



Mortality differentials and causes of death

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DEMOGRAPHIC TRENDS IN RUSSIA:

LEGACY OF THE SOVIET ERA OR A NEW TENDENCY?

21-22 November 2019, Moscow

Higher School of Economics


Motivation and aims

- To explore the differences in causes of death with multidimensional approach
- To assess whether different types of variability exist
- To look at variability at different ages

Data

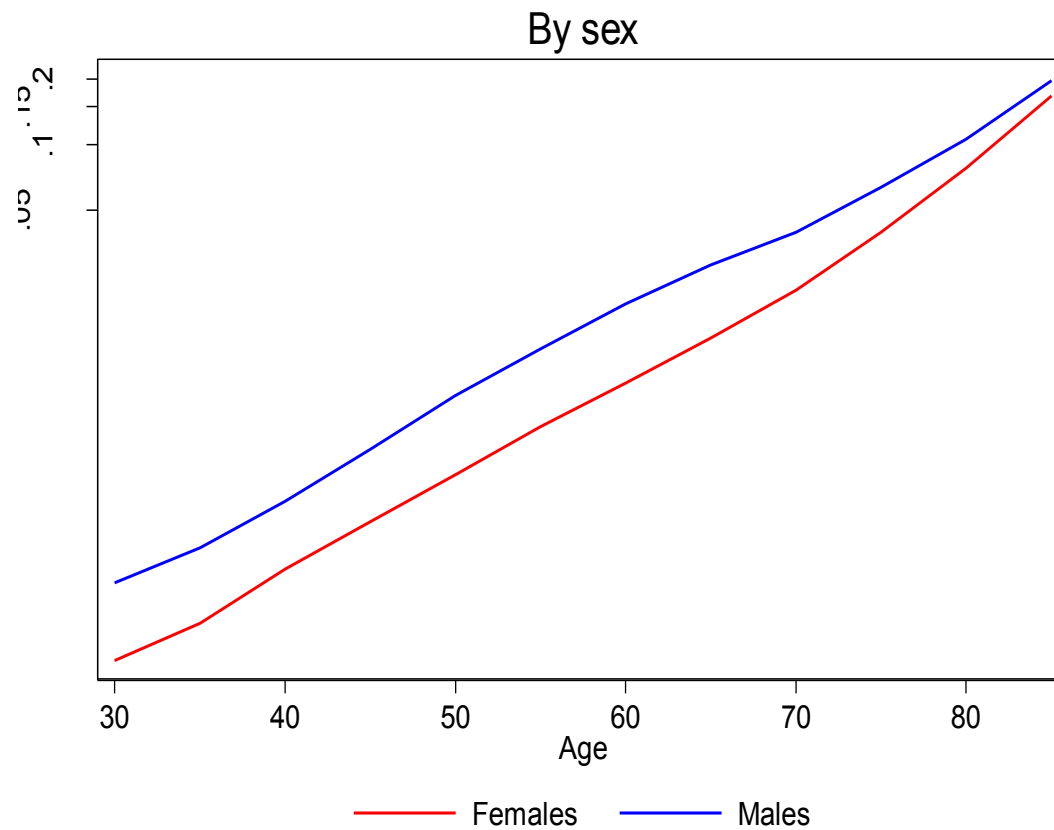
- Main source: Census-linked death records
- Probabilistic linkage (92% linked)
- 1 year follow up between March 2011 and March 2012
- 4-digit ICD10 codes
- Personal attributes + detailed territorial information
- Data size:
 - 106, 019 deaths (age 30+)
 - 7 million person-years

