



BIMD & HEALTH IMPACT

MARTINA OTAVOVA



Monitoring and mitigating
environmental health inequalities



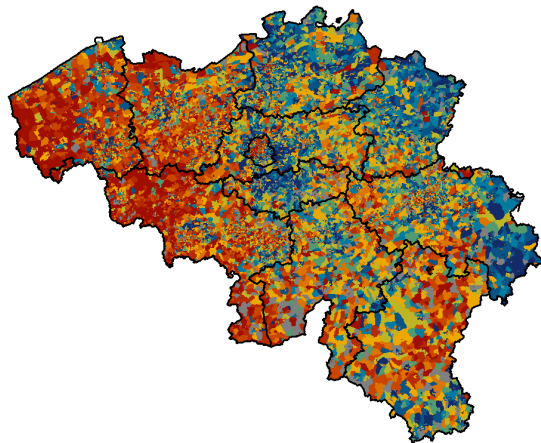
INEQUALITIES IN MORTALITY ASSOCIATED WITH
HOUSING CONDITIONS IN BELGIUM BETWEEN
1991 AND 2020

RESEARCH QUESTION

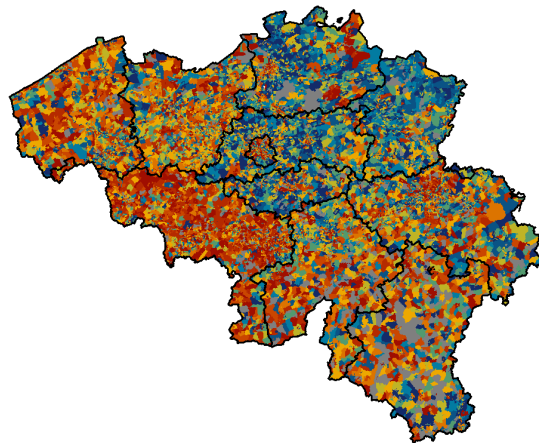
- How many deaths could be prevented if the entire population of Belgium faced the mortality rates of the least deprived areas in terms of housing?

METHODS

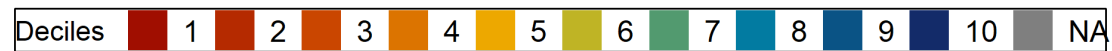
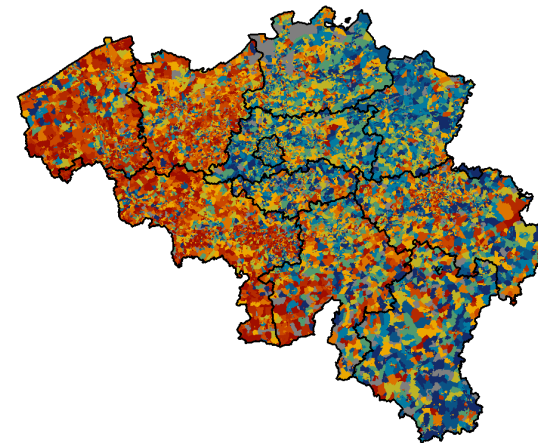
Housing Domain 1991



Housing Domain 2001



Housing Domain 2011



METHODS

- ❑ All-cause mortality data from Jan 1st 1991 to Dec 31st 2020.
- ❑ Health indicators (stratified by sex, deprivation decile, 10-year period):
 - ❑ Sex- and age-standardized mortality rates
 - ❑ Population attributable fraction (mortality associated with housing deprivation as the difference between the observed and expected number of deaths that would occur if the remaining deciles had the mortality rates of the least deprived decile)
 - ❑ Period life tables (used to decompose the differences in life expectancy between the most and least deprived deciles in men and women for all three decades separately)

RESULTS

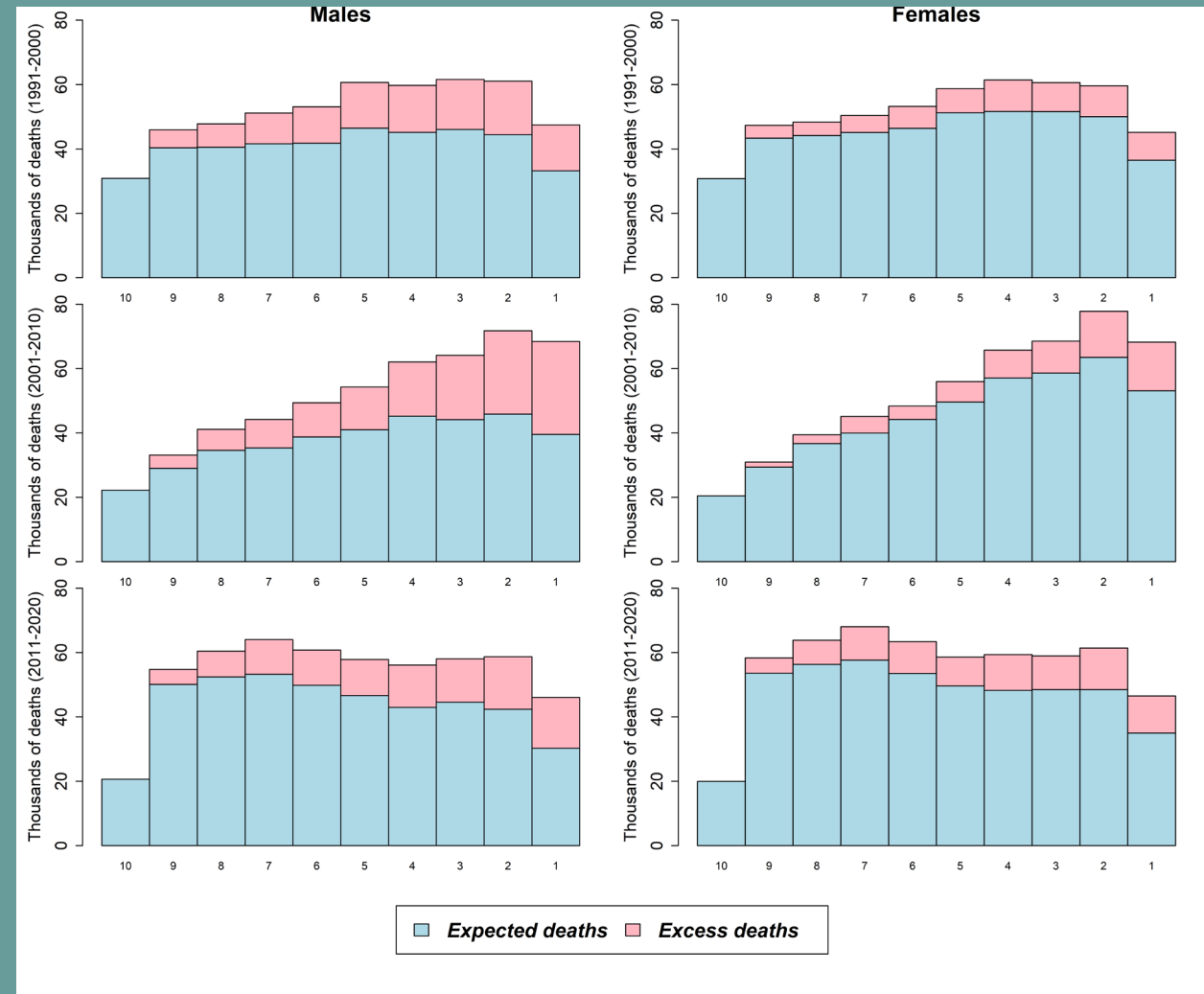
	1991–2000 ¹	2001–2010	2011–2020	Change (%)
Age-standardized mortality rates per 100,000 person-years and 95% CI⁵				
Male				
Most deprived²	1,649 [1634–1664]	1,495 [1484–1506]	1,243 [1231–1254]	-24.62
Least deprived³	1,193 [1181–1207]	923 [911–935]	826 [815–837]	-30.76
Difference	456	572	417	-8.55
Female				
Most deprived	1,402 [1389–1415]	1,271 [1262–1281]	1,140 [1130–1150]	-18.69
Least deprived	1,156 [1144–1170]	1,027 [1013–1041]	863 [851–875]	-25.34
Difference	246	244	277	12.60

