

Multimorbidity dynamics in Catalonia 2010-2021: A population-based cohort study

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Scor Chair on Mortality Research

Madrid

22 April 2026

RESEARCH AIM

We aim at documenting & analyzing patterns of multimorbidity in Catalonia by different cohorts by sex and socioeconomic status

More specifically, we want to describe:

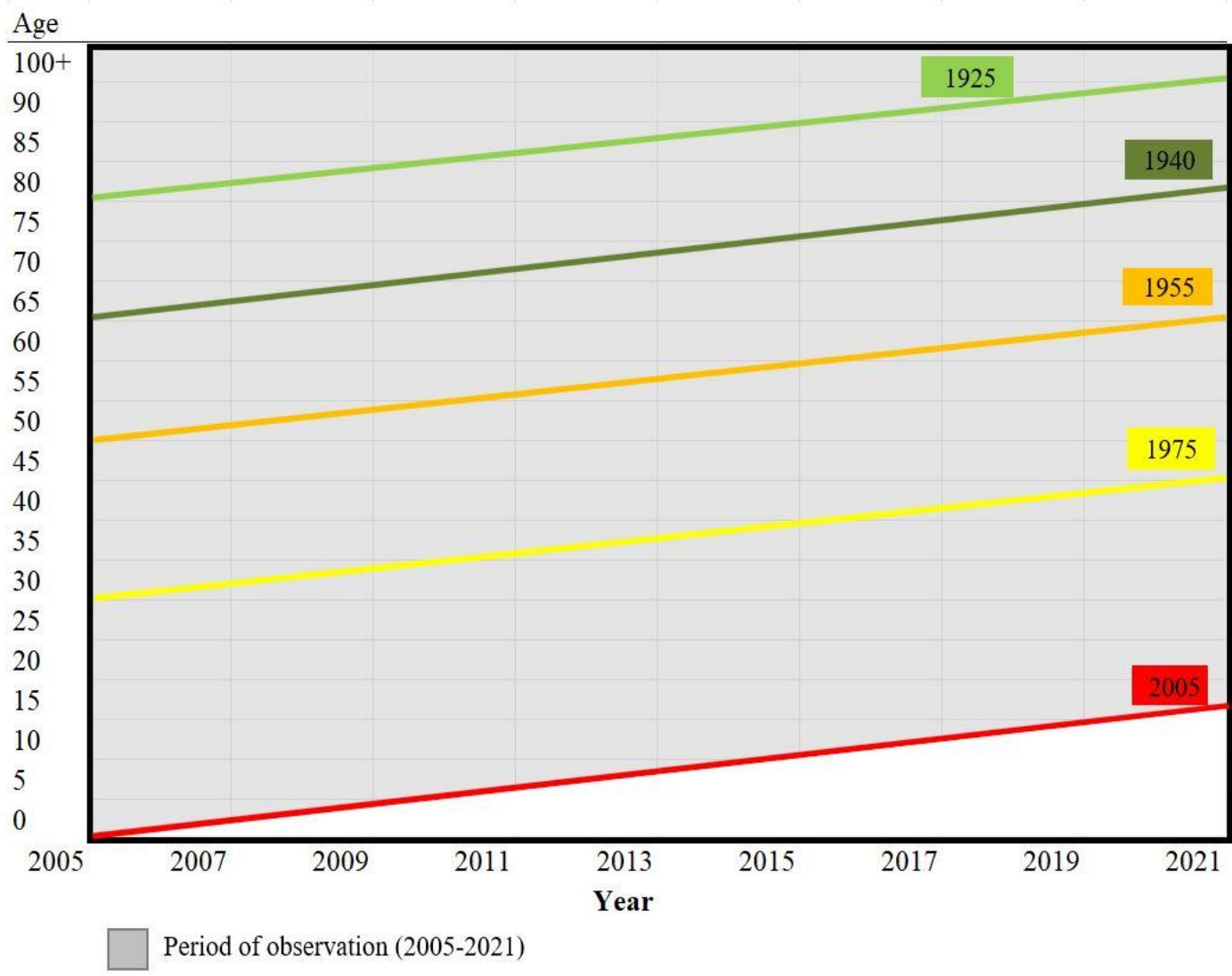
1. Trends in prevalence of multimorbidity
2. Trends in incidence of multimorbidity
3. Differences across SES groups
4. Differences between women and men
5. Relationship between multimorbidity and mortality

DATA: THE HEALIN COHORT

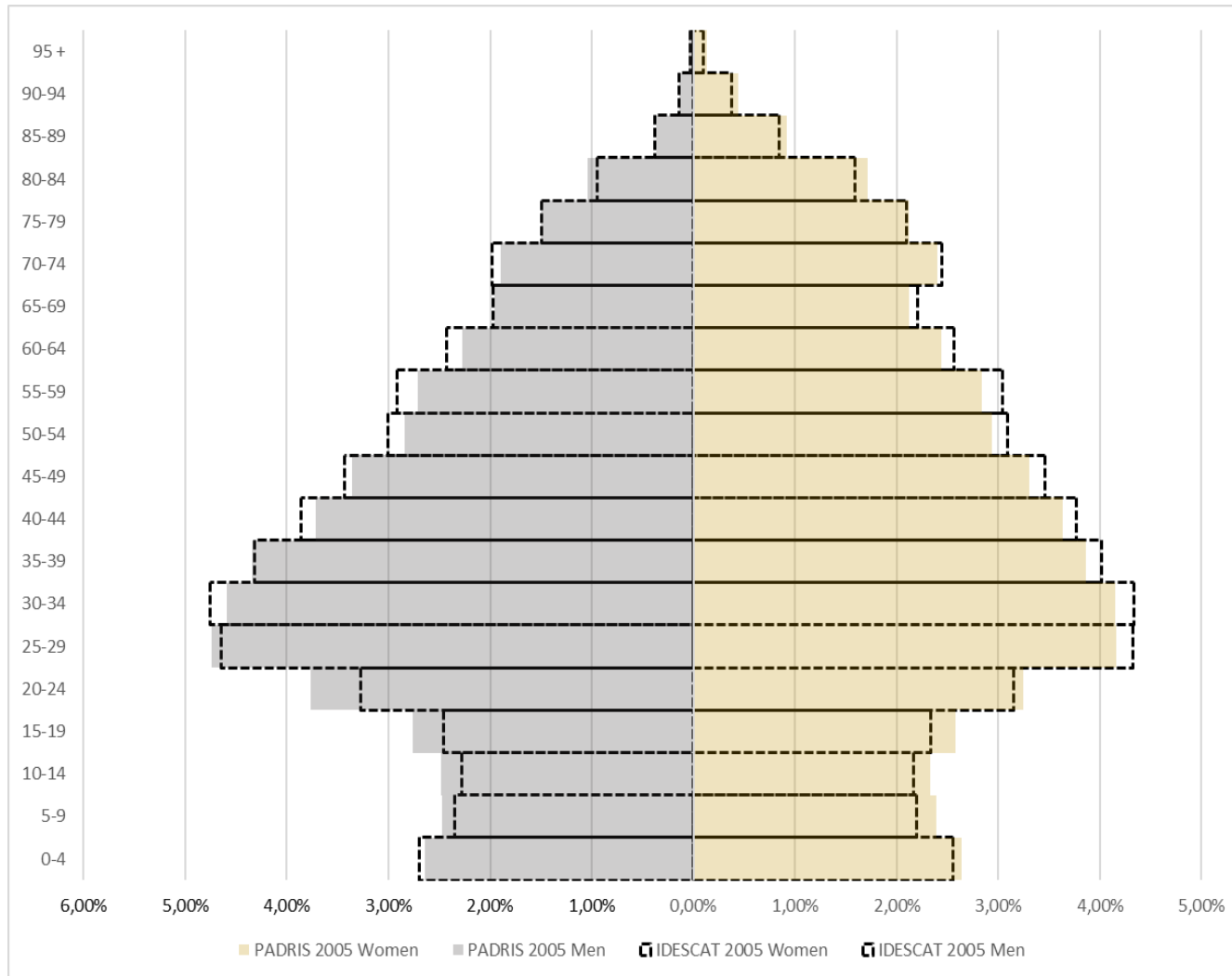
Health & Mortality Register data

- Population-based dataset following a sample of over 1.5 million people in Catalonia (22%) from 2005 onwards
- Information from Primary Care Centers (CAPs) and hospitalizations
- Representative of the whole Catalan population in 2005 according to age, sex & health regions

