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Ontario is Decreasing Avoidable Mortality Rates but not in its Marginalized Neighborhoods

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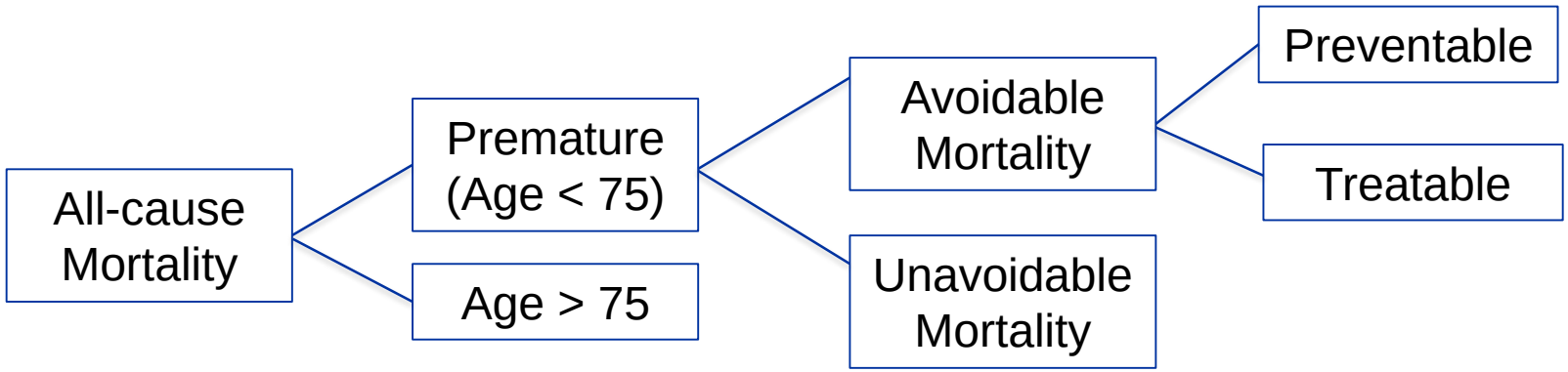
INTRODUCTION

- Avoidable Mortality (AM)
  - *Preventable causes*: drownings, colorectal cancer, COPD
  - *Treatable causes*: tuberculosis, hypertension, meningitis

- ↓ AM rates largely due to advances in medical treatment



OBJECTIVE

- To examine how changes in neighborhood-level marginalization impact Avoidable Mortality rates in Ontario

METHODS

Exposure: Ontario Marginalization Index

- Four Dimensions
  - **Ethnic concentration**: recent immigration, visible minorities
  - **Dependency**: workforce eligibility, dependency ratio
  - **Material deprivation**: income, education
  - **Residential instability**: home ownership, relationship status
- Dimensions stratified into quintiles (Q5 = most marginalized)

Outcome: Avoidable Mortality

- CIHI definition based on standard ICD-9 and ICD-10 codes

METHODS

- **Setting**: Ontario, Canada
- **Participants**: all avoidable deaths between 1993 and 2014 (N = 490,006)
- **Databases**: Death Registry, Ontario Health Insurance Plan (OHIP), Registered Persons
- **Exclusions**: no ON-Marg index, no cause of death, no health care number, no postal code (N = 26,991)
- **Final study size**: 463,015