RESULTS

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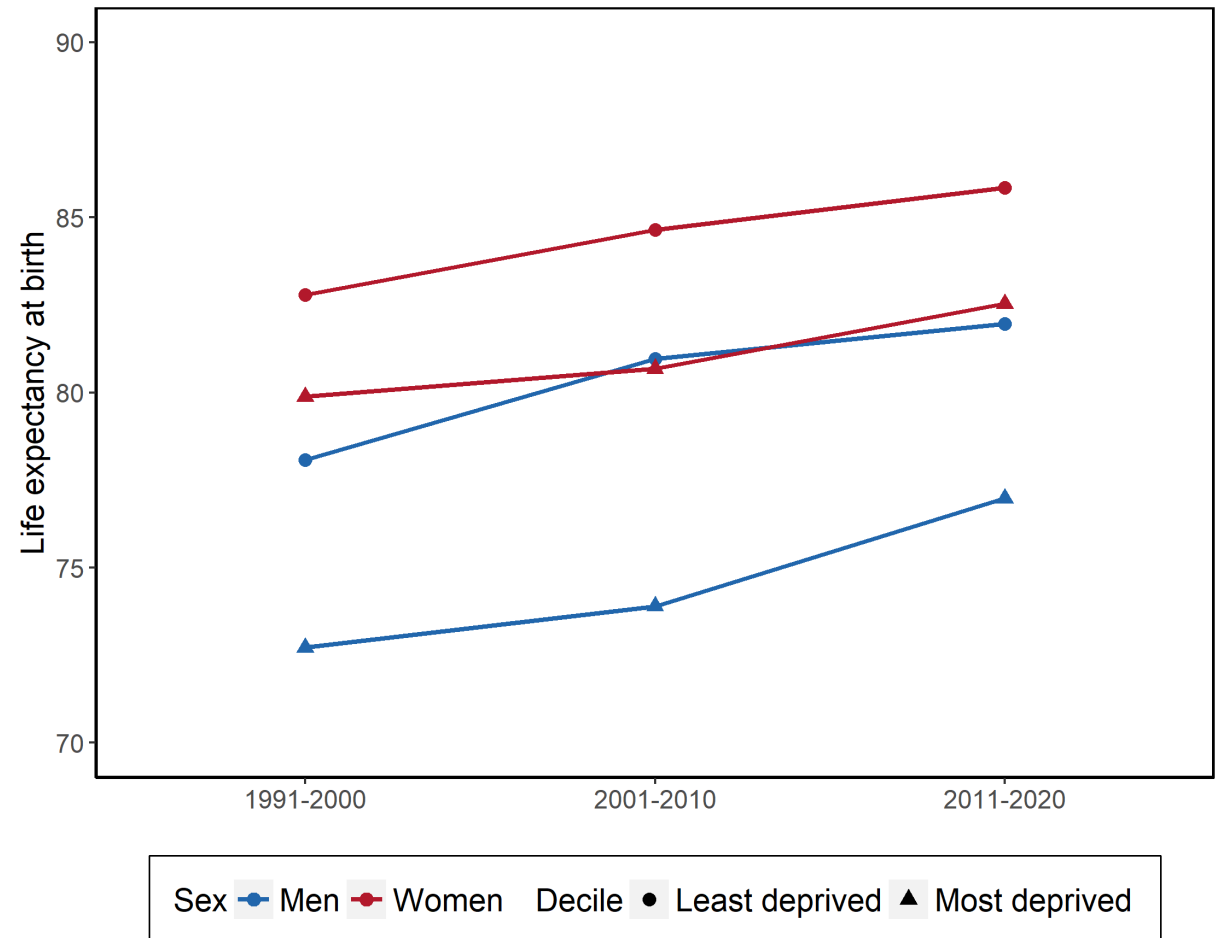
RESULTS

- Up to 18.5% (95%CI 17.7-19.3), ~ 584,875 deaths, of all deaths between 1991 and 2020 may have been avoided if Belgium had the mortality rates of the least deprived areas.



RESULTS

- In the periods studied, life expectancy at birth increased for all deciles, but at a different rate.
- The increase was driven mostly by declines in mortality in the age group 60-69 in men and 70-79 in women.



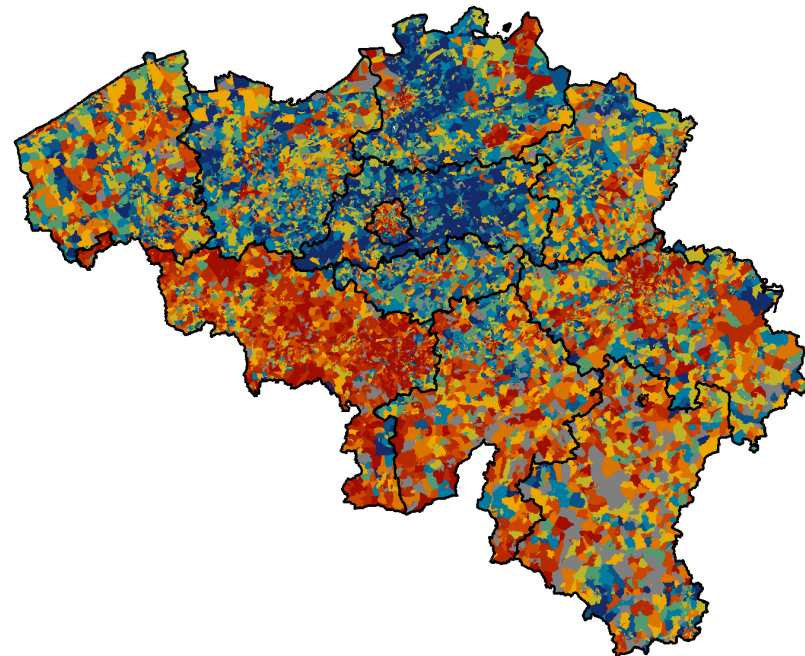
TRENDS IN SOCIOECONOMIC INEQUALITIES IN
CAUSE-SPECIFIC PREMATURE MORTALITY IN
BELGIUM, 1998-2019

RESEARCH AIM

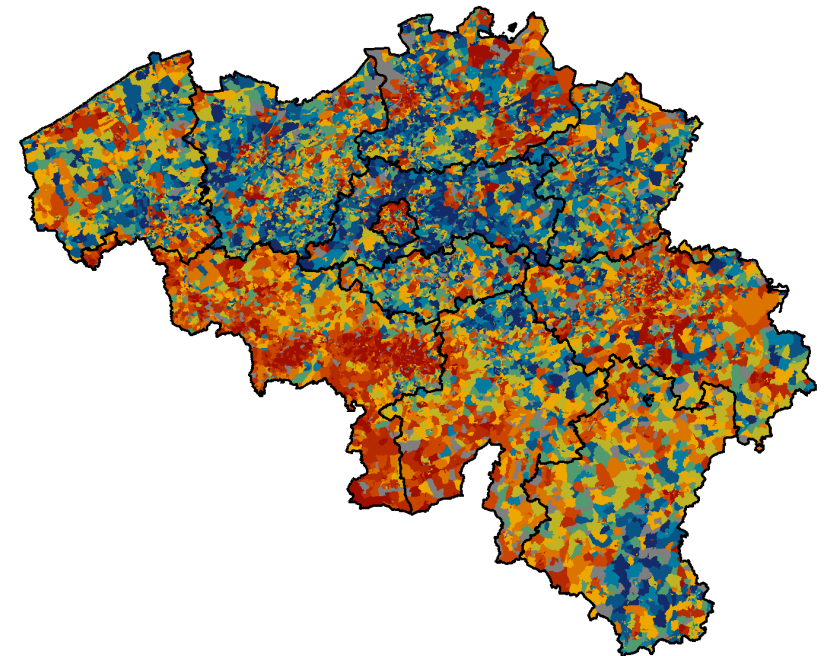
- ❑ To assess the overall magnitude of socioeconomic inequality in cause-specific premature mortality in Belgium.

