

Socio-economic inequities in dietary sodium consumption among Canadian adults

Lindsay McLaren PhD

Associate Professor and Alberta Innovates-Health Solutions
Population Health Investigator
University of Calgary



Background

- Excess sodium consumption is a significant public health concern
- Socio-economic inequities in sodium consumption seem likely, but have not been well-studied
- Backdrop: growing number of countries are developing national sodium reduction strategies
 - Canada

Study purpose

- To examine the association between indicators of socio-economic circumstances and sodium consumption among Canadian adults, in 1970/72 and 2004.

Methods

- Data sources
 - 1970-72 Nutrition Canada Survey
 - 2004 Canadian Community Health Survey (Cycle 2.2)

Methods (cont'd)

- Variables

Outcome variables	Key predictor variables	Covariates
Sodium consumption (mg/day) from 24-hour recall	Income (total family income from all sources in 1970/72; household income adequacy in 2004)	Age Region of residence Urban/rural Employment status Marital status Birthplace (Canada/other)
Reported use of table salt (yes/no)	Education (ordered 4 category variables based on # years of education in 1970/72; 4 category variable based on credentials in 2004)	Energy intake (kcal)

Methods (cont'd)

- Analysis
 - Sodium consumption, mg/day
 - OLS regression
 - Concentration index of income- and education- related inequality
 - CCHS 2004 only:
 - Estimated usual intake distribution using NCI macro
 - Compared 10th, 25th, 50th, 75th, 90th percentile, and mean, estimates using SES groups
 - Reported use of table salt (yes/no)
 - Binary logistic regression (reported use of table salt)

Results

** p<.01; *p<.05; † p<.10

Men – Results of OLS regression (sodium in mg/day) in 1970/72 (n=1,974) and 2004 (n=4,837)

Predictor variable		NCS 1970-72			CCHS 2004		
		Unadjusted estimates ¹ Coefficient (95% CI)	Partially adjusted model ² Coefficient (95% CI)	Fully adjusted model ³ Coefficient (95% CI)	Unadjusted estimates ¹ Coefficient (95% CI)	Partially adjusted model ² Coefficient (95% CI)	Fully adjusted model ³ Coefficient (95% CI)
Income (ref: low)	Middle	116.4 (-256.4 to 489.3)	-27.3 (-460.2 to 405.6)	-67.1 (-390.9 to 256.8)	172.3 (-147.6 to 492.2)	100.6 (-232.9 to 434.0)	6.8 (-200.2 to 213.7)
	High	-110.3 (-503.9 to 293.3)	-205.2 (-632.1 to 221.7)	-301.8 (-667.8 to 64.3)	69.5 (-251.5 to 390.5)	45.7 (-305.4 to 396.8)	-17.4 (-243.7 to 209.0)
Education (ref lowest)	Low-mid	95.4 (-195.1 to 386.0)	56.9 (-232.2 to 345.9)	5.5 (-233.9 to 245.0)	52.7 (-270.1 to 375.5)	-31.1 (-366.3 to 304.1)	82.8 (-154.0 to 319.7)
	Mid-high	11.4 (-409.0 to 431.7)	-14.6 (-411.4 to 382.2)	-119.4 (-469.5 to 230.8)	42.1 (-265.4 to 349.5)	-81.1 (-406.2 to 243.9)	2.2 (-233.4 to 237.8)
	Highest	-257.7 (-647.4 to 131.9)	-158.3 (-575.7 to 259.2)	-49.7 (-479.1 to 379.7)	147.6 (-457.1 to 161.9)	-238.3 (-585.7 to 109.2)	-141.2 (-408.5 to 126.1)

** p<.01; *p<.05; † p<.10

Women – Results of **OLS regression** (sodium in mg/day) in 1970/72 (n=2,566) and 2004 (n=5,612)

Predictor variable		NCS 1970-72			CCHS 2004		
		Unadjusted estimates ¹ Coefficient (95% CI)	Partially adjusted model ² Coefficient (95% CI)	Fully adjusted model ³ Coefficient (95% CI)	Unadjusted estimates ¹ Coefficient (95% CI)	Partially adjusted model ² Coefficient (95% CI)	Fully adjusted model ³ Coefficient (95% CI)
Income (ref: low)	Middle	152.2 (-35.0 to 339.5)	166.9 (-39.2 to 373.0)	68.8 (-103.2 to 240.8)	83.7 (-94.8 to 262.2)	18.0 (-168.8 to 204.8)	-5.6 (-152.0 to 140.7)
	High	-2.3 (-226.7 to 222.0)	102.7 (-133.1 to 338.5)	-46.3 (-257.4 to 164.8)	116.2 (-51.8 to 284.1)	54.9 (-140.9 to 250.7)	54.5 (-105.0 to 214.0)
Education (ref lowest)	Low-mid	-147.9 (-354.0 to 58.3)	-173.6 (-380.3 to 33.2)	-216.7 (-406.6 to -26.7)*	138.3 (-63.6 to 340.1)	151.8 (-58.5 to 362.1)	-15.5 (-191.4 to 160.4)
	Mid-high	52.3 (-245.6 to 350.2)	91.9 (-224.4 to 408.3)	-16.7 (-286.4 to 253.0)	383.5 (169.9 to 597.0)**	352.5 (129.0 to 576.1)**	106.0 (-80.5 to 292.5)
	Highest	-350.3 (-671.7 to -28.9)*	-362.3 (-709.3 to -15.3)*	-473.2 (-795.4 to -151.0)**	244.7 (28.2 to 461.1)*	223.3 (-16.7 to 463.3)†	-90.5 (-299.6 to 118.6)