ANALYSES

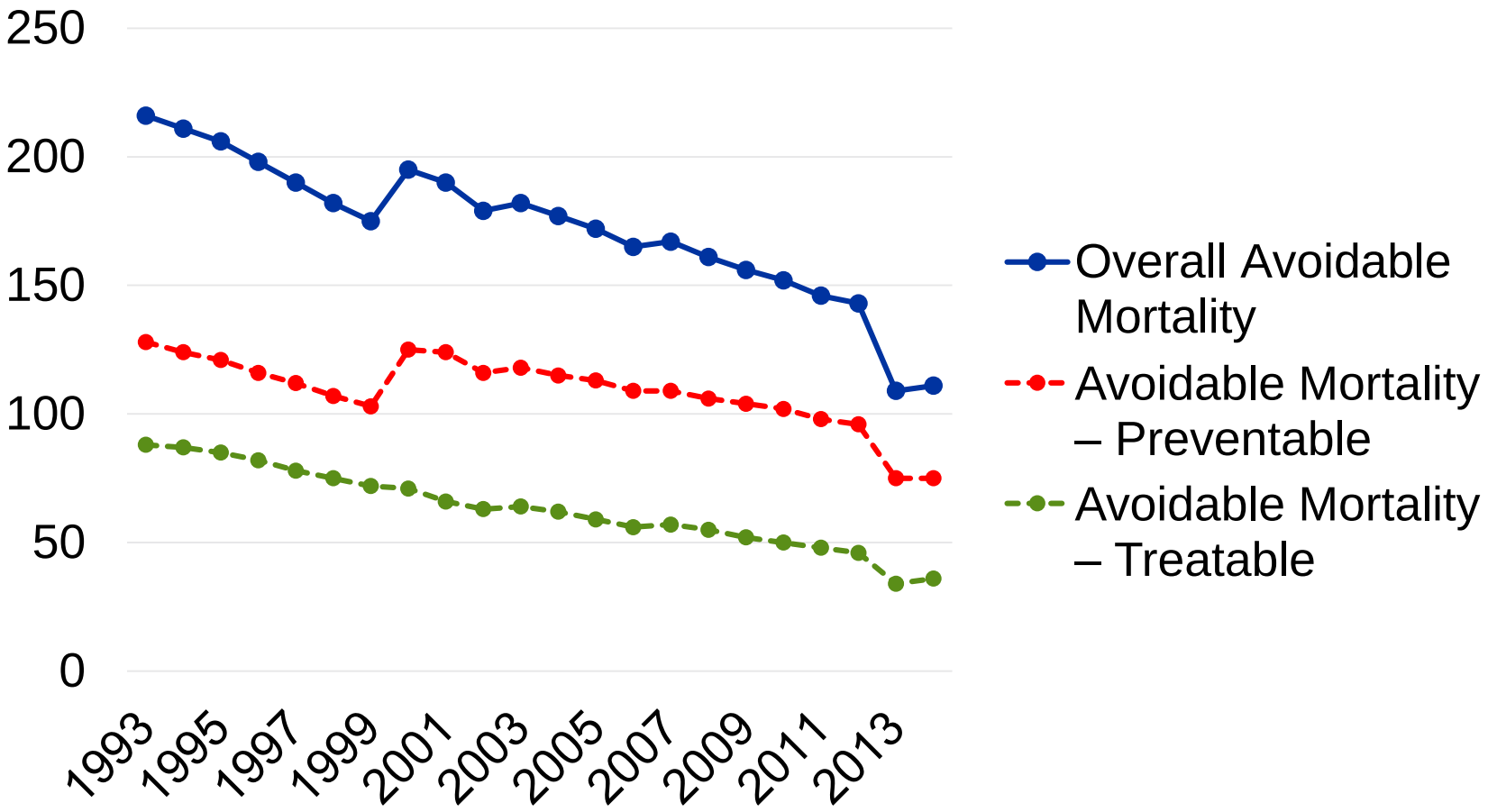
1. Annual age-sex standardized AM rates

- Overall and stratified by preventable and treatable causes
- Calculated for each marginalization dimension