METHODS

BIMD2001



BIMD2011



METHODS

- ❑ Causes of death between Jan 1st 1998 and Dec 31st 2019
 - ❑ Causes of death identified by ICD-10
 - ❑ Chapters, subcategories, and third-level diagnoses if they contained more than 1,000 deaths (e.g. I00-I99: circulatory diseases, I20-I25; ischemic heart diseases; I20: acute myocardial infarction)

METHODS

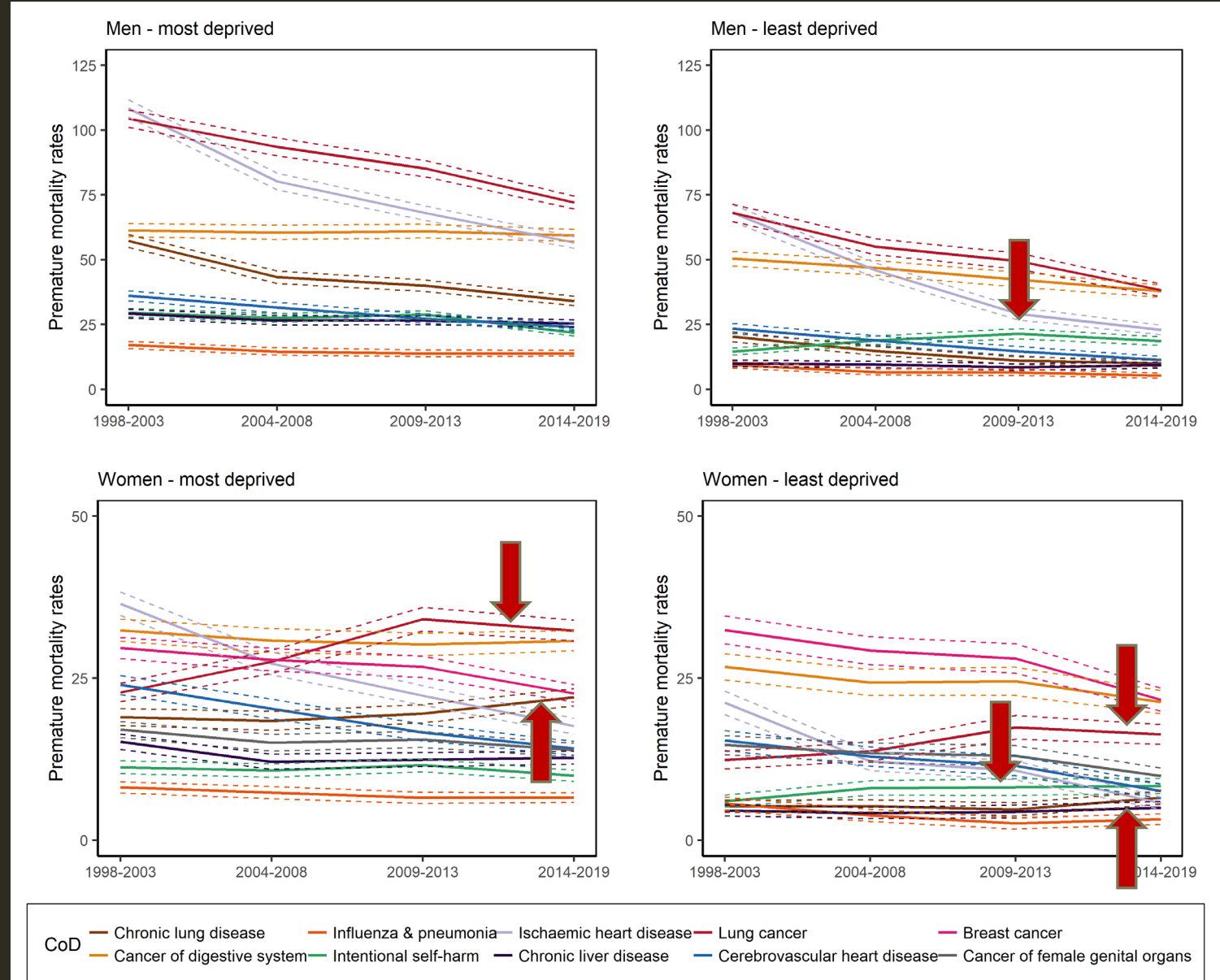
- ❑ Age- and sex-standardized premature mortality rates
 - ❑ the threshold of 75 years was selected as it is consistent with the recent definition of avoidable mortality
- ❑ Population-attributable fraction – premature mortality attributable to socioeconomic inequality
- ❑ Potential years of life lost due to socioeconomic inequality

RESULTS

- ❑ Men and women living in the most deprived statistical sectors had a 96% and 78% greater chance of dying prematurely compared to those living in the least deprived areas.
- ❑ Comparing the first with the last period studied, the gap between the most and least deprived decreased in men but stayed almost constant in women.

RESULTS

- ❑ A reduction in the majority of cause-specific premature mortality rates in the most and least deprived deciles – reduction greater for the least deprived areas.
- ❑ Exceptions: lung cancer, chronic lung disease in women – increase in the most and least deprived deciles observed.
- ❑ Death by drugs and alcohol poisoning doubled and tripled in the least and most deprived.



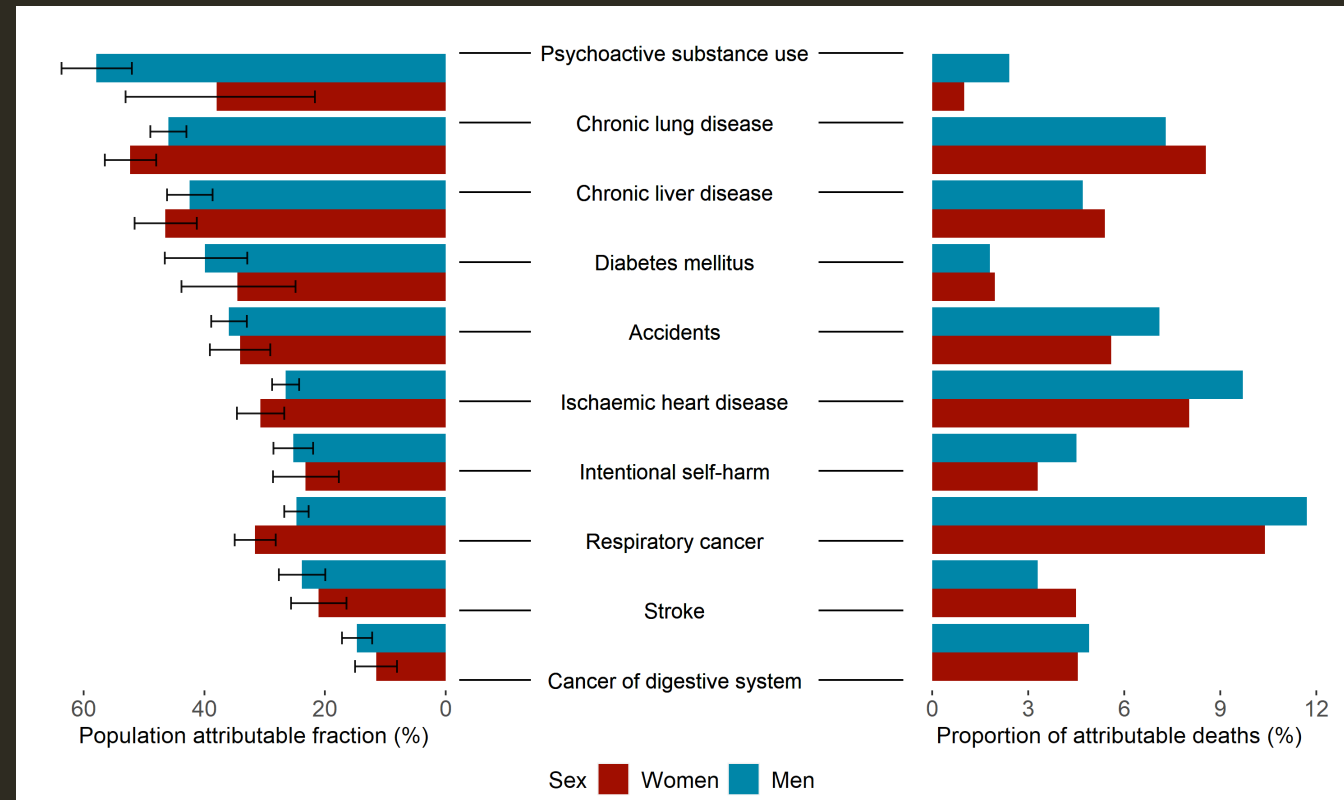
RESULTS

- About 28% of all premature deaths were attributable to socioeconomic inequality, corresponding to 1 person dying prematurely every hour in Belgium between 1998 and 2019.
- With a greater proportion of deaths attributable to SE inequality in men than women (29.1%, 95% CI 28.4 – 29.8 vs. 25.1%, 95% CI 24.2-26.1).
- The greatest proportion of deaths attributable to SE inequality occurred in men aged 40-59 years (~ 60%) and in women aged 40-54 years (~ 50%).