Categories of variables used in analysis

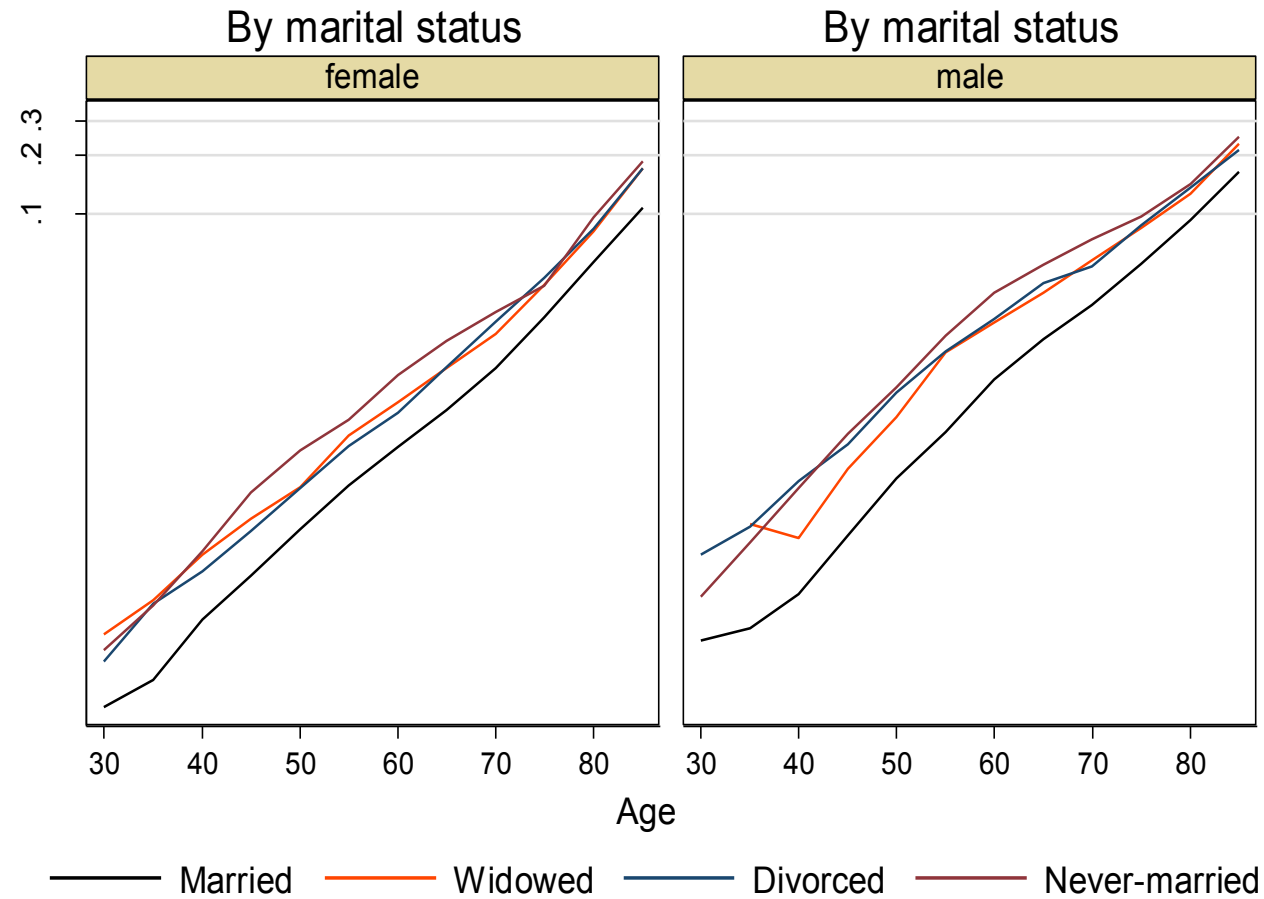
- 5-year age groups
- 2 sexes
- 3 categories of education
 - Primary
 - Secondary
 - Tertiary
- 4 marital statuses
 - Married
 - Widowed
 - Divorced
 - Never-married
- 3 area types
 - Metropolitan
 - Urban
 - Rural
- 17 causes of death 