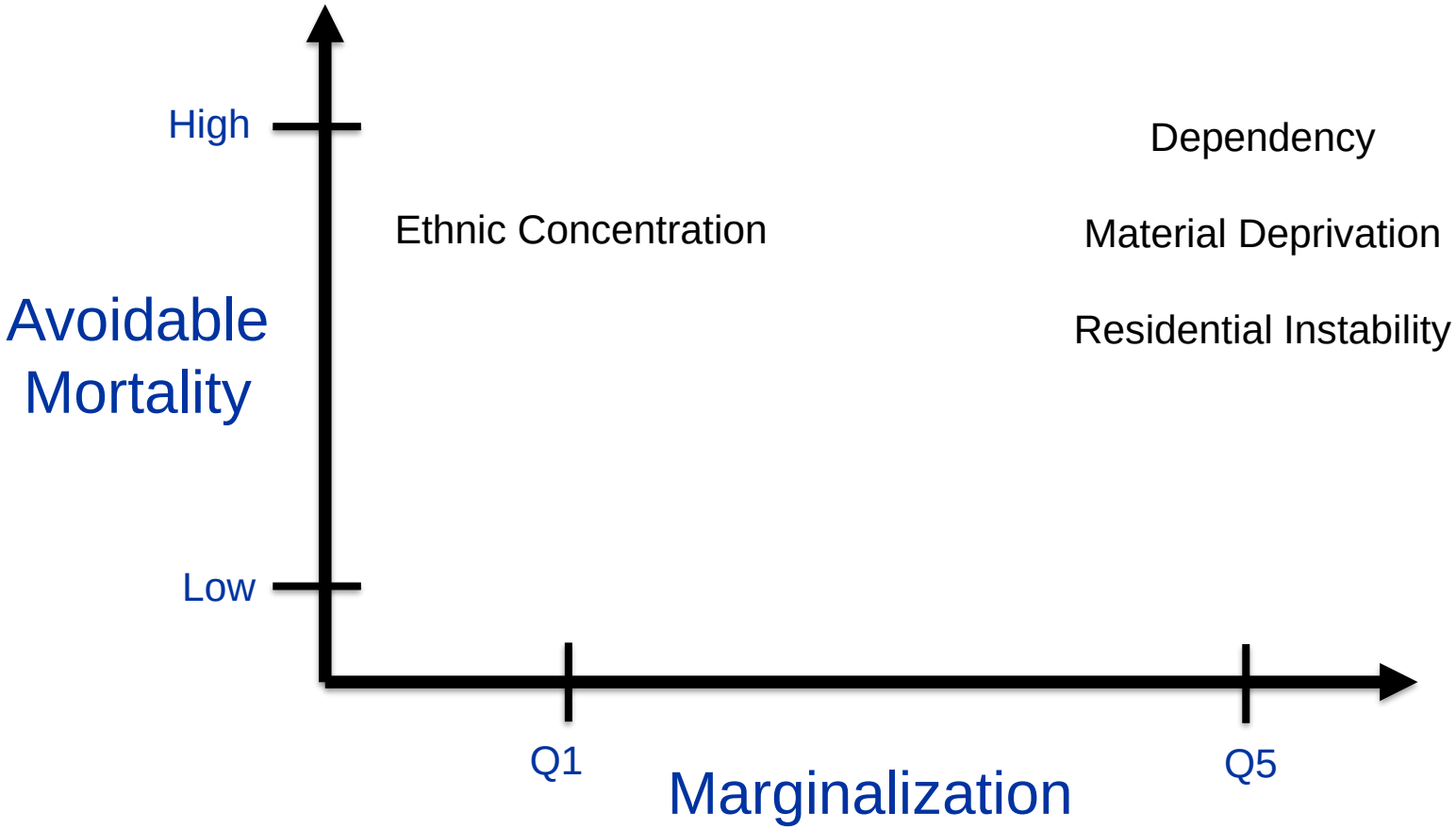
2. Marginalization trends

- Annual Avoidable Mortality rate ratio between most marginalized (Q5) and least marginalized (Q1) for each dimension
- E.g. for Material deprivation: AM_{Q5} rate / AM_{Q1} rate in 2014

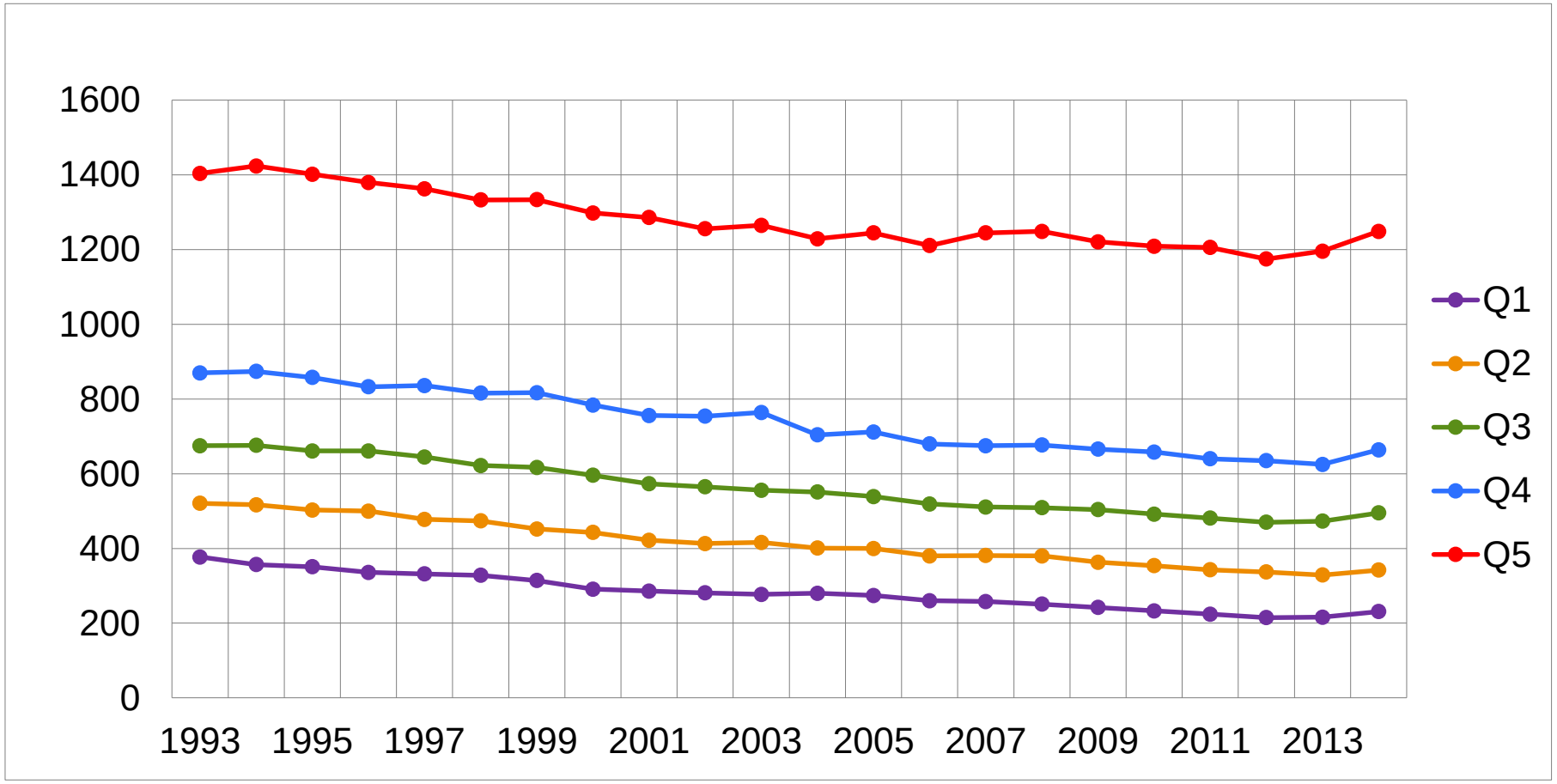
Age-sex standardized annual AM rates per 100,000 population



