Roles of Social Policy on Suicide Risk and Inequality in 10 Canadian Provinces: a Multilevel Population-based Cohort Study

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Rationales for study

- Universal socioeconomic inequalities in suicidal behaviour
- But, the extents vary by country or regions within a country
- Need to examine social policies as the predictor of the regional variances

Challenges

- Difficulty to conduct a cross-national study
- No multilevel study to distinguish contextual factors from compositional factors

Data: CanCHEC (Canadian Census Health and Environment Cohort)

- 1991 Canadian Long-form Census (2B/2D), non-institutional population
- 1984-2011 Historical Tax Summary Files (HTSF) (place of residence only)
- 1969-1991 National Cancer Incidence Reporting System (NCIRS),
- 1992-2010 Canadian Cancer Registry (CCR), and
- 1991-2011 Canadian Mortality Data Base (CMDB)
- Eligibility: 25+, temporary and permanent residents, non-institutional

Study Aims

1. Test the association between increased social expenditure (need-adjusted) and decreased suicide mortality after controlling for individual-level factors
2. Examine whether generous social policy modifies the association between unemployment and suicide mortality

Methods

- Data

1) 1991 CanCHEC (individual level predictors and outcome)
2) CANSIM (Canadian Socio-Economic Information Management System)

- Study population: working-age population (25-64) in 10 Canadian provinces
- Independent variables

1) Individual-level: age, gender, familial status, aboriginal status, migration status, household income and employment status
2) Provincial-level: total government spending, social service, social assistance, workers' compensation, and other social services

- Dependent variables: intentional self-harm and undetermined intent of deaths

Methods

- Statistical analysis

1) Descriptive statistics
2) Random-intercept models: proc glimmix in SAS nested in 10 provinces
3) Sensitivity analysis

- Intentional self-harm only
- Changing the indicator of 'needs' (own revenue in total revenue)
- Fixed-effects models with interaction terms

Results: Descriptive analysis

Province	Total Expenditure	Social Services	Social Assistance	Workers' Compensation	Other Social Services
Newfoundland	55.76	6.55	3.22	0.83	2.49
Prince Edward Island	49.40	4.67	2.21	0.66	1.79
Nova Scotia	49.28	5.35	2.48	0.77	2.05
New Brunswick	51.66	5.25	2.41	0.79	2.05
Quebec	54.65	11.52	3.30	1.21	3.50
Ontario	38.18	5.88	2.72	0.90	2.17
Manitoba	36.32	5.42	2.48	0.56	2.36
Saskatchewan	37.19	3.85	1.25	0.56	1.67
Alberta	33.27	4.29	1.57	0.55	1.54
British Columbia	41.57	5.53	2.27	1.02	2.25

Need adjusted aggregated and disaggregated social expenditures by province (%, 1989-2009): (expenditure/provincial GDP)/dependency ratio

Results: Descriptive analysis

Province	Suicide Rates[1]	OR[2] (95% CI)
Newfoundland	160	0.70 (0.38-1.29)
Prince Edward Island	375	1.52 (0.54-4.26)
Nova Scotia	263	1.82 (1.25-2.67)
New Brunswick	332	1.50 (1.03-2.19)
Quebec	393	1.76 (1.59-1.95)
Ontario	238	1.94 (1.71-2.19)
Manitoba	284	2.10 (1.53-2.89)
Saskatchewan	248	2.01 (1.36-2.98)
Alberta	409	1.95 (1.62-2.35)
British Columbia	246	2.02 (1.66-2.45)

Suicide rates and Odds ratio by province

1) Per 100,000 (weighted)
2) Odds of suicide mortality among the unemployed compared with other categories of employment status

	Suicide Rates[1]	
Covariate	Men	Women
Age		
25-44	497	160
45-64	371	129
Immigration status		
Non-immigrant (ref)	497	163
Immigrant	266	93
Aboriginal		
Non-aboriginal (ref)	444	145
Aboriginal	709	290
Family types		
Non-single family	407	137
Single family	910	282
Employment status		
Employed (ref)	401	123
Temporarily laid-off	665	172
Not in labour force	615	223
Unemployed	708	210
Income		
Non-low income	423	125
Low income	696	310
Total	450	149

