

Variation in Compliance with Cancer Screening Guidelines Across Canadian Provinces

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May 12, 2009

Overview

- Guidelines codify existing knowledge regarding clinical “best practice”
- Do guidelines affect:
 - Clinical practice?
 - Diagnosis of incident disease?
 - Health outcomes/mortality?
- For preventive screening, what’s the “right” balance of costs and benefits?
 - Current debate about PSA screening

Clinical Screening Guidelines

- Come from governmental organizations like the CTFPHC and from disease-specific entities like the Canadian Cancer Society
- Based on evidence from clinical trials
- Describe some/all: test, start age, periodicity, end age
- Usually rated (i.e., A to D) depending on the strength of the clinical evidence

Cancer Screening Guidelines

	Canada
Breast Cancer	Age 50-69: Mammography and CBE, 1-2 years
Colorectal Cancer	Age 50+: FOBT, sigmoidoscopy, 1-2 years; insufficient evidence for colonoscopy
Prostate Cancer	Age 50-70: insufficient evidence for/against DRE; PSA not to be used (CCS recommends discussing PSA)

Guidelines from Canadian Task Force on Preventive Health Care. Canadian Cancer Society's recommendations are the same unless noted.

Provincial Cancer Breast Cancer Screening Programs

- All 10 provinces and 2 territories offer organized screening programs
- All target asymptomatic women 50-69, but some are broader
- Focused on mammography, some include clinical breast examination
- Many programs offer mobile service to achieve greater reach
- Eligible women actively recruited through invitation letters

Previous Literature

- Many articles exist examining the use of cancer screenings at recommended ages in Canada
 - Generally find screening rates below 100% and conclude that guidelines are often not followed for target subpopulations
 - Examine patient- and physician-level predictors of cancer screening
 - Johnson et al 1996, Miedema et al 2003, Rabeneck et al 2004, Bancej et al 2005, Beaulac et al 2006, Sewitch et al 2007, Zarychanski et al 2007, Blackwell et al 2008
 - Role of provincial cancer screening programs
 - Paquette et al 2000, Rijnsburger et al 2004, Jatoi et al 2003

Previous Literature

- But understanding whether guidelines *affect* screening rates requires comparison with a valid control group
 - We examine screening probabilities just below and above the guidelines' recommended age to initiate screening
 - Only Tudiver et al (1998) and Abdel-Malek et al (2008) compare screening rates in the target age group with non-targeted age group

Data

- Cancer screening rates (individual-level data)
 - Canadian Community Health Survey, 2003 & 2005
- Provincial Cancer Screening Programs
 - Organized Breast Cancer Screening Programs in Canada (PHAC)
 - Provincial Health Ministries or the screening programs themselves

Empirical Strategy

- Do age-specific screening rates change discretely at the recommended initiation age?
- Logistic regression:
Screen in past 2 years = $\alpha + \beta_1 \text{agecutoff} + \dots + \varepsilon$
- Gender-appropriate subsample, 20 years around age cutoff
- Age, age², age³
- Race (white/non-white)
- Household income quartiles
- Marital status (5 categories)
- Education (4 categories)
- Sex (where applicable)

Screening Rates by Region

Percent	CAN	Atlantic	QC	ON	SK	Prairies	BC
Mammography last 2 years							
40-49	33.9	41.8	24.4	34.2		36.1	42.1
51-60	72.9*	73.5*	75.8*	73.0*		72.6*	67.0*
CRC Screening last 2 years							
40-49	9.7	8.3		10.3	6.2		8.9
51-60	24.3*	18.0*		28.0*	19.8*		17.8*
PSA last 2 years							
40-49	18.4	21.4		19.8			14.9
51-60	49.1*	52.6*		52.9*			42.2*

CCHS 2.1 (2003) and 3.1 (2005). * $p \leq .05$ relative to younger age group.