No.	Title	Category codes according to ICD10
0	All causes	A00-Y98
1	Certain infectious diseases	A00-B99
2	Neoplasms	C00-D48
3	Diseases of the blood and blood-forming organs	D50-D89
4	Endocrine, nutritional and metabolic diseases	E00-E90
5	Mental and behavioral disorders	F00-F99
6	Diseases of the nervous system and the sense organs	G00-G44, G47-H95
7	Heart diseases	I00-I52
8	Cerebrovascular diseases	G45, I60-I69
9	Other and unspecified disorders of the circulatory system	I70-I99
10	Acute respiratory diseases	J00-J22, U04
11	Other respiratory diseases	J30-J98
12	Diseases of the digestive system	K00-K93
13	Diseases of the skin and subcutaneous tissue, musculoskeletal system and connective tissue	L00-M99
14	Diseases of the genitourinary system and complications of pregnancy, childbirth and puerperium	N00-O99
15	Certain conditions originating in the perinatal period and congenital malformations/anomalies	P00-Q99, R95
16	External causes	V01-Y98

Mortality differentials - by sex...

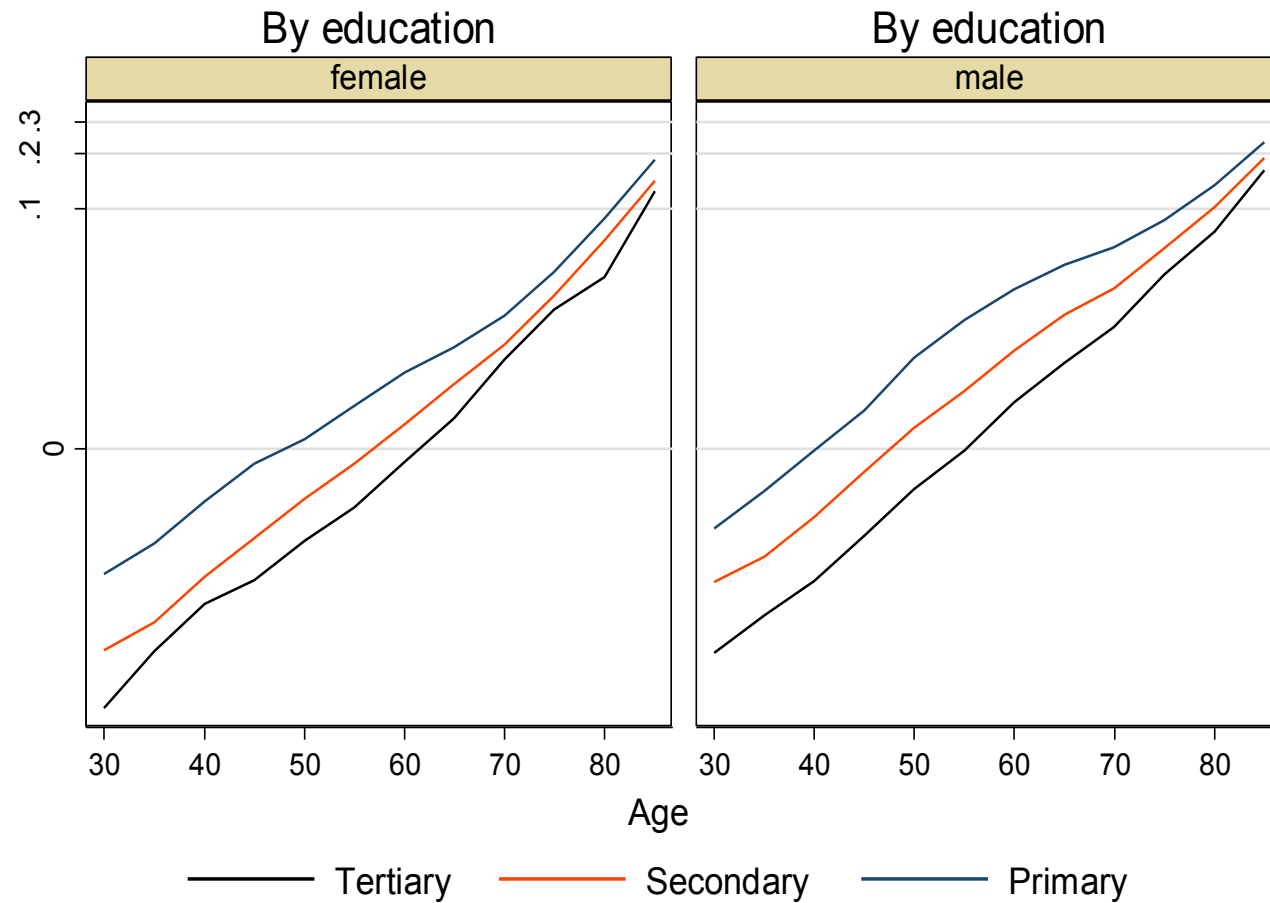


Mortality differentials - by marital status...



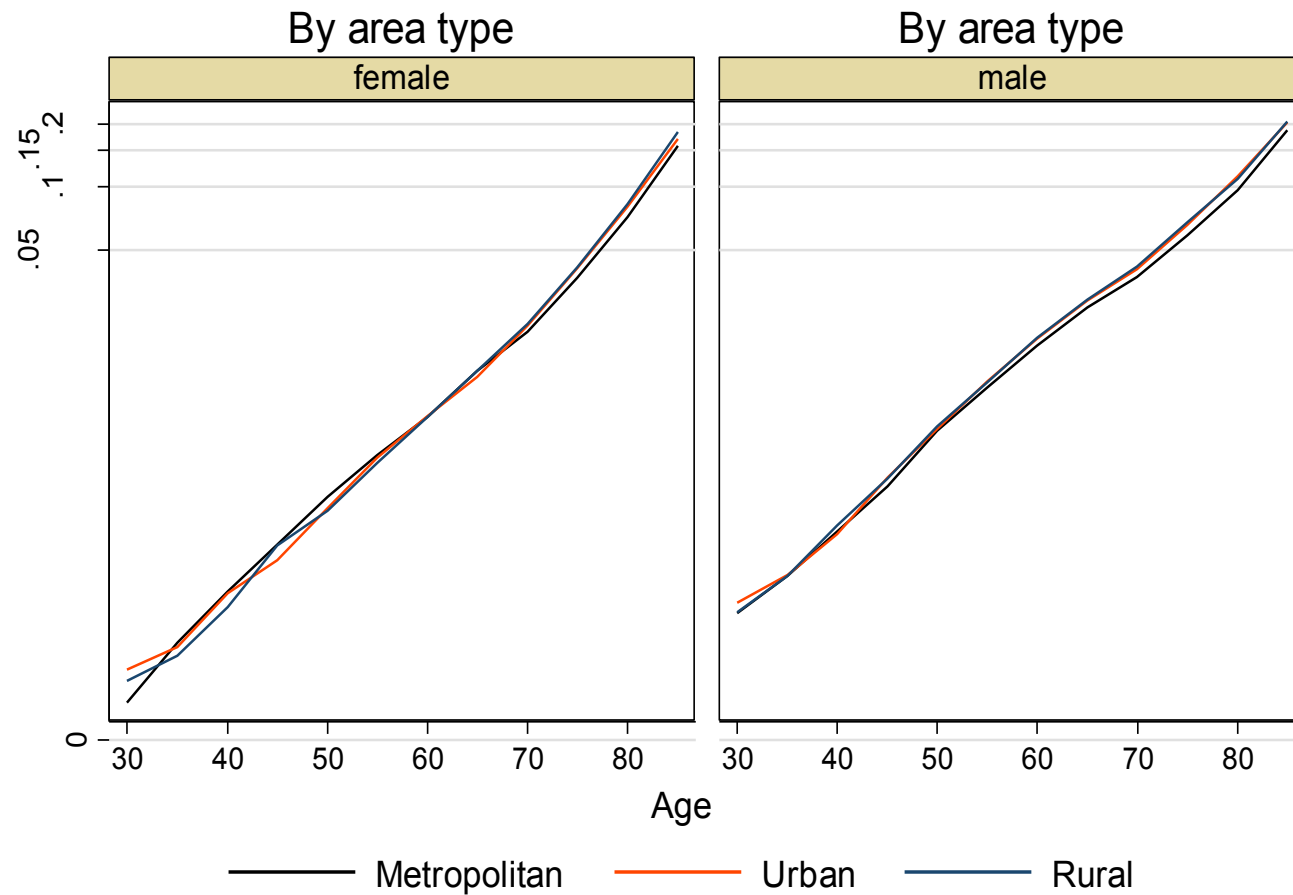
Graphs by Sex

Mortality differentials - by education...