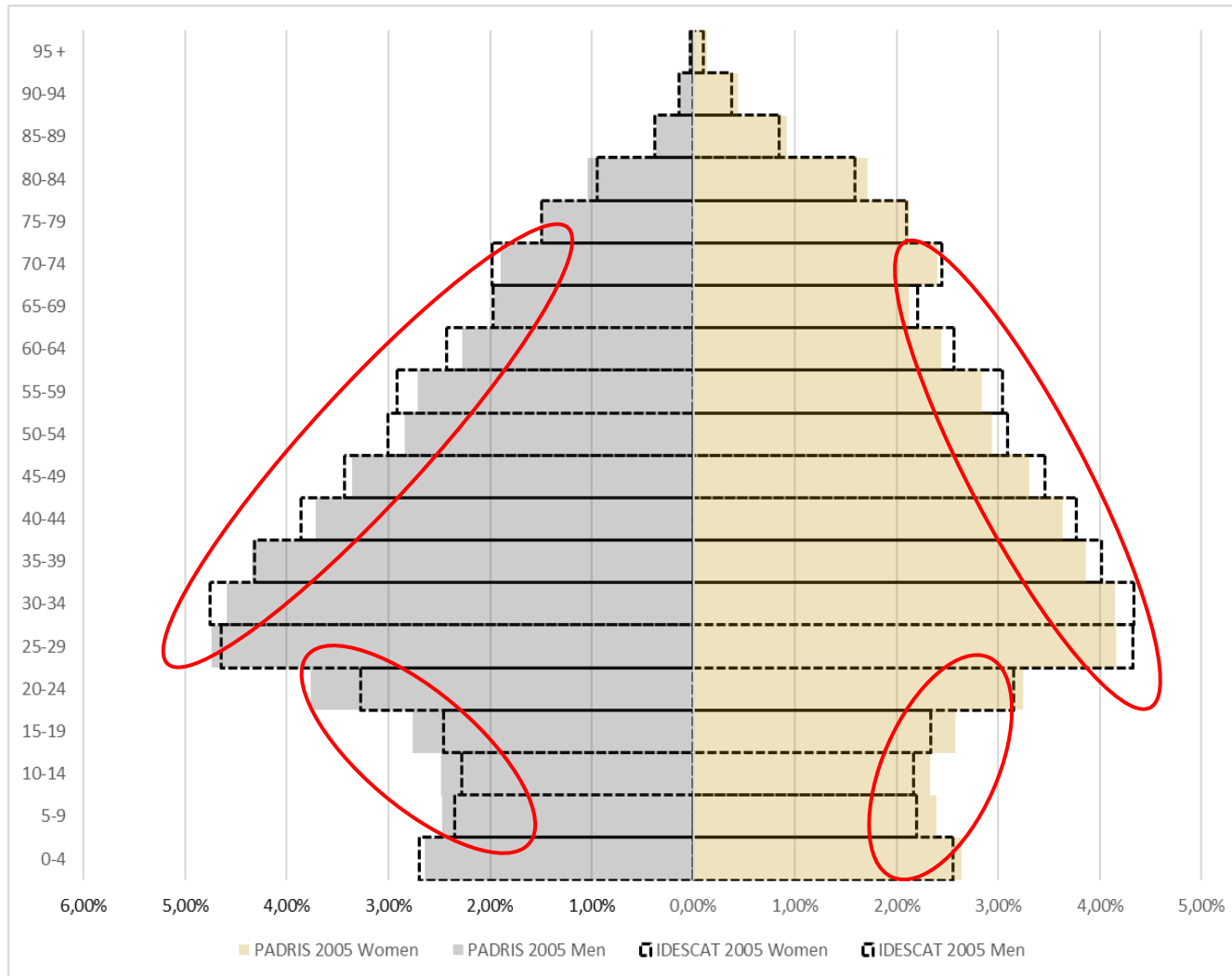
THE HEALIN COHORT ON A LEXIS DIAGRAM



DATA: THE HEALIN COHORT



DATA: THE HEALIN COHORT



DATA: THE HEALIN COHORT

Health & Mortality Register data

- Population-based dataset following a sample of over 1.5 million people in Catalonia (22%) from 2005 onwards
- Representative of the whole Catalan population in 2005 according to age, sex & health regions

Setting:

- 2010-2021 (washout period 2005-2009)
- 404 diseases from GP diagnostics
- Mortality (age at death & cause of death)
- Basic (2+) and complex (3+) multimorbidity

LIST OF DISEASES

Table A1. Original demographic and health variables available in the HEALIN cohort for each individual

Type of variable	Variables	ICD-10 Codes
Demographic variables	Date of birth, sex, nationality, health region, health sector, basic health areas, deaths	
Health measures	HIV/AIDS	B20-B24
	Malignant tumours	C00-C97
	Anemia	D50-D64
	Thyroid disorders	E00-E07
	Diabetes	E10-E14
	Obesity	E66
	Lipoprotein and other lipid metabolism disorders (high blood cholesterol)	E78
	Mental retardation	F70-F79
	Depression	F32-F33
	Anxiety	F40-F43
	Schizophrenia	F20-F21
	Dementia, Alzheimer's disease and brain degeneration	F00-F03, G30, G31
	Parkinson's disease	G20-G22
	Multiple Sclerosis	G35
	Epilepsy	G40-G41
	Migraines	G43
	Neuropathies	G50-G64, B02.2
	Blindness, glaucoma and macular degeneration	H54, H40, H35.3
	Hearing loss and vertigo	H90-H91, H81-H82
	Chronic rheumatic diseases of the heart	I05-I09
	Hypertensive diseases	I10-I15
	Ischemic heart diseases	I20-I25
	Atrial fibrillation	I48
	Heart failure	I50
	Peripheral arterial and venous vascular disease	I70.2, I72.4, I73, I74.2-I74.4, I80.2, I80.3, I83
	Cerebrovascular diseases	I60-I69
	Other diseases of the heart and circulatory system	I00-I02, I26-I47, I49, I51-I52, I70.1, I70.8, I70.9, I71-I72, I74.1, I74.5-I74.9, I77.0-I77.5, I77.9, I78-179, I801, I80.8, I81-I82, I86-I99
	Chronic diseases of the lower respiratory tract	J40-J45, J47
	Pneumoconiosis and hypersensitivity pneumonitis	J60-J67.9, J92
	Pulmonary fibrosis	J84.1
	Chronic ulcer/gastritis	K22.1, K25-K28, K29.3-K2
	Inflammatory bowel disease	K50-K51
	Intestinal diverticular disease	K57
Chronic hepatitis B and C and cirrhosis	B18, K70, K73, K74, K76.0, K76.6, I85	
Decubitus and/or pressure ulcers	L89	
Inflammatory arthropathies: Rheumatoid arthritis, Psoriatic arthropathy, Gout and depositional arthropathy	M05-M14, L40.5	
Arthritis and spondyloarthritis	M15-M19, M45-M55	


THE HEALIN COHORT: SES VARIABLES

- Income brackets
 - <18.000 €
 - 18.000 € – 100.000 €
 - >100.000 €
- Educational attainment



Cohort Profile

Cohort Profile: Health Inequalities in Catalonia (the HEALIN cohort)

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Juan-Francisco Martínez-Cerdá³, **Iñaki Permanyer^{2,4}**

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²Centre for Demographic Studies (CED), Centres de Recerca de Catalunya (CERCA), Universitat Autònoma de Barcelona, Bellaterra, Spain

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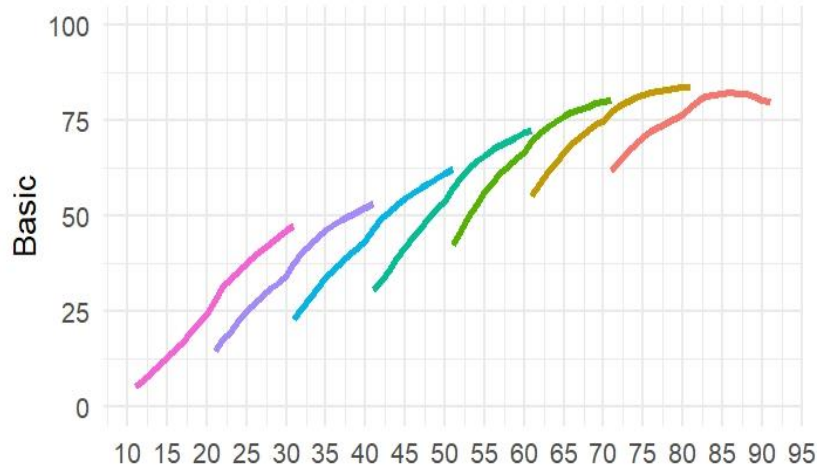
Keywords: population health; multimorbidity; health registers.