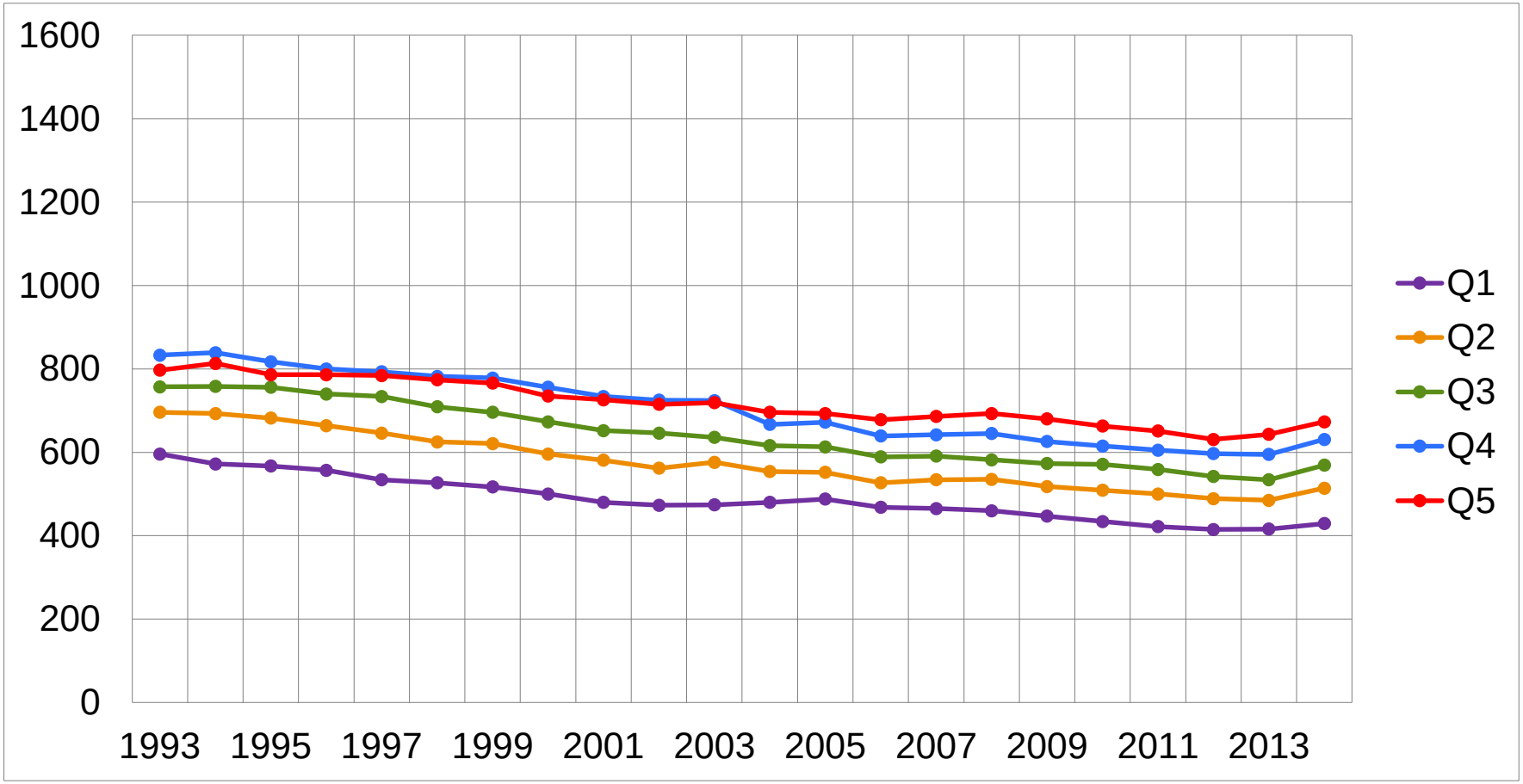
Annual AM rates by marginalization dimension