RESULTS

□ The greatest proportion of deaths attributable to SE inequality in cause-specific premature mortality was observed for:

- Premature mortality by psychoactive substance use (50.9%, 95% CI 44.9-56.8) – linked to drug use.
- Premature mortality by chronic lung disease (47%, 95% CI 44.5-49.5) – linked to tobacco use.
- Premature mortality by chronic liver disease (43%, 95% CI 40-46.2) – linked to alcohol consumption.

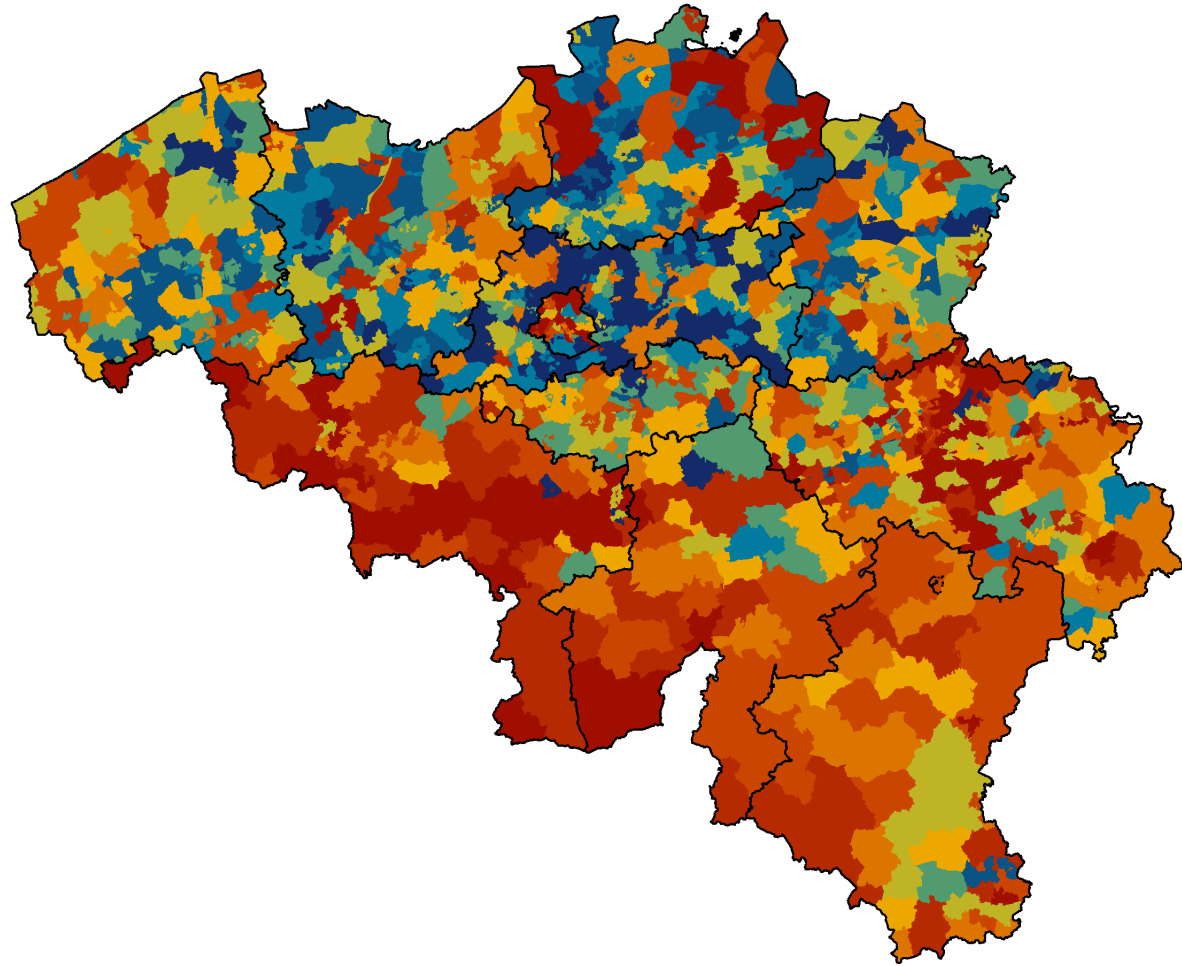


SPATIAL VARIATION IN CAUSE-SPECIFIC
PREMATURE MORTALITY AND ASSOCIATION WITH
SOCIOECONOMIC DEPRIVATION IN BELGIUM
FROM 2000 TO 2019

RESEARCH QUESTIONS

- ❑ Which geographical areas exhibit the highest risk of dying prematurely?
- ❑ Is the subnational variation in cause-specific risk of premature death decreasing or increasing?
- ❑ What effects do overall socioeconomic deprivation or domain-specific deprivation have on subnational variations in the cause-specific risk of premature death?

