

The Economic and Social Value of Innovation

Panos Kanavos

LSE Health & EHTI

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Agenda

- Objective: to outline some of the past and present evidence on the economic and social value of medical technology and identify the way(s) forward
- The past: Medical technology as a cost driver
- The present: Medical technology as a contributor to improvements in health status and the economy
- The future: where do we need to go from here

A. Medical Technology and its contribution to health care –
Technology as a cost driver

Measuring the impact of medical technology: The "Residual" approach

Fuchs, 1972

- Health expenditure 1947-1967 explained by
 - population growth (1.6%)
 - rise in prices (3.7%)
 - growth of real income (2.3%)
 - decline in demand due to price changes (-0.2%)
 - **residual (0.6%): technology increases costs**

Mushkin and Ladenfeld, 1979

- Health expenditure explained by
 - same as above
 - relative ageing of population (0.2%)
 - **residual (-0.5%): technology can lead to decrease in costs**

Measuring the impact of medical technology: Other Approaches

- The “service intensity” approach
(Freeland & Schendler, 1983; OTA, 1984)
- The “excess inflation” approach
(Atman & Blendon, 1979)
- The “cost of treatment” approach
(Scitowski & McCall, 1976; Scitowski, 1985)

“Service Intensity”

- ***“The rate increase in hospital costs has not occurred because more people have been going to hospital but because they spent more when they arrive” (Newhouse, 1993)***
- **Technological innovation accounted for one fifth to one fourth of total rise of hospital costs during the 1970s (Freeland and Schendler, 1983)**

"Cost of Treatment"

*Changes in LoS and use of Laboratory tests over time
(Scitowski, 1985)*

	<u>1964</u>	<u>1971</u>	<u>1981</u>
<u>Appendicitis</u>	<u>4.2</u>	<u>3.8[14.3]</u>	<u>3.5[19.2]</u>
<u>Myocardial infarction</u>	<u>19.7</u>	<u>18.8[81.3]</u>	<u>10.6[124.8]</u>
<u>Breast cancer</u>	<u>10.5</u>	<u>9.5[16.6]</u>	<u>3.3[32.9]</u>

- **cost of treating 9 conditions out of 11 increased from 1951 to 1971 (Scitowski & McCall, 1976); cost of treating 7 conditions out of 16 increased from 1971 to 1981 (Scitowski, 1985)**

Medical technology was often seen as ...

- ... a black box difficult to untangle
- ... a “residual” in a multi-factorial model
- ... responsible for increasing the volume of services provided to patients
- ... having positive impact on LoS, but very often cost increasing

B. Medical Technology and its contribution to health care – improvements in health status and contribution to growth?

The importance of medical innovation - value to medical professionals and patients

- 30 major technologies selected
- Survey relative importance of innovations among experts (N=274)
- What is the impact on patient health and welfare if medical technology is not available
 - Highest adverse effect from absence of innovations
 - Lowest adverse effect from absence of innovations
- Focus: benefits relative to best alternative treatment rather than absolute efficacy

