timesp = calendar, cubic knots(`CK1´ `CK2´)
preserve
clear
local rang1 = `rang´+1
set obs `rang1´
gen calendar = _n-1+`minn´
mkspline timesp = calendar, cubic knots(`CK1´ `CK2´)
forval a = 1/`rang1´ {
local A1`a´ = timesp1[`a´]
}
restore
}
else if inrange(`rang´,10,14.9) {
centile calendar, centile(10 50 90)
local CK1 = r(c_1)
local CK2 = r(c_2)
local CK3 = r(c_3)
mkspline timesp = calendar, cubic knots(`CK1´ `CK2´ `CK3´)
preserve
clear
local rang1 = `rang´+1
set obs `rang1´
gen calendar = _n-1+`minn´
mkspline timesp = calendar, cubic knots(`CK1´ `CK2´ `CK3´)
forval a = 1/`rang1´ {
local A1`a´ = timesp1[`a´]
local A2`a´ = timesp2[`a´]
}
restore
}
else {
centile calendar, centile(5 35 65 95)
local CK1 = r(c_1)
local CK2 = r(c_2)
local CK3 = r(c_3)
local CK4 = r(c_4)
mkspline timesp = calendar, cubic knots(`CK1´ `CK2´ `CK3´ `CK4´)
preserve
clear
local rang1 = `rang´+1
set obs `rang1´
gen calendar = _n-1+`minn´
mkspline timesp = calendar, cubic knots(`CK1´ `CK2´ `CK3´ `CK4´)
forval a = 1/`rang1´ {
local A1`a´ = timesp1[`a´]
local A2`a´ = timesp2[`a´]
```

```
local A3`a´ = timesp3[`a´]
}
restore
}
centile(coh), centile(5 35 65 95)
local CO1 = r(c_1)
local CO2 = r(c_2)
local CO3 = r(c_3)
local CO4 = r(c_4)
mkspline cohsp = coh, cubic knots(`CO1´ `CO2´ `CO3´ `CO4´)
preserve
poisson `ii´_d agesp* sex c.timesp*##i.dm, exposure(pys)
matrix A = (.,.,.)
if `rang´ < 10 {
forval a = 1/`rang1´ {
margins, dydx(dm) at(timesp1==`A1`a´´) predict(xb) atmeans
matrix A = (A\r(table)[1,2],r(table)[5,2],r(table)[6,2])
}
}
else if inrange(`rang´,10,14.9) {
forval a = 1/`rang1´ {
margins, dydx(dm) at(timesp1==`A1`a´´ timesp2==`A2`a´´) predict(xb) atmeans
matrix A = (A\r(table)[1,2],r(table)[5,2],r(table)[6,2])
}
}
else {
forval a = 1/`rang1´ {
margins, dydx(dm) at(timesp1==`A1`a´´ timesp2==`A2`a´´ timesp3==`A3`a´´) predict(xb) atmeans
matrix A = (A\r(table)[1,2],r(table)[5,2],r(table)[6,2])
}
}
local rang2 = `rang1´+1
mat A = A[2..`rang2´,1..3]
keep country cal
bysort cal : keep if _n == 1
svmat A
replace A1 = exp(A1)
replace A2 = exp(A2)
replace A3 = exp(A3)
gen OC = "`ii´"
replace cal = cal+2009.5
save MD/SMR_`i´_`ii´, replace
restore
forval iii = 0/1 {
preserve
su agesp1
local B1 = r(mean)
su agesp2
local B2 = r(mean)
su agesp3
local B3 = r(mean)
keep if sex == `iii´
poisson `ii´_d agesp* c.timesp*##i.dm, exposure(pys)
matrix A = (.,.,.)