METHODS



Deciles 1 2 3 4 5 6 7 8 9 10

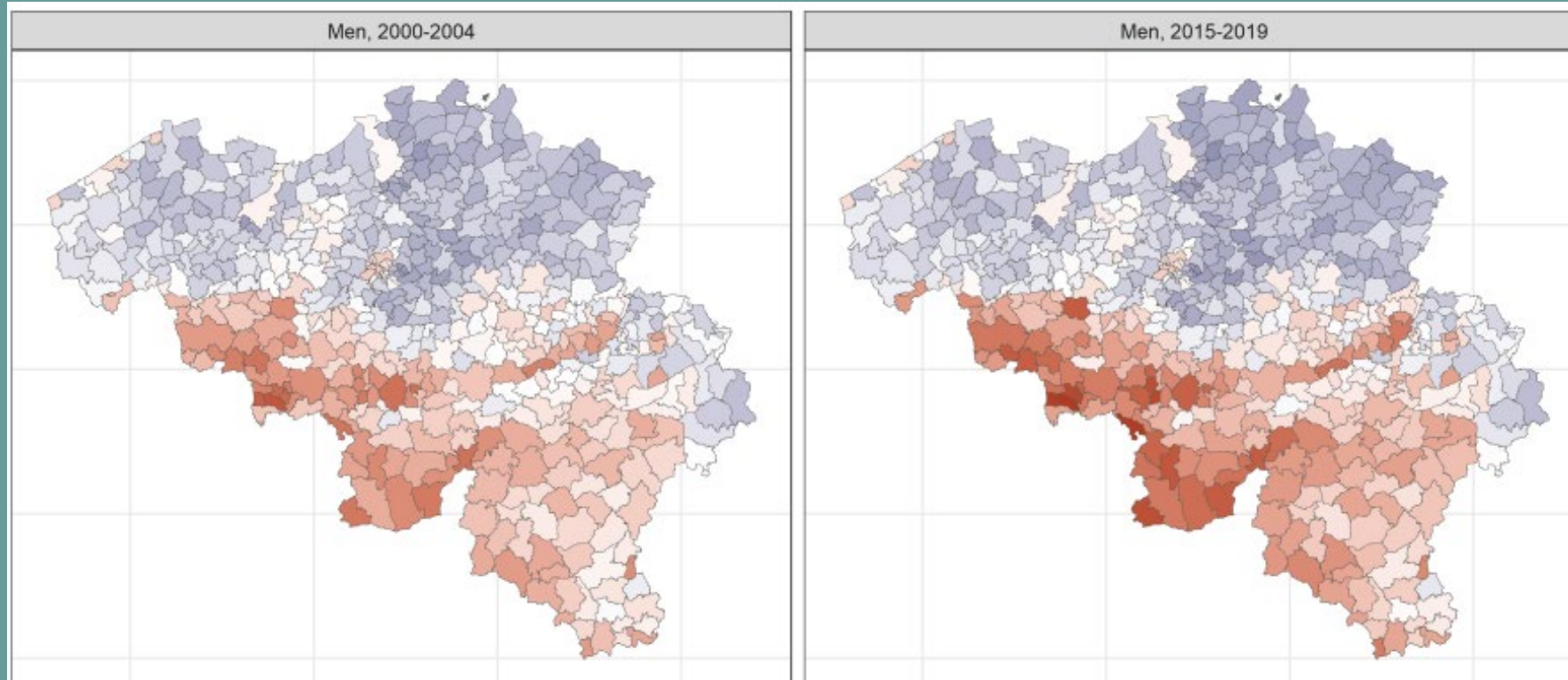
METHODS

- ❑ Premature mortality risk between Jan 1st 2000 and Dec 31st 2019
- ❑ Modelled 13 avoidable causes of death: lung cancer; cancer of mouth and neck; colorectal cancer; diabetes mellitus; cerebrovascular and cardiovascular diseases; alcohol-related deaths; COPD; mental and neurological diseases; breast cancer; suicides; non-transport accidents; and road accidents.

METHODS

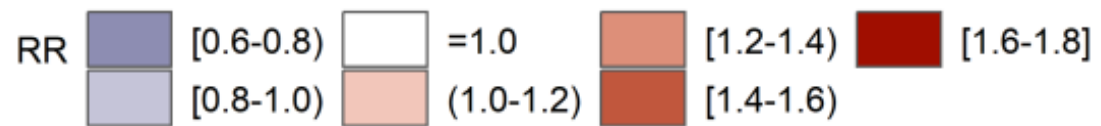
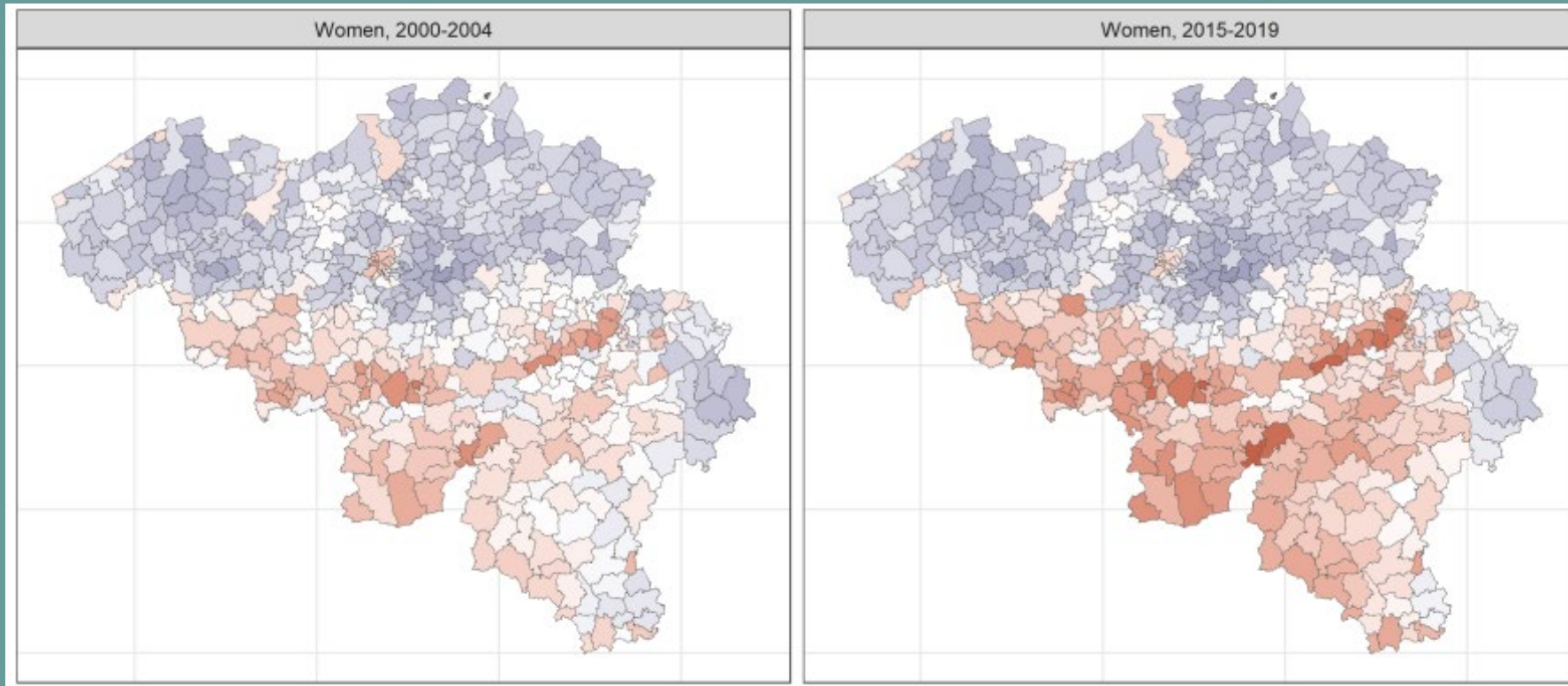
- ❑ Model relative risk of dying prematurely – fitting the Bernardinelli model (an extension of BYM model) with a spatial and temporal structure.
- ❑ Fitted for each sex and cause of death.
- ❑ Independent variables – period, domain score, or BIMD score.

RESULTS



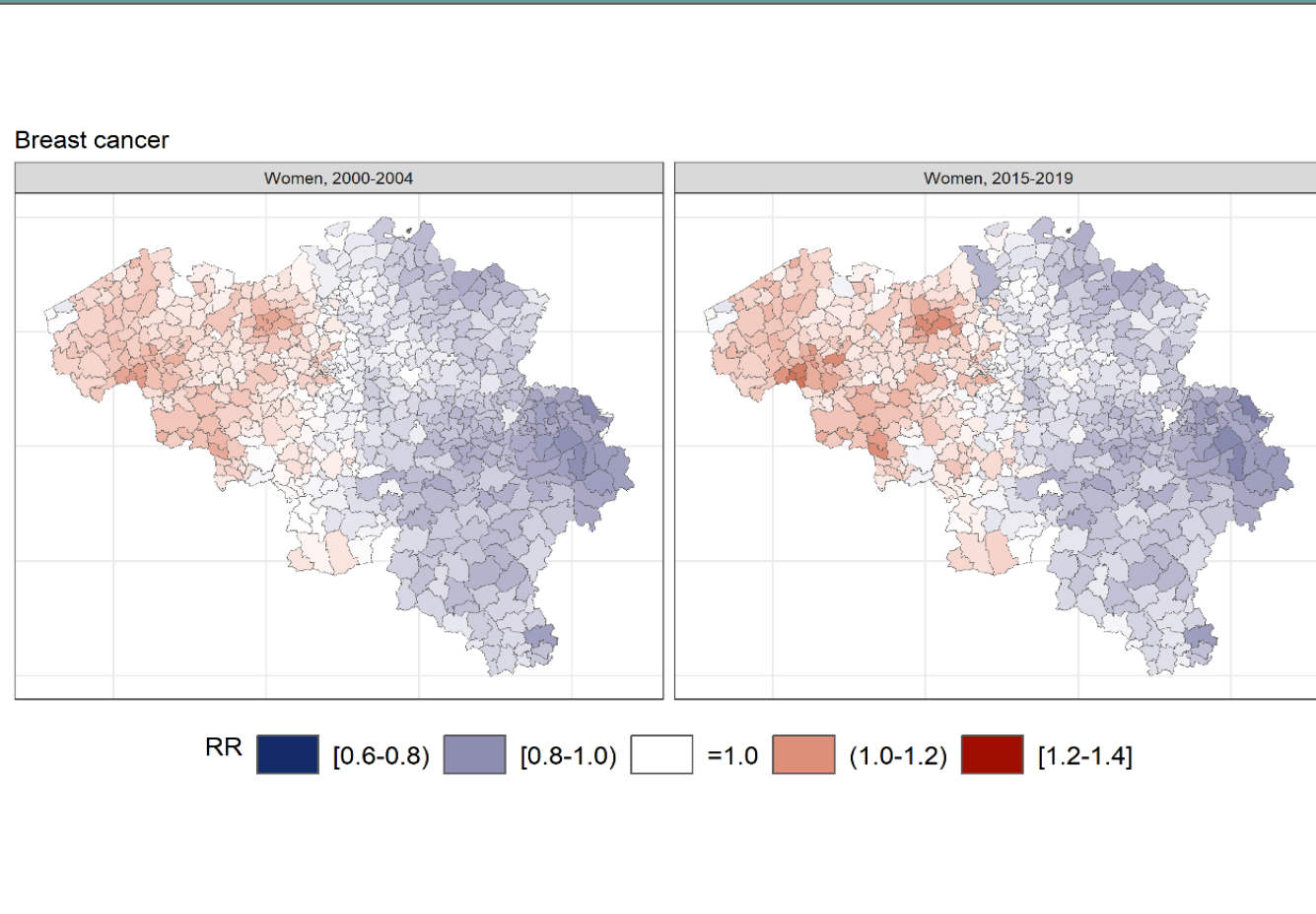
- ❑ Which geographical areas exhibit the highest RR?
- ❑ North-South gradient suggesting a higher RR for those living in the areas in Wallonia.
- ❑ Diabetes mellitus, alcohol-related deaths, COPD.

