The "McMaster Pilot" – and The Increased Concentration of Health Care Expenditure on the Elderly: The Role of Technological Innovation

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Increasing costs

- Public expenditures on health care are rising faster than in almost other category
- – *much* faster than most others, including education

Population aging?

- Such cost increases are often associated with population aging
- ZOMBIES!
- Per capita expenditures have increased at all ages –→ more intensive service provision
- In OECD only 11 percent of the expenditure increase is attributed to population aging
- Ministries of Health (should) have a great interest in understanding what is happening

“The McMaster Pilot”

- OMHLTC agreed in principal to provide physician and hospital data – but 5 years only
  - And to allow 3 projects
- Data files to go to StatCan under the Statistics Act
- The agreement with McMaster was signed in March 2005 and funds flowed right away
- Call for proposals – much interest!

Complications!

- Contract arrangements: OMHLTC & StatCan
- All research proposals to StatCan Policy Committee if any record linkage involved
- Files suited to approved proposals sent to RDC

More complications …

- OMHLTC-StatCan contract negotiations took more than 2 years; first useable files received in November 2007
- Researchers were left with only a few months to produce persuasive results
- We all delivered!
- OMHLTC “pleased”!

The Future

- Formal evaluation under way
- Hope is that similar data files will be readily available in (Ontario?) RDCs
- That could set the standard for other provinces

What data?

Data Files Available

	1994/95	1996/97	1999/00	2000/01	2001/02	2004/05
Medical Service Files*	√		√	√	√	√
DAD In-Patient	√		√	√	√	√
DAD Day Procedures	√		√	√	√	
NACRS Files						√
CCHS 1.1				√		
NPHS		√				

* based on OHIP claims and Reg'd Persons data

What projects?

RDC Health Data Pilot

			Linkages involving --				
Project	Approach	Title	Hosp	Phys	NACRS	NPHS 96/7	CCHS 1.1
1	1	Population dynamics of influenza	√	√	√		
	2	Knowledge-based system	?	?	?	?	?
2		Equity in the HC system	√	√	√	√	√
3	1	Analysis of age-utilization patterns	√	√	√	√	√
	2	Issues in tourist communities					
	3	Telehealth in First Nations communities					
	4	Arthritis	√	√	√		√
	5	Obesity	√	√	√		√

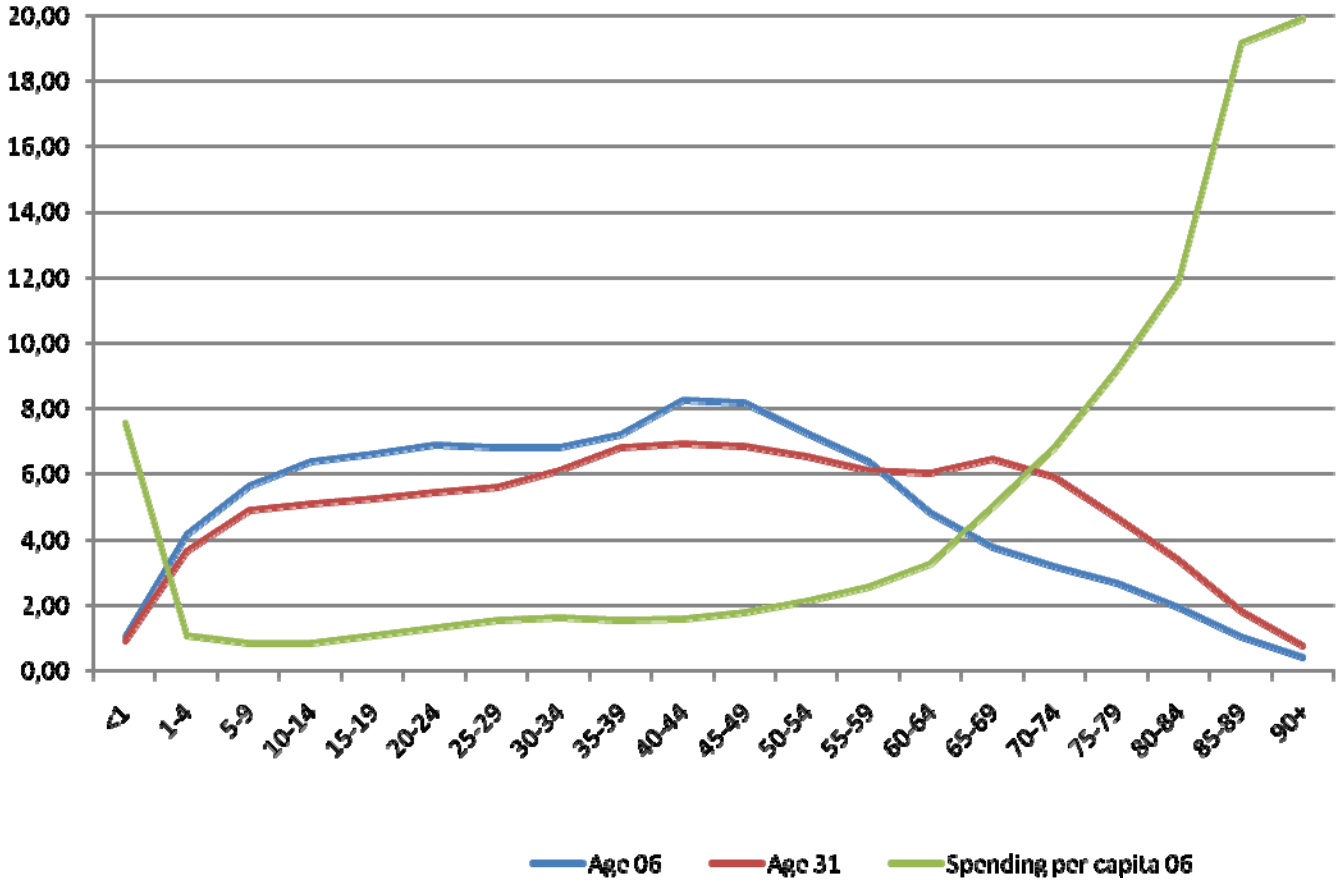
One Report -- on Increased Concentration of Health Care Expenditure …