Suicide rates by sociodemographic predictors

Results: Model results

Parameter	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Fixed effects							
Intercept	-5.86***	-5.58***	-5.86***	-5.72***	-5.69***	-5.51***	-5.75***
Individual level							
Age (continuous)		0.99*** (0.98-0.99)	0.99*** (0.98-0.99)	0.99*** (0.98-0.99)	0.99*** (0.98-0.99)	0.99*** (0.98-0.99)	0.99*** (0.98-0.99)
Gender (ref: women)		3.36*** (3.18-3.56)	3.37*** (3.19-3.57)	3.37*** (3.18-3.56)	3.37*** (3.18-3.56)	3.37*** (3.19-3.56)	3.37*** (3.18-3.56)
Single family (ref: non-single family)		2.01*** (1.89-2.13)	2.00*** (1.88-2.12)	2.01*** (1.89-2.14)	2.01*** (1.89-2.13)	2.01*** (1.89-2.13)	2.01*** (1.89-2.14)
Immigrants (ref: non-immigrants)		0.63*** (0.53-0.75)	0.63*** (0.53-0.75)	0.63*** (0.52-0.75)	0.63*** (0.52-0.75)	0.63*** (0.52-0.75)	0.63*** (0.52-0.75)
Aboriginal (ref: non-aboriginal)		1.47*** (1.33-1.62)	1.44*** (1.31-1.59)	1.46*** (1.32-1.62)	1.45*** (1.31-1.61)	1.45*** (1.31-1.60)	1.45*** (1.31-1.61)
Income (continuous)		0.94*** (0.93-0.96)	0.94*** (0.93-0.95)	0.94*** (0.93-0.95)	0.94*** (0.93-0.96)	0.94*** (0.93-0.95)	0.94*** (0.93-0.95)
Employment status (ref: employed)							
non-employed		1.74*** (1.63-1.86)	2.77*** (2.36-3.25)	2.05*** (1.83-2.30)	2.18*** (1.79-2.66)	2.47*** (2.17-2.82)	2.24*** (1.99-2.56)
Expenditure			1.01 (0.98-1.03)	1.02 (0.96-1.09)	1.13 (0.53-2.38)	0.97 (0.68-1.37)	1.07 (0.79-1.47)
non-employed*Expenditure			0.99* (0.98-0.99)	0.98* (0.97-0.99)	0.79* (0.66-0.94)	0.88*** (0.84-0.92)	0.91* (0.87-0.95)
Random parameter (Level 2)							
Intercept	0.065*	0.067*	0.070*	0.065	0.064***	0.068*	0.068*
-2loglikelihood	89322.08	87075.73	87065.51	87070.54	87068.32	87071.63	87069.24

Squared age were included and significant in the models but not presented.

Model 3 includes total government expenditures;

Model 4 included are expenditures on total social services;

Model 5 included are expenditures on workers' compensation;

Model 6 included are expenditures on social assistance ;

Model 7 included are other social services expenditures

Results: Sensitivity analysis

Parameter	Model 1	Model 2	Model 4	Model 5	Model 6	Model 7
Intercept	-4.60***	-4.42***	-4.56***	-4.54***	-4.51***	-4.53***
Individual-level						
Age (continuous)	0.99*** (0.98-0.99)	0.99*** (0.98-0.99)	0.99***(0.98-0.99)	0.99***(0.98-0.99)	0.99***(0.98-0.99)	0.99***(0.98-0.99)
Gender (ref: women)	3.36*** (3.18-3.56)	3.37*** (3.18-3.57)	3.37***(3.18-3.56)	3.37***(3.18-3.56)	3.37***(3.18-3.56)	3.37***(3.18-3.56)
Single family (ref: non-single)	2.01*** (1.88-2.14)	2.01*** (1.88-2.14)	2.01***(1.88-2.14)	2.01***(1.88-2.14)	2.01***(1.88-2.14)	2.01***(1.89-2.14)
Immigrants (ref: non-immigrants)	0.63*** (0.58-0.68)	0.63*** (0.58-0.68)	0.63***(0.58-0.68)	0.63***(0.58-0.68)	0.63***(0.58-0.68)	0.63***(0.52-0.75)
Aboriginal (ref: non-aboriginal)	1.47*** (1.33-1.62)	1.45*** (1.32-1.60)	1.45***(1.32-1.61)	1.45***(1.32-1.60)	1.45***(1.31-1.60)	1.45***(1.31-1.61)
Income (continuous)	0.94*** (0.93-0.95)	0.94*** (0.93-0.95)	0.94***(0.93-0.95)	0.94***(0.93-0.95)	0.94***(0.93-0.95)	0.94***(0.93-0.95)
Employment (ref: employed)						
non-employed	1.74*** (1.64-1.85)	3.26*** (2.26-4.7)	2.05***(1.77-2.39)	2.18***(1.75-2.74)	2.43***(1.90-3.10)	2.24***(1.83-2.75)
Cross-level interaction						
non-employed*Expenditure		0.99* (0.98-1.00)	0.98* (0.96-1.00)	0.79* (0.63-0.99)	0.88***(0.81-0.97)	0.91* (0.84-0.98)
-2loglikelihood	87074.64	87072.3	87069.3	87070.51	87067.29	87068.12
Pseudo R square	0.0391	0.0392	0.0392	0.0392	0.0392	0.0392

Squared age were included and significant in the models but not presented.

Discussion: Strengths

- Reliability: large sample and long follow-up years
- Disaggregated expenditure
- Addressed indifference to need in measuring welfare generosity
- Able to conduct a comparative case study over Canadian provinces after adjusting for individual-level factors

Discussion: Limitations

- Individual-level factors were measured only at the baseline: employment status, residences, familial status, etc.
- Unobserved confounders at both individual and provincial level
- Qualities of social policy were not considered

Conclusion

- The random intercept is small, but significant, which means that there is a random variance in suicide mortality across Canadian provinces to be explained.
- Expenditures on total social services and social assistance were significantly associated with suicide inequalities.
- The unemployed benefit more from higher social expenditure than the employed.

Q & A

- Thank you!