RESULTS



- The distribution has not changed much but the intensity has increased.

RESULTS

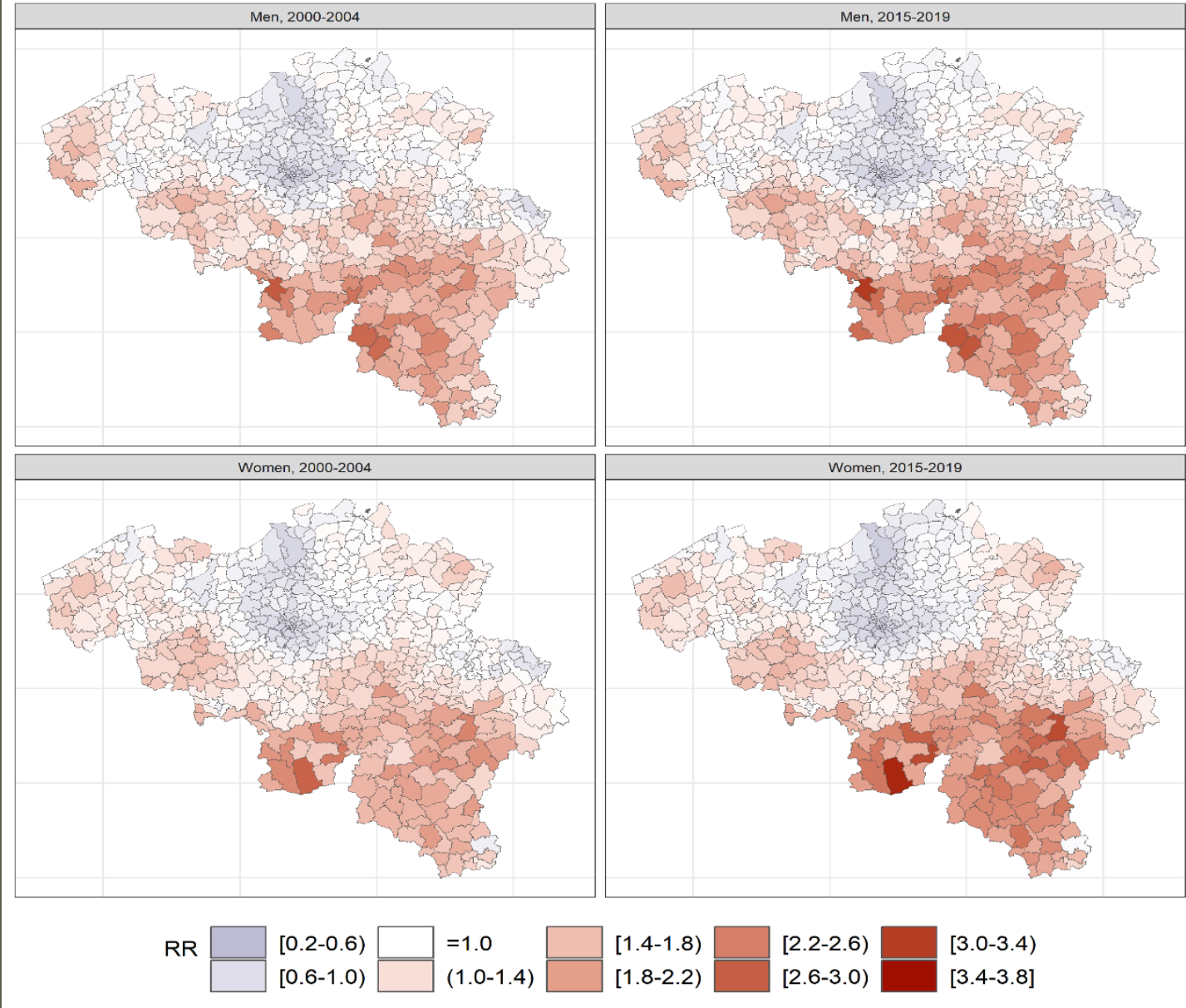


- ❑ West-East gradient suggesting a higher RR for those living in the least deprived areas.
- ❑ Noted in previous studies SE deprivation does not strongly affect breast cancer mortality.

RESULTS

- A mix of several patterns
- High RRs mostly in less urbanized areas – road accidents are linked to longer-distance travels at higher speed.
- Low RRs mostly in and around highly urbanized and populated municipalities.

Road accidents



**UNCOVERING SOCIOECONOMIC DISPARITIES IN
MODAL AGE AT DEATH AND ITS DISPERSION IN
BELGIUM SINCE 2000**

RESEARCH QUESTIONS

- ❑ What are the trends and levels of all-cause and cause-specific modal age at death (M) in the most and least deprived deciles from 2000 to 2019?
- ❑ Are there similarities between all-cause M and life expectancy at birth (e_0) trends in the most and least deprived deciles?
- ❑ What is the degree of variability in the all-cause and cause-specific M among elderly individuals in the most and least deprived deciles during the study period?