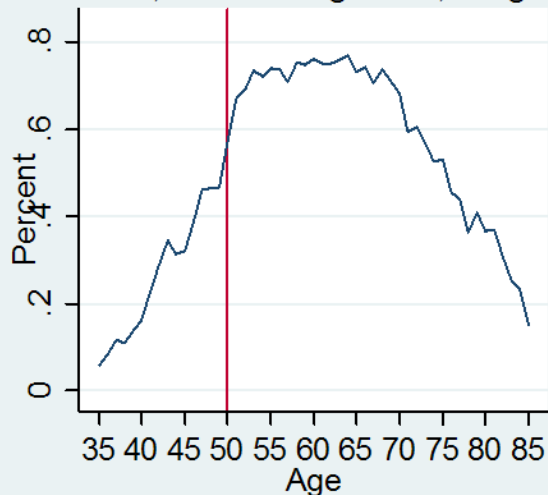
Regression Results: Canada

Mammogram		
Age \geq 50	1.489**	9.9% points
N, Age 40-60		20, 554
CRC Screening		
N, Age 40-60	1.114	1.3% points
		23,802
PSA	1.052	1.0% points
N, Age 40-60		7,564

* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$. Data: Mammography CCHS 2005, CRC and PSA CCHS 2003 and 2005; weighted. Log odds, standard errors in brackets. Age trends: age, age², age³. Demographics: white, non-white, household income (4), marital status (5), education (4), sex (crc), and year (crc and psa).

