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Introduction

Age-associated disability may reduce quality of life in the older population and lead to wide-range implications for social and health policy. The identification of diseases that contribute to the burden of disability is crucial to develop intervention strategies to reduce disability. In this study, we assessed the contribution of chronic diseases to the prevalence of disability in the Belgian population.

Methods

Data

- Belgian Health Interview Survey (HIS) of 1997, 2001, 2004, and 2008
- N = 36,269 individuals aged 15 years or older, including institutionalized population
- Disability and chronic diseases: face-to-face questionnaire
- Response rate (HIS): 59% (1997), 61% (2001), 61% (2004), 55% (2008)

Disability

- Limitations in activities of daily living (ADL) or mobility
- ADLs:** transfer in and out of bed, transfer in and out of chair, dressing, washing hands and face, feeding, and going to the toilet
- Mobility:** self-reported ability to walk without stopping < 200m

Chronic diseases

- 21 diseases/conditions included: respiratory diseases, diabetes, cancer, depression, chronic cystitis, heart attack, stroke, rheumatoid arthritis, osteoarthritis, back pain, osteoporosis, stomach ulcer, bowel diseases, cirrhosis, gall-stones, cataract, glaucoma, migraine, thyroid problems, skin diseases, neurological diseases

Attribution of disability to diseases¹

- Estimation of disability prevalence by cause using cross-sectional data

Background disability

- Disability can occur without any disease
- Under-reporting of diseases in the surveys
- Diseases/conditions that caused the disability are not present anymore at the time of the survey

Multiple additive regression model

$$Y_i \sim \text{Bernoulli}(\pi_i)$$

$$\pi_i = 1 - e^{-\eta_i}$$

$$\eta_i = \alpha_a + \sum_{d=1}^m \beta_d X_{di}$$

- Y_i : binary response variable (disability) for each individual i
- π_i : estimated probability that individual i is disabled
- e : base of the natural logarithm
- η_i : linear predictor for each individual i
- α_a : background disability rate by 5-years age group a ($a = 1, \dots, n$)
- β_d : cause-specific rates of disability for each disease d ($d = 1, \dots, m$)
- X_{di} : indicator variable for each disease d and individual i

Assumptions

- Distribution of disability by cause at the time of the survey = diseases that are still present + background
- Disease hazards proportionally equal during the period of incidence of disability
- Background rate varies across age-groups
- Causes of disability (diseases and background) act as independent competing causes
- Same start of the time at risk for disability from each cause
- Reduced rank regression models with one rank (RRR1) were fitted to assess the existence of age-disease interaction
- Based on the bootstrap confidence intervals of 1000 replicas, separate models for men and women with one-rank interaction between age and diseases (RRR1) were fitted

References

[1] European Health Expectancy Monitoring Unit. (2010). *Decomposition tools: technical report on attribution tool* (EHEMU Technical Report 2010_7.2).