Mean Response And Ranking Of Physicians' Ratings Of Innovations, 2001

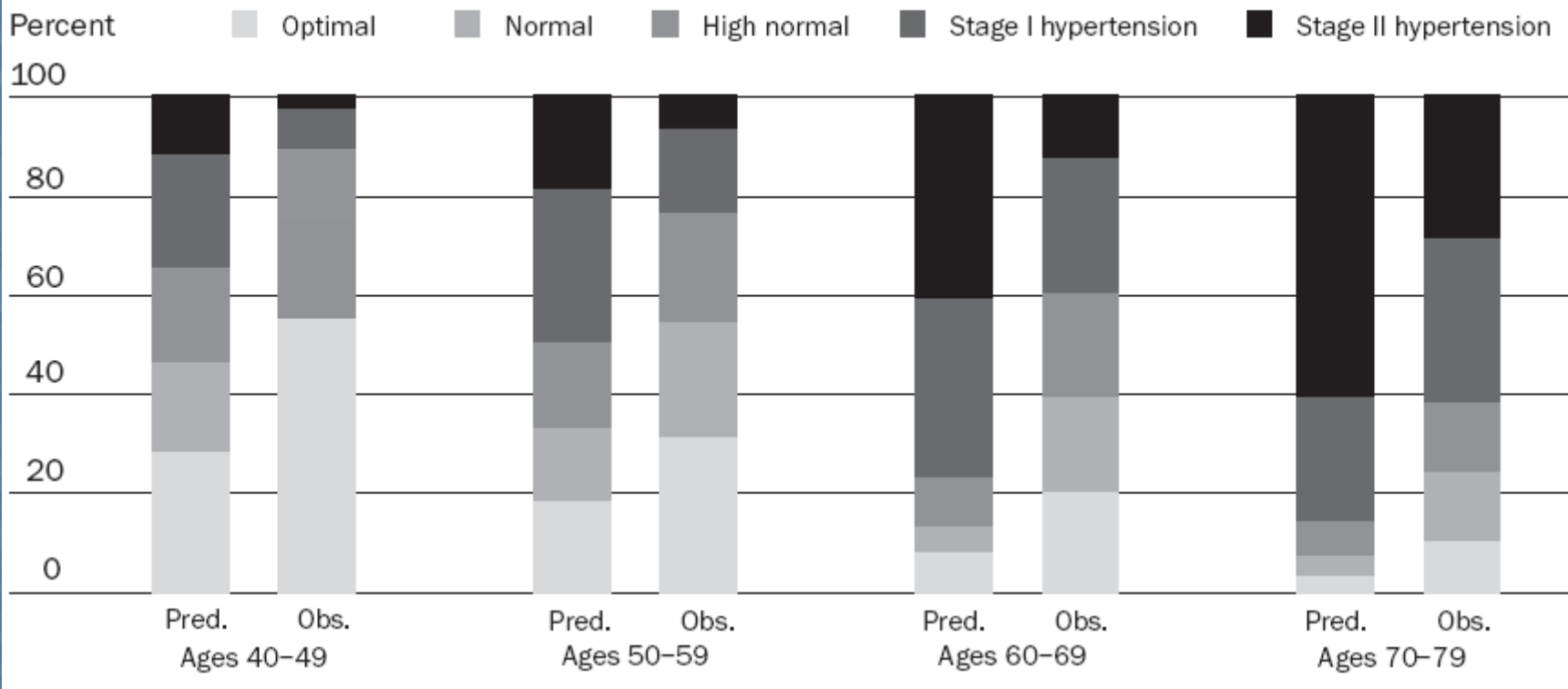
Rank	Innovation	Mean score ^a	Percent of respondents choosing		
			Most	Not most or least	Least
1	MRI and CT scanning	0.878	75.6%	24.4%	0.0%
2	ACE inhibitors	0.767	54.2	44.9	0.9
3	Balloon angioplasty	0.758	53.8	44.0	2.2
4	Statins	0.736	48.0	51.1	0.9
5	Mammography	0.733	47.6	51.6	0.9
6	CABG	0.693	40.4	57.8	1.8
7	Proton pump inhibitors and H2 blockers	0.687	40.0	57.3	2.7
8	SSRIs and recent non-SSRI antidepressants	0.678	39.6	56.4	4.0
9	Cataract extraction and lens implant	0.651	38.2	53.8	8.0
10	Hip and knee replacement	0.649	31.6	66.7	1.8
11	Ultrasonography	0.647	31.1	67.1	1.8
12	Gastrointestinal endoscopy	0.624	28.0	68.9	3.1
13	Inhaled steroids for asthma	0.591	23.6	71.1	5.3
14	Laparoscopic surgery	0.558	20.9	69.8	9.3
15	NSAIDs and Cox-2 inhibitors	0.531	14.2	77.8	8.0
All 30 innovations		0.520	22.3	59.6	18.2

