The webinar, “Multimorbidity in Canada,” will begin shortly.

For first-time WebEx users:

- Follow the instructions that appear on your screen and choose your audio preference (phone or computer). To change your audio settings at any point during the webinar, select Audio>Audio Conference from the main toolbar.
- The only people in the session who can speak and be heard are the host and panelists.
- If you have questions/comments, you can type them into the chat box in the bottom right of the WebEx window. Ensure “All Participants” is selected from the dropdown menu before you press “send.” Mobile users must select “Chat with Everyone.” Questions will be visible to all attendees.
- You can type your questions at any point during the session, but they won’t be answered until the end of the presentation.
- At the conclusion of the webinar, please remember to exit the WebEx session.

CLSA Webinar Series

Multimorbidity in Canada

Philip St. John, MD

Noon to 1 p.m. ET | May 24, 2017

Many people have more than one chronic health problem. These diseases add up, and the combined effect is more important than the effect of any one problem alone. Using data from the Canadian Longitudinal Study on Aging (CLSA), this webinar will examine the relationship between disease combinations and if they are more common in older people, or in people with lower income and education.

Dr. Philip St. John is an associate professor and head of geriatric medicine in the Department of Internal Medicine at the University of Manitoba. He is an affiliate of the Centre on Aging at the University of Manitoba, and is the co-lead investigator of the CLSA Manitoba site. His research interests include rural health and epidemiology of cognitive impairment and depression.

Register online at http://bit.ly/clsawebinars

Webinars will be broadcast using WebEx
Further instructions will be sent by email

clsa élcv
Canadian Longitudinal Study on Aging
Étude longitudinale canadienne sur le vieillissement

www.clsa-elcv.ca

EPIDEMIOLOGY OF MULTIMORBIDITY

CLSA Webinar

P St John, L Torbiak, S Tyas, V Menec,
R Tate, L Griffith, S Nowicki

CONFLICT OF INTEREST

- Thanks to Centre on Aging Grant for these analyses
- Thanks to Scott Nowicki
- No conflicts of interest except that I am in the high income group

- 81 year old lady, living in house for 40 years, daughter lives next door
- Previously ADL independent; ADL dependent
- Past Hx: DM2, HBP, macular degeneration, OA, IHD, CHF, CRF (Cr 250 range), falls, urinary incontinence, cognitive issues noted by family (never assessed)
- Followed by GP and eight specialists

- Admitted with stroke – Lt weakness, slurred speech, falls
- tPA and transferred back to peripheral hospital
- Transferred for rehab
- Day 2 – worsening SOB – increased lasix
- Day 4 – 15L – transferred to third acute care hospital
- Diagnosed with BOOP – high dose steroids

- Came to a second (different) rehab site
- Survived the pneumonia, but did not rehab well
- Remained with substantial cognitive and functional deficits
- “She was lucky to survive the pneumonia”
- “No – she wasn’t”

- Planned to go home with home stroke programme follow up
- Follow-up with 14 specialists
- Kept falling with SBP 90 vs symptomatic CHF
- Went home on palliative care programme, no specialists

MULTIMORBIDITY

- Described in Byzantine texts on ageing, c 300ACE
- Well described in clinical papers in UK in the 1940s
- Increasing attention

MEDICAL AND NURSING NEEDS

The medical staff of the department is available to treat all patients in the different parts of the scheme. Naturally patients in the initial-treatment ward need the most attention, with daily visits from the senior medical staff. About two-thirds of the patients have multiple pathological conditions. About 31% (with seasonal variations) have acute illnesses. A further 28% have acute illnesses in addition to long-term disorders, and these patients tend to remain longest in the initial-treatment ward. If it seems

Exton-Smith, Lancet, 1962

Physical Findings

Our most striking observation was the frequency of multiple disabilities. Men had a mean of 3·26 disabilities, of which 1·87 were unknown to the family doctor; women a mean of 3·42 disabilities, with 2·03 unknown

This is not a new idea

Williamson, Lancet, 1964


BRITISH HOME AND HOSPITAL FOR INCVRABLES
ENTIRELY DEPENDENT ON VOLUNTARY CONTRIBUTIONS


NotreFamille.com
381
AMIENS. — Hospice des Incurables, Pavillon Duvauchel.

DEFINITIONS

- **Chronic disease**: health problems that require ongoing management over a period of years or decades.
- **Multimorbidity:** the coexistence of multiple chronic diseases and medical conditions in the same individual (usually defined as two or more conditions).
- **Co-morbidity:** any distinct additional entity that has existed or may occur during the clinical course of a patient who has the index disease under study.

American Geriatrics Society

- Defined as ≥3 chronic diseases
- Has distinctive cumulative effects for each individual
- Associated with increased rates of:
  - Death
  - Disability
  - Adverse effects
  - Institutionalization
  - Use of health care resources
  - Impaired QOL

- Even when diagnosed with the same pattern of conditions, older adults with multimorbidity are heterogeneous in terms of:
  - Illness severity
  - Functional status
  - Prognosis
  - Personal priorities
  - Risk of adverse events
- Treatment options also differ
- So multimorbidity requires a flexible approach to care

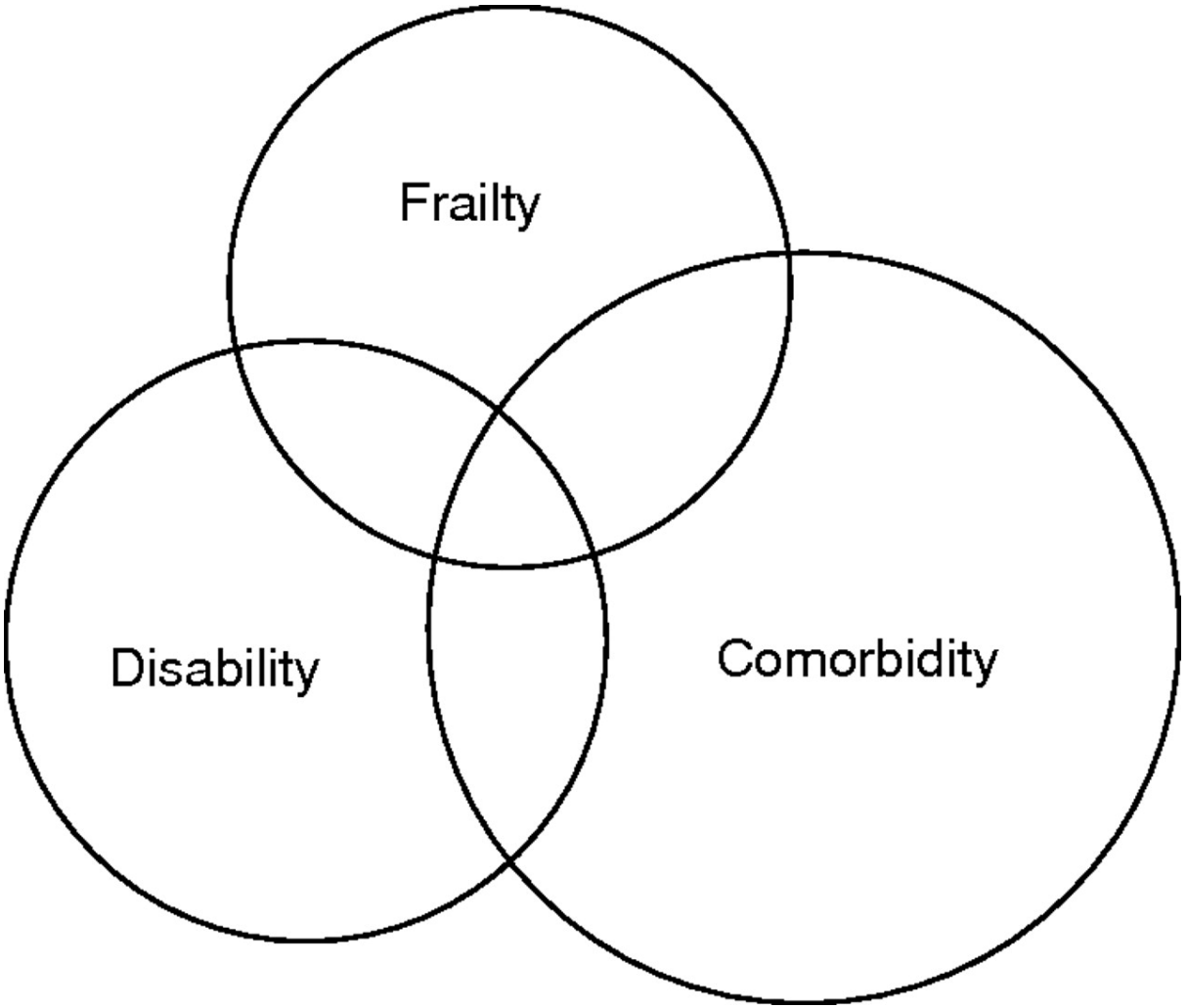
IMPLICATIONS

- Need to move away from subspecialty based care
  - Complicated
  - Requires balancing
- Prognostication

Measurement

- Data source
  - Admin data
  - Clinical data
  - Self-report
  - Biomedical
- Time Frame
  - Point or period prevalence
- Included conditions
  - Risk factors
  - Symptoms and complaints
  - Double counting
  - Not counting
- Dichotomous or Continuous?
- Disease severity