**** p<.01; *p<.05; † p<.10**

Results (cont'd)

- **Concentration index**

- Women, 2004:

- Education-related inequality: 0.007 [95% confidence interval 0.002 to 0.012], $p=.011$

- **Estimated usual intake distribution**

- One effect only: women in middle-high education category (mean 2860.8 mg/day, SE 96.7) > women in lowest education category (mean 2466.8 mg/day, SE 114.8), $t=2.6$

Men – Results of **binary logistic regression** (reported use of salt) in 1970/72 (n=1,974) and 2004 (n=4,837)

Predictor variable		NCS 1970-72			CCHS 2004		
		Unadjusted estimates ¹ Odds ratio (95% CI)	Partially adjusted model ² Odds ratio (95% CI)	Fully adjusted model ³ Odds ratio (95% CI)	Unadjusted estimates ¹ Odds ratio (95% CI)	Partially adjusted model ² Odds ratio (95% CI)	Fully adjusted model ³ Odds ratio (95% CI)
Income (ref: low)	Middle	3.6 (1.3 to 9.6)*	3.30 (.90 to 12.1)†	3.6 (.93 to 14.1)†	1.4 (.86 to 2.1)	1.09 (.69 to 1.7)	1.08 (.68 to 1.7)
	High	3.1 (.91 to 10.7)†	2.8 (.55 to 13.8)	2.96 (.53 to 16.4)	.67 (.45 to 1.02)†	.50 (.31 to .80)**	.49 (.31 to .79)**
Education (ref: lowest)	Low-mid	1.5 (.57 to 3.8)	.79 (.026 to 2.4)	.69 (.23 to 2.1)	1.2 (.66 to 2.3)	1.2 (.60 to 2.2)	1.2 (.60 to 2.2)
	Mid-high	6.4 (.82 to 50.9)†	3.6 (.38 to 34.5)	3.2 (.33 to 30.7)	.76 (.44 to 1.3)	.68 (.38 to 1.2)	.69 (.38 to 1.2)
	Highest	1.9 (.38 to 9.6)	.76 (.12 to 5.0)	.58 (.09 to 3.9)	.86 (.47 to 1.6)	.88 (.46 to 1.7)	.89 (.46 to 1.7)

**** p<.01; *p<.05; † p<.10**

Women – Results of **binary logistic regression** (reported use of salt) in 1970/72 (n=2,566) and 2004 (n=5,612)

Predictor variable		NCS 1970-72			CCHS 2004		
		Unadjusted estimates ¹ Odds ratio (95% CI)	Partially adjusted model ² Odds ratio (95% CI)	Fully adjusted model ³ Odds ratio (95% CI)	Unadjusted estimates ¹ Odds ratio (95% CI)	Partially adjusted model ² Odds ratio (95% CI)	Fully adjusted model ³ Odds ratio (95% CI)
Income (ref: low)	Middle	.90 (.29 to 2.7)	.59 (.16 to 2.1)	.59 (.16 to 2.1)	.94 (.61 to 1.4)	.81 (.52 to 1.3)	.80 (.51 to 1.3)
	High	.93 (.23 to 3.8)	.45 (.13 to 1.6)	.45 (.13 to 1.6)	.74 (.47 to 1.2)	.64 (.40 to 1.03)†	.64 (.40 to 1.03)†
Education (ref: lowest)	Low-mid	.92 (.33 to 2.6)	.70 (.27 to 1.8)	.70 (.27 to 1.8)	1.2 (.69 to 2.2)	1.5 (.85 to 2.6)	1.4 (.82 to 2.5)
	Mid-high	.67 (.13 to 3.4)	.50 (.13 to 1.9)	.50 (.13 to 1.9)	1.2 (.71 to 2.1)	1.4 (.85 to 2.5)	1.4 (.81 to 2.4)
	Highest	4.8 (.81 to 28.2)†	4.5 (.66 to 30.8)	4.5 (.65 to 30.9)	.88 (.48 to 1.6)	1.1 (.59 to 2.1)	1.05 (.54 to 2.03)

** p<.01; *p<.05; † p<.10

Summary of findings:

Men

- Effects for reported salt use only
- Effects for income only
- Association between income and reported salt use was positive in 1970/72 but negative in 2004
 - Emerging inequity?

Women

- Effects for sodium consumption (mg/day) only
- Effects for education only
- Association between education and sodium consumption in mg/day was negative in 1970/72 but positive in 2004
 - 1970/72 effect questionable

Discussion points

- No indication of contemporary socio-economic inequity in sodium consumption (mg/day)
- Why not?
 - Our findings are faulty → data limitations
 - Our findings are true → sodium is an exception to socio-economic patterning of nutrients
 - Our findings truly reflect the present but not necessarily the future → as prevalence of excess consumption declines, inequities could emerge
 - Fundamental cause theory

Discussion points (cont'd)

- It is important to have a national sodium reduction strategy that is both impactful and equitable.

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