Key Features

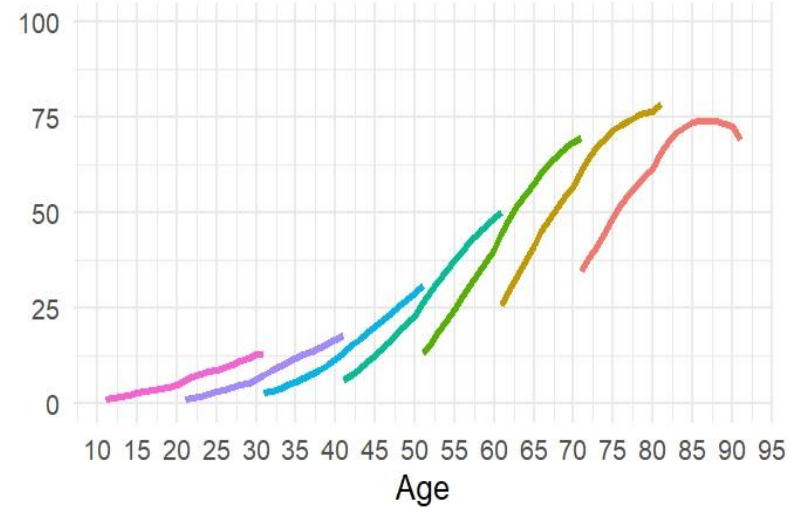
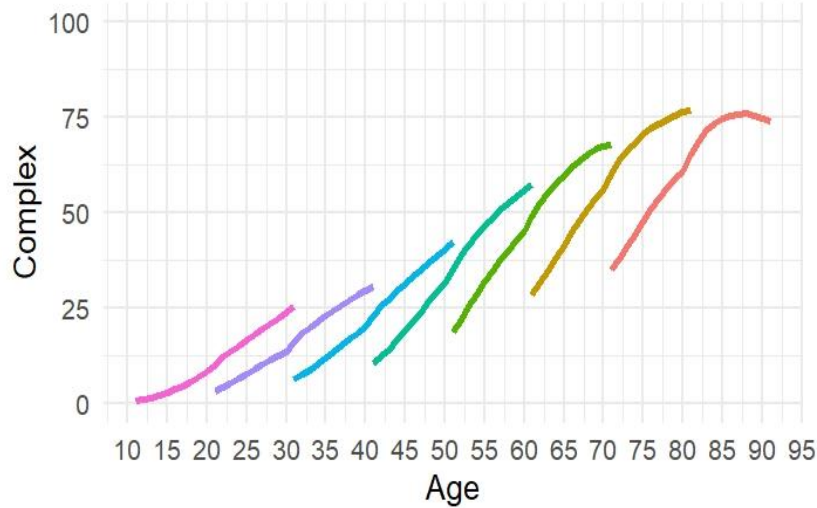
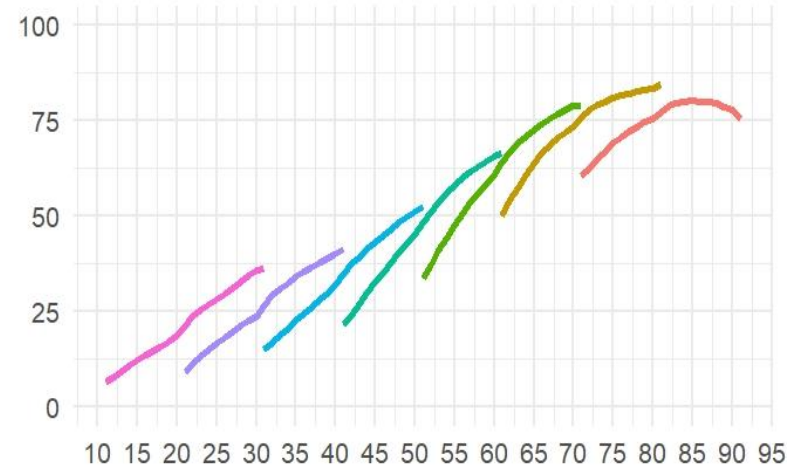
- The Health Inequalities (HEALIN) cohort is a population-based dataset following a sample of >1.5 million people in Catalonia (Spain), covering all ages, between the years 2005 and 2021.
- The HEALIN cohort includes data on multiple chronic diseases, drawing on both primary care and hospital record data (health history), and is linked with mortality data (causes of death).
- The HEALIN cohort contains demographic information (age and sex), territorial details (health regions), and income levels (based on co-pharmacy payments).
- The educational attainment of individuals included in the HEALIN cohort is to be made available shortly by linking up with various statistical and administrative sources.
- Researchers can request access to the HEALIN cohort data, under the supervision and acceptance of the Agència de Qualitat i Avaluació Sanitàries de Catalunya (AQuAS), at <https://salutweb.gencat.cat/ca/inici>.