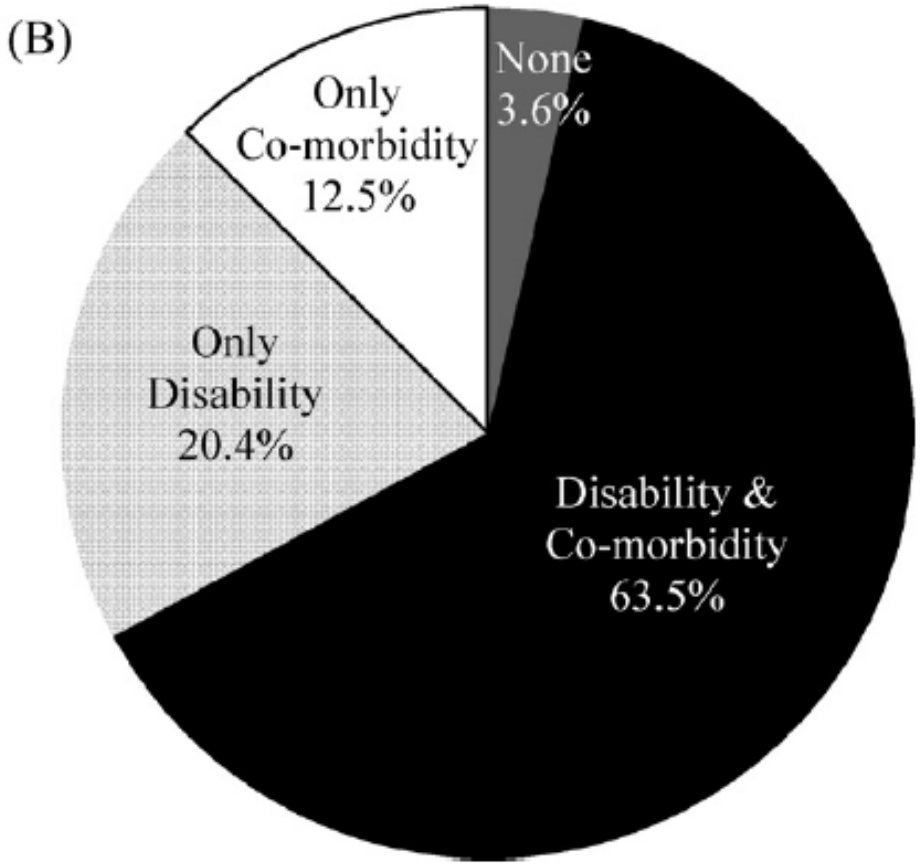
Syndrome Overlap



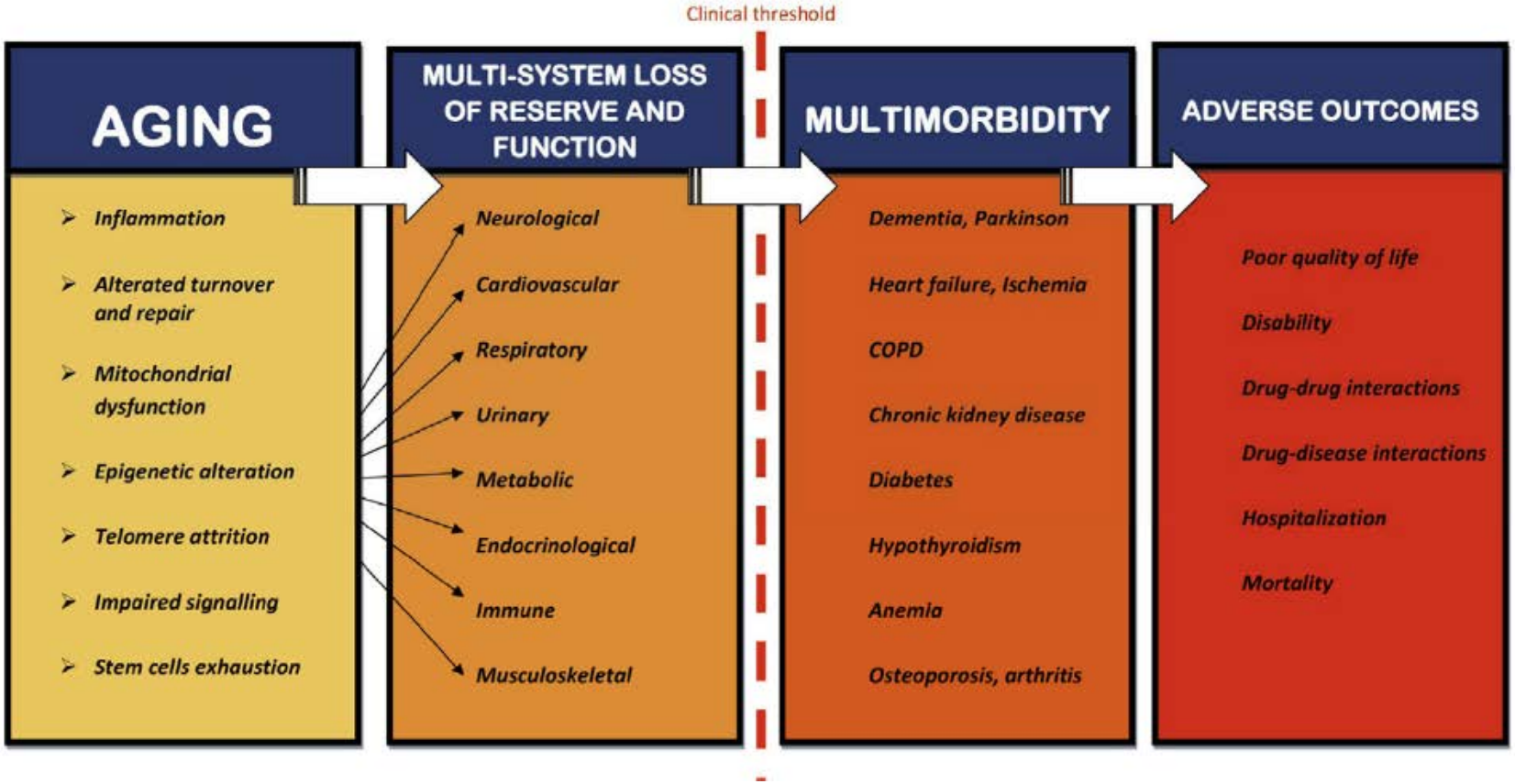
Lally F , Crome P Postgrad Med J 2007;83:16-20

OVERLAP OF SYNDROMES

- Most people with frailty phenotype have disability and/or comorbidity



Theou et al, 2012



E. Fabbri et al. / JAMDA 16 (2015) 640–647

Descriptive Epidemiology

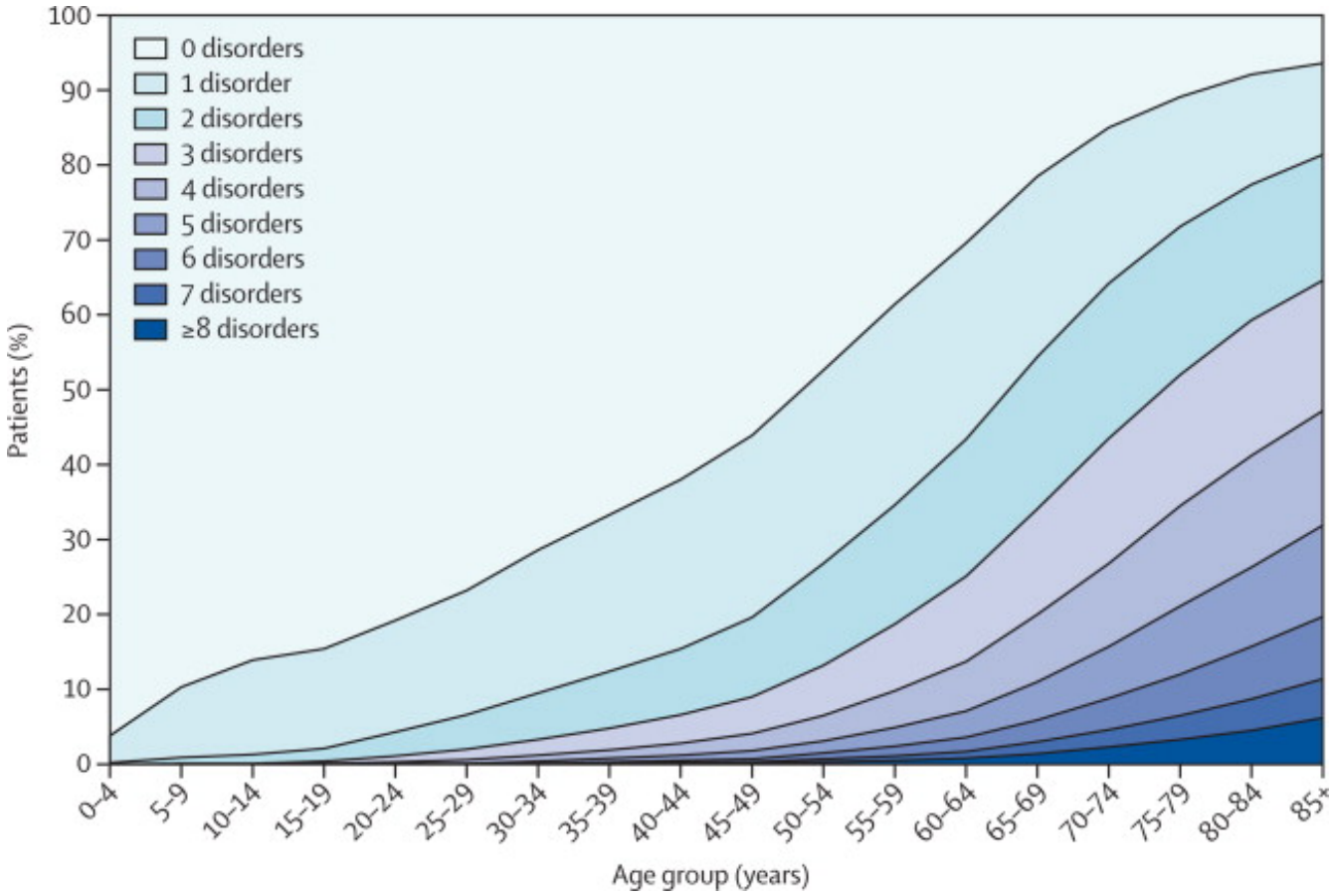
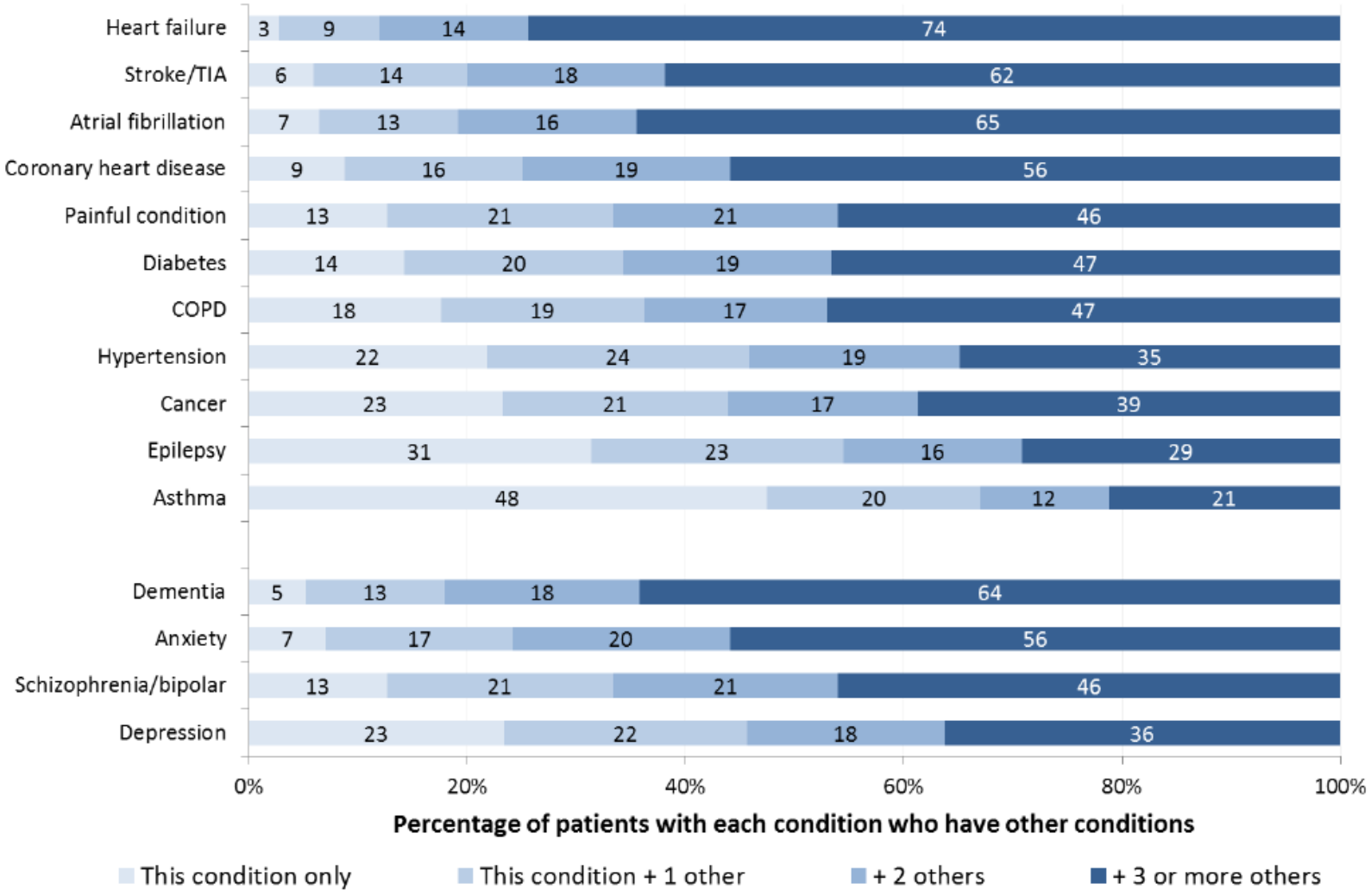


Figure 1. Number of chronic disorders by age-group

Epidemiology of multimorbidity and implications for health care, research, and medical education: a cross-sectional study

null, Volume 380, Issue 9836, 2012, 37–43

Supplementary figure S1: Number of conditions experienced by patients with common, important diseases



