The contribution of pharmaceutical innovation to longevity, improved outcomes and economic growth

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  - Evidence based on aggregate data
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- Use of new medicines reduces need for other health care resources
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Today, People Live 10 Years Longer Than in 1960

- Life expectancy at birth has increased by more than 10 years in OECD countries since 1960, reflecting a sharp decrease in mortality rates at all ages.
- Life expectancy at age 65 in OECD countries stands, on average, at over 20 years for women and close to 17 years for men.

Contribution of innovative drugs to longevity increase in Germany

German life expectancy at birth increased by 1.4 years during the period 2001-2007.

About one-third (0.45 years or 32%) of the increase in life expectancy was due to the replacement of older drugs by newer drugs.

Estimated cost per life-year gained from the use of newer drugs is €11,597 (without taking reduced resource used due to medicines into account).


New treatments reduced mortality rates in Canada

Introduction of the new treatments in the last three decades reduced the risk of mortality by 51% for the overall study population.

Recent drug innovation, in particular medications launched after 1990, had a significant beneficial impact on the survival of elderly Canadians.

Substantial contribution by new drugs to improved survival: overall population


Substantial contribution by new drugs to improved survival: asthma subpopulation

Substantial contribution by new drugs to improved survival: cancer subpopulation

Estimated survival curves by drug vintage use.


Substantial contribution by new drugs to improved survival: CVD subpopulation

Estimated survival curves by drug vintage use.

Availability of innovative drugs

7 new molecules and 2 new drug classes for treating HIV were introduced 1995-1997

No. of HIV/AIDS Rx's per person with HIV/AIDS


The Amount of Available Innovative HIV Medicines Correlates With Survival

Change in average no. of HIV Rx's

% change in mortality rate

Source: Lichtenberg (2008), Biomedical innovation, longevity, and quality of life. Presentation at Swiss Congress of Health Economics and Health Sciences.
Decreasing mortality rates in HIV/AIDS


Survival function 1/1/1993
Survival function 1/1/2000

Prob. of survival

Years since diagnosis


Increase in life expectancy due to new HIV medicines

Due to new medicines

0 1 2 3 4 5 6 7 8 9 10 11 12

Years

2001 predicted with 1993 drug utilization
2001 actual

Drastically decreasing needs for hospitalization

Drug utilization and hospital utilization by AIDS patients


Cancer
Decreasing cancer mortality rates in Germany

Sharp increase in 5-year cancer relative survival rate in the US

Chemotherapy innovation contributed by 74% to the increase in the 1-year survival

Cancer survival rates, 1992-2003: actual vs predicted in the absence of chemotherapy innovation

Decreasing cancer mortality despite increasing incidence

A 1% reduction in cancer mortality is worth nearly $500 billion*

Decreasing CVD mortality rates in OECD countries

Age-adjusted mortality rates, 1950-2006

Source: Health, United States, 2009, Table 26
CVD mortality rates in Germany and launch of new drugs

Top 10 (ranked by no. of standard units) CVD drugs in 2005 Switzerland vs. Austria

<table>
<thead>
<tr>
<th></th>
<th>Switzerland (N=1,903,135)</th>
<th>Austria (N=1,890,382)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HYDROCHLOROTHIAZIDE</td>
<td>1959 3%</td>
<td>HYDROCHLOROTHIAZIDE</td>
</tr>
<tr>
<td>HEPARIN</td>
<td>1910 3%</td>
<td>METOPROLOL</td>
</tr>
<tr>
<td>ATORVASTATIN</td>
<td>1997 2%</td>
<td>AMLODIPINE</td>
</tr>
<tr>
<td>METOPROLOL</td>
<td>1975 2%</td>
<td>CRATAEGUS OXYACANTHA</td>
</tr>
<tr>
<td>HYDROCHLOROTHIAZIDE</td>
<td>1995 2%</td>
<td>Furosemide</td>
</tr>
<tr>
<td>TORASEMIDE</td>
<td>1992 2%</td>
<td>BISOPROLOL</td>
</tr>
<tr>
<td>AMLODIPINE</td>
<td>1990 2%</td>
<td>GINKGO BILoba</td>
</tr>
<tr>
<td>ATENOLOL</td>
<td>1976 2%</td>
<td>SIMVASTATIN</td>
</tr>
<tr>
<td>SIMVASTATIN</td>
<td>1988 2%</td>
<td>HEPARIN</td>
</tr>
</tbody>
</table>
Use of newer CVD drugs implies lower mortality rates and reduced costs

Use of newer cardiovascular drugs has reduced hospitalization, average length of stay and age-adjusted cardiovascular mortality rate.

The decrease in expenditure on cardiovascular hospital stays is about 3.7 times as large as in per capita increase for cardiovascular drugs.