Source: Fuchs and Sox, *Health Affairs*, 2001

- Diagnostic innovations have a higher mean score (0.570) than innovations taking the form of medicines (0.473) and lower than surgical innovations (0.583).
- Effect of innovations on length or/and quality of life was rated in a similar way

**The importance of medical innovation –
clinical benefits, health improvement &
economic consequences**

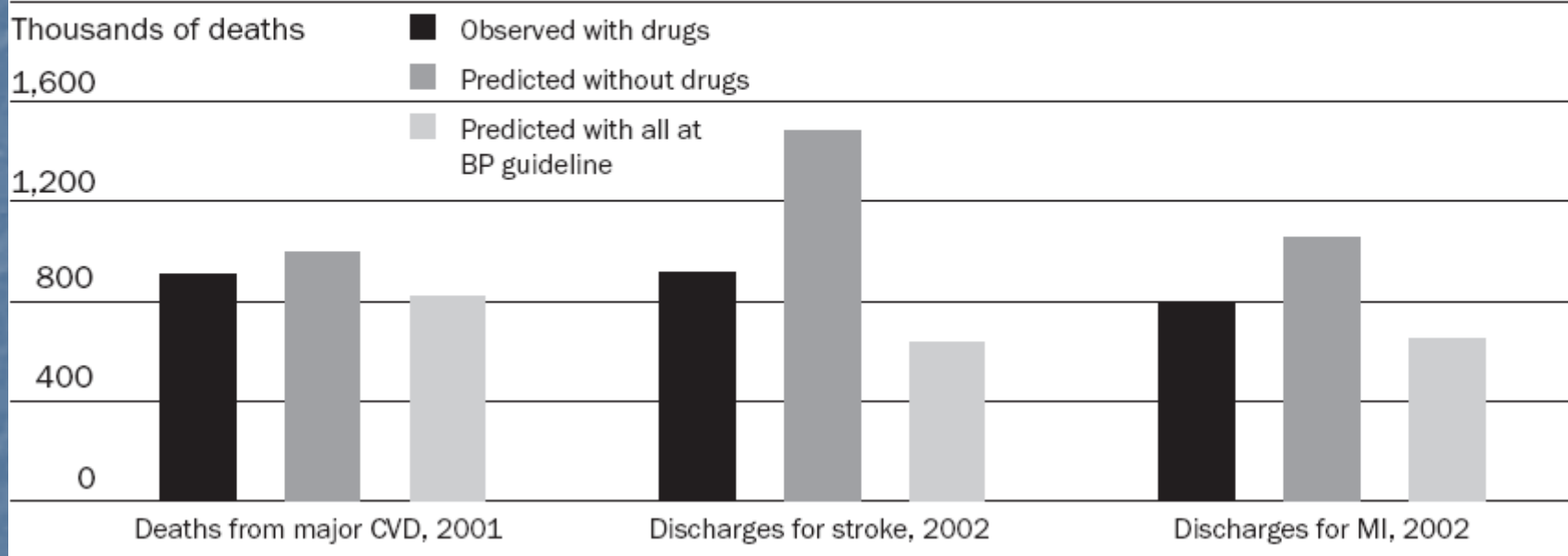
Blood Pressure Among Women, Predicted Without Drugs And Observed With Drugs, By Blood Pressure Level And Age Group, 1999–2000



Source: Cutler et al., *Health Affairs*, 2007

In the absence of anti-hypertensive drug therapy, average BPs for the population aged 40 and over would have been 10 – 13% higher

Deaths In 2001 And Hospital Discharges For Strokes And Myocardial Infarctions (MIs) In 2002 For Men And Women: Observed With Antihypertensive Drugs, Predicted Without Drugs, And Potential With All At Blood Pressure (BP) Guideline