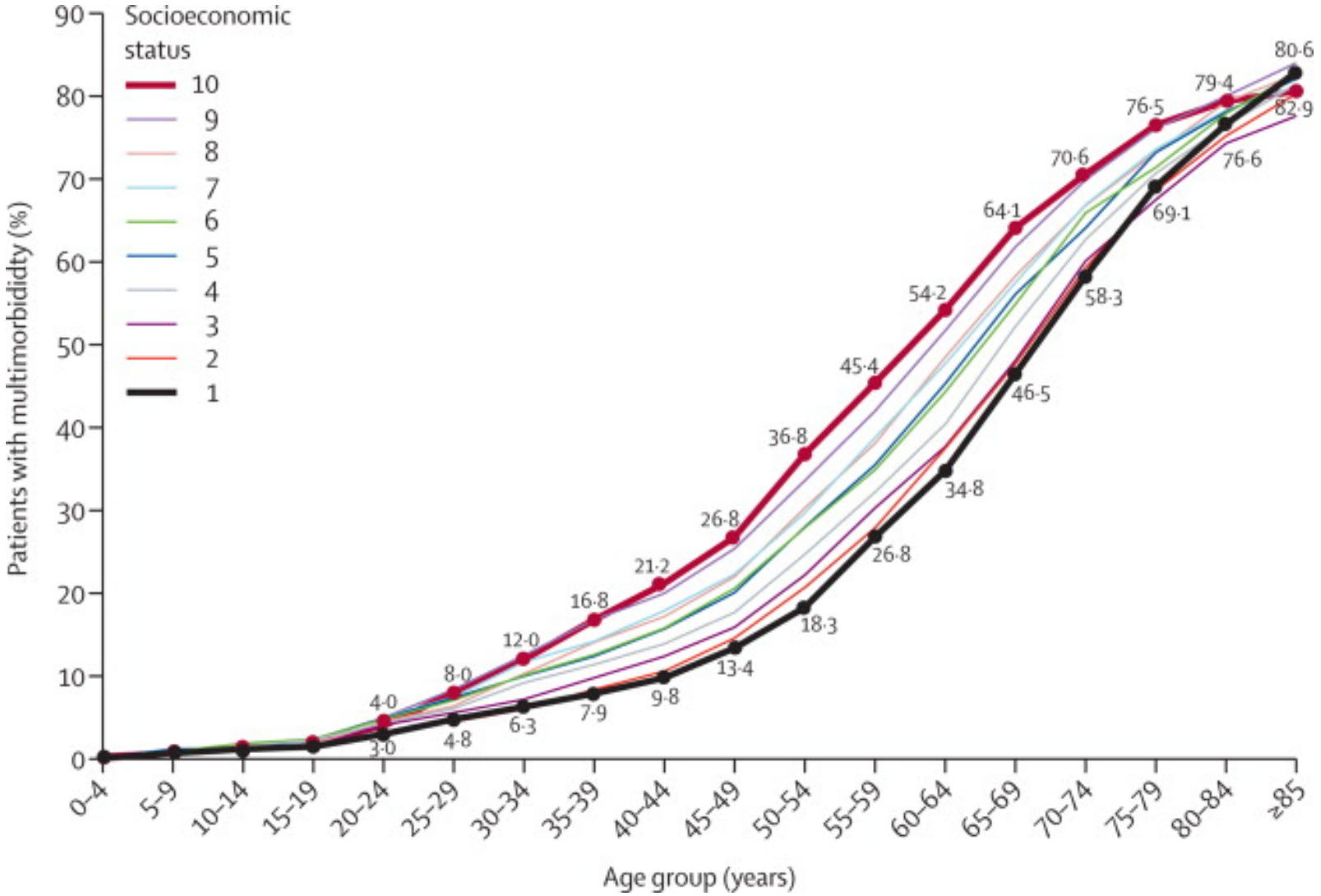


Figure 2. Prevalence of multimorbidity by age and socioeconomic status
On socioeconomic status scale, 1=most affluent and 10=most deprived.

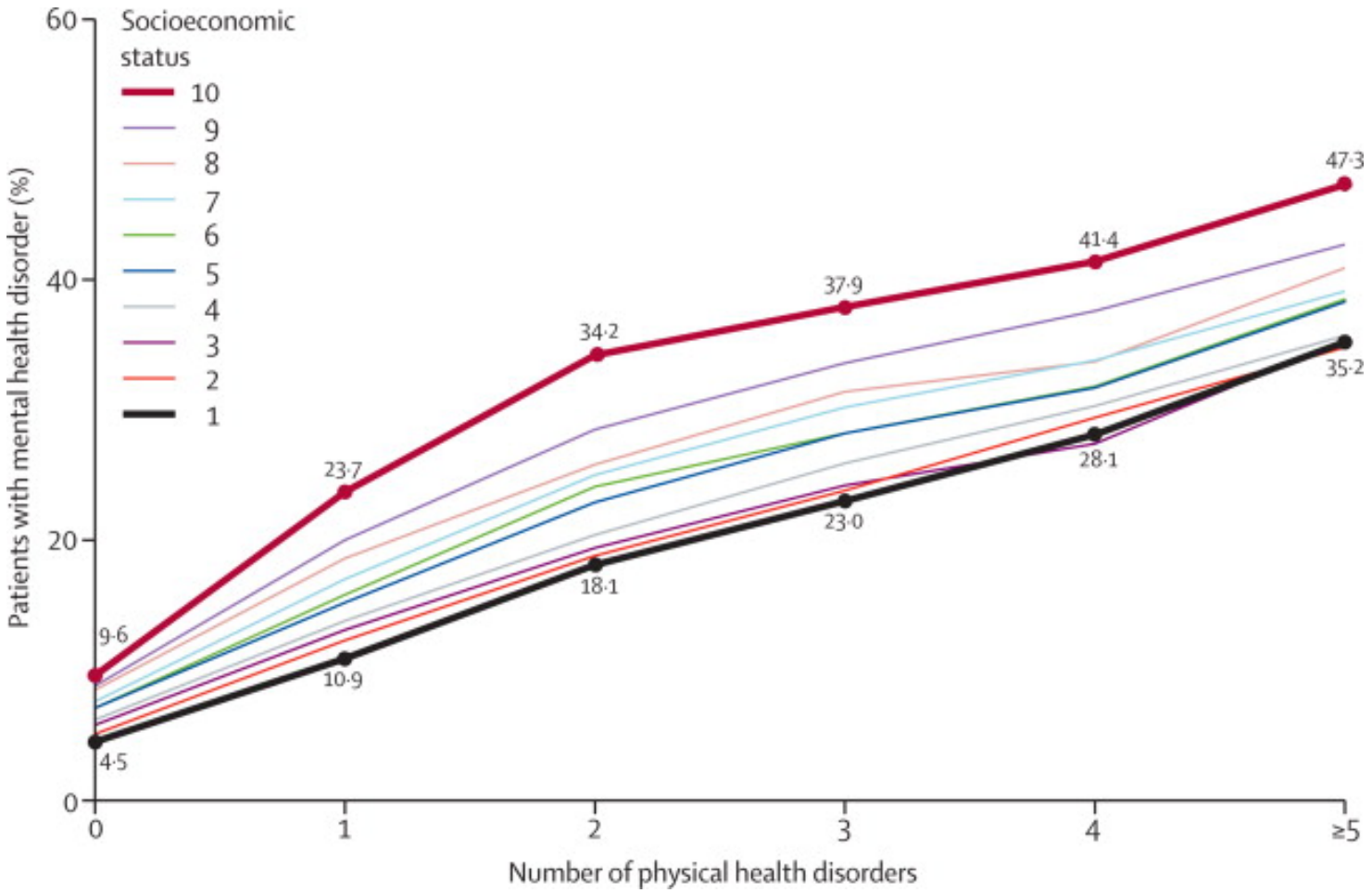
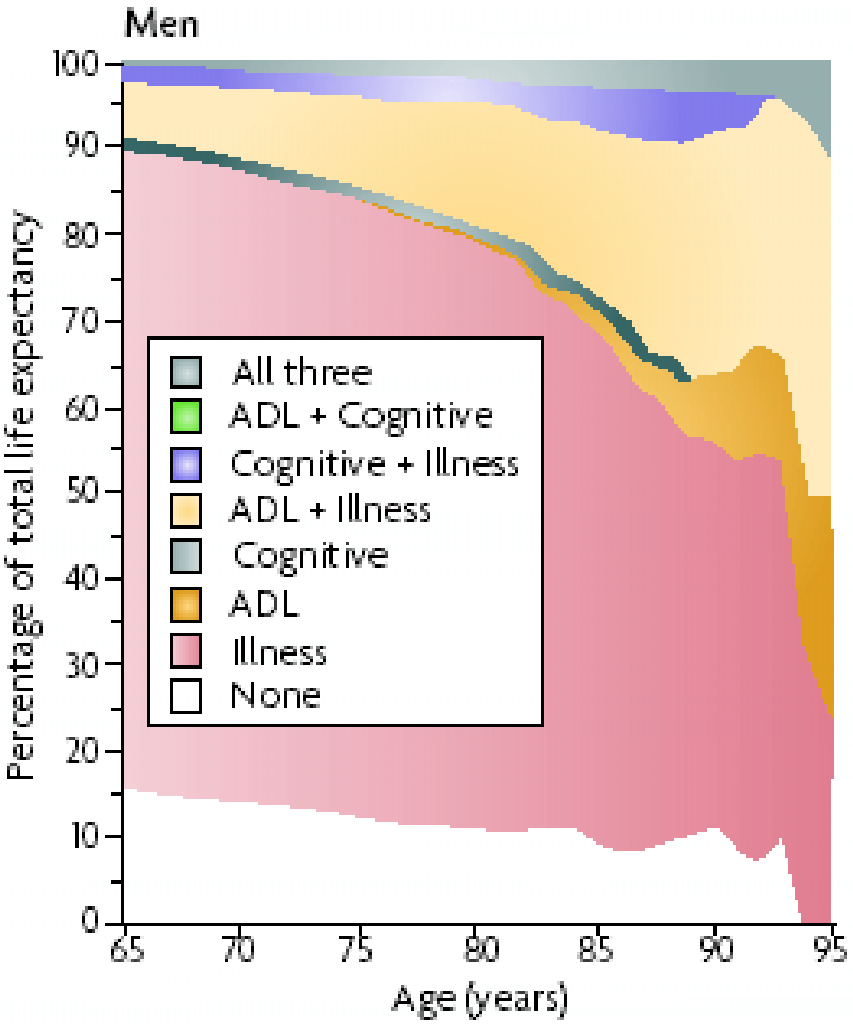
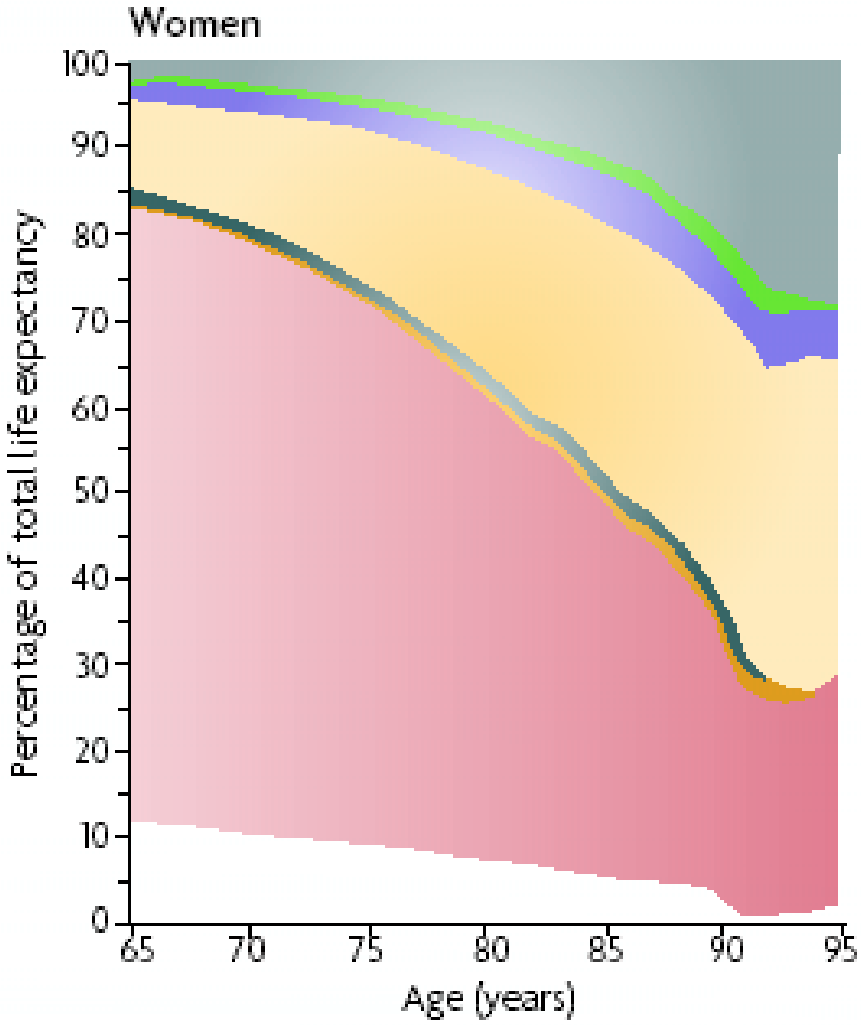
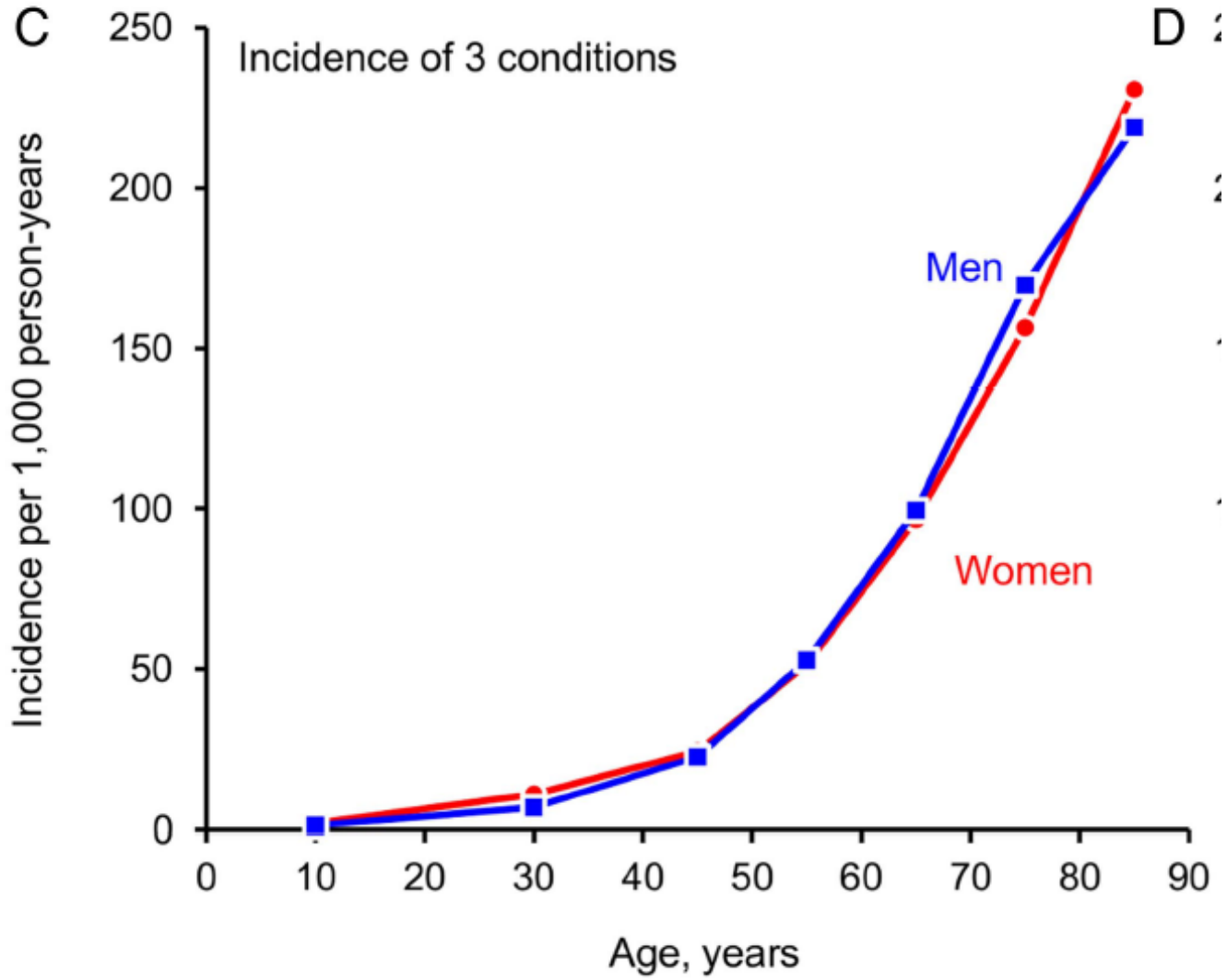