FINDINGS: PREVALENCE OF MULTIMORBIDITY

Women

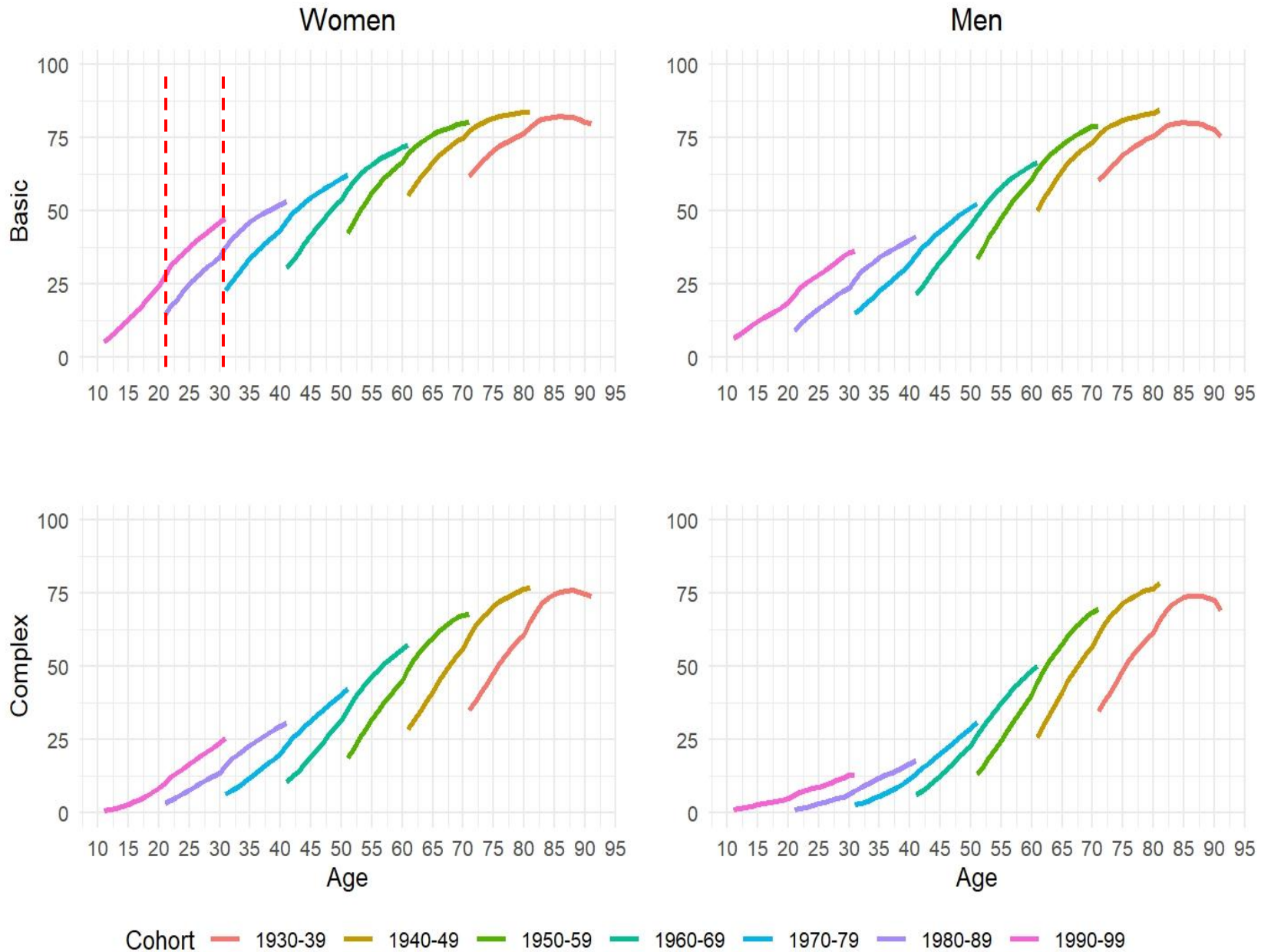


Men



Cohort — 1930-39 — 1940-49 — 1950-59 — 1960-69 — 1970-79 — 1980-89 — 1990-99

FINDINGS: PREVALENCE OF MULTIMORBIDITY



THE MOST PREVALENT CONDITIONS

Women							
Cohort	1930-39	1940-49	1950-59	1960-69	1970-79	1980-89	1990-99
Chapter I	2.79	2.26	1.50	1.02	0.49	0.27	0.08
Chapter II	17.04	14.60	10.68	6.57	2.91	1.05	0.43
Chapter III	24.59	14.29	10.57	15.03	14.20	10.63	9.03
Chapter IV	60.12	64.15	57.51	40.55	24.51	18.22	15.51
Chapter V	45.78	42.25	44.17	43.73	39.21	36.40	27.40
Chapter VI	20.88	19.22	18.54	17.83	13.60	10.93	8.51
Chapter VII	25.64	22.19	13.87	8.18	4.15	2.45	4.02
Chapter VIII	29.00	24.08	18.08	13.17	9.12	6.57	4.40
Chapter IX	73.59	66.48	50.16	34.10	23.34	19.72	19.35
Chapter X	11.22	10.21	8.26	5.99	4.86	4.44	5.16
Chapter XI	17.50	18.53	14.88	8.72	3.58	1.90	1.04
Chapter XII	3.94	1.21	0.56	0.37	0.20	0.11	0.07
Chapter XIII	75.13	75.72	70.57	62.40	56.77	50.59	39.31
Chapter XIV	29.70	14.78	6.16	3.29	1.76	0.83	0.31

THE MOST PREVALENT CONDITIONS

Women							
Cohort	1930-39	1940-49	1950-59	1960-69	1970-79	1980-89	1990-99
Chapter I	2.79	2.26	1.50	1.02	0.49	0.27	0.08
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THE MOST PREVALENT CONDITIONS

Men							
Cohort	1930-39	1940-49	1950-59	1960-69	1970-79	1980-89	1990-99
Chapter I	2.18	2.00	1.67	1.77	0.91	0.44	0.12
Chapter II	27.46	21.85	11.24	3.99	1.37	0.72	0.42
Chapter III	23.82	14.73	7.09	3.56	2.01	1.49	2.04
Chapter IV	53.15	58.77	51.63	36.77	21.47	11.23	10.91
Chapter V	33.68	33.22	34.58	33.45	29.98	28.69	20.72
Chapter VI	17.74	14.69	11.01	8.09	5.98	4.76	4.51
Chapter VII	24.41	20.48	12.15	6.67	3.10	1.63	2.93
Chapter VIII	24.51	20.99	14.82	9.10	5.95	4.10	2.81
Chapter IX	71.94	67.67	52.34	33.25	18.73	14.35	15.08
Chapter X	18.34	15.78	10.22	5.44	3.82	3.58	5.56
Chapter XI	16.45	18.43	15.51	9.66	4.71	2.39	1.03
Chapter XII	2.93	1.28	0.71	0.40	0.22	0.10	0.06
Chapter XIII	66.10	66.71	59.97	52.12	45.14	39.89	34.23
Chapter XIV	55.54	52.58	33.44	13.53	3.75	1.33	0.58

THE MOST PREVALENT CONDITIONS

Men							
Cohort	1930-39	1940-49	1950-59	1960-69	1970-79	1980-89	1990-99
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Chapter XIV	55.54	52.58	33.44	13.53	3.75	1.33	0.58

ICD-10 Chapters

Chapter I: Certain infectious and parasitic diseases;

Chapter II: Neoplasms;

Chapter III: Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism;

Chapter IV: Endocrine, nutritional and metabolic diseases;

Chapter V: Mental and behavioural disorders;

Chapter VI: Diseases of the nervous system;

Chapter VII: Diseases of the eye and adnexa;

Chapter VIII: Diseases of the ear and mastoid process;

Chapter IX: Diseases of the circulatory system;

Chapter X: Diseases of the respiratory system;

Chapter XI: Diseases of the digestive system;

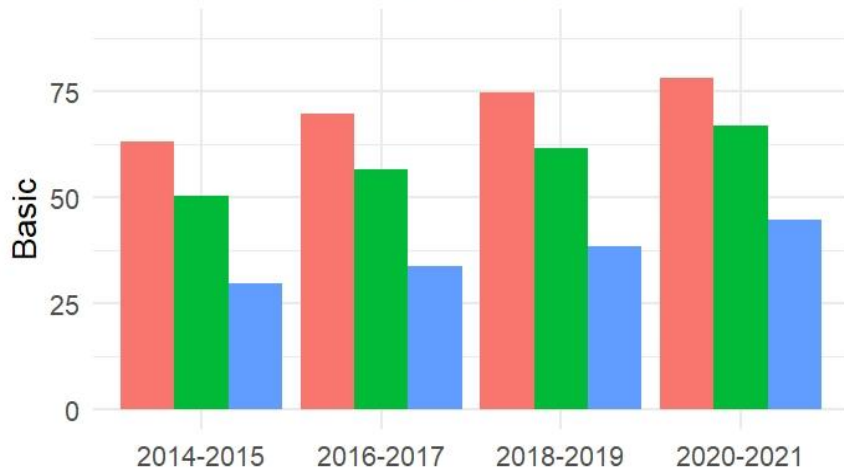
Chapter XII: Diseases of the skin and subcutaneous tissue;

Chapter XIII: Diseases of the musculoskeletal system and connective tissue;

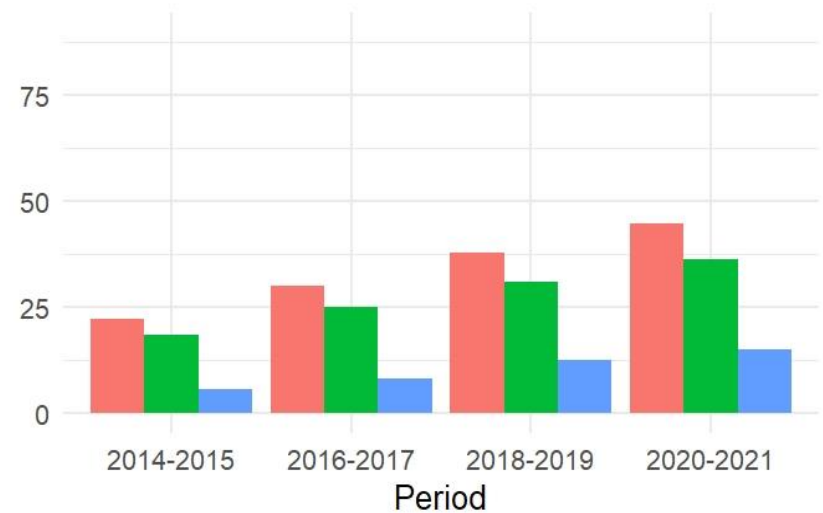
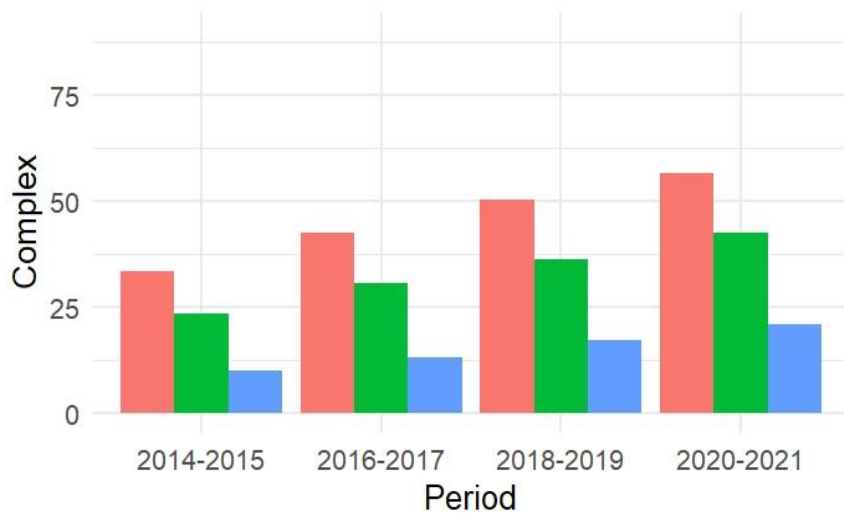
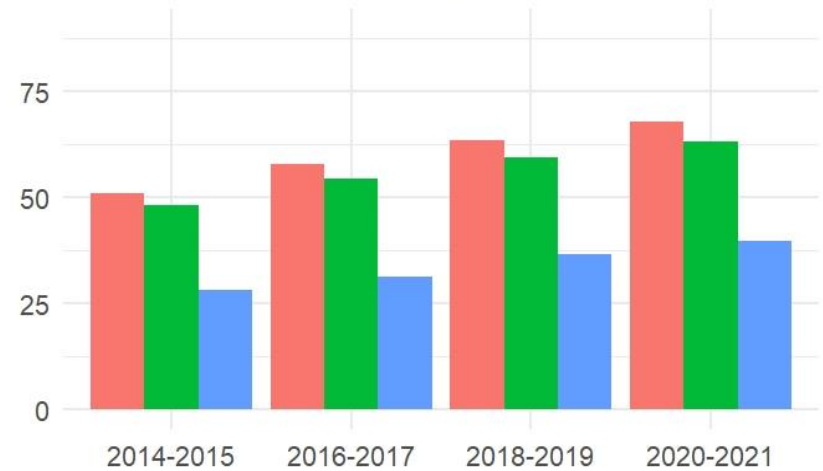
Chapter XIV: Diseases of the genitourinary system.