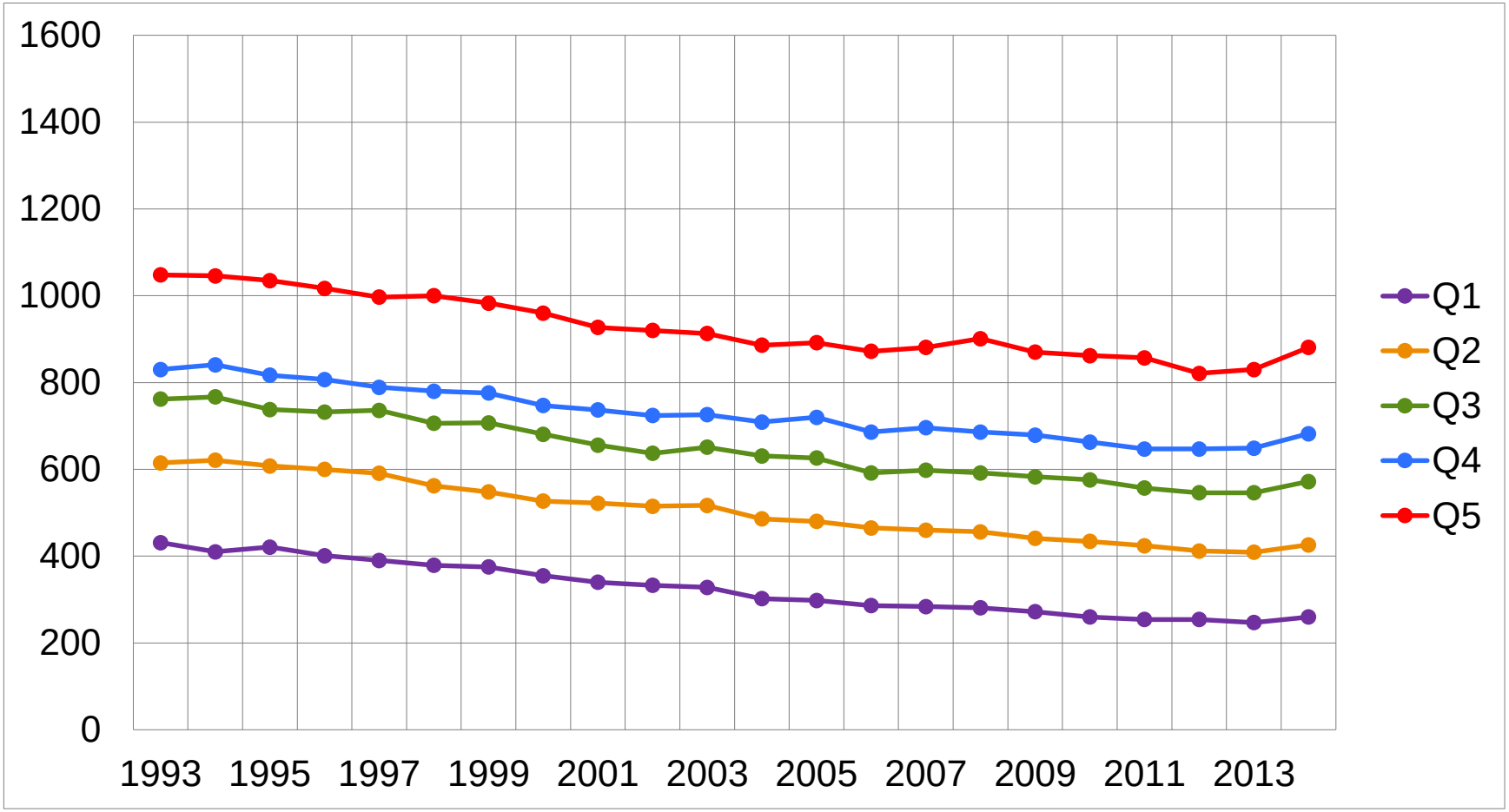
Dependency: Annual age-sex standardized AM rates by quintile