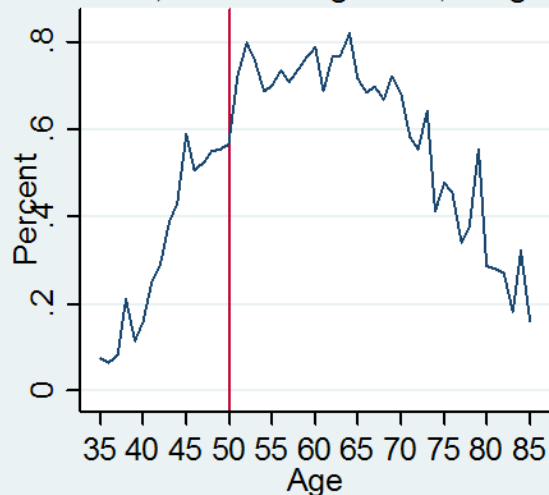
Mammography, Canada

2 Years, Women Age 35+, weighte



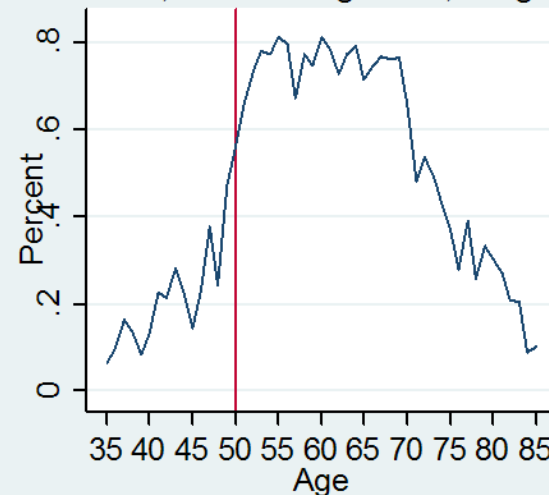
Mammography, Region 10

2 Years, Women Age 35+, weighte



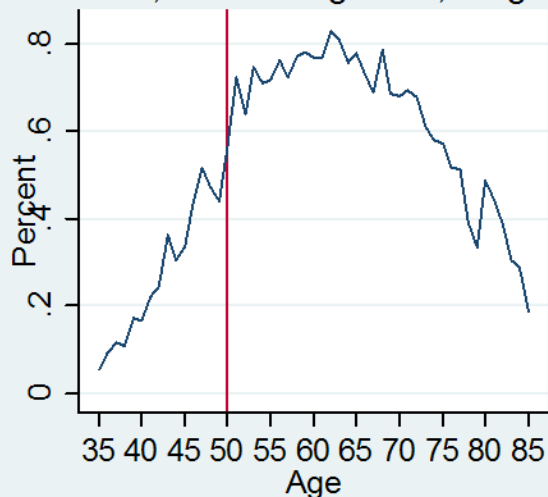
Mammography, Region 24

2 Years, Women Age 35+, weighte



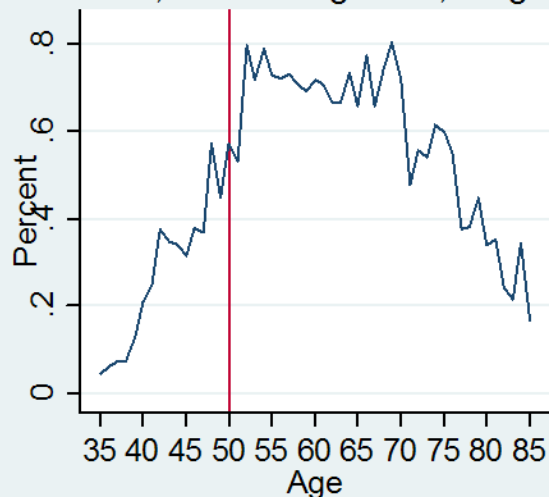
Mammography, Region 35

2 Years, Women Age 35+, weighte



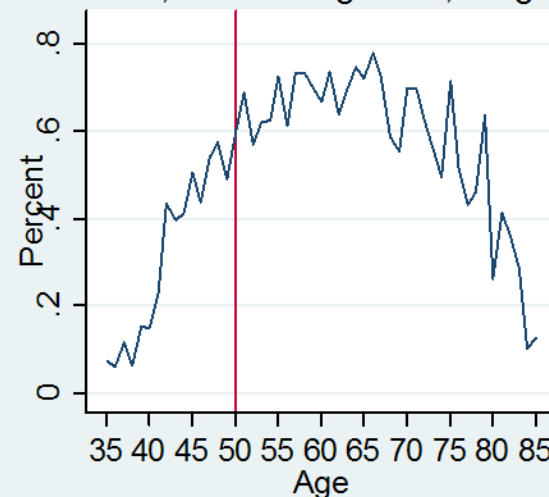
Mammography, Region 40

2 Years, Women Age 35+, weighte



Mammography, Region 59

2 Years, Women Age 35+, weighte



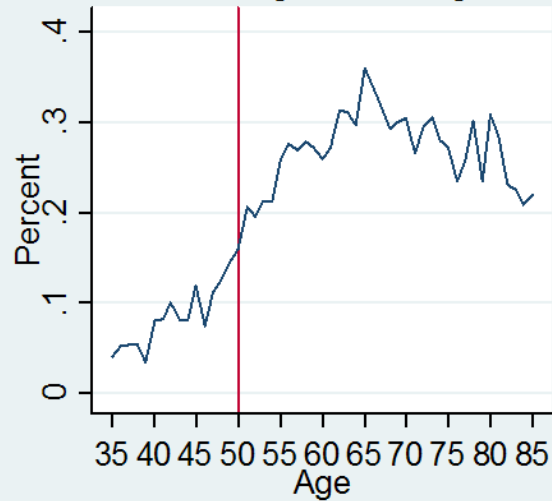
Mammogram in Last 2 Years

	Atlantic	QC	ON	Prairies	BC
Age>=50	1.695	2.166**	1.317	1.323	1.237
	[.581]	[.594]	[.299]	[.411]	[.437]
N (40-60)	2,745	4,885	6,341	3,849	2,324
Age>=40	.896	2.014*	1.100	2.261*	1.416
	[.354]	[.718]	[.319]	[.830]	[.626]
Age>=45	1.232	.352***	.807	.542	.802
	[.417]	[.100]	[.198]	[.183]	[.276]
N (35-55)	2,637	4,592	6,328	3,883	2,338

Data: CCHS 3.1, weighted. * $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$. Standard errors in brackets. All models include age trends and demographic controls. Age trends: age, age², age³, age⁴. Demographics: white, non-white, household income (4), marital status (5), education (4).