SES DIFFERENCES IN MULTIMORBIDITY

Women



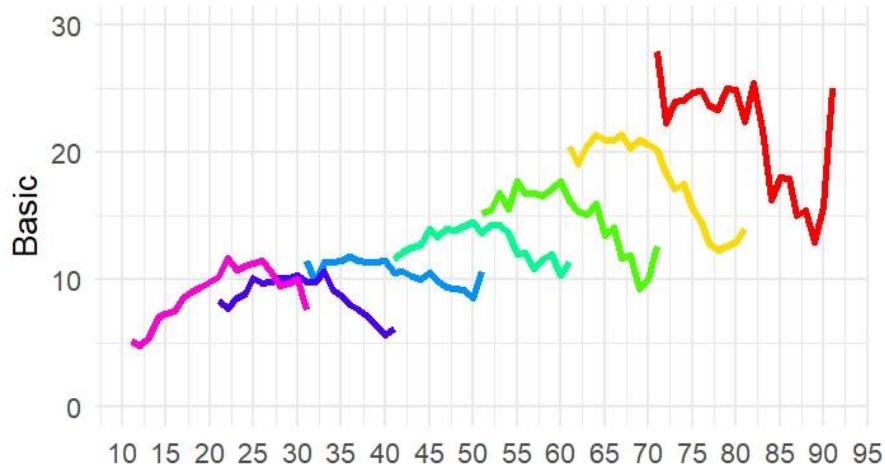
Men



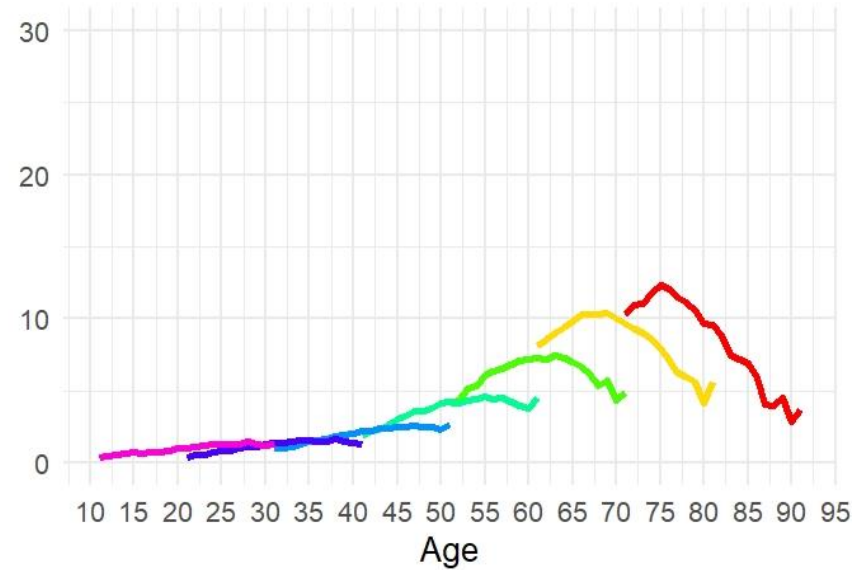
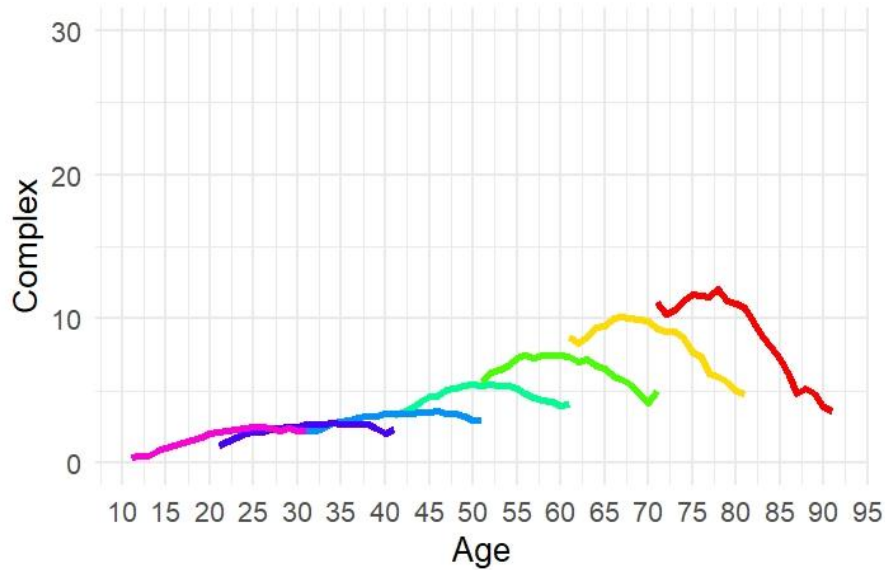
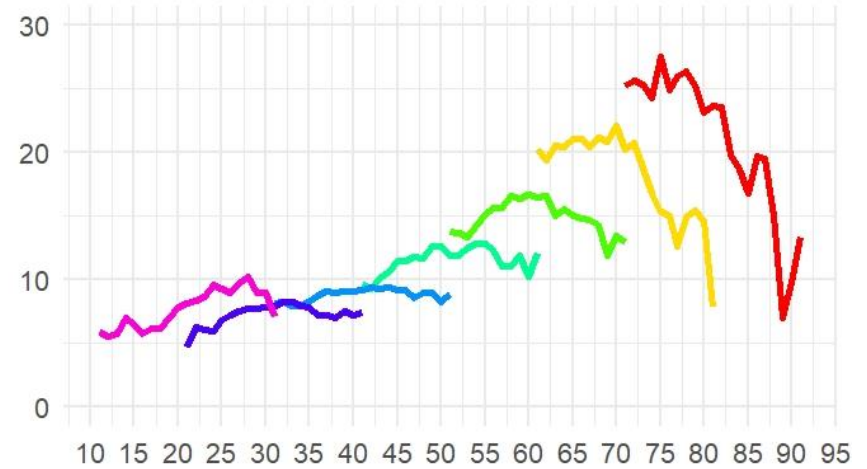
SES Low Medium High