Figure 3. Physical and mental health comorbidity and the association with socioeconomic statusOn socioeconomic status scale, 1=most affluent and 10=most deprived.


Men
Percentage of total life expectancy
100
90
80
70
60
50
40
30
20
10
0
65
70
75
80
85
90
95
Age (years)
All three
ADL + Cognitive
Cognitive + Illness
ADL + Illness
Cognitive
ADL
Illness
None

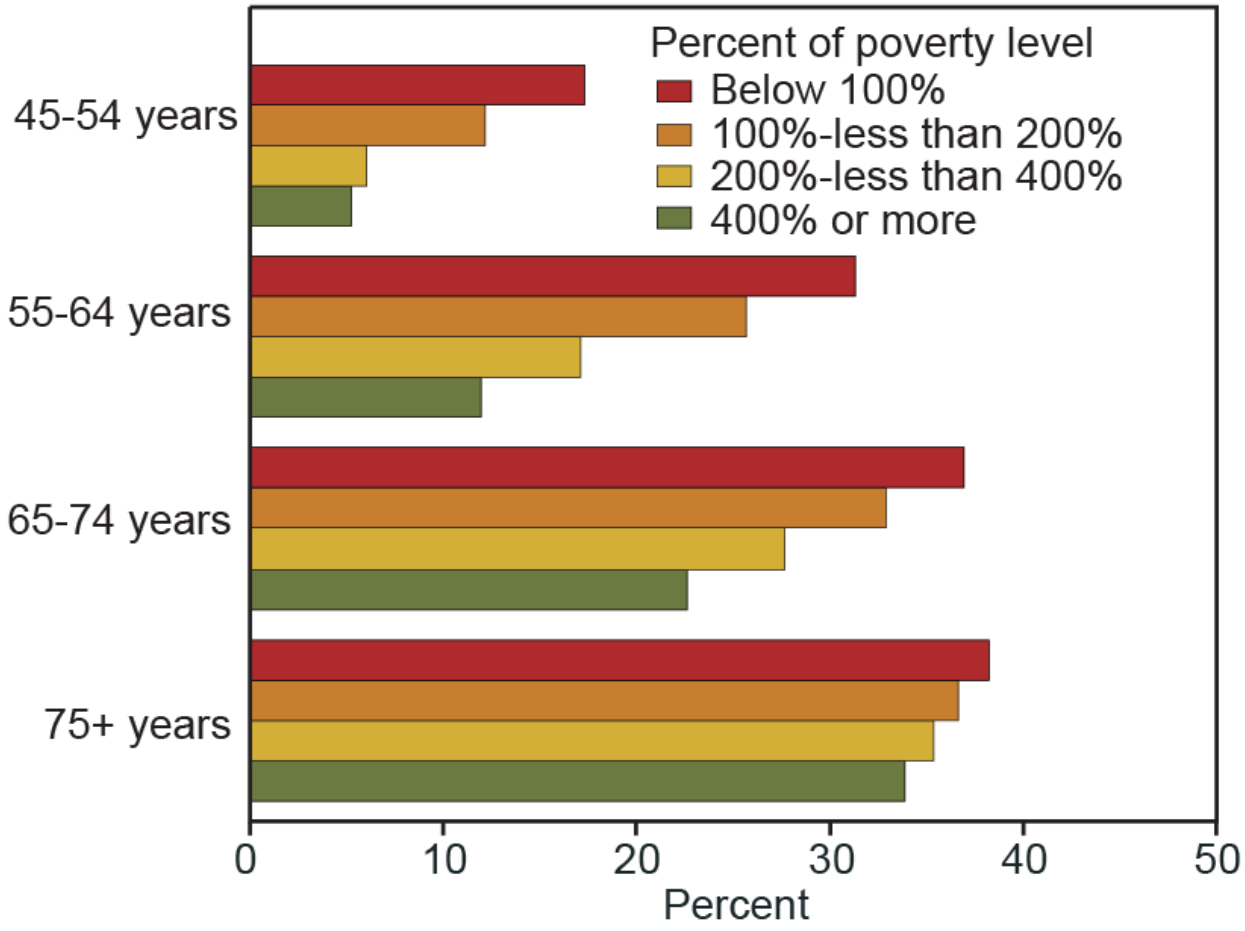

Women
Percentage of total life expectancy
100
90
80
70
60
50
40
30
20
10
0
65
70
75
80
85
90
95
Age (years)

Brayne et al



BMJ Open 2015;**5:**e006413.

Three or more chronic conditions among adults 45+ years, 2004



SOURCES: Centers for Disease Control and Prevention, National Center for Health Statistics, *Health, United States, 2006*, Figure 15. Data from the National Health Interview Survey.

Common Disease Combinations

TABLE 3. Most frequently co-occurring chronic conditions[a] among Women's Health and Aging Study screenees

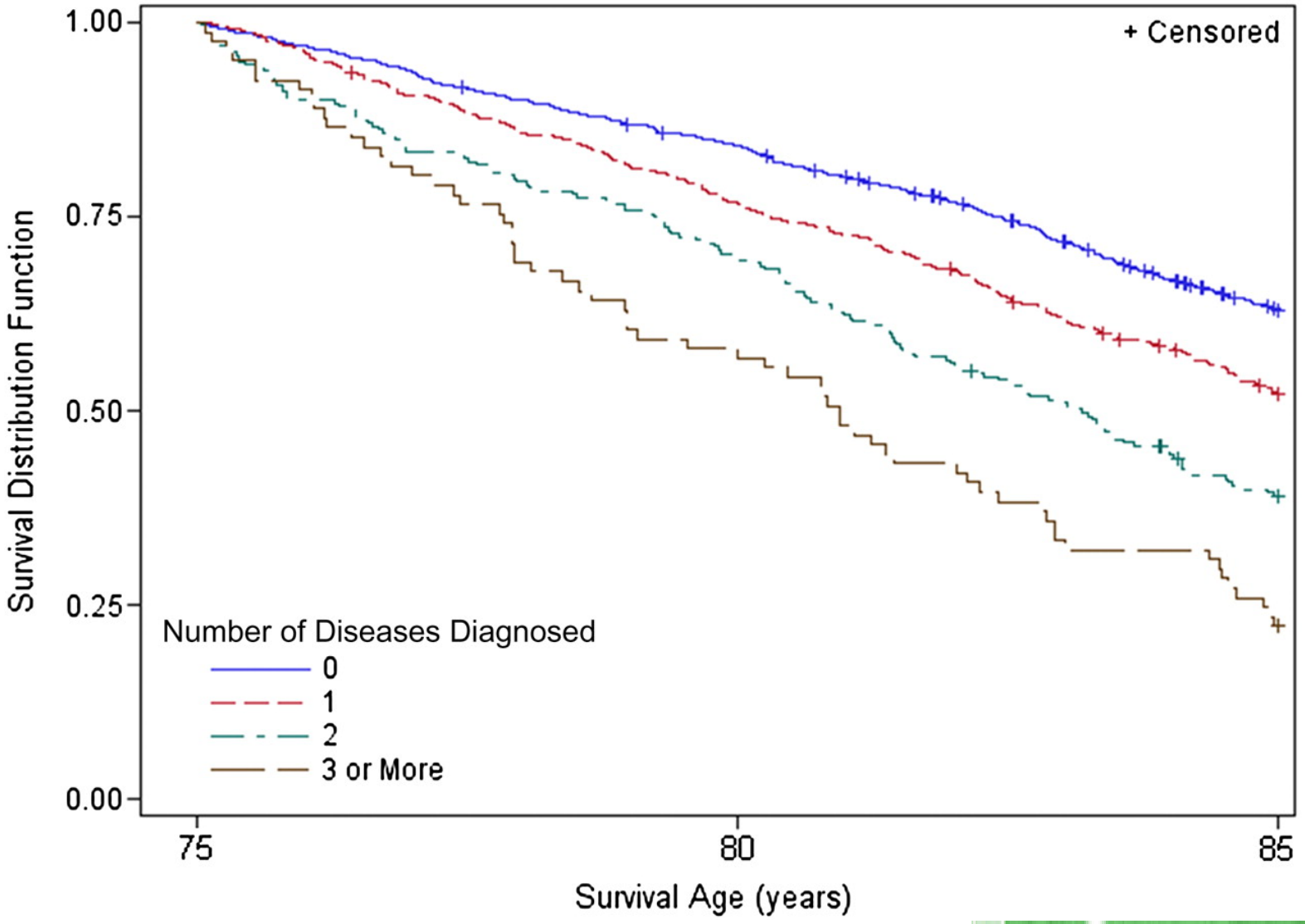
Rank	Diseases present	Proportion of population[b] with both diseases (%)
1	Arthritis, visual impairment	44
2	Visual impairment, high blood pressure	40
3	Arthritis, high blood pressure	34
4	Any heart disease, visual impairment	17
5	Visual impairment, hearing impairment	15
6	Any heart disease, arthritis	14
7	Any heart disease, high blood pressure	13
8	Arthritis, hearing impairment	12
9	Diabetes, visual impairment	12
10	Cancer, visual impairment	10

[a]Among 11 chronic conditions assessed (3 heart disease categories summed in 1 category).
[b]Weighted to reference population.