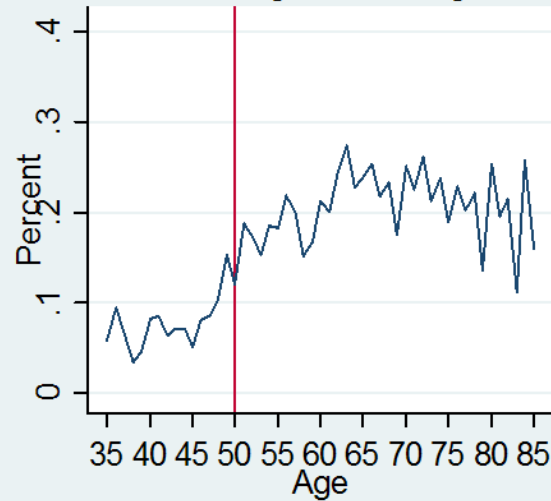
CRC Screening, Canada

2 Years, Age 35+, weighted



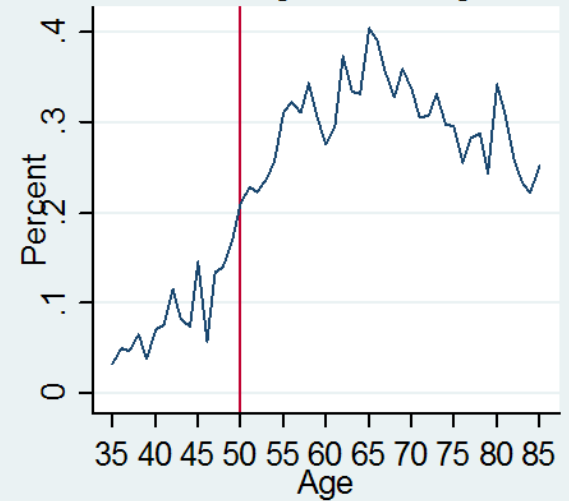
CRC Screening, Region 10

2 Years, Age 35+, weighted



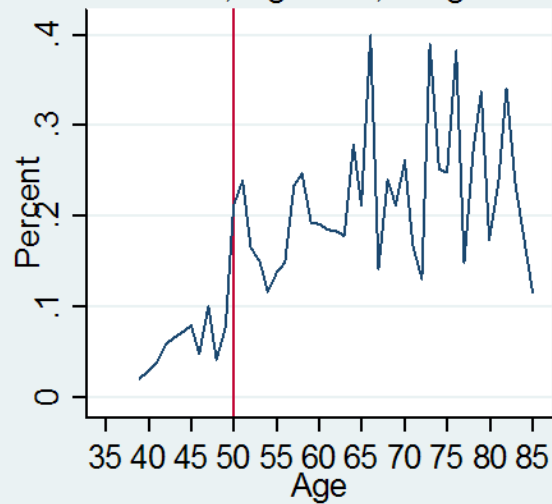
CRC Screening, Region 35

2 Years, Age 35+, weighted



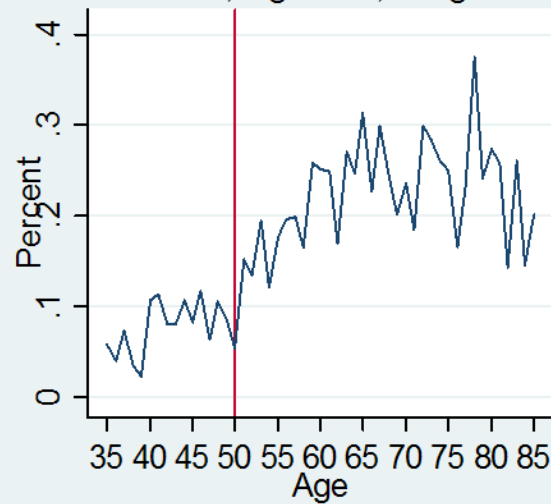
CRC Screening, Region 47

2 Years, Age 35+, weighted



CRC Screening, Region 59

2 Years, Age 35+, weighted

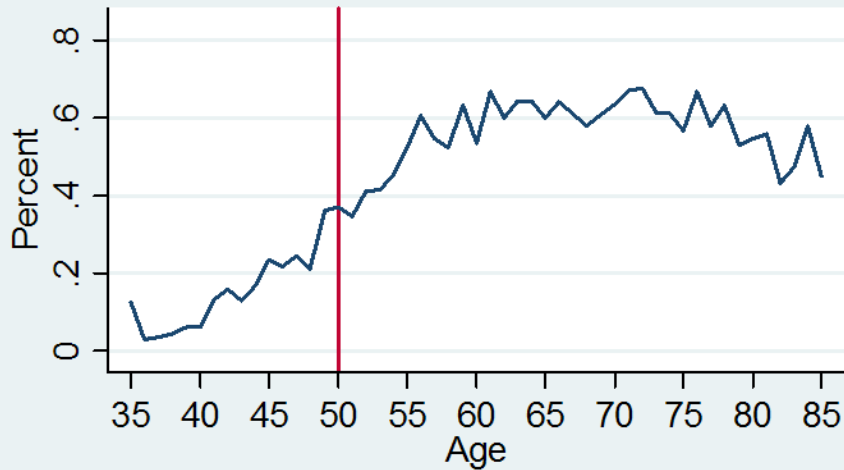


Colorectal Cancer Screening in Last 2 Years

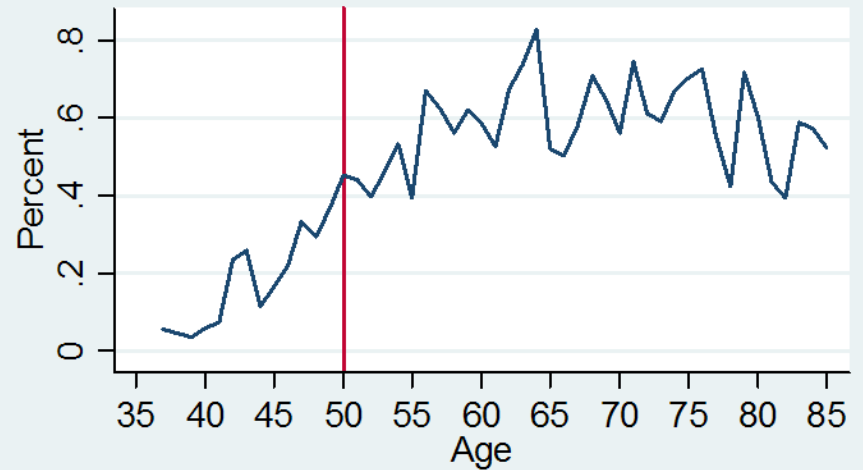
	Atlantic	ON	SK	BC
Age \geq 50	.830	1.145	4.374*	.977