FINDINGS: INCIDENCE OF MULTIMORBIDITY

Women



Men

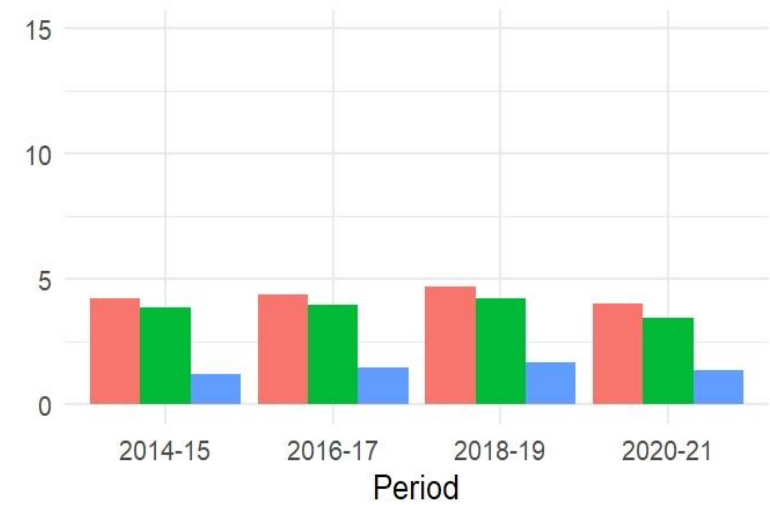
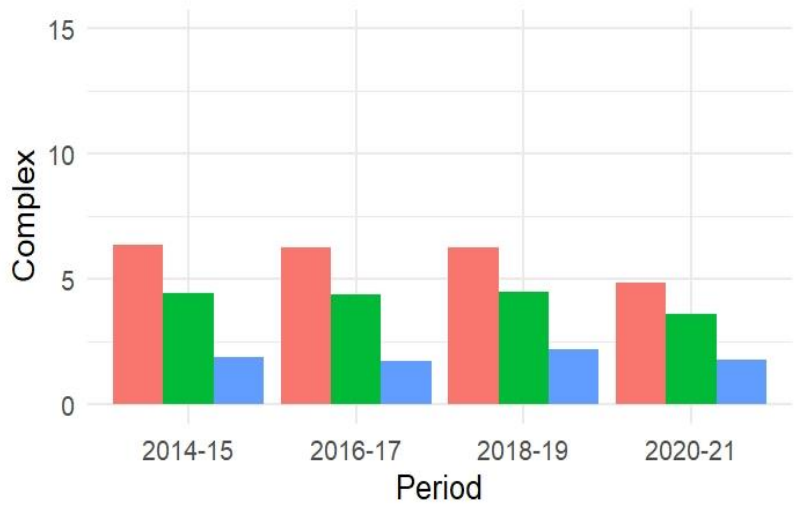
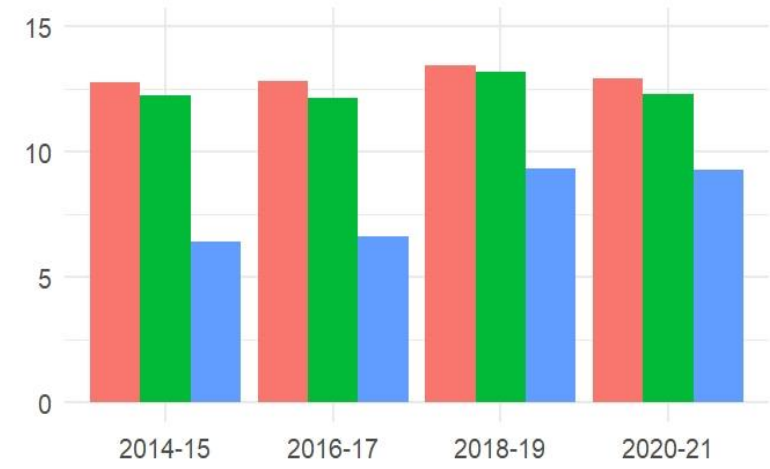
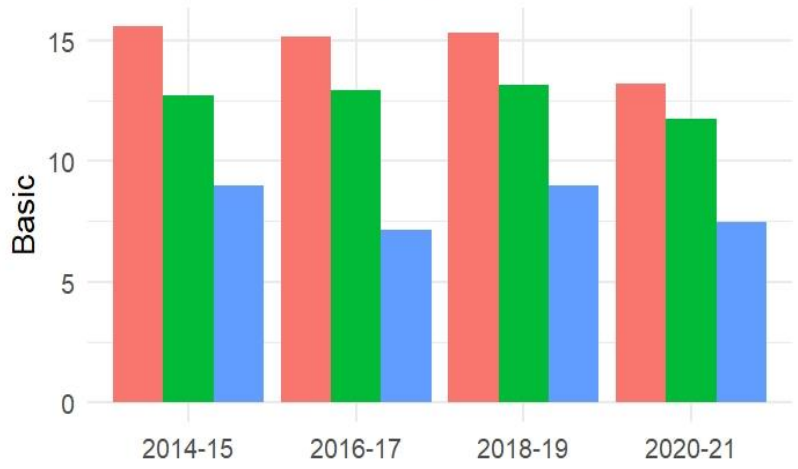