Source: Cutler et al., *Health Affairs*, 2007

- 86,000 excess premature deaths from cardiovascular disease would have occurred in 2001 among the US population aged 40 and older without anti-hypertensive drug therapy
- 9% fewer deaths from major CVD, 38% fewer hospital discharges for stroke, 25% fewer hospital discharges for MI

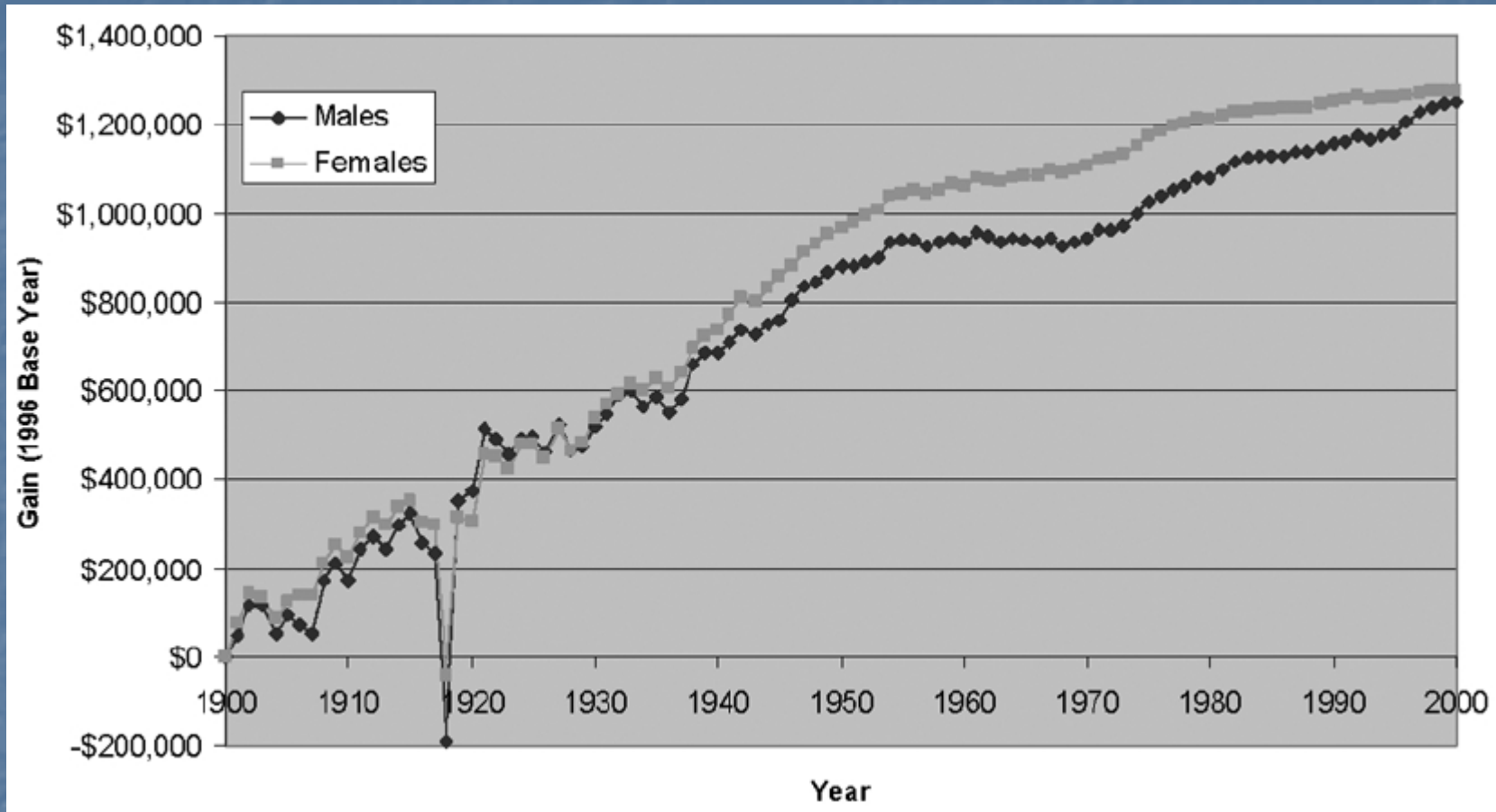
Estimated Avoided Direct Costs Resulting From Improved Blood Pressures, 2002