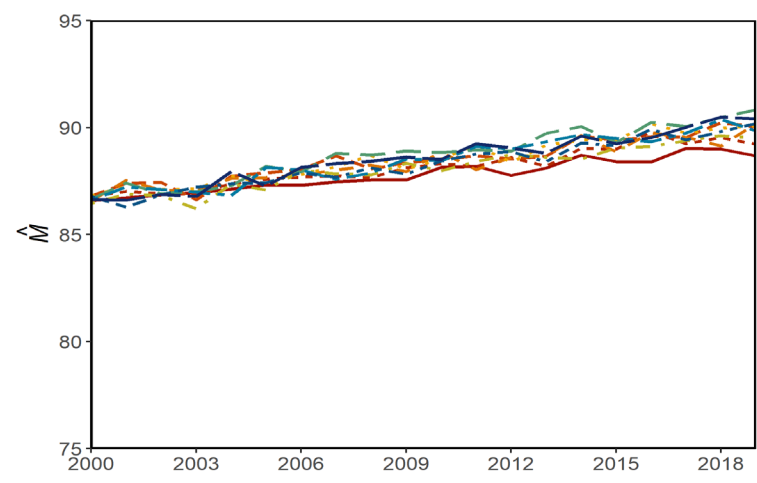
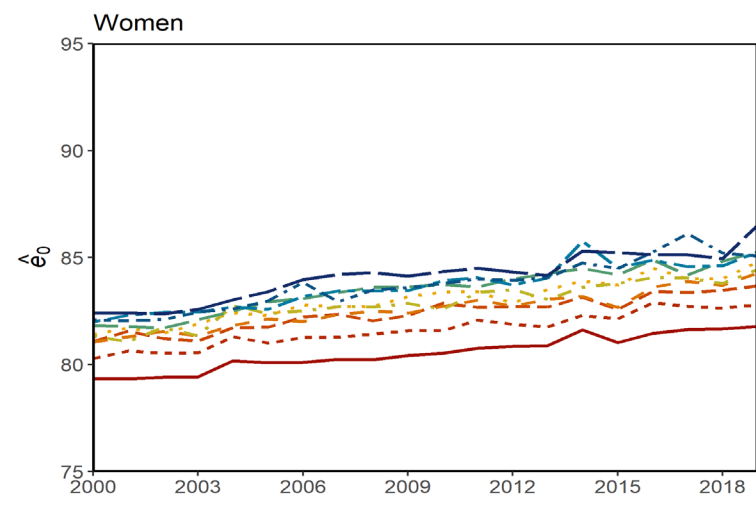
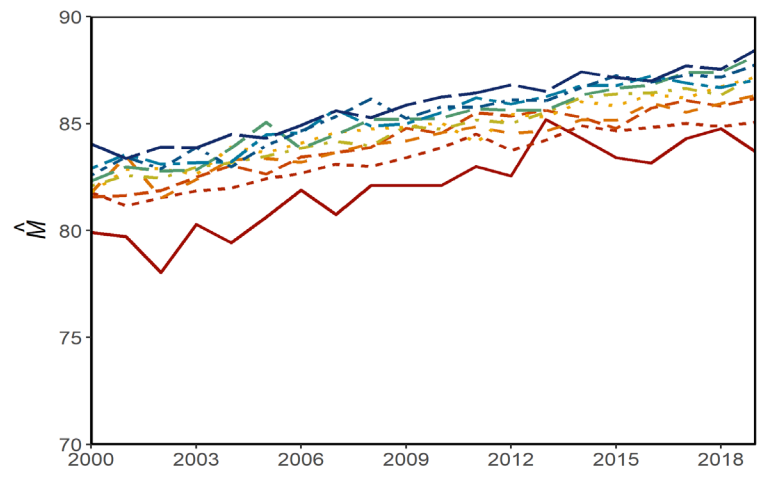
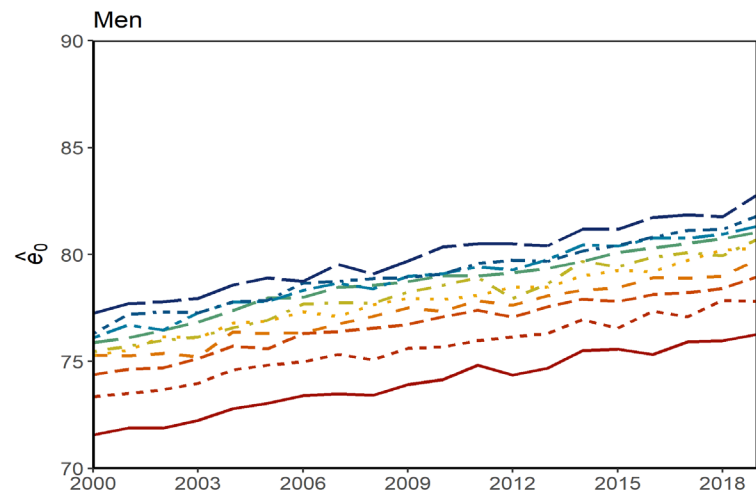
METHODS

- ❑ BIMD at the level of the statistical sector used to measure deprivation
- ❑ Individual-level mortality data from 2000 to 2019.
- ❑ Leading causes of death:
 - ❑ cerebrovascular diseases (I60-I69); heart diseases (I00-909, I11, I13, I20-I51); trachea, bronchus, and lung cancer (C33-C34); prostate cancer (C61); breast cancer (C50); colorectal cancer (C18-C21)

METHODS

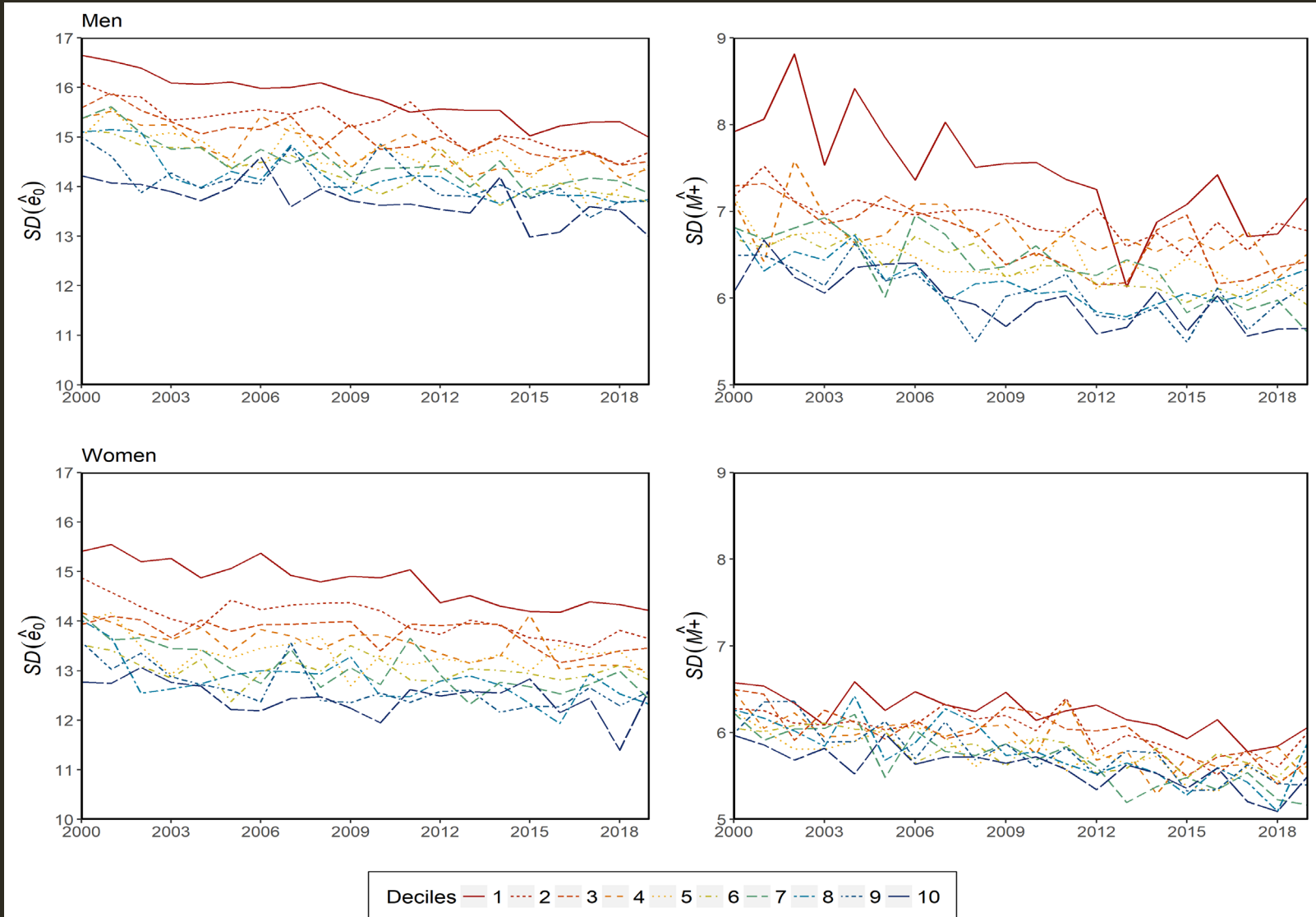
- ❑ period life tables constructed for each sex, year, and decile to extract the life expectancy at birth
- ❑ modal age at death estimated by P-splines, non-parametric method by Ouellette and Bourbeau (2011)
- ❑ dispersion measure of life expectancy at birth and modal age at death