New drugs and decreasing consumption of other health care resources

Increase in drug vintage index 1991-2004
Use of newer drugs reduced consumption of health care resources

States that had larger **increases in drug vintage** had **smaller increases** in the number of hospital and nursing-home admissions.

成本 for admissions inverted


Patient-level evidence about the relationship between use of newer drugs and cost of events

People consuming newer drugs had **significantly** fewer hospital stays and decreased costs for **all** non-drug medical expenditures.

Reducing the age of the drug results in a **substantial net reduction in the total cost of treating the condition.**

Costs for other resources inverted

Branded vs generic drugs

Since reducing the age of the drug results in a substantial net reduction in the total cost of treating the condition, if only generic drugs were used instead of actual mix of 60% branded and 40% generic, costs would increase.

Estimates indicate that denying people access to branded drugs would increase total treatment costs, not reduce them, and would lead to worse outcomes.


The impact of pharmaceutical use on hospital care and overall medical expenditures

Number of hospital bed-days declined most rapidly for those diagnoses with the greatest increase in the total number of drugs prescribed and the greatest change in the distribution of drugs.

An increase of 100 prescriptions is associated with 16.3 fewer hospital days

The effect of drug vintage on activity limitations and perceived health status

People who used newer drugs had better health than people using older drugs for the same condition.

They were more likely to survive, their perceived health status was higher, and they experienced fewer activity, social, and physical limitations.


Cost impact of PPI Therapeutic substitution in British Columbia

Medically unnecessary drug switching by compliance with TS policy appears to be independently associated with higher overall health care resources.

The impact of reference pricing on switching behaviour and health care utilisation: the case of statins in Germany

Switching occurred significantly more often in patients with low-income

**Switching behaviour after RP implementation**

![Graph showing switching behaviour after RP implementation](image)

<table>
<thead>
<tr>
<th>Switching Behaviour</th>
<th>Atorvastatin</th>
<th>Other Statin</th>
</tr>
</thead>
<tbody>
<tr>
<td>No switch</td>
<td>12%</td>
<td>2%</td>
</tr>
<tr>
<td>1 switch</td>
<td>38%</td>
<td>11%</td>
</tr>
<tr>
<td>&gt; 1 switch</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>Non-adherent (MPR&lt;0.8)</td>
<td>39%</td>
<td>31%</td>
</tr>
</tbody>
</table>

*P<0.0001


The impact of reference pricing on switching behaviour and health care utilisation: the case of statins in Germany

Patients initially on atorvastatin discontinued to a larger extent than other.

**Non adherence and discontinuation in patients previously treated with Atorva and other statins**

![Graph showing non adherence and discontinuation](image)

Link to productivity and ability to work

Cumulative number of drugs approved for three conditions relative to the cumulative number of drugs approved for that condition in 1975
Availability of new drugs and Americans' ability to work

- The probability of being unable to work, limited in work, and having ever been hospitalized, and the number of work-loss days and restricted-activity days, are all inversely related to the stock of drugs approved 3 to 5 years earlier.
- The estimates imply that the growth in the lagged stock of all drugs reduced the unconditional probability of being unable to work due to the 47 sample conditions by 1.8% per year during the period 1982-1996.

Have new drugs increased society's ability to produce goods and services?

The estimated benefit of the new drugs, in terms of the value of the increase in workforce participation and hours, is almost nine times as great as the estimated cost of the new drugs.

If no new drugs had been introduced during 1982-1996, the probability of being unable to work in 1996 would have been 29% higher than it actually was—5.2% instead of 4.0%.

Has pharmaceutical innovation reduced Social Security Disability growth?


Summary

- Contribution of new medicines to longevity increase
  - Evidence based on aggregate data
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- Use of new medicines reduces need for other health care resources
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Patients In Germany and UK Get Access To New Medicines Most Quickly

The chart shows the time intervals between marketing authorization for HIV treatment access for different countries. Germany and the UK have the shortest intervals, with Germany having the shortest interval. Other countries, such as France, Spain, and Italy, also have relatively short intervals, indicating quick access to new medicines. Belgium has the longest interval.

Articles

- The Impact of Drug Vintage on Patient Survival: A Patient-Level Analysis Using Quebec's Provincial Health Plan Data
- The quality of medical care, behavioral risk factors, and longevity growth
- Availability of New Drugs and Americans' Ability to Work
- Has pharmaceutical innovation reduced Social Security Disability growth?
- The contribution of pharmaceutical innovation to longevity growth in Germany and France, 2001-2007
O VALOR DO MEDICAMENTO PARA A SOCIEDADE
THE VALUE OF MEDICINES TO SOCIETY