	[.302]	[.256]	[2.929]	[.334]
N (40-60)	5,005	12,112	1,149	4,722
Age \geq 40	2.661*	1.577	1.124	3.268**
	[1.226]	[.471]	[1.021]	[1.404]
Age \geq 45	.684	1.047	2.289	.612
	[.270]	[.267]	[1.889]	[.241]
N (35-55)	4,838	12,351	1,182	4,866

Data: CCHS 2.1 and 3.1, weighted. * $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$. Standard errors in brackets. All models include age trends and demographic controls. Age trends: age, age², age³, age⁴. Demographics: white, non-white, household income (4), marital status (5), education (4).

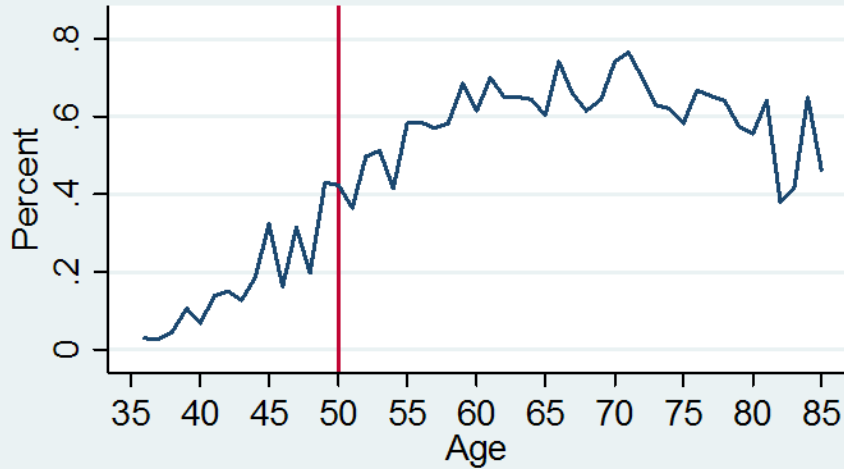
PSA Screening, Canada
2 Years, Age 35+, weighted