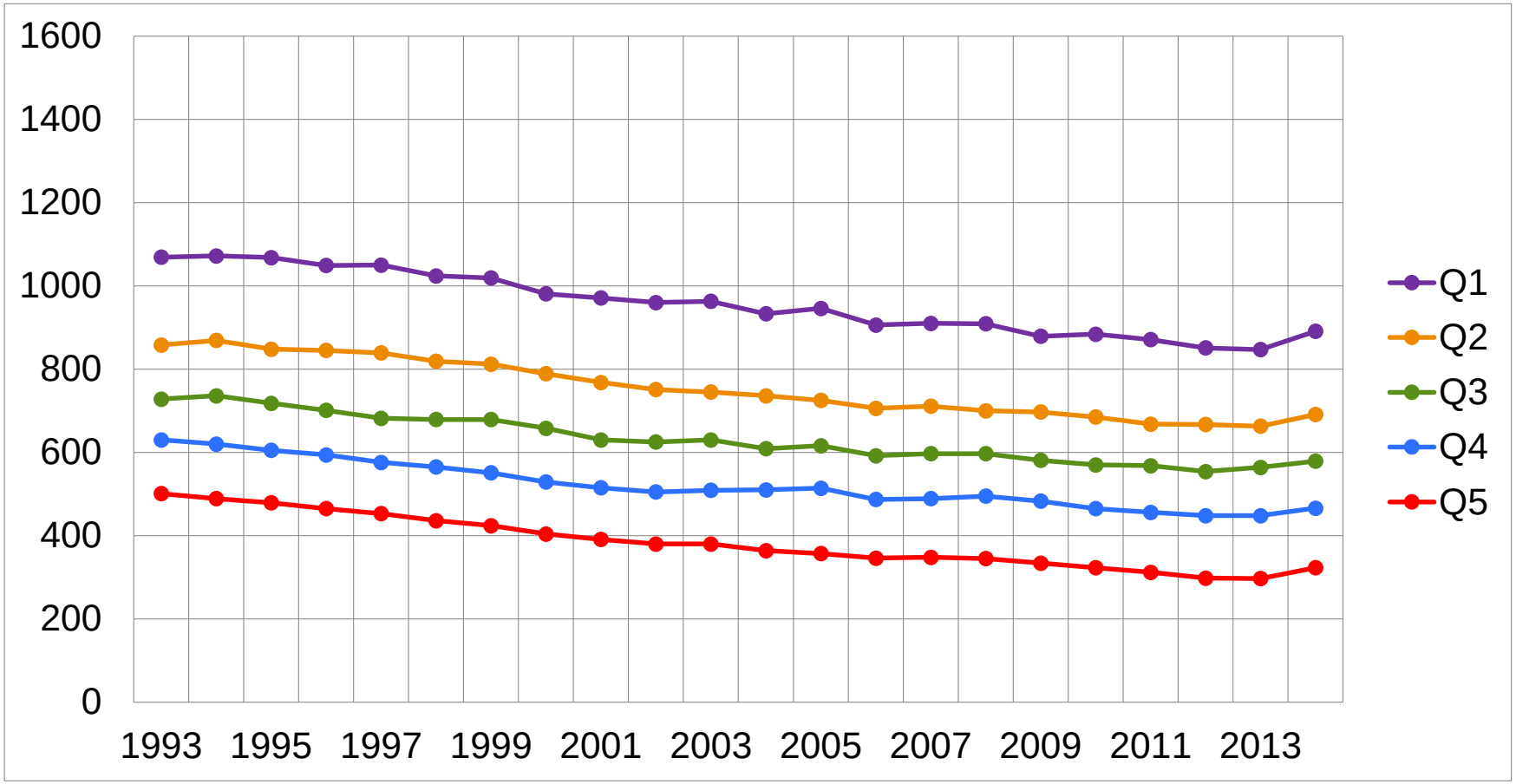
Material Deprivation: Annual age-sex standardized AM rates by quintile