Cohort — 1930-39 — 1940-49 — 1950-59 — 1960-69 — 1970-79 — 1980-89 — 1990-99

INCIDENCE OF M-M: SES DIFFERENCES

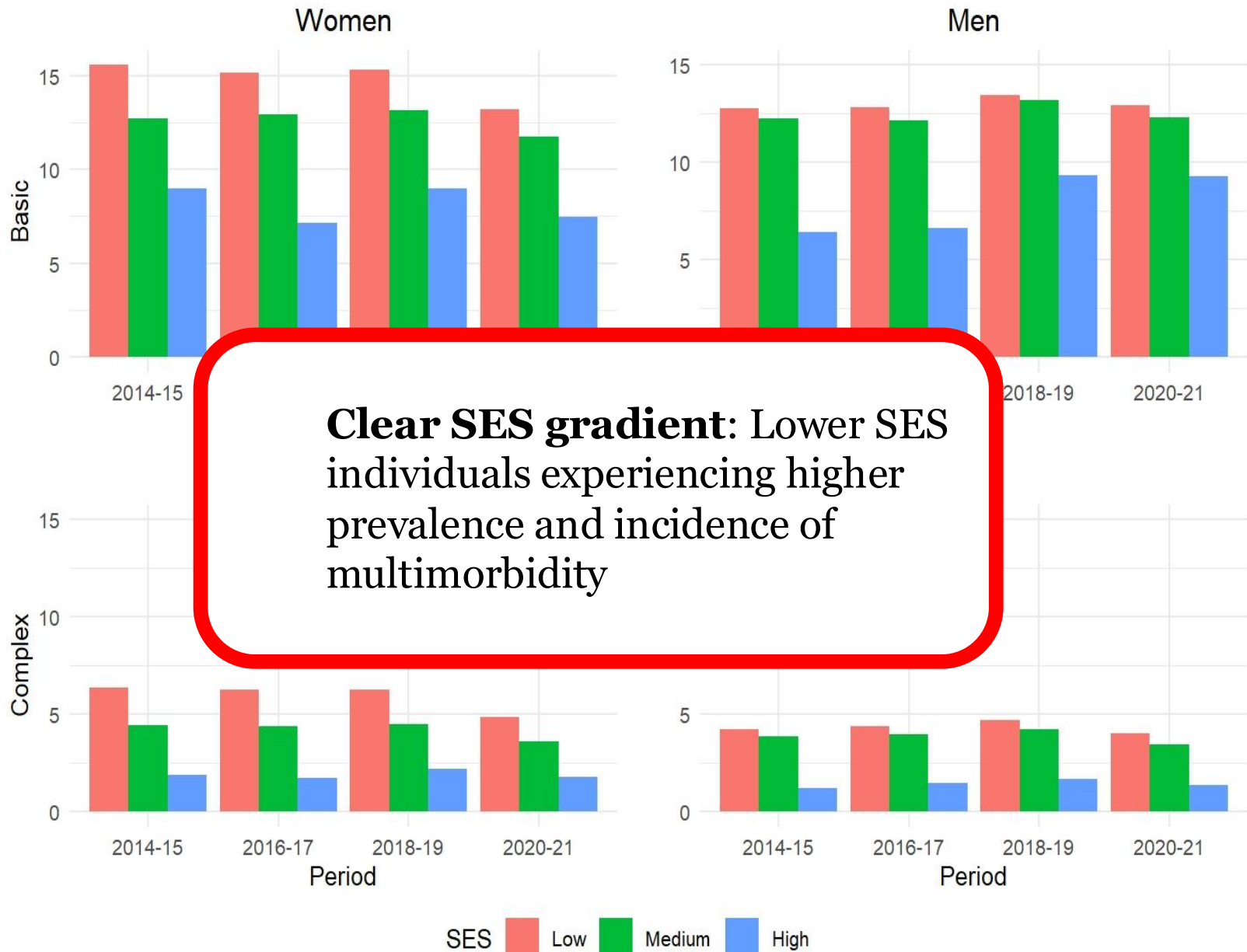
Women

Men

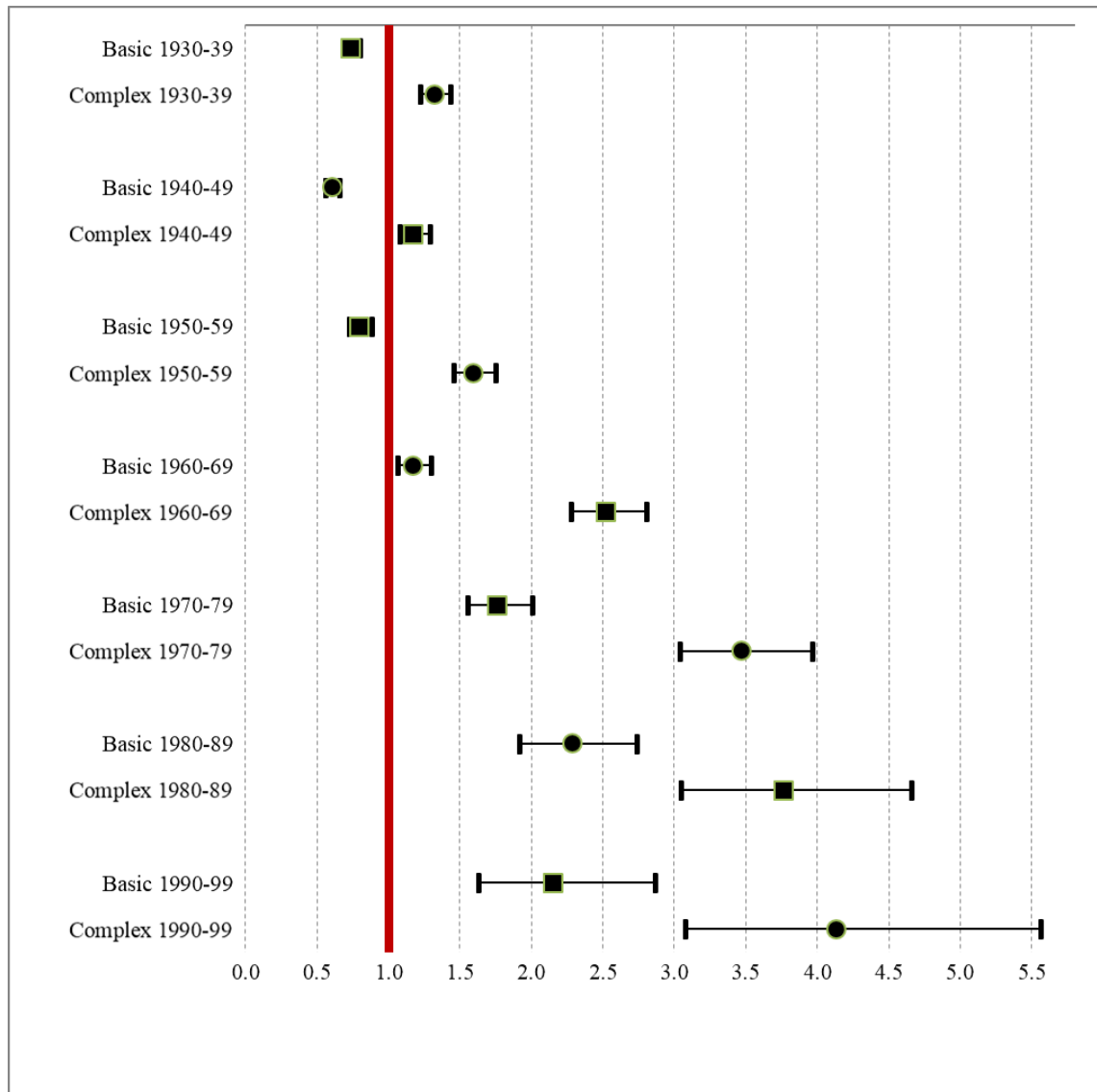


SES Low Medium High

INCIDENCE OF M-M: SES DIFFERENCES







MORTALITY RISKS



Quasi-Poisson regression coefficients for the relative risk of dying for individuals experiencing basic and complex multimorbidity

Original article

Multimorbidity trends in Catalonia, 2010–21: a population-based cohort study

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Abstract

Background: With rising longevity, multimorbidity is an increasingly important challenge for healthcare systems. We describe trends in the prevalence and incidence of multimorbidity across socioeconomic groups in Catalonia.

Methods: We use a random sample of 1 551 126 individuals (22% of the Catalan population, for whom we have the complete primary care health records) and follow them from 2010 until 2021. We document the age- and sex-specific prevalence and incidence of multimorbidity stratifying by income groups and birth cohorts. Logistic regression models are used to estimate the association between multimorbidity and mortality.

Results: Between 2010 and 2021, the prevalence of multimorbidity, higher among women, has increased for both sexes and all cohorts in our analysis. Importantly, each cohort attains the same ages, with higher multimorbidity prevalence than their predecessors had 10 years ago. Older generations are mostly affected by degenerative diseases, while younger age groups are more affected by mental health problems. Incidence tends to be higher among the older cohorts across all adult ages. We observe a strong socioeconomic gradient, with lower-income individuals experiencing worse multimorbidity prevalence and incidence. Such a gradient is persistent and becomes more pronounced at the end of the study period. Across all age groups, individuals experiencing multimorbidity have a higher risk of dying than those who do not.

Conclusion: The documented increases in multimorbidity alongside its socioeconomic gradients suggest that preventive strategies are urgently needed to defer or prevent its onset and slow its progression—especially among younger generations.

Keywords: aging; multimorbidity; inequalities; mortality; health registers.

SUMMARY/CONCLUSION

- Increases in multimorbidity in Catalonia since 2010 (in line with other studies in the US, UK, Canada, Scotland, the Netherlands, Sweden,...)

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- Multi-morbidity increases the risk of mortality
- **Clear socio-economic gradient**
 - **Low-income individuals experiencing worse MM outcomes**
 - **⇒ Policies can delay or prevent the onset of MM**

SUMMARY/CONCLUSION

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- **Mental health, increasingly prominent among younger generations**

SUMMARY/CONCLUSION

- Increases in multimorbidity in Catalonia since 2010 (in line with other studies in the US, UK, Canada, Scotland, the Netherlands, Sweden,...)
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- Multi-morbidity increases the risk of mortality
- Clear socio-economic gradient
 - Low-income individuals experiencing worse MM outcomes
 - ⇒ Policies can delay or prevent the onset of MM
- Mental health, increasingly prominent among younger generations
- Increasing complexity of multimorbid profiles as individuals age
 - Diversification of health profiles. Implications for public health planning

DISCUSSION (I)

- Each generation ages with higher multimorbidity levels than the previous generation did some years ago
 - ⇒ **Generational health drift** (Gimeno et al 2024)