if `rang´ < 10 {
forval a = 1/`rang1´ {
margins, dydx(dm) at(timesp1==`A1`a´´ agesp1==`B1´ agesp2==`B2´ agesp3==`B3´) predict(xb) atmeans
matrix A = (A\r(table)[1,2],r(table)[5,2],r(table)[6,2])
}
}
else if inrange(`rang´,10,14.9) {
forval a = 1/`rang1´ {
margins, dydx(dm) at(timesp1==`A1`a´´ timesp2==`A2`a´´ agesp1==`B1´ agesp2==`B2´ agesp3==`B3´) predi
> ct(xb) atmeans
matrix A = (A\r(table)[1,2],r(table)[5,2],r(table)[6,2])
}
}
else {
```

```
forval a = 1/`rang1´ {
margins, dydx(dm) at(timesp1==`A1`a´´ timesp2==`A2`a´´ timesp3==`A3`a´´ agesp1==`B1´ agesp2==`B2´ ag
> esp3==`B3´) predict(xb) atmeans
matrix A = (A\r(table)[1,2],r(table)[5,2],r(table)[6,2])
}
}
local rang2 = `rang1´+1
mat A = A[2..`rang2´,1..3]
keep country cal
bysort cal : keep if _n == 1
svmat A
replace A1 = exp(A1)
replace A2 = exp(A2)
replace A3 = exp(A3)
gen OC = "`ii´"
replace cal = cal+2009.5
save MD/SMR_`i´_`ii´_`iii´, replace
restore
}
}
}
}
foreach ii in cvd chd cbd hfd {
if "`ii´" == "cvd" {
local oo = "Cardiovascular disease"
}
if "`ii´" == "chd" {
local oo = "Coronary heart disease"
}
if "`ii´" == "cbd" {
local oo = "Cerebrovascular disease"
}
if "`ii´" == "hfd" {
local oo = "Heart failure"
}
clear
foreach i in Australia Canada Denmark Finland France Lithuania Scotland SKorea {
append using MD/SMR_`i´_`ii´
}
replace country = "Canada (Alberta)" if country == "Canada"
replace country = "South Korea" if country == "SKorea"
preserve
bysort country : keep if _n == 1
forval i = 1/8 {
local C`i´ = country[`i´]
}
restore
if "`ii´" == "hfd" {
replace A1 =. if country == "Finland" | country == "Lithuania"
replace A2 =. if country == "Finland" | country == "Lithuania"
replace A3 =. if country == "Finland" | country == "Lithuania"
}
local col1 = "0 0 255"
local col2 = "75 0 130"
local col3 = "255 0 255"
local col4 = "255 0 0"
local col5 = "255 125 0"
local col6 = "0 125 0"
local col7 = "0 175 255"
local col8 = "0 0 0"
twoway ///
(rarea A3 A2 calendar if country == "`C1´", color("`col1´%30") fintensity(inten80) lwidth(none)) ///
(line A1 calendar if country == "`C1´", color("`col1´") lpattern(solid)) ///
(rarea A3 A2 calendar if country == "`C2´", color("`col2´%30") fintensity(inten80) lwidth(none)) ///
(line A1 calendar if country == "`C2´", color("`col2´") lpattern(solid)) ///
(rarea A3 A2 calendar if country == "`C3´", color("`col3´%30") fintensity(inten80) lwidth(none)) ///
(line A1 calendar if country == "`C3´", color("`col3´") lpattern(solid)) ///
(rarea A3 A2 calendar if country == "`C4´", color("`col4´%30") fintensity(inten80) lwidth(none)) ///