L. P. Fried et al.

OUTCOMES OF MULTIMORBIDITY

- Death
- Reduced quality of life
- Reduced functional status
- Institutionalization



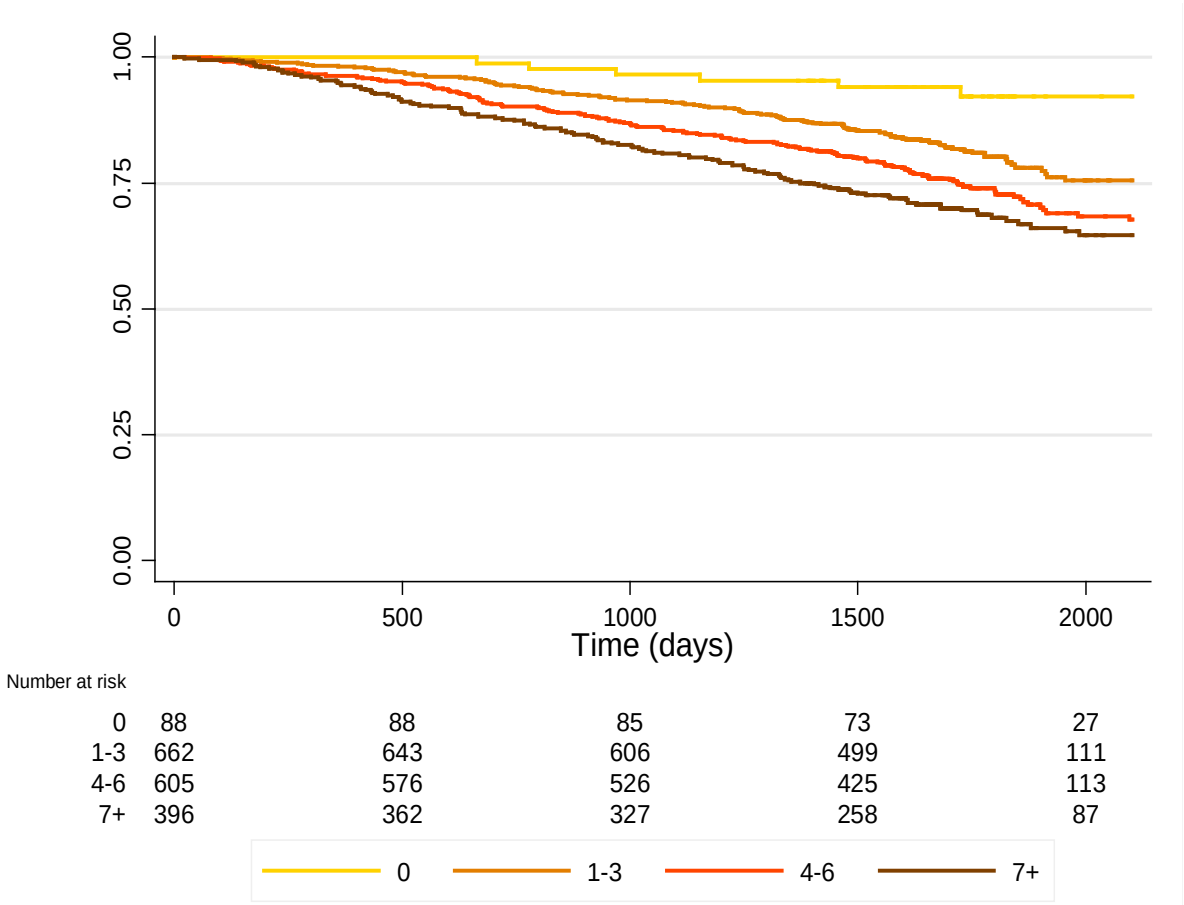
Robert B. Tate et al. The Gerontologist 2012;geront.gns050

THE GERONTOLOGIST

"It's fine to discover cures, but, remember, chronic conditions are our bread and butter."

New Yorker

In the Manitoba Study of Health and Aging



St John et el, CFP, 2014

FUNCTIONAL STATUS

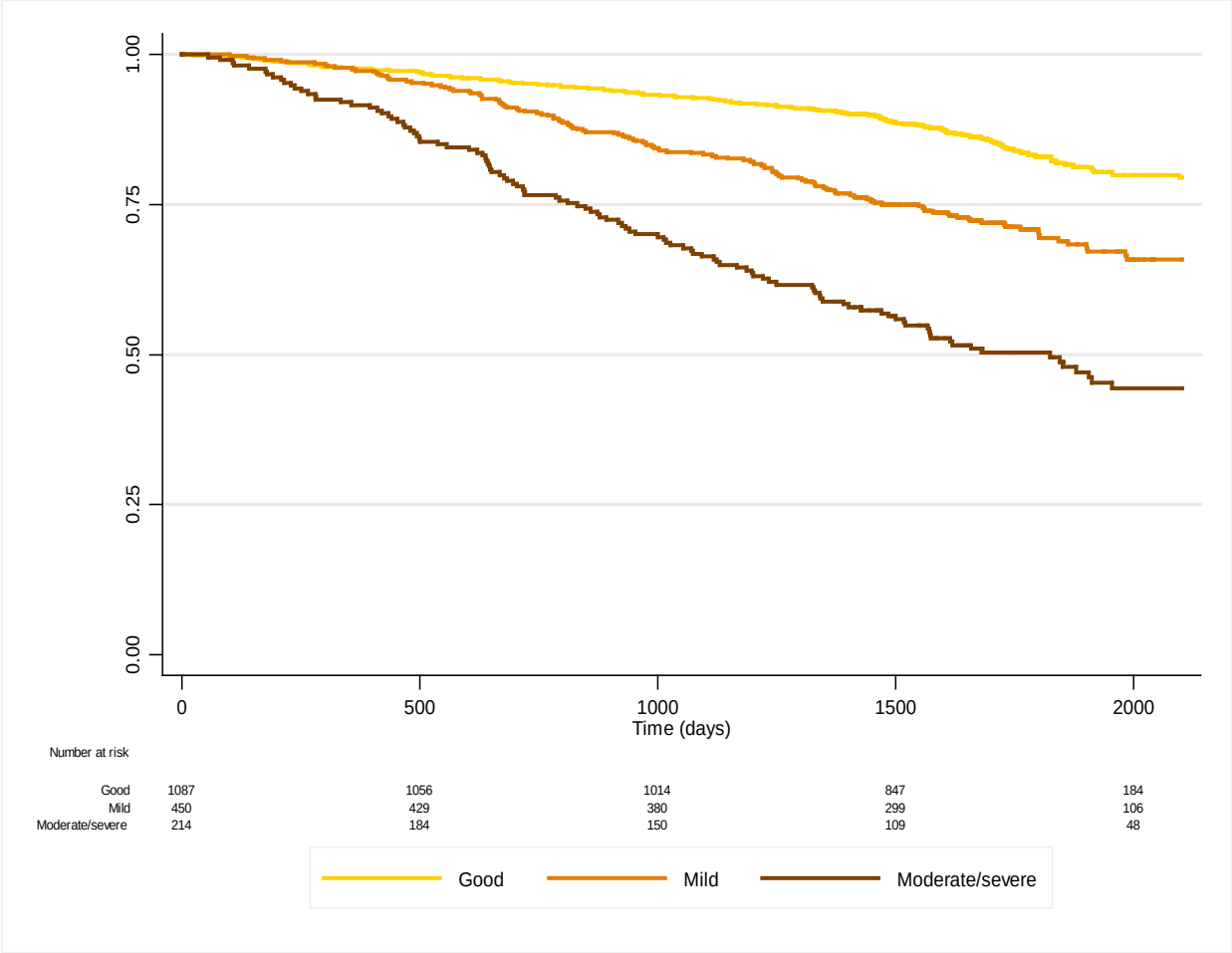
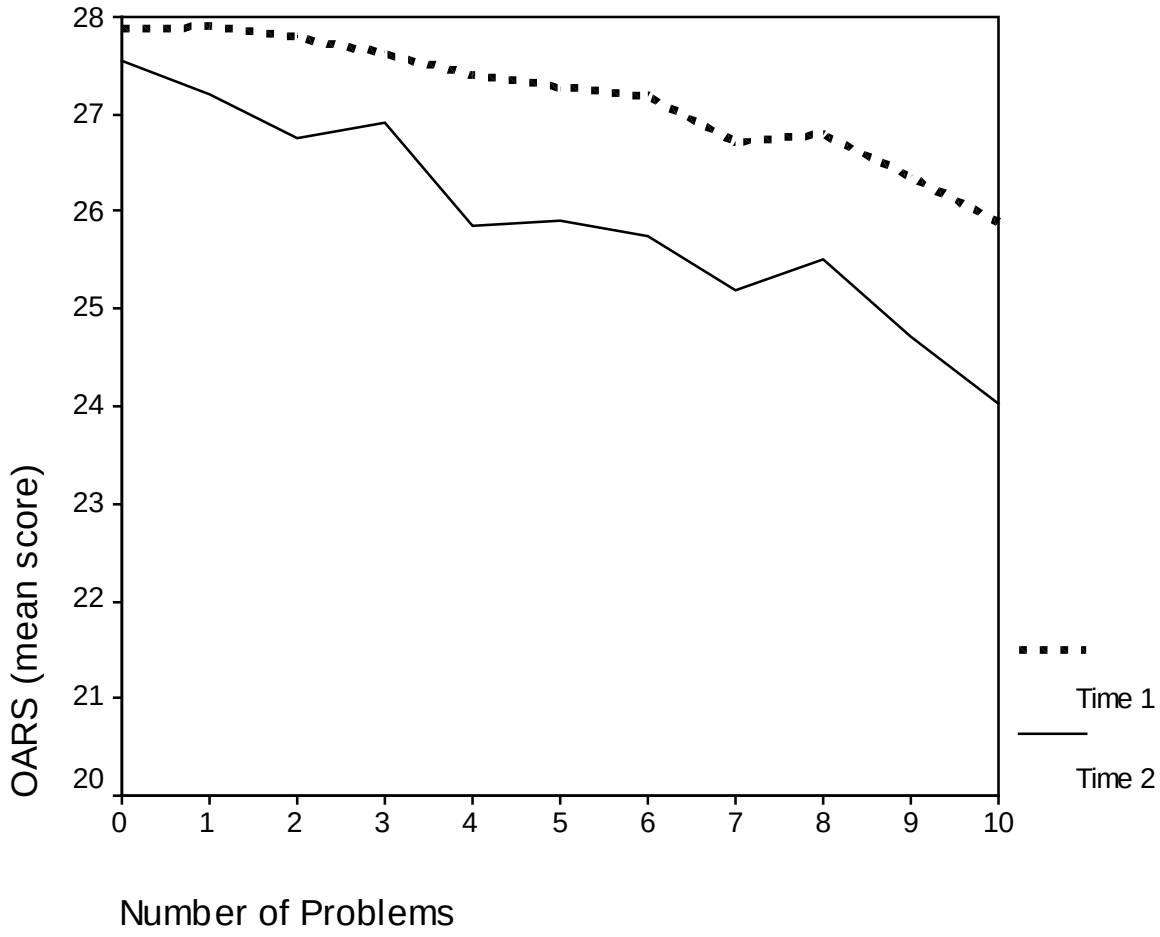


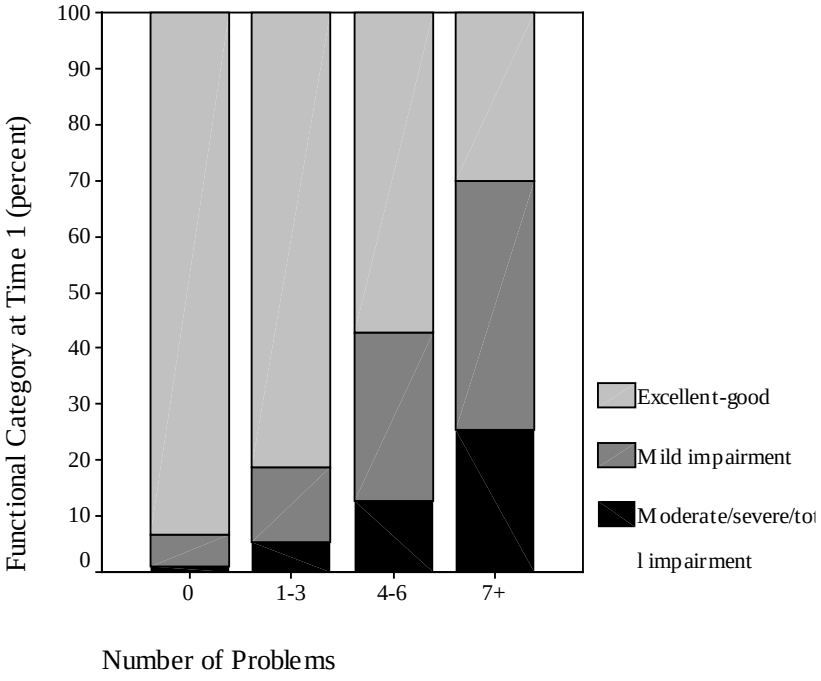
Table 2: The association between multimorbidity and five-year mortality in community-dwelling older adults