- Grignon, Spencer, and Wang (McMaster)
- The problem: innovation, costs, and age-specific rates of diffusion
- The research questions:
  - can we identify age-specific rates of diffusion?
  - Can we measure changes over time?
- Data and Methods
- Findings

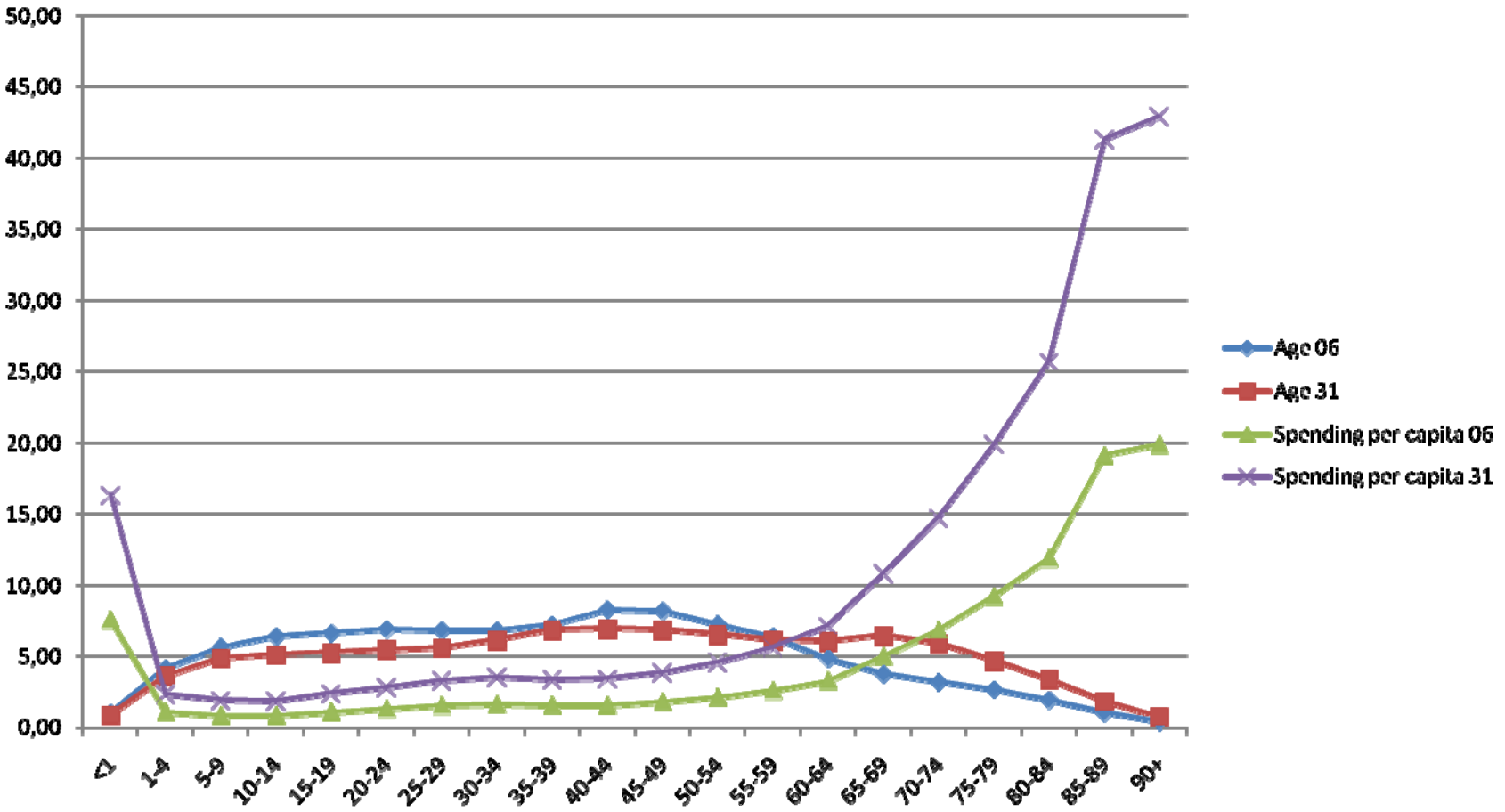
Drivers of health care costs

- Aging is a minor driver of rising health care costs (10 to 15% of past increases, max 25% of future increases)
- Innovation is the major driver by far (close to 50% according to Newhouse)
- Often seen as: aging is a wave, innovation a tsunami

Pop'n aging and (public) spending: the wave effect



Tsunami: impact of +3% per year at each age



Interaction between age and innovation

Interaction means: tsunami + changes in age profile of spending – Why study interaction?

Ratio of per capita spending 65+ to 0-64 varies across national health care systems: Canada has highest of OECD countries (at 5.3), versus US (3.8) and France (3.3)

Also changes over time within each country: was 5.0 in Canada in 1980, down to 4.8 in 1993 and up to 5.3 today. US: from 4.1 in 1996 to 3.8 today

Technology and the age profile of costs

- Two types of medical innovation:
  - High tech: based on understanding of biological mechanisms, prevents onset or development of disease (e.g. Vaccine)
  - Halfway tech: repairs the consequences of disease (e.g. CABG for AMI, cataract excision, symptomatic treatment for depression)
- High tech saves costs, halfway is ambiguous

Technology and age-cost profiles (2)

- Two effects of halfway technologies:
  - *Substitution*: cheaper intervention (e.g. drugs, not surgery)
  - *Expansion*: more patients (e.g., cataract excision, or angioplasty; Cutler and Huckman, 2002)
- If diffusion starts with younger patients (substitution) and expands to older ones, *interaction* is relevant

Technology and age-cost profiles (3)

- Younger patients benefit most from recent technology; OECD (Jacobzone)
- Rate of growth of treatments higher among elderly – catch-up demand; US (Fuchs)
- Potential model (Sheiner): rapid diffusion (higher g) or slow expansion (lower U) ➔ flatter profile