Results

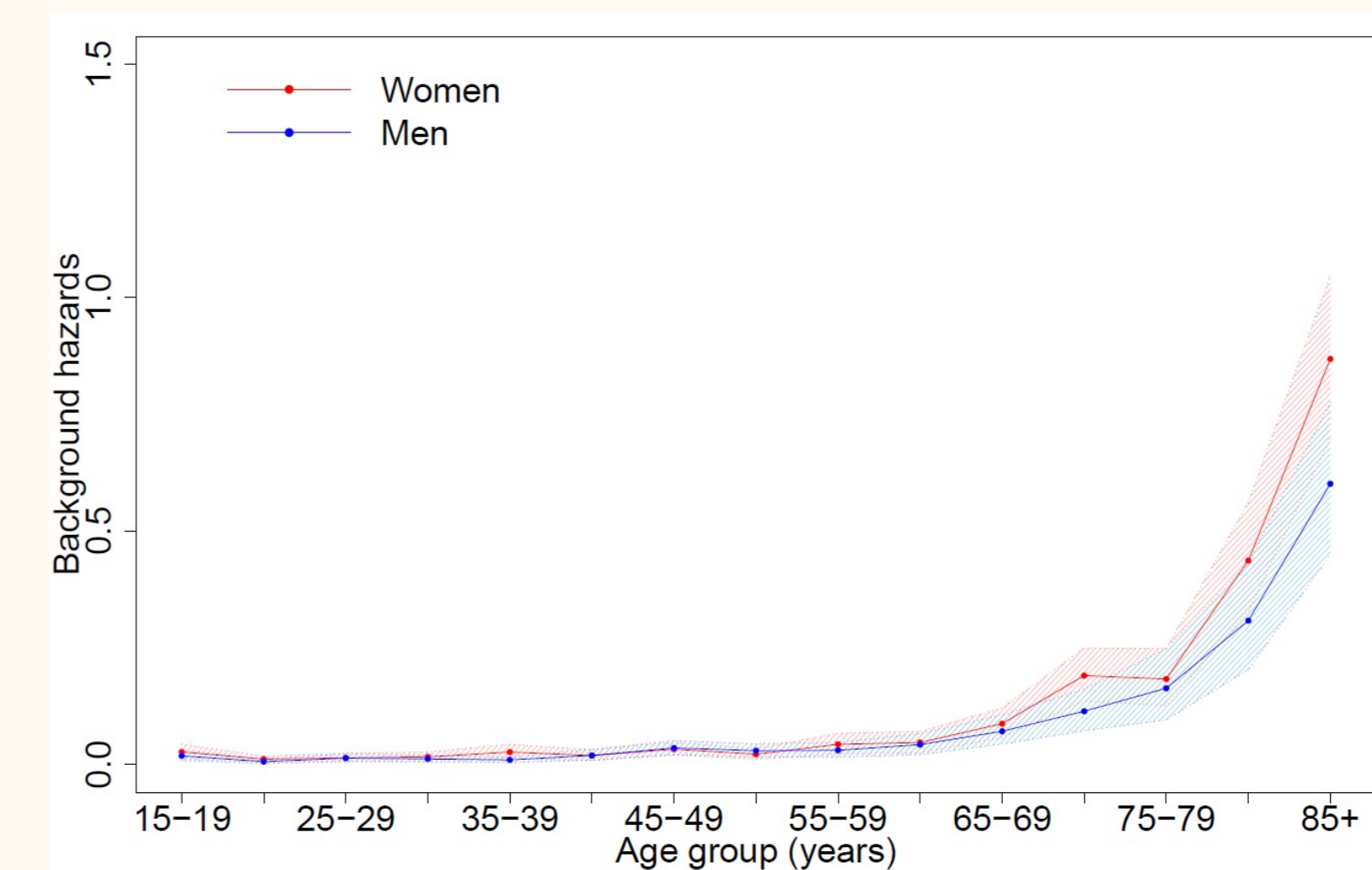


Figure 1. Background hazards for men and women.

Table 1. Disease prevalence and disabling impacts by gender.

Diseases	Disease prevalence					Disabling impacts (β_{di})				
	15-29	30-44	45-59	60-74	≥ 75	15-29	30-44	45-59	60-74	≥ 75
Men										
Respiratory diseases	5.5	5.2	5.6	15.0	20.2	0.03(0.02;0.06)	0.07(0.05;0.10)	0.11(0.07;0.16)	0.17(0.10;0.12)	0.29(0.15;0.44)
Diabetes	0.3	0.9	3.8	8.9	12.4	0.02(0.00;0.03)	0.03(0.01;0.06)	0.04(0.01;0.09)	0.07(0.02;0.14)	0.12(0.03;0.23)
Cancer	0.1	0.2	1.0	3.9	4.6	0.04(0.01;0.07)	0.07(0.02;0.14)	0.11(0.03;0.21)	0.17(0.04;0.31)	0.28(0.08;0.52)
Depression	2.4	5.2	5.1	5.5	4.0	0.03(0.02;0.06)	0.07(0.04;0.11)	0.10(0.06;0.16)	0.16(0.09;0.26)	0.27(0.14;0.46)
Heart attack	0.3	0.8	4.1	12.4	19.4	0.04(0.02;0.08)	0.09(0.04;0.15)	0.13(0.07;0.19)	0.20(0.13;0.29)	0.34(0.20;0.50)
Stroke	0.1	0.2	0.5	1.6	4.5	0.06(0.02;0.13)	0.13(0.05;0.24)	0.19(0.07;0.36)	0.30(0.11;0.54)	0.48(0.20;0.86)
Rheumatoid arthritis	0.7	3.1	5.7	10.4	13.9	0.03(0.01;0.05)	0.06(0.03;0.09)	0.08(0.04;0.12)	0.13(0.07;0.19)	0.22(0.10;0.35)
Osteoarthritis	1.6	5.1	11.7	23.5	27.0	0.01(0.01;0.03)	0.03(0.01;0.05)	0.04(0.02;0.07)	0.07(0.03;0.11)	0.11(0.04;0.19)
Back pain	4.6	13.6	15.8	19.1	14	0.03(0.02;0.05)	0.06(0.04;0.08)	0.09(0.06;0.12)	0.14(0.09;0.18)	0.23(0.14;0.33)
Osteoporosis	0.2	0.3	1.1	2.7	5.5	0.08(0.03;0.16)	0.16(0.07;0.29)	0.24(0.11;0.39)	0.37(0.18;0.60)	0.62(0.33;0.96)
Neurological diseases	0.6	0.9	0.6	1.7	2.3	0.15(0.07;0.27)	0.32(0.18;0.49)	0.46(0.28;0.69)	0.74(0.43;1.14)	1.22(0.71;1.90)
Women										
Respiratory diseases	5.6	7.0	7.6	10.9	13.1	0.02(0.00;0.03)	0.06(0.04;0.10)	0.10(0.06;0.14)	0.12(0.07;0.18)	0.26(0.15;0.38)
Diabetes	0.4	1.0	4.0	8.5	10.1	0.01(0.00;0.03)	0.06(0.02;0.11)	0.09(0.03;0.15)	0.11(0.04;0.18)	0.23(0.09;0.39)
Cancer	0.2	0.7	2.0	4.4	3.6	0.02(0.00;0.04)	0.08(0.03;0.15)	0.12(0.04;0.22)	0.14(0.05;0.26)	0.31(0.10;0.57)
Depression	4.1	7.9	9.0	9.6	8.4	0.02(0.00;0.03)	0.07(0.04;0.10)	0.10(0.05;0.15)	0.12(0.07;0.18)	0.26(0.14;0.40)
Heart attack	0.2	0.7	2.4	6.9	13.9	0.02(0.00;0.04)	0.08(0.03;0.13)	0.11(0.05;0.19)	0.13(0.06;0.22)	0.29(0.14;0.48)
Stroke	0.1	0.3	0.6	1.7	4.4	0.07(0.01;0.13)	0.27(0.14;0.47)	0.04(0.22;0.66)	0.49(0.26;0.78)	1.06(0.57;1.64)
Rheumatoid arthritis	1.0	3.6	9.4	19.8	27.1	0.02(0.01;0.04)	0.10(0.06;0.15)	0.15(0.10;0.20)	0.18(0.12;0.25)	0.39(0.26;0.53)
Osteoarthritis	1.3	5.9	17.9	38.5	47.7	0.02(0.00;0.03)	0.07(0.04;0.11)	0.10(0.07;0.14)	0.12(0.09;0.16)	0.27(0.18;0.36)
Back pain	5.7	11.1	18.3	24.2	23.7	0.02(0.00;0.03)	0.06(0.04;0.09)	0.10(0.06;0.13)	0.12(0.07;0.16)	0.25(0.16;0.36)
Osteoporosis	0.1	0.7	6.3	16.7	23.5	0.01(0.00;0.01)	0.02(0.00;0.05)	0.04(0.00;0.07)	0.04(0.01;0.09)	0.10(0.01;0.19)
Neurological diseases	0.8	0.9	0.6	1.7	3.0	0.06(0.02;0.12)	0.27(0.12;0.48)	0.40(0.21;0.63)	0.49(0.25;0.78)	1.06(0.55;1.68)