Graphs by Sex

Mortality differentials - by area type...



Graphs by Sex

Method: Poisson regression model

- Mortality rate ratios (with person-years as offset) estimated via Poisson regression:

$$\ln(\mu_i) = \ln(E_i) + \beta_0 + \beta_1(edu)_i + \beta_2(m.status)_i + \beta_3(sex)_i + \beta_4(area)_i + \beta_5 age$$

- Reference categories:
 - Tertiary education
 - Married
 - Female
 - Metropolitan
- Regressions performed for ages 40-64 and 65+
- 16 causes of death (HCD shortlist) + ill-defined + all causes combined

All causes: mortality rate ratios, age 40-64

Poisson regression

All_causes	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Age	1.110	0.001	91.78	0.000	1.107	1.112	***
Tertiary (ref)		.	.	.	.	.
Secondary		0.055	21.20	0.000	1.759	1.973	***
Primary		0.111	41.64	0.000	3.396	3.832	***
Married (ref)		.	.	.	.	.
Widowed		0.047	21.36	0.000	1.675	1.859	***
Divorced		0.032	43.53	0.000	1.938	2.063	***
Never-married		0.049	39.80	0.000	2.215	2.405	***
Female (ref)		.	.	.	.	.
Male		0.037	61.46	0.000	2.431	2.578	***
Metropolitan (ref)		.	.	.	.	.
Urban		0.016	0.57	0.570	0.978	1.041	
Rural		0.018	0.80	0.422	0.980	1.049	
Constant	0.000	0.000	-174.79	0.000	0.000	0.000	***

Mean dependent var	62.308	SD dependent var	113.715
Pseudo r-squared		Number of obs	360.000
Chi-square	19435.981	Prob > chi2	0.000
Akaike crit. (AIC)	2410.688	Bayesian crit. (BIC)	2449.549