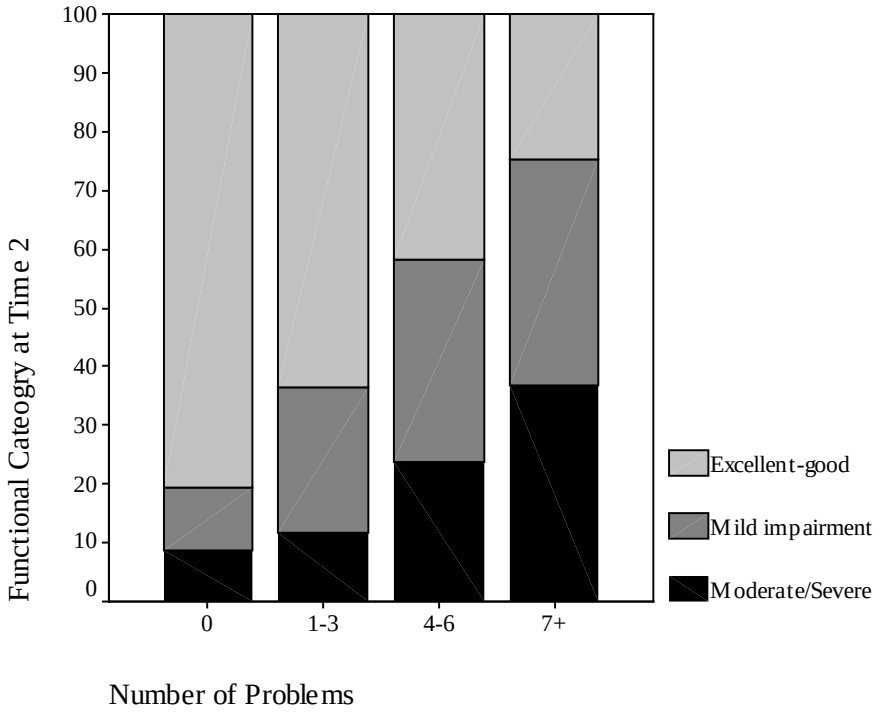
	Hazard Ratio for five-year mortality (95% confidence interval)			
	Model 1	Model 2	Model 3	Model 4
Multimorbid conditions	1.09 (1.05, 1.12)	1.06 (1.02, 1.09)	1.04 (1.00, 1.08)	1.00 (0.96, 1.04)
Age		1.08 (1.06, 1.09)	1.07 (1.05, 1.08)	1.06 (1.04, 1.07)
Gender		0.53 (0.43, 0.64)	0.54 (0.44, 0.66)	0.50 (0.41, 0.62)
Education		0.98 (0.96, 1.01)	1.01 (0.98, 1.04)	1.00 (0.97, 1.04)
Marital Status				
Never married			ref	ref
Married			0.82 (0.55, 1.23)	0.89 (0.59, 1.33)
Separated			1.30 (0.69, 2.46)	1.36 (0.72, 2.58)
Divorced			0.96 (0.64, 1.45)	1.03 (0.68, 1.55)
MMSE			0.94 (0.92, 0.97)	0.96 (0.93, 0.99)
CESD			1.01 (1.00, 1.02)	1.01 (0.99, 1.02)
Functional Status				
Good				ref
Mild Impairment				1.80 (1.39, 2.33)
Moderate/severe				2.54 (1.91, 3.41)

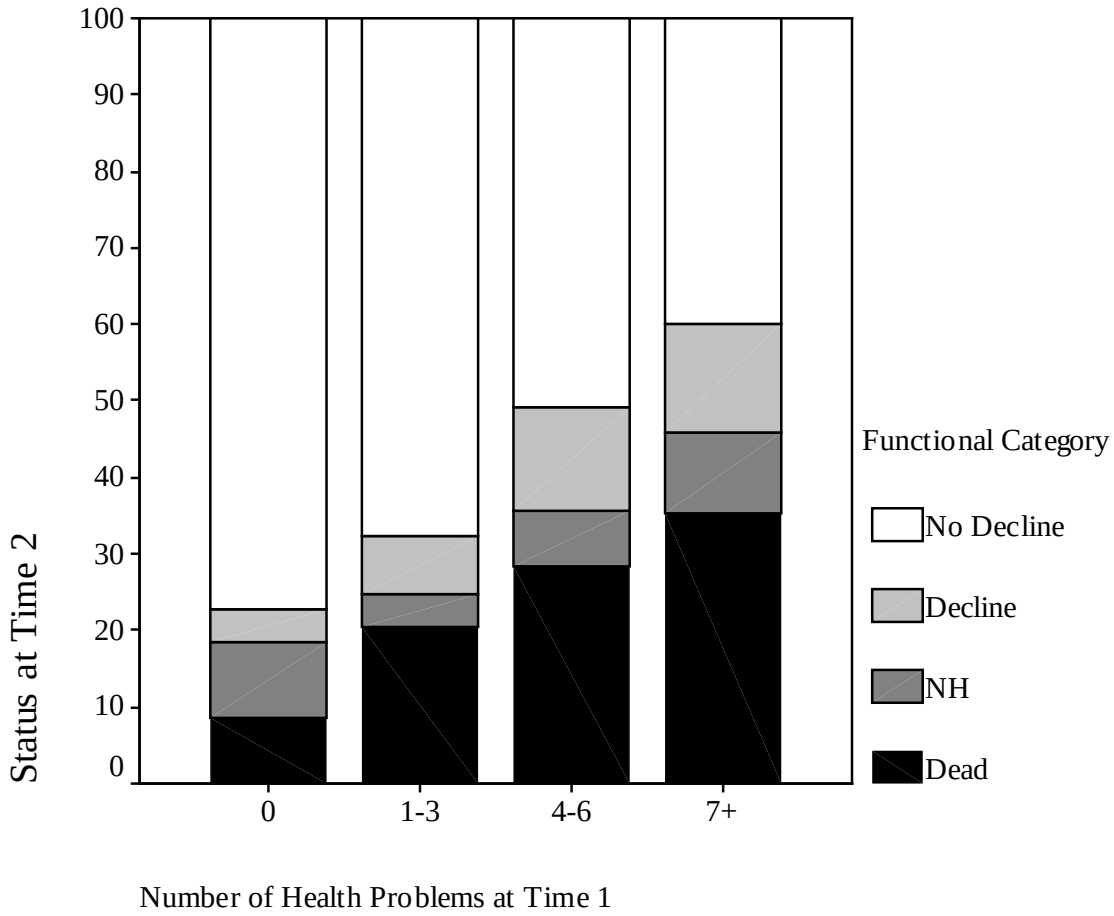
CES-D is the Centre for Epidemiologic Studies – Depression scale; MMSE is the Mini-mental State Examination

Functional Status and Multimorbidity




Functional Category at Time 1 (percent)
100
90
80
70
60
50
40
30
20
10
0
0
1-3
4-6
7+
Number of Problems
Excellent-good
Mild impairment
Moderate/severe/tot
l impairment


Functional Cateogry at Time 2
100
90
80
70
60
50
40
30
20
10
0
0
1-3
4-6
7+
Number of Problems
Excellent-good
Mild impairment
Moderate/Severe


100
90
80
70
60
50
40
30
20
10
0
Status at Time 2
0
1-3
4-6
7+
Number of Health Problems at Time 1
Functional Category
No Decline
Decline
NH
Dead

Multimorbidity In Canada

1. To describe the prevalence of MM in Canada
2. To determine if there are gradients in MM across social position
3. (To determine if diseases cluster together)

Analysis of the Canadian Longitudinal Study on Aging

- Prospective study of aging (Wave 1)
- As representative sampling frame as possible
  - Two cohorts – clinical component (not representative) and tracking cohort (representative)
  - Used trimmed data
- Aged 45 to 85
- 21 235 people in the “tracking cohort”

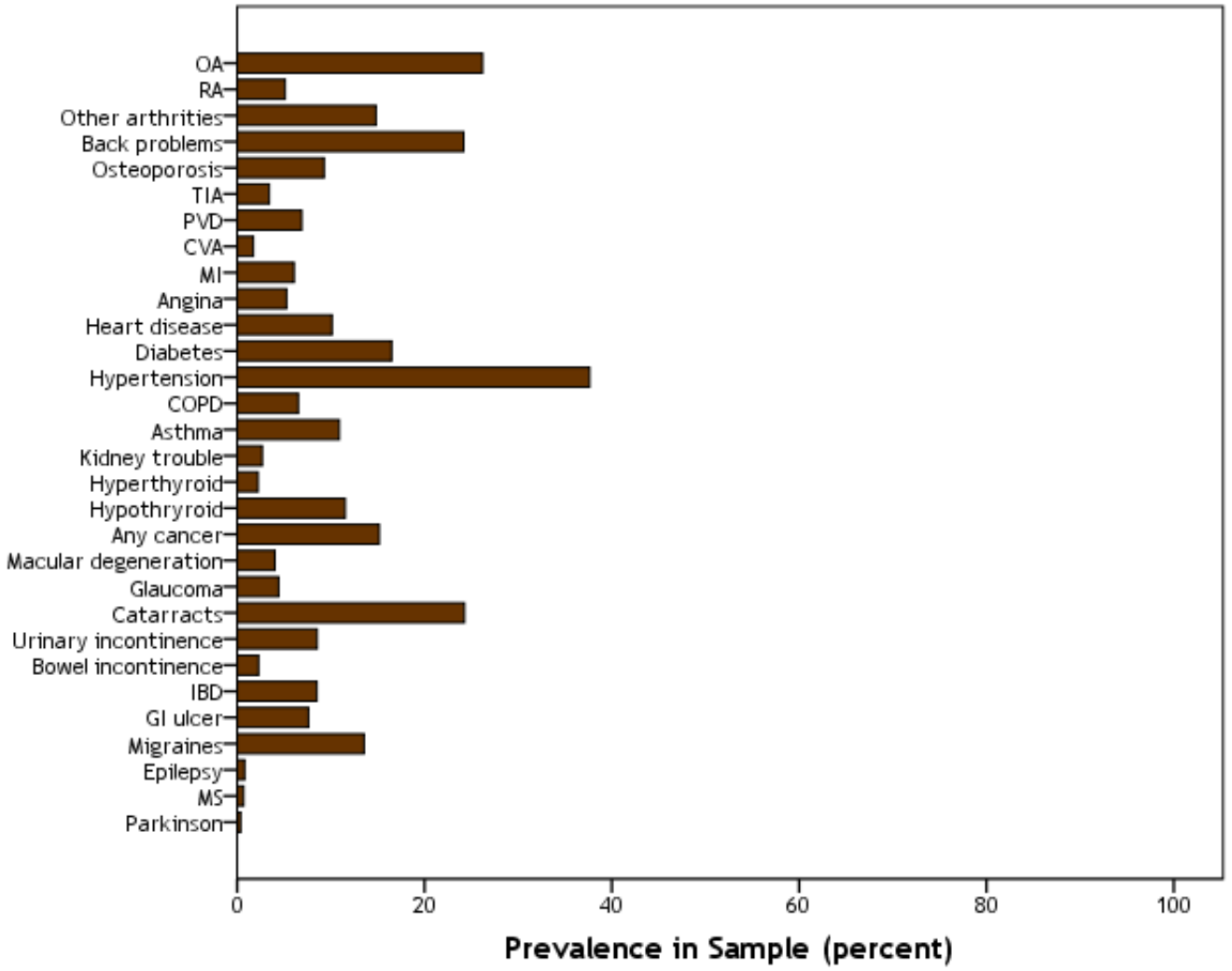
Measures

- Age
- Gender
- Social Position
  - Education category (note that education has dramatically increased in older Manitobans)
  - Individual Income (recoded)
  - Household Income (recoded)
  - Income Source

Measurement of Multimorbidity

- Self reported diseases
  - List of common conditions
  - We chose
    - Physical health (ie excluded mental health)
    - Included risk factors
    - Chronic in nature