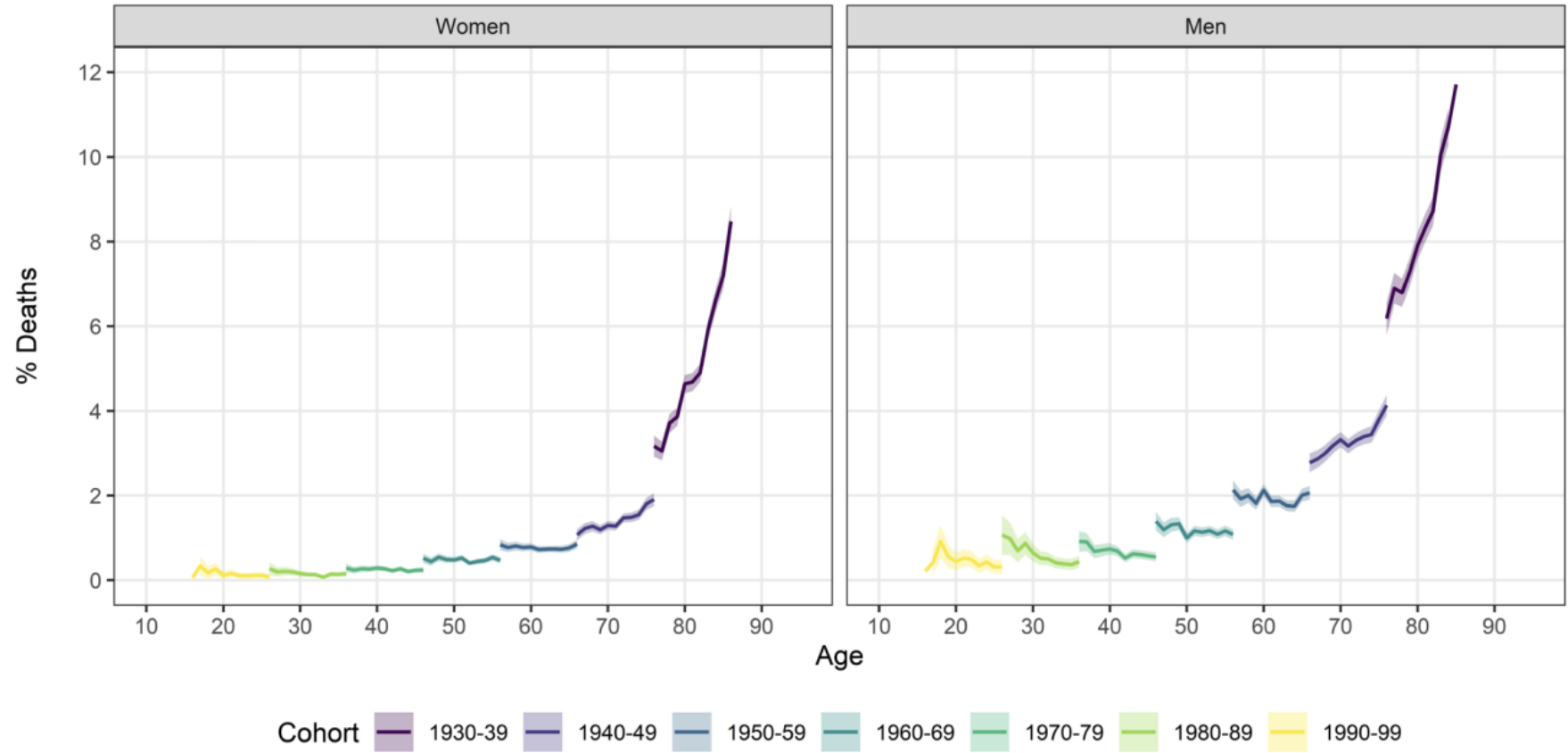
DISCUSSION (I)

- Each generation ages with higher multimorbidity levels than the previous generation did some years ago
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- Why?
 - Are we really getting sicker? Worsening of health conditions? Health-seeking behavior? Screening campaigns? Or we have improved our capacity to capture/detect morbidity onset?

DISCUSSION (I)

- Each generation ages with higher multimorbidity levels than the previous generation did some years ago
 - ⇒ **Generational health drift** (Gimeno et al 2024)
- Why?
 - Are we really getting sicker? Worsening of health conditions? Health-seeking behavior? Screening campaigns? Or we have improved our capacity to capture/detect morbidity onset?
 - How to disentangle different effects? Use “acute” disease episodes (e.g., heart attacks, strokes) that occur suddenly?

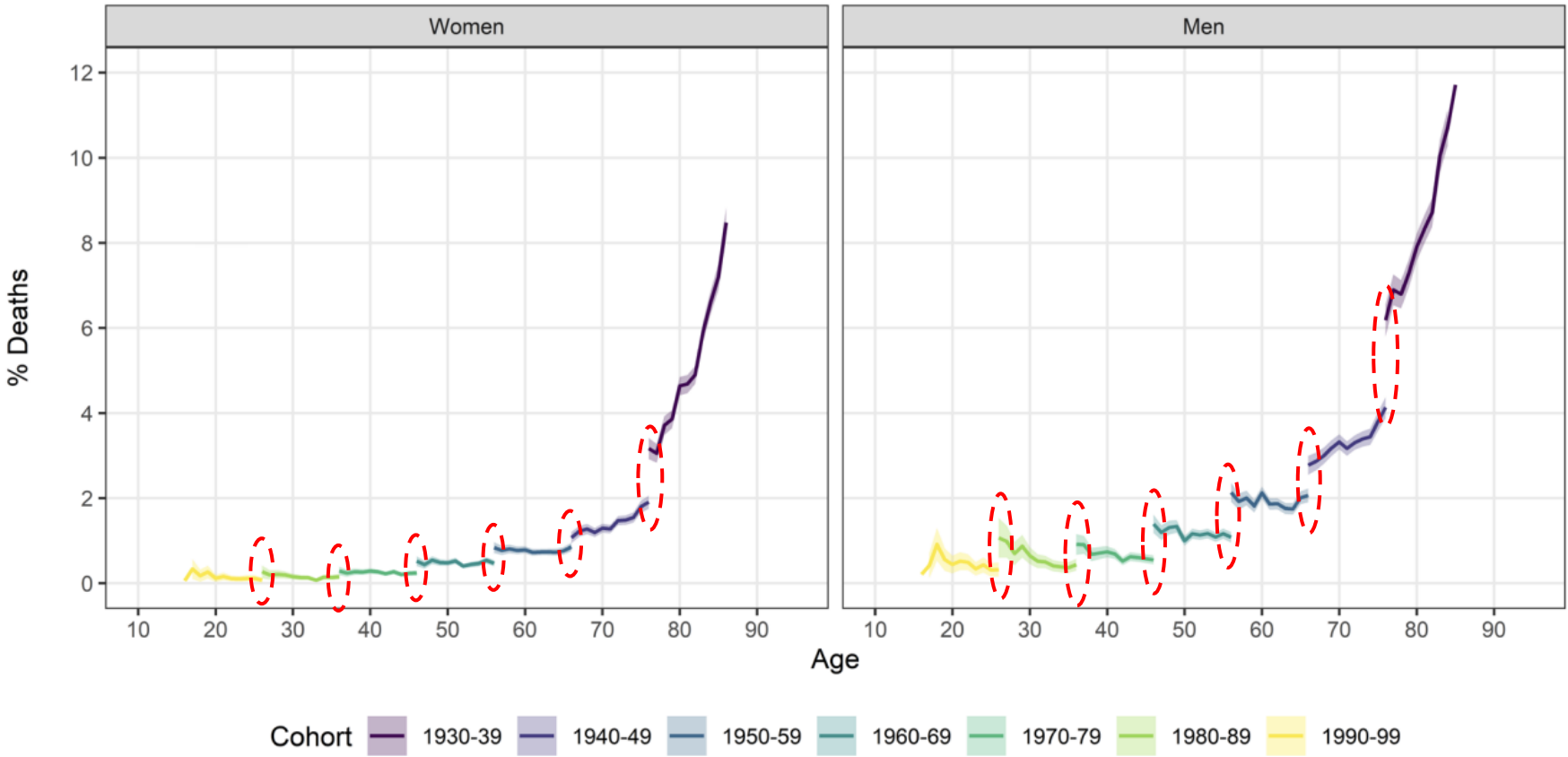
Multimorbids today are less likely to die



Graph 2. Proportion of deaths among multimorbid individuals belonging to different cohorts and at different ages (women in the left panel and men in the right panel).

Source: Authors elaboration using data from the HEALIN cohort.

Multimorbids today are less likely to die



Graph 2. Proportion of deaths among multimorbid individuals belonging to different cohorts and at different ages (women in the left panel and men in the right panel).

Source: Authors elaboration using data from the HEALIN cohort.

DISCUSSION (II)

- Rethinking the “expansion vs compression of morbidity debate”
Is early morbidity onset necessarily a bad outcome? It might simply reflect (i) technological progress, (ii) more active health-seeking behavior, or (iii) more exhaustive and inclusive prevention/screening programs.

DISCUSSION (II)

- Rethinking the “expansion vs compression of morbidity debate”
Is early morbidity onset necessarily a bad outcome? It might simply reflect (i) technological progress, (ii) more active health-seeking behavior, or (iii) more exhaustive and inclusive prevention/screening programs.
- Role of AI techniques?

Collection

Artificial intelligence and medical imaging

Submission status

Open

Submission deadline

01 August 2025

Artificial Intelligence (AI), particularly deep learning, offers promise for descriptive, predictive and prescriptive profiling on medical images, complementary to manual analysis. Benefiting from the increasing emergence of medical image datasets and expert annotations, as well as advances in computing power, AI-driven medical image analysis systems are booming in the fields of cardiovascular, oncology, respiratory, orthopedics, and ophthalmology fields, among others. However, the heterogeneity and complexity of medical images pose challenges to the development of robust or versatile AI tools, and the integration of AI tools into the clinical workflow remains an open question to the real world. — [show all](#)



Thank you for
your attention

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