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

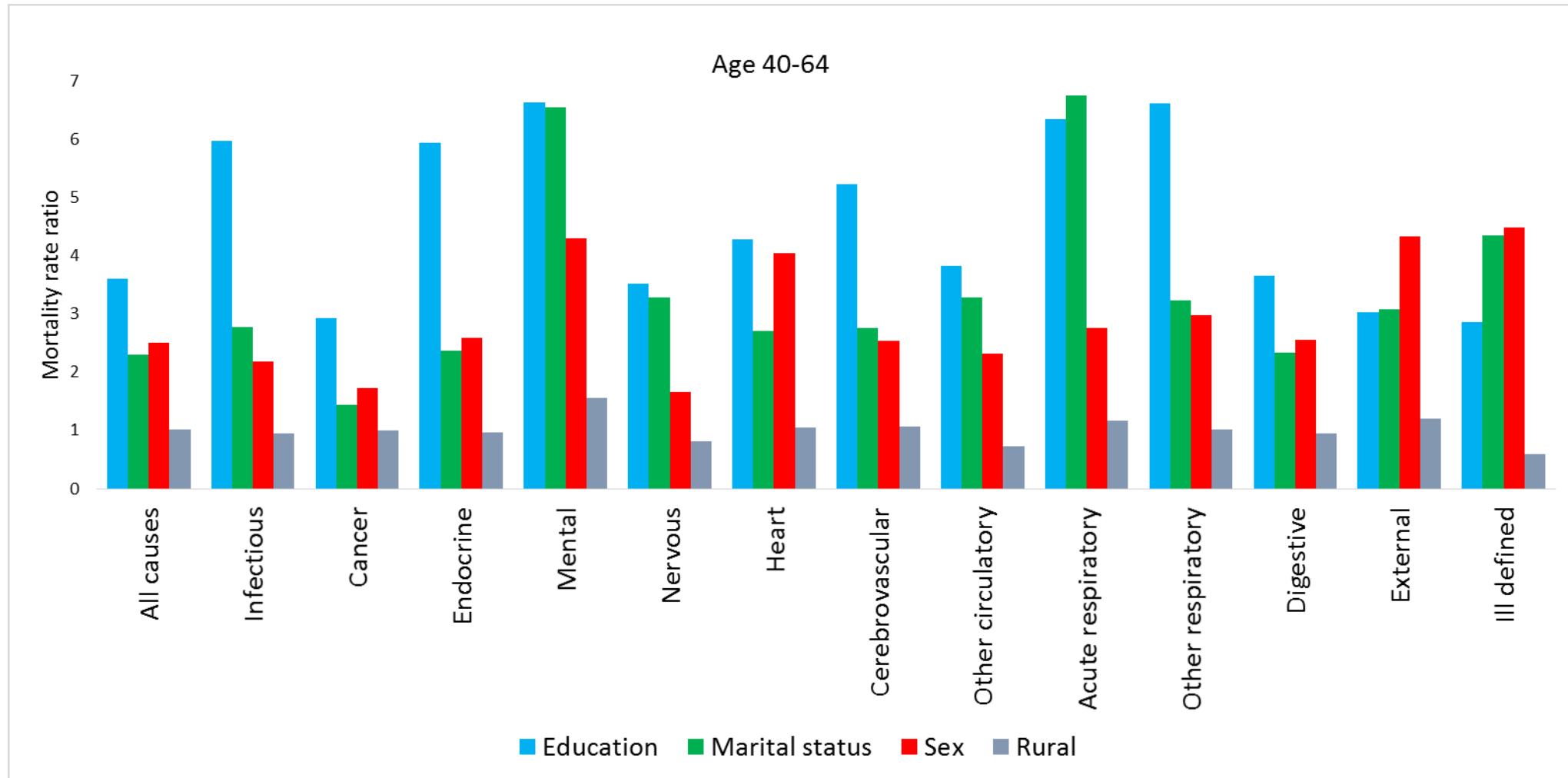
All causes: mortality rate ratios, age 65+