Table 2. Contribution of diseases to the prevalence of disability (in % points).

Diseases	Age group (years)				
	15-29	30-44	45-59	60-74	≥ 75
Men					
Background	1.34	1.31	2.87	7.68	27.01
Respiratory diseases	0.14	0.43	0.62	1.81	2.43
Diabetes	0.00	0.02	0.14	0.36	0.51
Cancer	0.00	0.02	0.14	0.61	0.72
Depression	0.06	0.38	0.50	0.58	0.40
Heart attack	0.01	0.09	0.62	2.03	3.11
Stroke	0.00	0.03	0.12	0.41	1.14
Rheumatoid arthritis	0.01	0.18	0.45	0.87	1.16
Osteoarthritis	0.02	0.16	0.50	1.10	1.23
Back pain	0.09	0.81	1.27	1.67	1.20
Osteoporosis	0.02	0.07	0.32	0.84	1.67
Neurological diseases	0.07	0.30	0.24	0.76	0.98
Women					
Background	1.59	1.99	3.06	9.24	26.97
Respiratory diseases	0.11	0.41	0.61	0.98	1.81
Diabetes	0.01	0.06	0.31	0.73	1.39
Cancer	0.00	0.06	0.21	0.51	0.65
Depression	0.08	0.48	0.75	0.90	1.22
Heart attack	0.00	0.05	0.24	0.75	2.33
Stroke	0.00	0.06	0.16	0.54	1.92
Rheumatoid arthritis	0.03	0.33	1.14	2.70	5.69
Osteoarthritis	0.03	0.38	1.59	3.88	7.57
Back pain	0.11	0.70	1.58	2.31	3.57
Osteoporosis	0.00	0.02	0.22	0.64	1.44
Neurological diseases	0.06	0.20	0.19	0.53	1.25

Conclusions

Since the attribution of disability to diseases depends on both, the disease prevalence and the disabling impacts, the diseases that contributed most to the disability burden were respiratory diseases and back pain for men aged < 60 years and heart attack and respiratory diseases among elderly men. For women, back pain, respiratory diseases and depression were the main contributors to the disability prevalence among women aged < 45 years, while musculoskeletal diseases (rheumatoid arthritis, osteoarthritis, and back pain) were the main contributor among women aged ≥ 45 years.

In conclusion, the strategies to reduce the burden of disability in Belgium should be different according to age group and gender. For the youngest men, respiratory diseases should be targeted, while for young women, back pain, respiratory diseases, and depression should be prioritized. Among the elderly individuals (≥ 60 years), priority should be given for cardiovascular diseases and respiratory diseases, while for women, the focus should primarily be on musculoskeletal diseases.