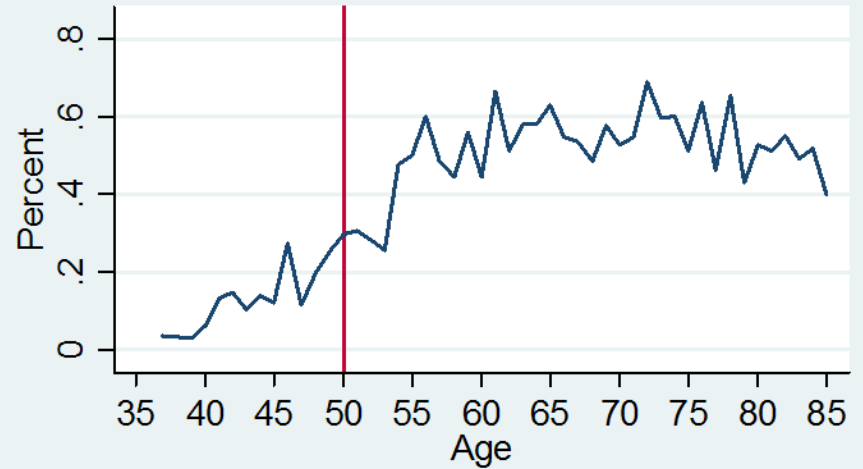
PSA Screening, Region 10
2 Years, Age 35+, weighted



PSA Screening, Region 35
2 Years, Age 35+, weighted



PSA Screening, Region 59
2 Years, Age 35+, weighted



PSA in Last 2 Years

	Atlantic	ON	BC
Age \geq 50	1.391	1.226	1.105
	[.673]	[.393]	[.441]
N (40-60)	1,533	3,353	2,230
Age \geq 40	1.373	.654	1.181
	[.758]	[.365]	[.820]
Age \geq 45	.679	1.218	1.017
	[.306]	[.460]	[.469]
N (35-55)	1,497	3,522	2,333

Data: CCHS 2.1 and 3.1, weighted. * $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$. Standard errors in brackets. All models include age trends and demographic controls. Age trends: age, age², age³, age⁴. Demographics: white, non-white, household income (4), marital status (5), education (4).

Screening Programs: ON, BC, QC

	Ontario	British Columbia	Quebec
Year established	1990	1988	1998
Target age group ¹	50-69	40-79	50-69
Total # of screens in first year	590	4,395	43,987
Total # of screens in 2004	248,551	230,830	220,821
Average annual spending	33,406,538 ²	10,448,836 ³	N/A

¹ Defined as those not requiring physician referral

² Average of yearly estimates provided by the Ontario Ministry of Health, 2002-2009

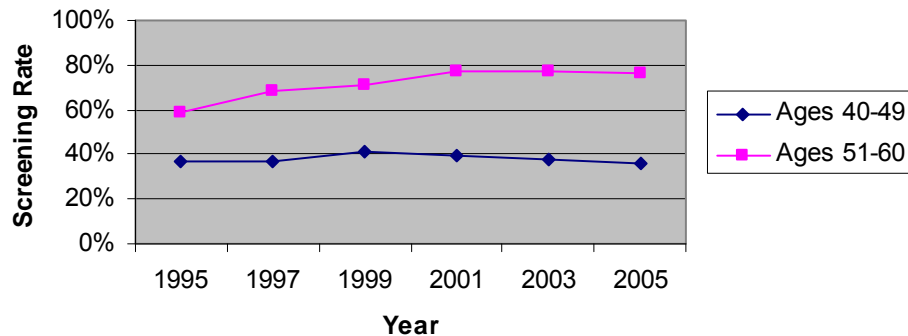
³ Average of expenses provided by the Screening Mammography Program of British Columbia, 1992-2008