	Coronary heart disease	Cerebrovascular disease
Total direct expenditures (millions \$, 2002) ^a	\$58,470	\$29,786
Hospital care	33,352	12,358
All other	25,117	17,428
Avoided hospital discharges due to BP improvement (thousands, 2002) ^b	261	572
Average hospital care expenditures per discharge (\$, 2002) ^c	\$15,628	\$13,063
Avoided direct expenditures (millions \$, 2002) ^d	\$ 5,845	\$10,719
Hospital care	4,092	7,503
All other	1,754	3,216

Source: Cutler et al., *Health Affairs*, 2007

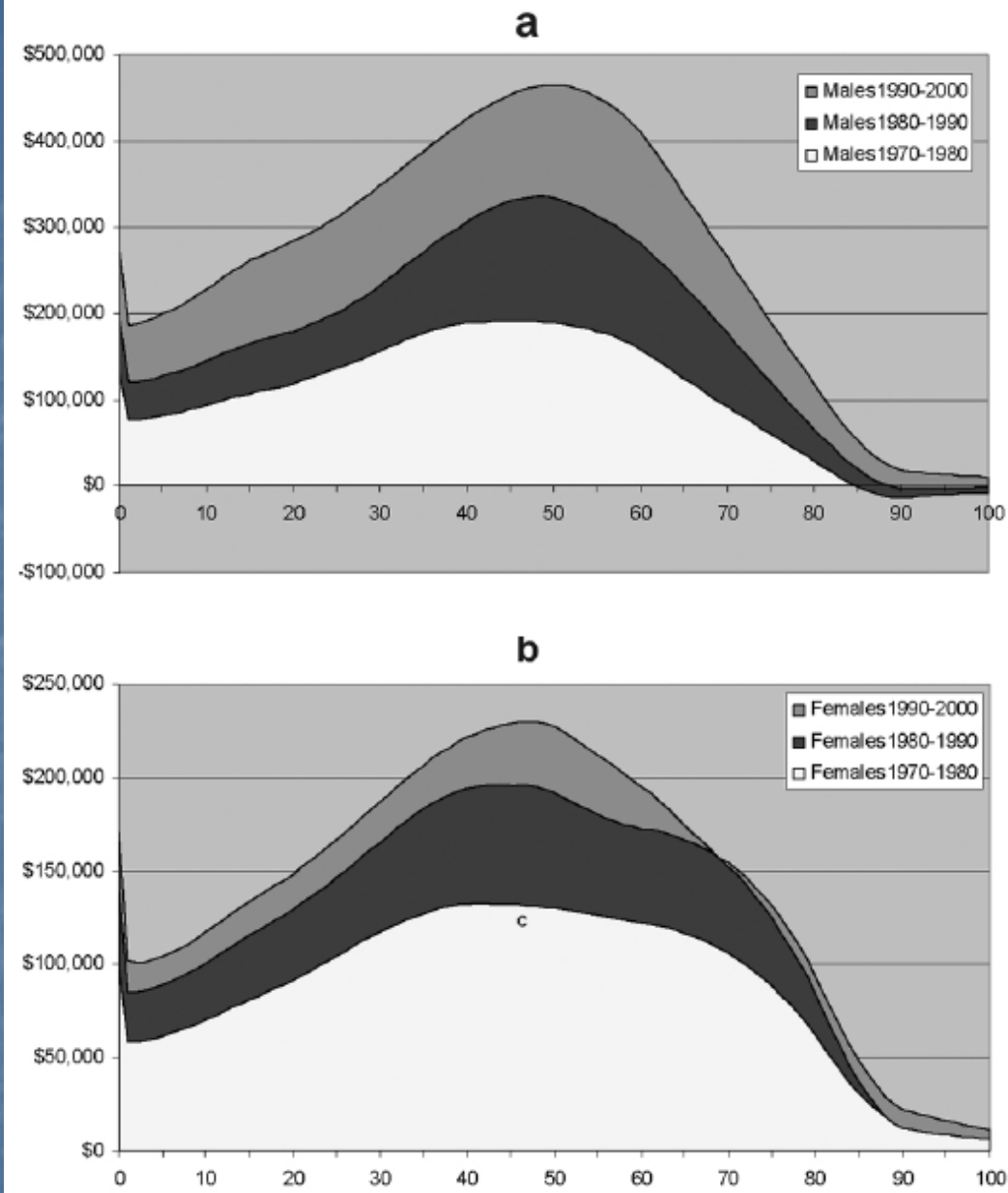
Significant avoidable hospitalisations and significant avoidable direct and indirect economic cost from improved blood pressure