$$\frac{S_E}{S_Y} = \frac{P_E(1+gU)}{P_Y(1+g)}, U \leq 1$$

Why is the diffusion of technology age-related?

- Is it general health status, co-morbidities, severity, or age-based discrimination?
- We ask two questions:
  1. What factors influence the type of treatment received for a given condition (and what specific role of age)?
  2. Is there a change over time in the role of age?

Age profile of treatments

- Question 1 – can use linked administrative and survey data
  - CCHS 1.1: September 2000 to November 2001, N=32,848 from Ontario
  - linked to inpatient DAD from April 1999 to March 2002 – i.e., admin data from18 months prior to interview and 4 months after
- Question 2 – must use admissions data

Two types of results

- 1) Admission rates controlling for health status (using all linked observations)
- 2) Treatment received when admitted for specific diagnostic (here AMI – using AMI admissions, all five fiscal years)

Admission rates (1)

Table 1: Rates of hospitalization, by age and health status

		Age				70+ relative
		0-29	30-49	50-69	70+	to 0-29
All		7%	8%	11%	24%	3.4
Self assessed health	Fair+poor	17%	19%	25%	38%	2.2
	Excellent	7%	7%	6%	10%	1.4
Number of chronic conditions	Four +	18%	15%	20%	33%	1.8
	None	5%	5%	4%	11%	2.2
Limitation of activities	Often	18%	17%	24%	38%	2.1
	Never	7%	7%	8%	15%	2.1
Restrictions of activities	Often	11%	15%	21%	36%	3.3
	None	7%	7%	8%	15%	2.1

Source: CCHS 1.1 and inpatient data from the Discharge Abstract Database for fiscal years 1999-2000, 2000-01 and 2001-02

Admission rates (2): controlling for health

Table 2: Rates of hospitalization, by age and chronic condition

	Age				70+ relative
	0-29	30-49	50-69	70+	to 0-29
Thyroid problem	15%	11%	13%	27%	1.8
Migraines	12%	13%	16%	23%	1.9
Blood pressure	13%	10%	15%	26%	2.0
Bowel disorder	23%	16%	19%	46%	2.0
Arthritis	10%	10%	15%	26%	2.6
Back problems	10%	9%	13%	26%	2.6
Food allergies	8%	12%	14%	21%	2.6
Other allergies	10%	10%	14%	28%	2.8
Ulcers	13%	12%	23%	39%	3.0
Asthma	11%	16%	17%	34%	3.1
Diabetes	-	15%	20%	30%	-
Heart condition	-	33%	29%	38%	-
Cancer	-	24%	35%	40%	-
Effects of Stroke	-	-	32%	42%	-
Urinary disorder	-	20%	22%	33%	-