Data from Organized Breast Cancer Screening Programs in Canada, unless indicated otherwise

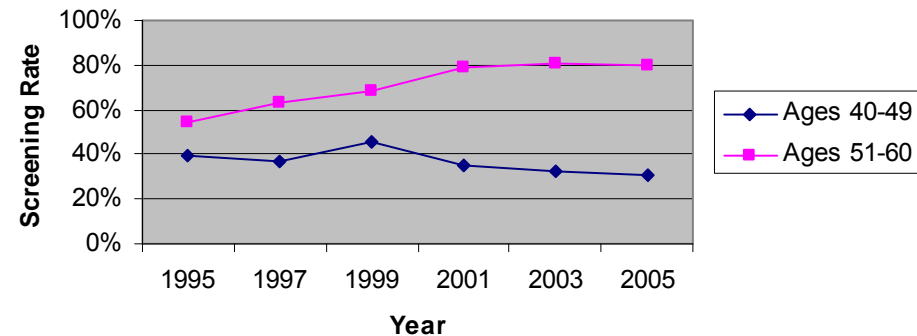
Screening Rate by Age Group

40-49 vs. 51-60

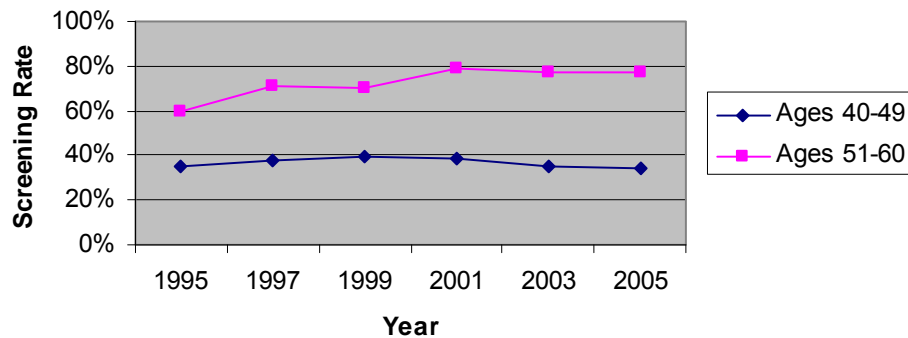
**Mammography Screening Rate
All Provinces**



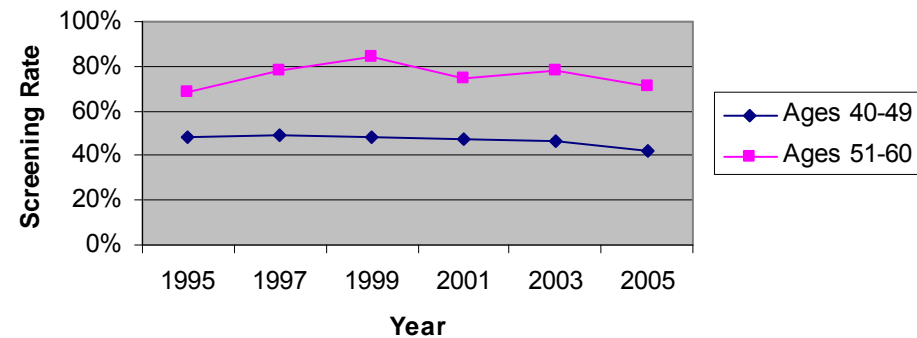
**Mammography Screening Rate
Quebec**



**Mammography Screening Rate
Ontario**



**Mammography Screening Rate
British Columbia**



Conclusions

- Clinical practice in Canada conforms to clinical guidelines for breast cancer screening, but not colorectal cancer screening
- Significant variation exists across provinces, with some exhibiting an earlier initiation age than recommended
- Early results suggest that provincial breast cancer screening programs may play a role in compliance with, or deviation from, clinical guidelines from national agencies