RESULTS

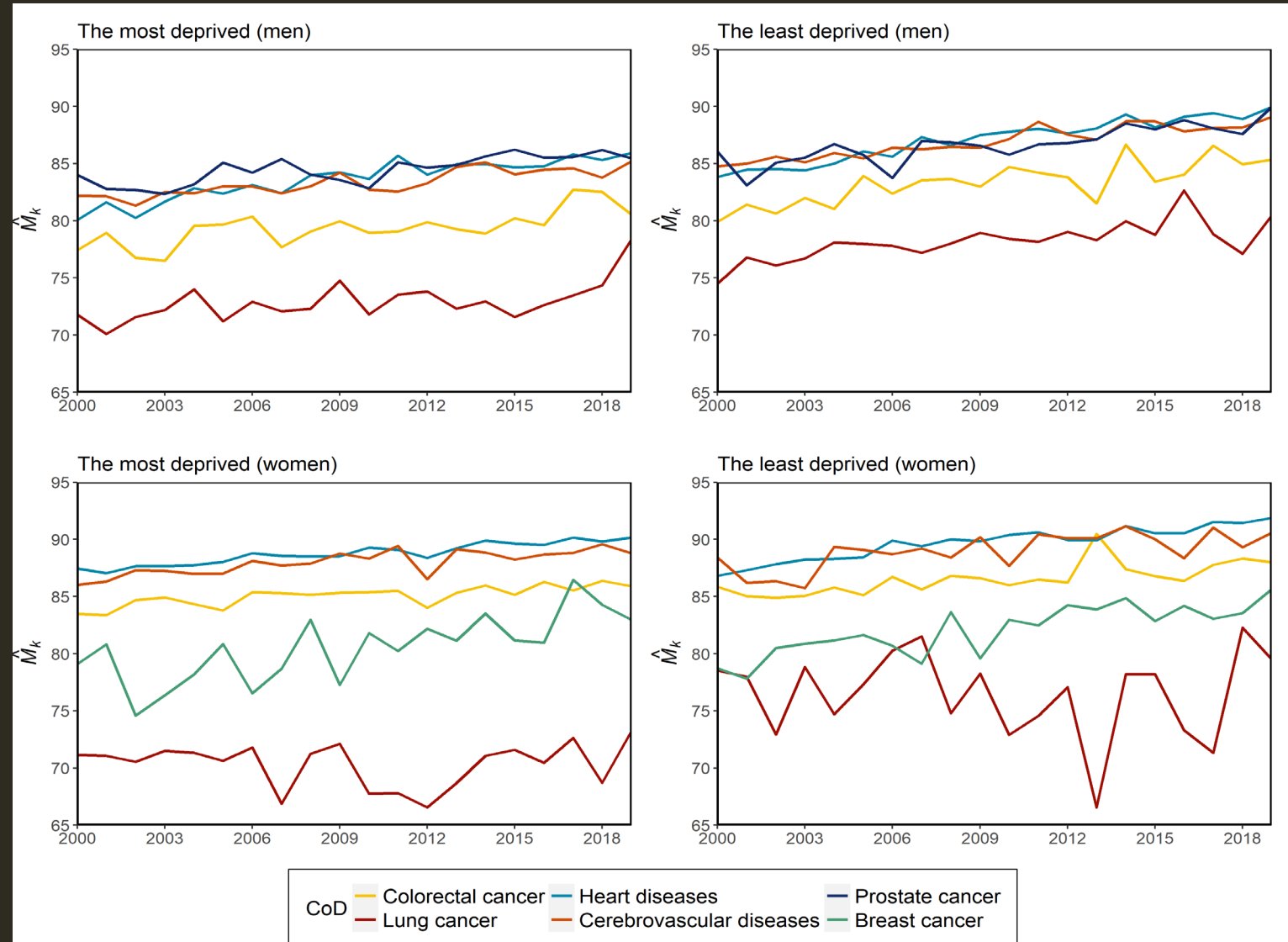


Deciles 1 2 3 4 5 6 7 8 9 10

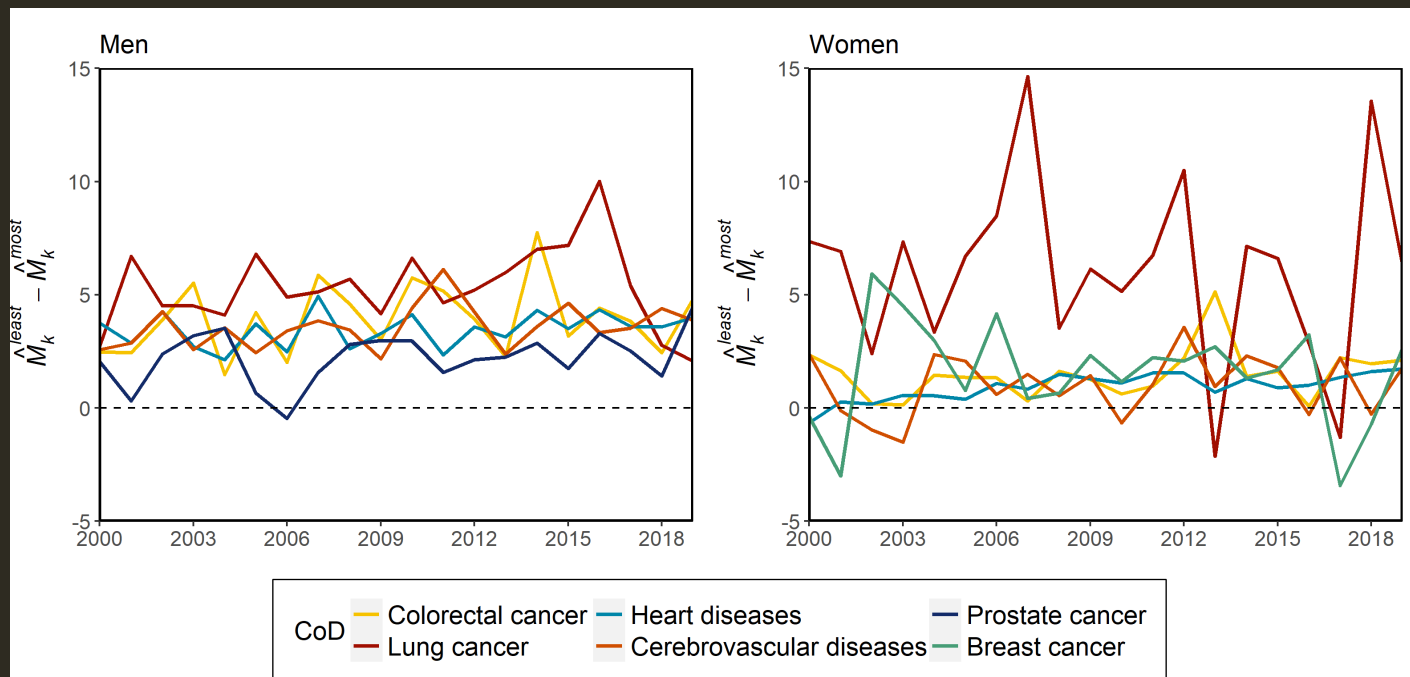
RESULTS



RESULTS



RESULTS



OTAVOVA M, MASQUELIER B, FAES C, VAN DEN BORRE L, DE CLERCQ E, VANDENINDEN B, DEVLEESSCHAUWER B. (2023). *TRENDS IN SOCIOECONOMIC INEQUALITIES IN CAUSE-SPECIFIC PREMATURE MORTALITY IN BELGIUM, 1998-2019*. BMC PUBLIC HEALTH. [HTTPS://DOI.ORG/10.1186/S12889-024-17933-Z](https://doi.org/10.1186/s12889-024-17933-z)

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THANK YOU