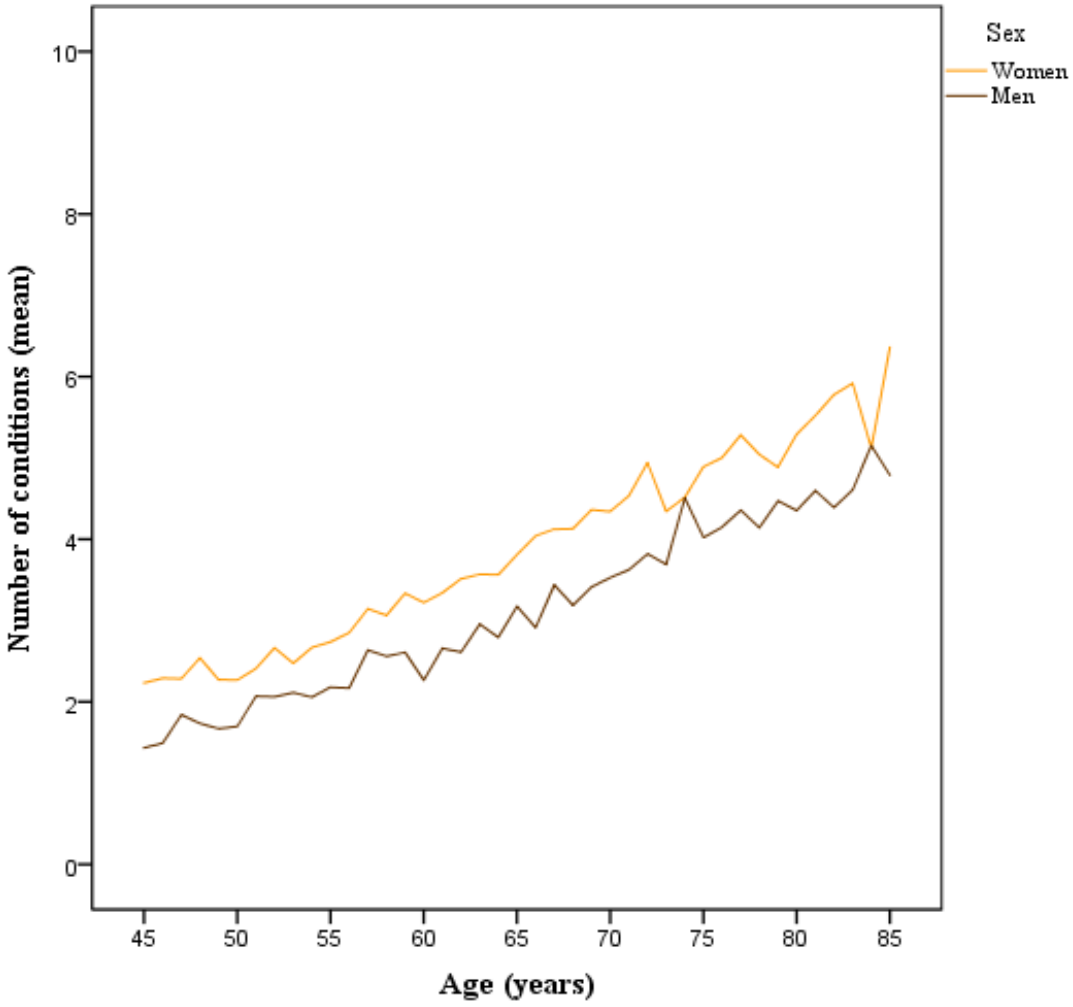
Common Conditions

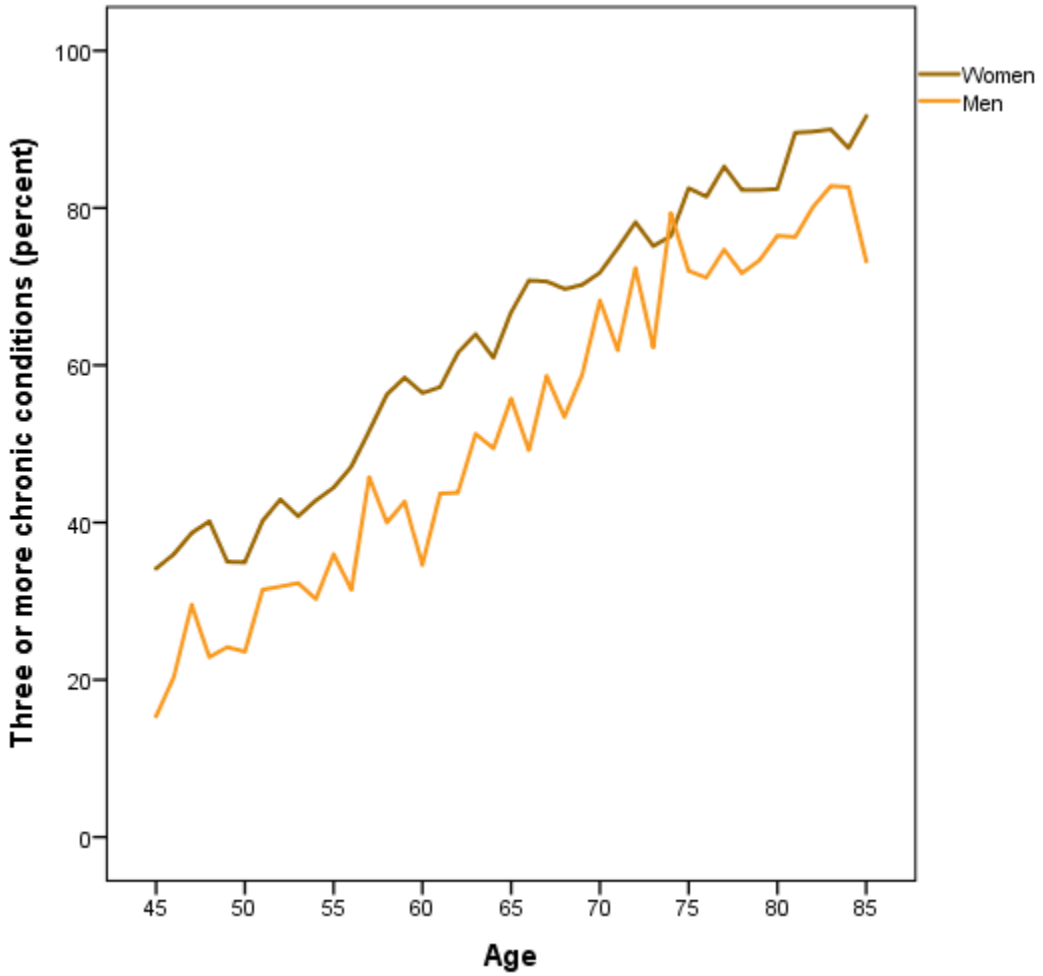


Overall

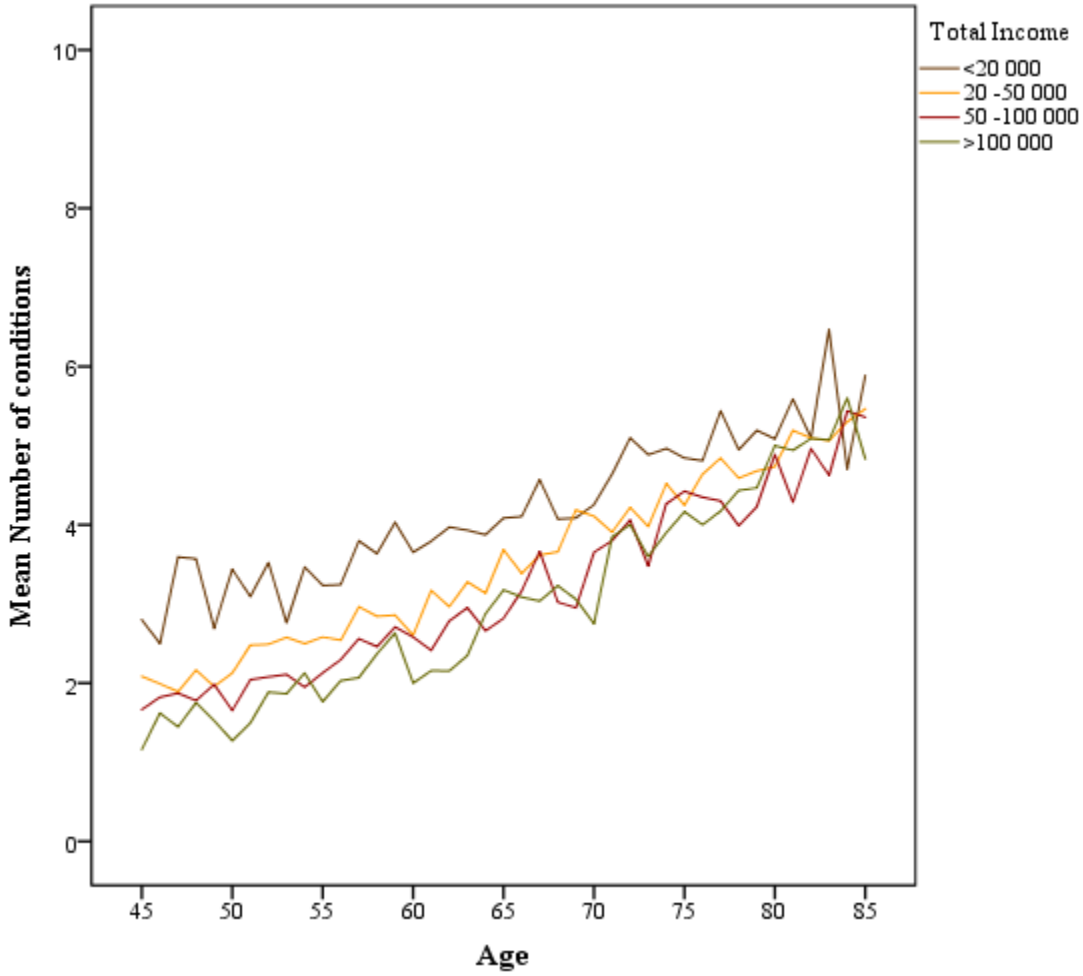
- Standardized the sample against the Canadian population of 2011
- Mean number of chronic conditions was 3.1 for the Canadian population age 45 to 85

Age, Gender and Multimorbidity

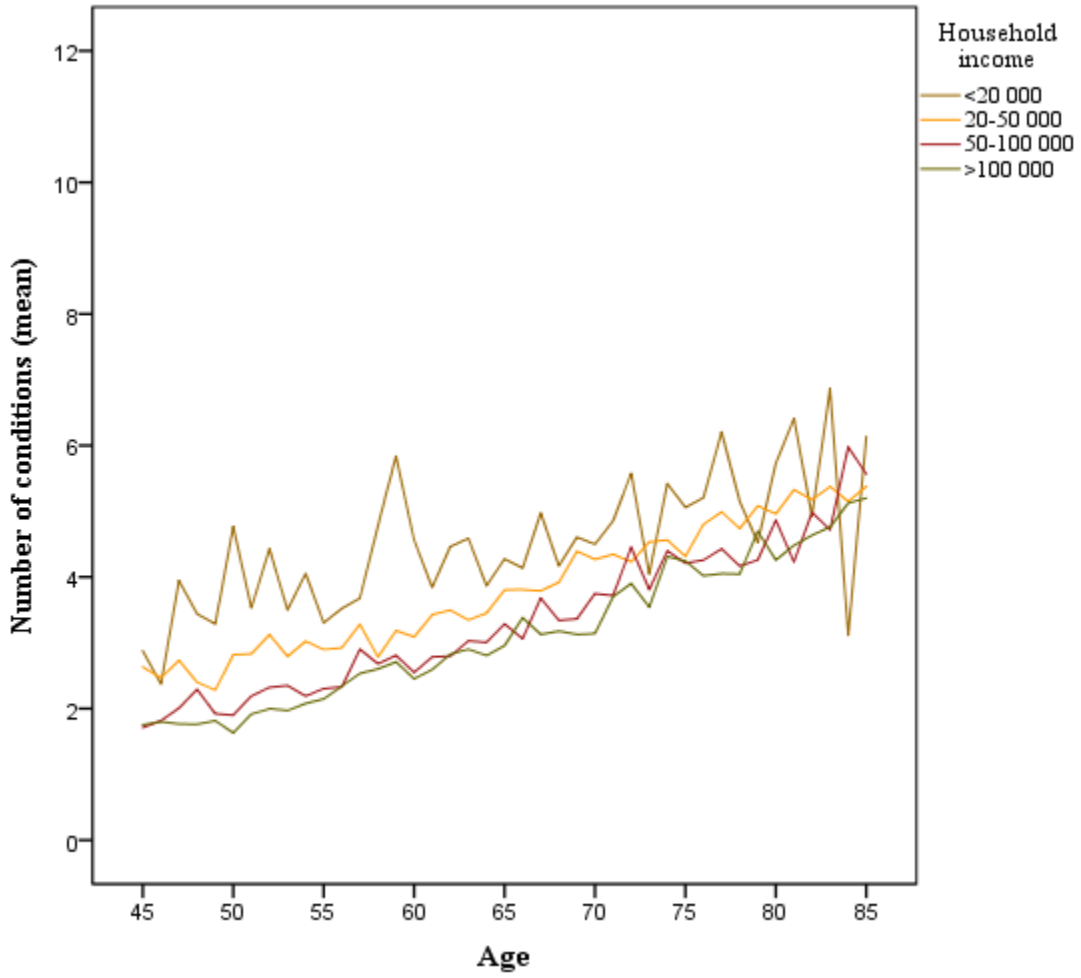



Three or more chronic conditions (percent)
100
80
60
40
20
0
45
50
55
60
65
70
75
80
85
Age
Women
Men