Poisson regression

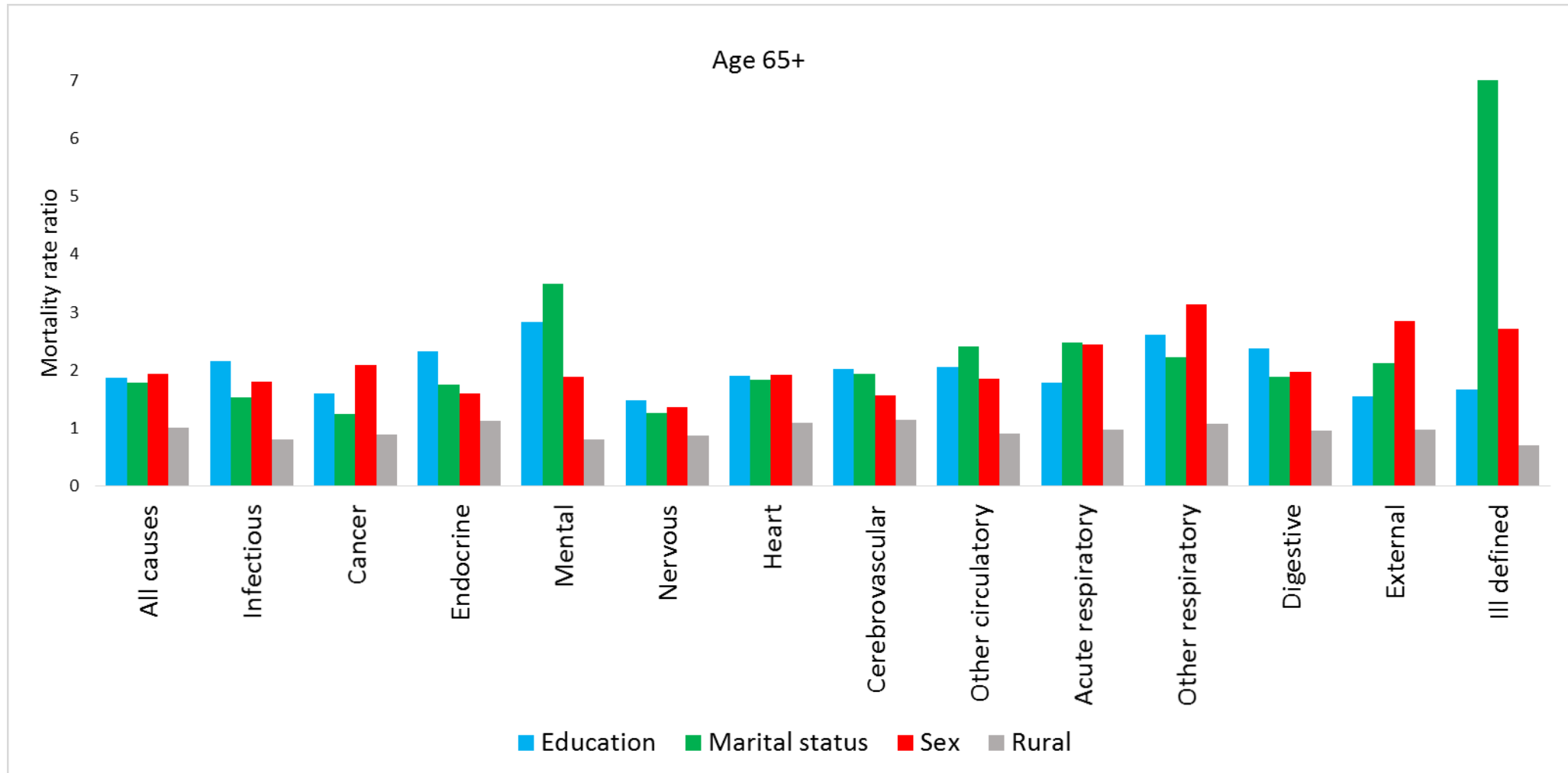
All_causes	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Age	1.112	0.001	188.65	0.000	1.111	1.113	***
Tertiary (ref)	1.000	.	.	.	.	.
Secondary	1.373	0.022	19.93	0.000	1.331	1.416	***
Primary	1.864	0.031	37.54	0.000	1.805	1.926	***
Married (ref)	1.000	.	.	.	.	.
Widowed	1.475	0.013	43.01	0.000	1.449	1.501	***
Divorced	1.620	0.022	36.33	0.000	1.579	1.663	***
Never-married	1.785	0.033	31.25	0.000	1.722	1.852	***
Females (ref)	1.000	.	.	.	.	.
Males	1.949	0.016	82.01	0.000	1.918	1.980	***
Metropolitan (ref)	1.000	.	.	.	.	.
Urban	1.028	0.009	3.34	0.001	1.012	1.045	***
Rural	1.014	0.009	1.49	0.136	0.996	1.032	
Constant	0.000	0.000	-262.21	0.000	0.000	0.000	***
Mean dependent var		228.222	SD dependent var			436.484	
Pseudo r-squared			Number of obs			360.000	
Chi-square		58090.919	Prob > chi2			0.000	
Akaike crit. (AIC)		4233.086	Bayesian crit. (BIC)			4271.947	

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Mortality rate ratios, age 40-64



Mortality rate ratios, age 65+



Concluding remarks

- Education and marital status are important differentiation factors in adult and premature mortality (40-64 years), while in the ages above 65, sex becomes equally important
- Extreme educational inequalities are found in infectious, endocrine, cerebrovascular and respiratory mortality (40-64 years)
- Mental diseases show particular education and marital status disadvantage which persists to older age – possibly related to negative selection effects
- Further models are needed to confirm the robustness of the estimates and explain the mechanisms of differentials variation with cause and age.

Thank you.