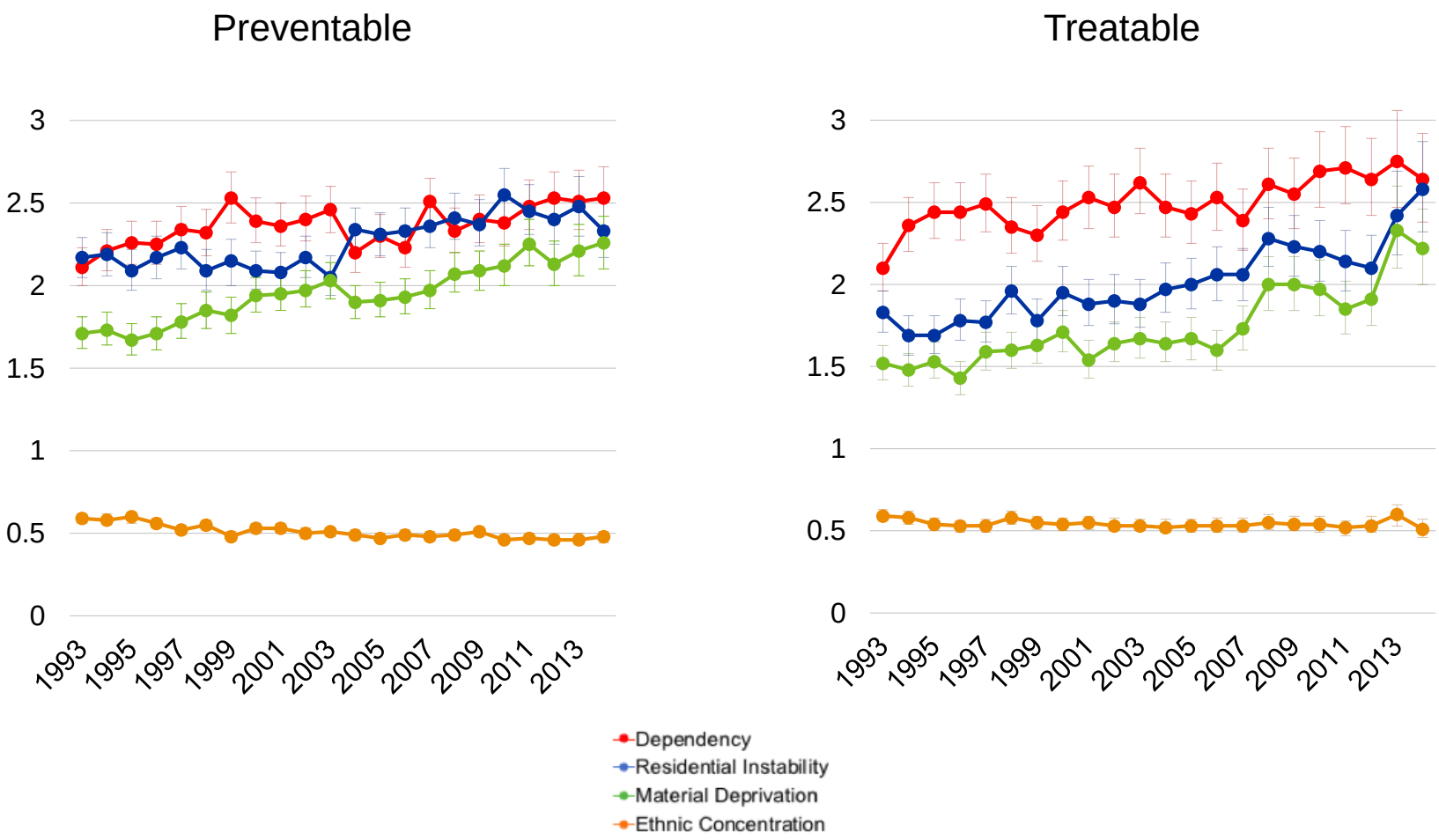
Residential Instability: Annual age-sex standardized AM rates by quintile



Ethnic Concentration: Annual age-sex standardized AM rates by quintile



Marginalization Trends: Annual Q5/Q1 AM rate ratios by dimension



DISCUSSION

- Marginalized neighbourhoods are increasingly disadvantaged in ↓ AM rates
- Marginalized neighbourhoods may not have seen full benefit from advances in medical treatment
- Benefits for ethnically concentrated neighbourhoods may be due to healthy immigrant effect

DISCUSSION

Strengths

- Robust databases and variable definitions
- Multiple dimensions of marginalization to examine AM trends over time