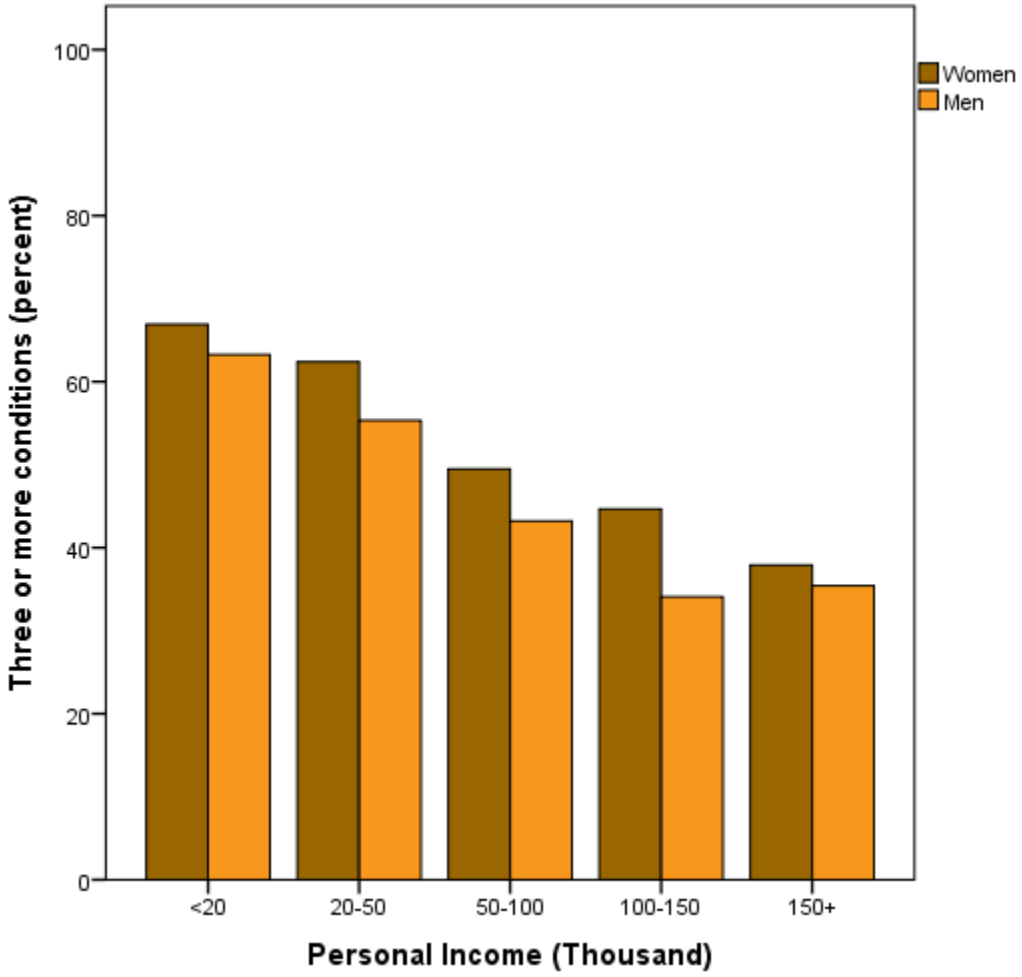
Age, Individual Income and MM

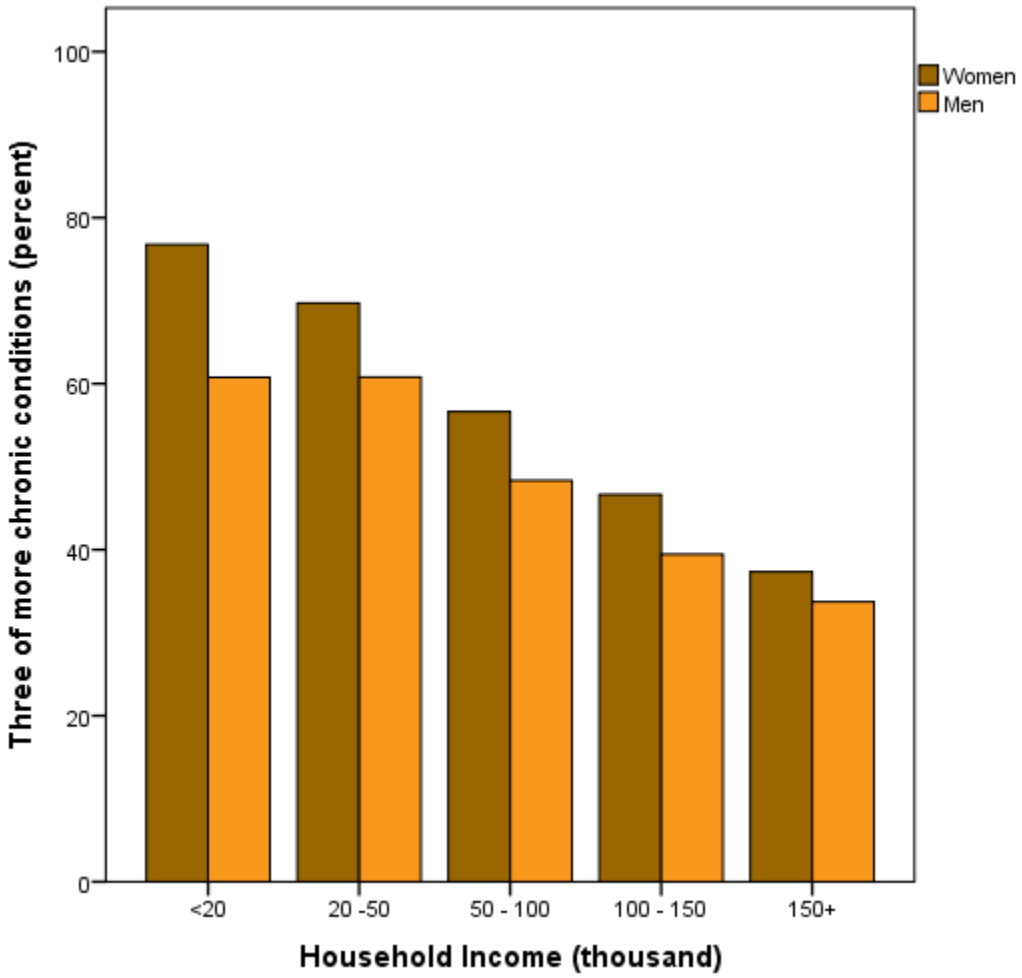


Age, Household Income and MM

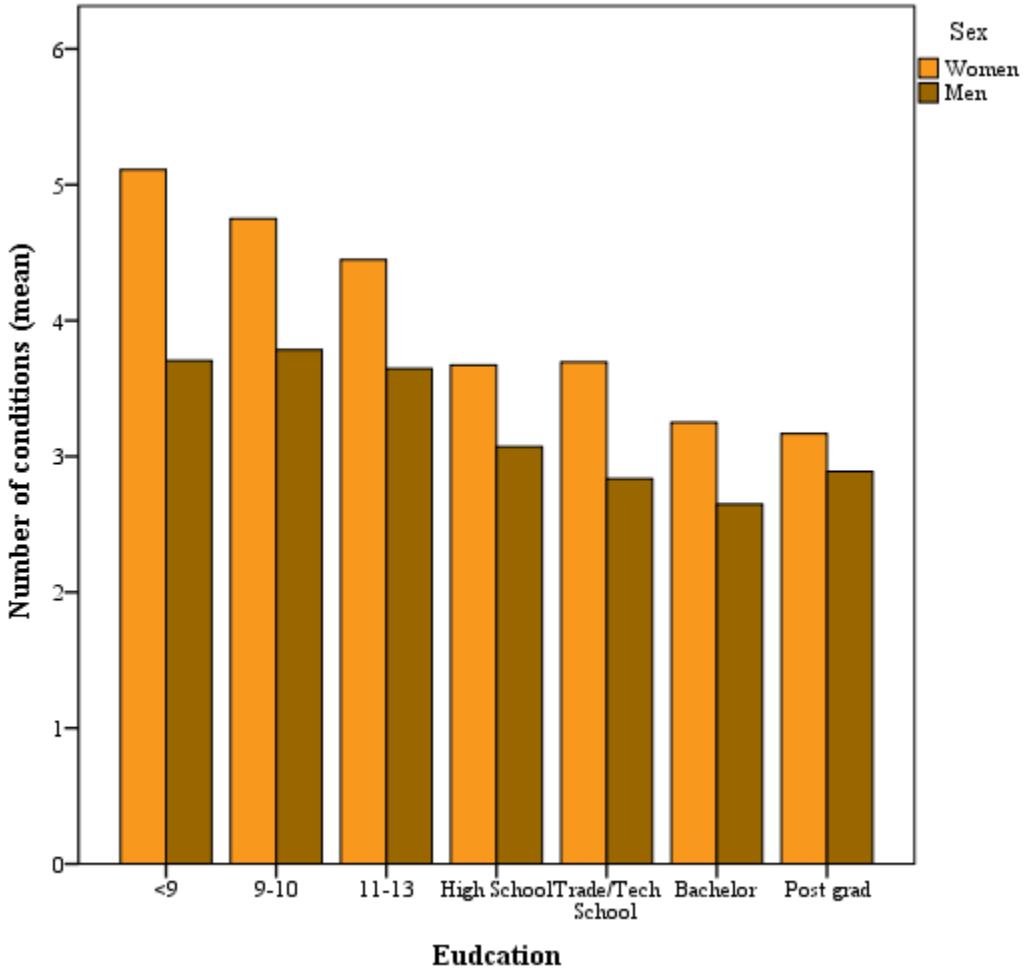


Gender, Income and MM




Three of more chronic conditions (percent)
100
80
60
40
20
0
Women
Men
<20
20 -50
50 - 100
100 - 150
150+
Household Income (thousand)

Gender and Education



Results of Logistic Regression Models

	Effect of Personal Income (Odds Ratio)		Effect of Household Income (Odds Ratio)	
	Unadjusted	Adjusted	Unadjusted	Adjusted
Income				
<20 000	3.35*	1.97*	3.77*	2.12*
20 – 50 000	2.51*	1.47*	2.94*	1.51*
50 – 100 000	1.46*	1.19*	1.66*	1.18*
100 000+	ref	ref	ref	ref
Age (per year)		1.07*		1.07*
Gender (ref = women)		0.64*		0.60*

Note that these are main effects models

Logistic Regression

- 1.38 (1.21, 1.59) for those who did not complete high school;
- 1.03 (0.94, 1.14) for those who completed high school; and 1.18 (1.04, 1.36) for those with some post graduate education;

Interaction

- There is strong interaction between age and income on multimorbidity
  - The effect is attenuated in older groups

Social Position

- Strong social gradient across the spectrum of all measures
- More pronounced with income

INTERPRETATION

- Measurement of social position is problematic in late life
  - Retirement
  - Gender and retirement
  - Income versus wealth
- Life course effect
  - Persistent effect – “Allostatic load”
- Survivor effects
- Cohort, period and age effects of wealth and education, as well as exposure to societal inequality

Limitations

- Definition of multimorbidity
- Exclusion of acute illness and mental health diagnoses
- Inclusion of risk factors

CONCLUSIONS

- Social position affects the development of chronic illness
- The effect is strong and consistent within most societies, as here in the CLSA
- The effect may be attenuated in late life, or there may be a survivor bias

CONCLUSIONS

- Dichotomisation of MM may not be appropriate
- MM is extremely common in late life

IMPLICATIONS

- Need to review the models of care
  - Disease management versus individual care
  - Drug interactions
  - Prognostication for screening and aggressiveness of care
- Need to consider functional status and disease severity

MY THOUGHTS

- Likely will never have an “ideal” measure of MM
- Need to be flexible and consider the data at hand
- Need to be explicit about the measurement
- Findings very similar to Scotland (then and now!)

Upcoming CLSA Webinars

Factorial Invariance of the Centre for Epidemiological Studies Depression Scale (CES-D)

Megan O'Connell, Ph.D., R.D. Psych.

June 29, 2017 | 1 p.m. ET

Register: bit.ly/clsawebinars