Source: CCHS 1.1 and inpatient data from the Discharge Abstract Database for fiscal years 1999-2000, 2000-2001, 2001-02

Note: "-" indicates cells with insufficient size or calculations not possible

Admission rates (3): controlling for combinations of conditions

Table 5: Rates of hospitalization, by age and most frequent of combinations of chronic conditions

	Age			70+ relative to <60
	<60	60-69	70+	
Heart condition + blood pressure + arthritis (no disabetes, no cancer)	32%	25%	33%	1.0
Heart condition + arthritis (no blood pressure, no diabetes, no cancer)	19%	35%	37%	1.9
Heart condition + blood pressure (no arthritis, no diabetes, no cancer)	33%	33%	44%	1.3
Blood pressure + arthritis (no heart condition, no diabetes, no cancer)	11%	12%	23%	2.1
Blood pressure + diabetes (no heart condition, no arthritis, no cancer)	17%	23%	20%	1.2
Blood pressure + diabetes + arthritis (no heart condition, no cancer)	15%	21%	16%	1.1

Source: CCHS 1.1 and inpatient data from Discharge Abstract Database for fiscal years 1999-2000, 2000-2001, 2001-02

Treatment received, AMI admissions

- Table 7: Distribution of inpatient stays according to the number of procedures received and patients admitted for AMI, by age. All years

Number of procedures during stay	Age Group				All
	0-49	50-59	60-69	70+	
	Percent distribution				
0	47.2	49.0	51.4	61.0	55.2
1	17.6	17.1	17.1	17.3	17.3
2	12.8	12.4	11.5	8.9	10.5
3	10.1	9.6	8.7	5.7	7.5
4+	12.2	12.0	11.3	7.1	9.5
All	100.0	100.0	100.0	100.0	100.0

- Source: Discharge Abstract Database, 1994-95, 1999-00, 2000-01, 2001-02, and 2004-05 combined
- Note: Row “0” indicates that no procedure beyond therapeutic treatment was provided.

Table 8: Distribution of main procedure provided to patients admitted for AMI (all admissions with procedures beyond therapeutic treatment) in each age category.

Procedure codes	Age			
	<50	50-59	60-69	70+
Angioplasty	21.20	19.02	16.05	9.73
Coronary Artery Bypass Graft	3.09	4.82	5.47	3.45
Other surgery	**37.66**	**36.64**	**35.56**	**28.99**
Other operations on heart and pericardium	*28.12*	*26.09*	*24.38*	*17.77*
Other operations on vessels of heart	*8.28*	*8.60*	*7.89*	*4.90*
Implantation of cardiac pacemaker system	*0.47*	*0.89*	*1.63*	*3.17*
Conversions of cardiac rhythm	*0.78*	*1.06*	*1.67*	*3.15*
Other non surgery	**34.03**	**34.63**	**35.19**	**43.26**
Diagnostic ultrasound	*6.48*	*7.03*	*7.59*	*11.00*
Other injection or infusion of other therapeutic or prophylactic substance	*16.49*	*14.48*	*12.41*	*10.71*
Other cardiac function tests	*4.15*	*5.03*	*5.18*	*6.06*
X-ray of face, head, and neck	*0.65*	*0.98*	*1.71*	*4.62*
Respiratory therapy	*0.53*	*1.05*	*2.06*	*4.06*
Cardiac stress tests and pacemaker checkes	*3.02*	*3.05*	*2.98*	*2.33*
X-ray of thorax	*0.62*	*0.84*	*1.03*	*1.68*
Injection or infusion of other therapeutic or prophylactic substance	*1.46*	*1.32*	*1.17*	*1.45*
X-ray of abdomen	-	-	-	*1.35*
Nuclear medicine	*0.63*	*0.86*	*1.05*	-
Other procedures (not among 15 most frequent)	**4.02**	**4.89**	**7.73**	**14.57**

- Note: The table shows the distribution of the 15 most frequent procedures in each age category. The last row indicates the proportion of procedures other than the 15 most frequent.

Future work

- Test our second hypothesis regarding the age driven expansion of treatments
  - by analysing the time path of adoption of innovations over several years
- Integrate information derived from day procedures and ambulatory care with the hospital inpatient records
- Investigate age patterns of adoption of technological innovations in: breast cancer, stroke, hip replacement
- Test whether general health status affects the probability of receiving surgery rather than medical management – using the linked dataset