```

```
(line A1 calendar if country == "`C4´", color("`col4´") lpattern(solid)) ///
(rarea A3 A2 calendar if country == "`C5´", color("`col5´%30") fintensity(inten80) lwidth(none)) ///
(line A1 calendar if country == "`C5´", color("`col5´") lpattern(solid)) ///
(rarea A3 A2 calendar if country == "`C6´", color("`col6´%30") fintensity(inten80) lwidth(none)) ///
(line A1 calendar if country == "`C6´", color("`col6´") lpattern(solid)) ///
(rarea A3 A2 calendar if country == "`C7´", color("`col7´%30") fintensity(inten80) lwidth(none)) ///
(line A1 calendar if country == "`C7´", color("`col7´") lpattern(solid)) ///
(rarea A3 A2 calendar if country == "`C8´", color("`col8´%30") fintensity(inten80) lwidth(none)) ///
(line A1 calendar if country == "`C8´", color("`col8´") lpattern(solid)) ///
, legend(symxsize(0.13cm) position(3) region(lcolor(white) color(none)) ///
order(2 "`C1´" ///
4 "`C2´" ///
6 "`C3´" ///
8 "`C4´" ///
10 "`C5´" ///
12 "`C6´" ///
14 "`C7´" ///
16 "`C8´") ///
cols(1)) ///
graphregion(color(white)) ///
ylabel(0.5 "0.5" 1 2 3, grid angle(0)) ///
xscale(range(2000 2020)) ///
xlabel(2000(5)2020, nogrid) ///
yline(1, lcol(black)) yscale(log range(0.5 3)) ///
ytitle("Mortality rate ratio", margin(a+2)) ///
xtitle("Calendar year") ///
title("`oo´", placement(west) color(black) size(medium))
graph save GPH/SMR_`ii´, replace
forval iii = 0/1 {
if `iii´ == 0 {
local s = "females"
}
if `iii´ == 1 {
local s = "males"
}
clear
foreach i in Australia Canada Denmark Finland France Lithuania Scotland SKorea {
append using MD/SMR_`i´_`ii´_`iii´
}
replace country = "Canada (Alberta)" if country == "Canada"
replace country = "South Korea" if country == "SKorea"
preserve
bysort country : keep if _n == 1
forval i = 1/8 {
local C`i´ = country[`i´]
}
restore
if "`ii´" == "hfd" {
replace A1 =. if country == "Finland" | country == "Lithuania"
replace A2 =. if country == "Finland" | country == "Lithuania"
replace A3 =. if country == "Finland" | country == "Lithuania"
}
local col1 = "0 0 255"
local col2 = "75 0 130"
local col3 = "255 0 255"
local col4 = "255 0 0"
local col5 = "255 125 0"
local col6 = "0 125 0"
local col7 = "0 175 255"
local col8 = "0 0 0"
twoway ///
(rarea A3 A2 calendar if country == "`C1´", color("`col1´%30") fintensity(inten80) lwidth(none)) ///
(line A1 calendar if country == "`C1´", color("`col1´") lpattern(solid)) ///
(rarea A3 A2 calendar if country == "`C2´", color("`col2´%30") fintensity(inten80) lwidth(none)) ///
(line A1 calendar if country == "`C2´", color("`col2´") lpattern(solid)) ///