Limitations

- Change from ICD-9 to ICD-10 codes in 2000
- Changes to classification of cause of death in 2013
- Census data may underestimate some types of marginalization (e.g. First Nations living on reserves)

CONCLUSION

- Neighbourhoods with the highest levels of dependency, material deprivation, and residential instability consistently have the highest AM rates

- Despite ↓ AM rates, the gap between the most and least marginalized neighbourhoods is increasing

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ONTARIO MARGINALIZATION INDEX

- **Dependency:** proportion of the population aged 65+, dependency ratio (total population 0-14 and 65+/total population 15 to 64), proportion of the population aged 15+ not participating in labor force
- **Ethnic Concentration**: proportion of the population who are recent immigrants and proportion of the population who self-identify as a visible minority
- **Material Deprivation:** proportion of the population aged 20+ without a high school diploma, proportion of families who are lone parent families, proportion of the population receiving government transfer payments, proportion of the population aged 15+ who are unemployed, proportion of the population considered low income, proportion of households living in dwellings that are in need of major repair
- **Residential Instability**: proportion living alone, proportion of population who are not youth (aged 16+), average number of persons per dwelling, proportion of dwellings that are apartment buildings, proportion of the population who are single/divorced/widowed, proportion of dwellings that are not owned, proportion of the population who moved during the past 5 years

DEMOGRAPHICS

Variable	Avoidable Mortality Preventable	Avoidable Mortality Treatable
Total population	N=294,799	N=168,216
Mean age ± SD	59.98 ± 12.91	61.53 ± 11.69
Sex		
F	100,503 (34.1%)	79,415 (47.2%)
M	194,295 (65.9%)	88,801 (52.8%)

DEMOGRAPHICS

Variable	Avoidable Mortality Preventable	Avoidable Mortality Treatable
Dependency		
Q1 (lowest)	44,735 (15.2%)	24,555 (14.6%)
Q2	50,896 (17.3%)	28,900 (17.2%)
Q3	57,708 (19.6%)	32,696 (19.4%)
Q4	62,798 (21.3%)	35,902 (21.3%)
Q5 (highest)	78,662 (26.7%)	46,163 (27.4%)
Q5 – Q1 difference	33,927 (11.5%)	21,608 (12.8%)
Ethnic Concentration		
Q1 (lowest)	68,315 (23.2%)	38,738 (23.0%)
Q2	63,345 (21.5%)	35,719 (21.2%)
Q3	56,468 (19.2%)	31,613 (18.8%)
Q4	52,888 (17.9%)	30,199 (18.0%)
Q5 (highest)	53,783 (18.2%)	31,947 (19.0%)
Q1 – Q5 difference	14,532 (4.9%)	6,791 (4.0%)

DEMOGRAPHICS

Variable	Avoidable Mortality Preventable	Avoidable Mortality Treatable
Material Deprivation		
Q1 (lowest)	41,391 (14.0%)	24,984 (14.9%)
Q2	49,298 (16.7%)	29,260 (17.4%)
Q3	57,512 (19.5%)	33,475 (19.9%)
Q4	65,722 (22.3%)	37,038 (22.0%)
Q5 (highest)	80,876 (27.4%)	43,459 (25.8%)
Q5 – Q1 difference	39,485 (13.4%)	18,475 (11.0%)
Residential Instability		
Q1 (lowest)	34,861 (11.8%)	21,541 (12.8%)
Q2	50,962 (17.3%)	30,075 (17.9%)
Q3	57,854 (19.6%)	33,676 (20.0%)
Q4	67,164 (22.8%)	37,548 (22.3%)
Q5 (highest)	83,958 (28.5%)	45,376 (27.0%)
Q5 – Q1 difference	49,097 (16.7%)	23,835 (14.2%)

AVOIDABLE MORTALITY CLASSIFICATION EXAMPLE

Causes of Death	ICD-9 Codes	ICD-10 Codes	AM - Preventable	AM - Treatable
Infections				
Enteritis and other diarrhoeal disease	001-009	A00 - A09	x	…
Tuberculosis	010-018	A16- A19	…	x
	137	B90		
		J65		
Selected invasive bacterial infections	034.1	A38	…	x
	482.8	A48.1		
	41.0	A49.1		
Sepsis	038 (except 038.2)	A40 (except A40.3)	…	x
		A41 (except A41.3)		
Malaria	084	B50-B54	…	x
Meningitis	320.2,3,8,9	G00.2,3,8,9	…	x
Viral Hepatitis	070	B15-B19	x	…
HIV/AIDS	042.0-044.9	B20-B24	x	…