Population-weighted cumulative value of longevity gains since 1900



Source: Murphy and Topel, *Journal of Political Economy*, 2006

Average gains for men and women (using end-of-century population weights) are estimated to be \$1.3 million for the representative individual of each sex.



Gains from increased longevity, 1970-2000, a, males; b, females

Source: Murphy and Topel, *Journal of Political Economy*, 2006

DECADE AVERAGES OF GDP AND PRODUCTION OF HEALTH CAPITAL PER CAPITA, 1900–2000 (2004 Dollars)

	1900–1910	1910–20	1920–30	1930–40	1940–50	1950–60	1960–70	1970–80	1980–90	1990–2000
GDP	\$6,011	\$7,239	\$7,703	\$7,578	\$13,592	\$15,856	\$20,343	\$25,342	\$28,381	\$32,057
Health capital	\$4,987	\$2,754	\$5,513	\$6,062	\$12,314	\$4,951	\$2,381	\$12,839	\$7,305	\$8,240
Total	\$10,998	\$9,993	\$13,216	\$13,640	\$25,906	\$20,807	\$22,724	\$38,181	\$35,685	\$40,297
Share of health capital	.45	.28	.42	.44	.48	.24	.10	.34	.20	.20

ECONOMIC GAINS FROM REDUCTIONS IN MORTALITY, 1970–2000
(Billions of 2004 Dollars)

	1970–80	1980–90	1990–2000	1970–2000
Males	\$26,699	\$15,471	\$19,153	\$61,323
Females	\$20,515	\$9,067	\$4,440	\$34,022
Total	\$47,214	\$24,538	\$23,593	\$95,345

Source: Murphy and Topel, *Journal of Political Economy*, 2006

ESTIMATED GAINS NET OF THE INCREASE IN HEALTH EXPENDITURES, 1970–2000

	1970–80	1980–90	1990–2000	1970–2000
Gross gains (from table 4)	\$47,214	\$24,538	\$23,593	\$95,345
Increase in expenditures	\$8,206	\$14,928	\$11,591	\$34,725
Gains net of expenditure growth	\$39,008	\$9,611	\$12,001	\$60,620
Expenditure increase as a per- centage of gains	17.4%	60.8%	49.1%	36.4%

Source: Murphy and Topel,, *Journal of Political Economy*, 2006

C. Medical Technology and its contribution to health care – Where do we need to go from here?

Economic and social value of innovation

- Body of evidence is increasing, but is probably inadequate
- Still much to do in terms of research
 - Develop methods allowing us to disaggregate the effect of medical technologies
 - Generate evidence across different types of technologies, esp. devices
 - Impact on health, health gains, life expectancy & QoL
 - Measure economic impact of technologies
 - Diffusion of innovation and factors affecting it
 - Measure the distributive consequences of innovations
- Evidence-based policy-making