(rarea A3 A2 calendar if country == "`C3´", color("`col3´%30") fintensity(inten80) lwidth(none)) ///
(line A1 calendar if country == "`C3´", color("`col3´") lpattern(solid)) ///
(rarea A3 A2 calendar if country == "`C4´", color("`col4´%30") fintensity(inten80) lwidth(none)) ///
```

```
(line A1 calendar if country == "`C4´", color("`col4´") lpattern(solid)) ///
(rarea A3 A2 calendar if country == "`C5´", color("`col5´%30") fintensity(inten80) lwidth(none)) ///
(line A1 calendar if country == "`C5´", color("`col5´") lpattern(solid)) ///
(rarea A3 A2 calendar if country == "`C6´", color("`col6´%30") fintensity(inten80) lwidth(none)) ///
(line A1 calendar if country == "`C6´", color("`col6´") lpattern(solid)) ///
(rarea A3 A2 calendar if country == "`C7´", color("`col7´%30") fintensity(inten80) lwidth(none)) ///
(line A1 calendar if country == "`C7´", color("`col7´") lpattern(solid)) ///
(rarea A3 A2 calendar if country == "`C8´", color("`col8´%30") fintensity(inten80) lwidth(none)) ///
(line A1 calendar if country == "`C8´", color("`col8´") lpattern(solid)) ///
, legend(symxsize(0.13cm) position(3) region(lcolor(white) color(none)) ///
order(2 "`C1´" ///
4 "`C2´" ///
6 "`C3´" ///
8 "`C4´" ///
10 "`C5´" ///
12 "`C6´" ///
14 "`C7´" ///
16 "`C8´") ///
cols(1)) ///
graphregion(color(white)) ///
ylabel(0.5 "0.5" 1 2 3, grid angle(0)) ///
xscale(range(2000 2020)) ///
xlabel(2000(5)2020, nogrid) ///
yline(1, lcol(black)) yscale(log range(0.5 3)) ///
ytitle("Mortality rate ratio", margin(a+2)) ///
xtitle("Calendar year") ///
title("`oo´, `s´", placement(west) color(black) size(medium))
graph save GPH/SMR_`ii´_`iii´, replace
}
}
```

Figure 7.1: Mortality rate ratio by cause of death and sex. Cardiovascular disease

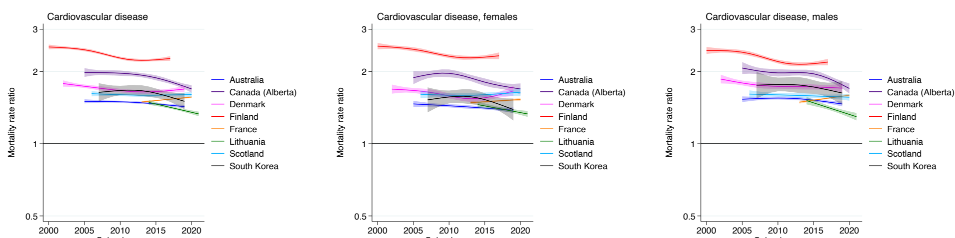
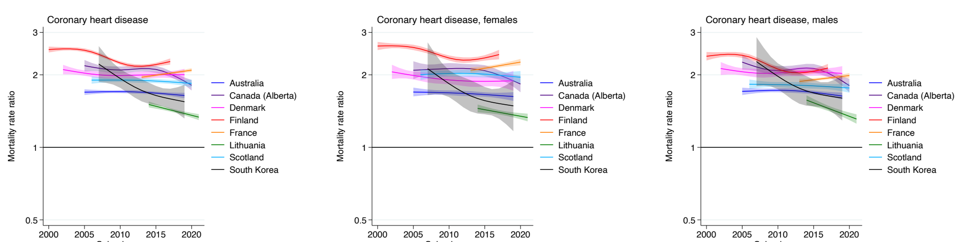


Figure 7.2: Mortality rate ratio by cause of death and sex. Coronary heart disease




```
foreach ii in cvd chd cbd hfd {
if "`ii´" == "cvd" {
local oo = "Cardiovascular disease"
}
if "`ii´" == "chd" {
```

Figure 7.3: Mortality rate ratio by cause of death and sex. Cerebrovascular disease

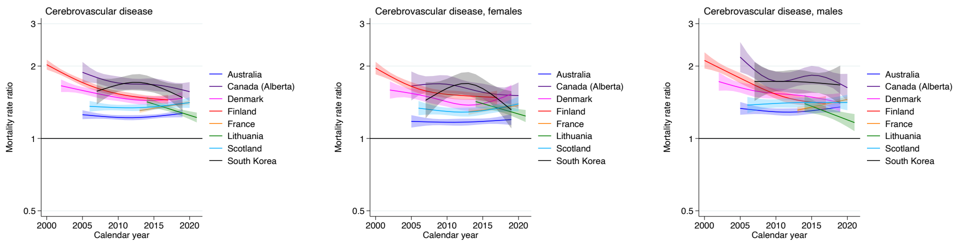
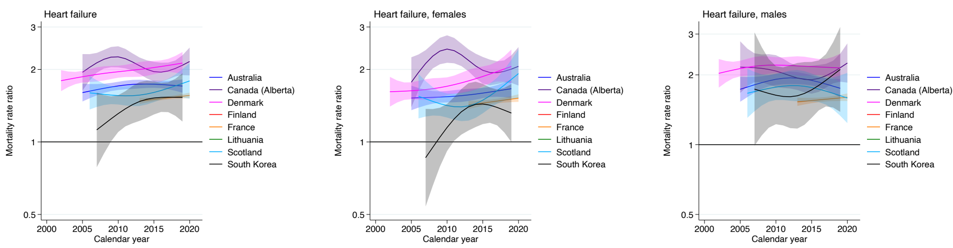


Figure 7.4: Mortality rate ratio by cause of death and sex. Heart failure




```
local oo = "Coronary heart disease"
}
if "`ii´" == "cbd" {
local oo = "Cerebrovascular disease"
}
if "`ii´" == "hfd" {
local oo = "Heart failure"
}
graph combine ///
GPH/SMR_`ii´.gph ///
GPH/SMR_`ii´_0.gph ///
GPH/SMR_`ii´_1.gph ///
, graphregion(color(white)) cols(3) altshrink xsize(15)
}
```