

Economic implications of Influenza Vaccine

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Topics

- Costs of Annual Seasonal Outbreaks of Influenza compared to Pandemics & Methods
- Cost-Effectiveness and Cost-Benefit of vaccination & inconsistencies in methods and results

Influenza Economic Estimates: Standard Costs Included

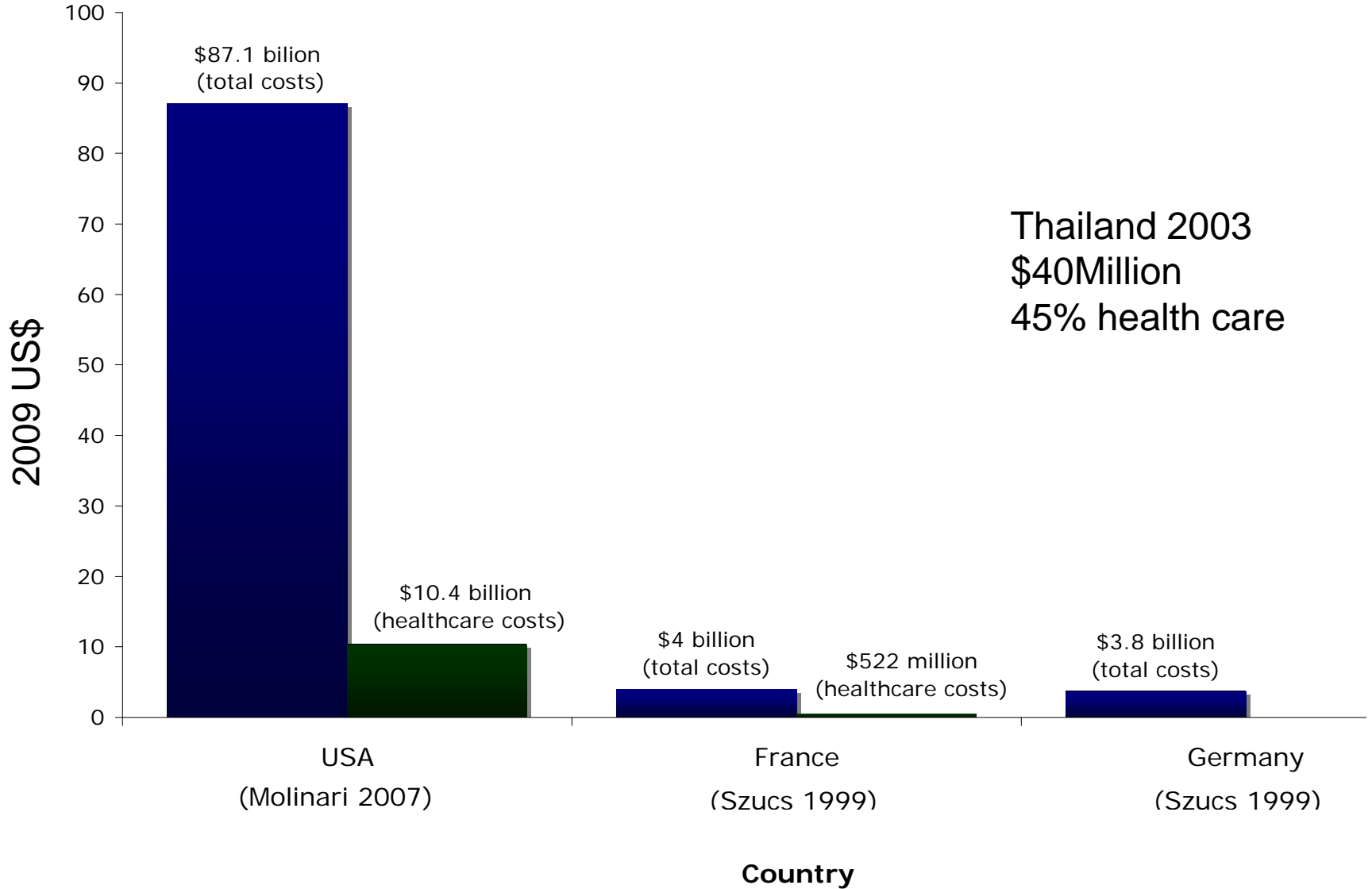
Annual seasonal influenza two types of costs:

- **Direct:** Health care (payer & out-of-pocket)
- **Indirect:** Societal (absenteeism & productivity losses)

Pandemic influenza additional costs:

- Containment efforts by public health system
- Consumer behavior change to avoid infection

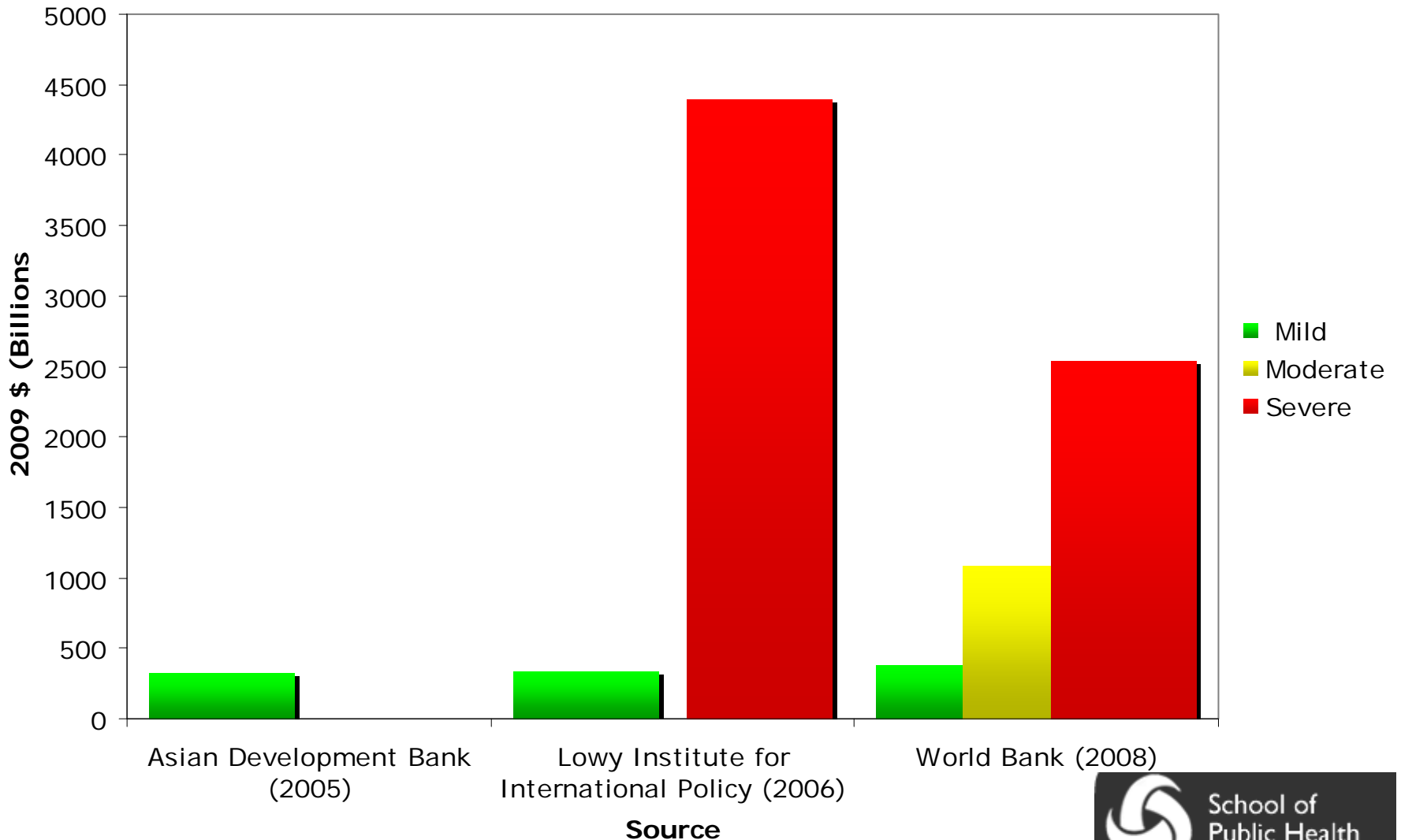
Average cost of seasonal influenza



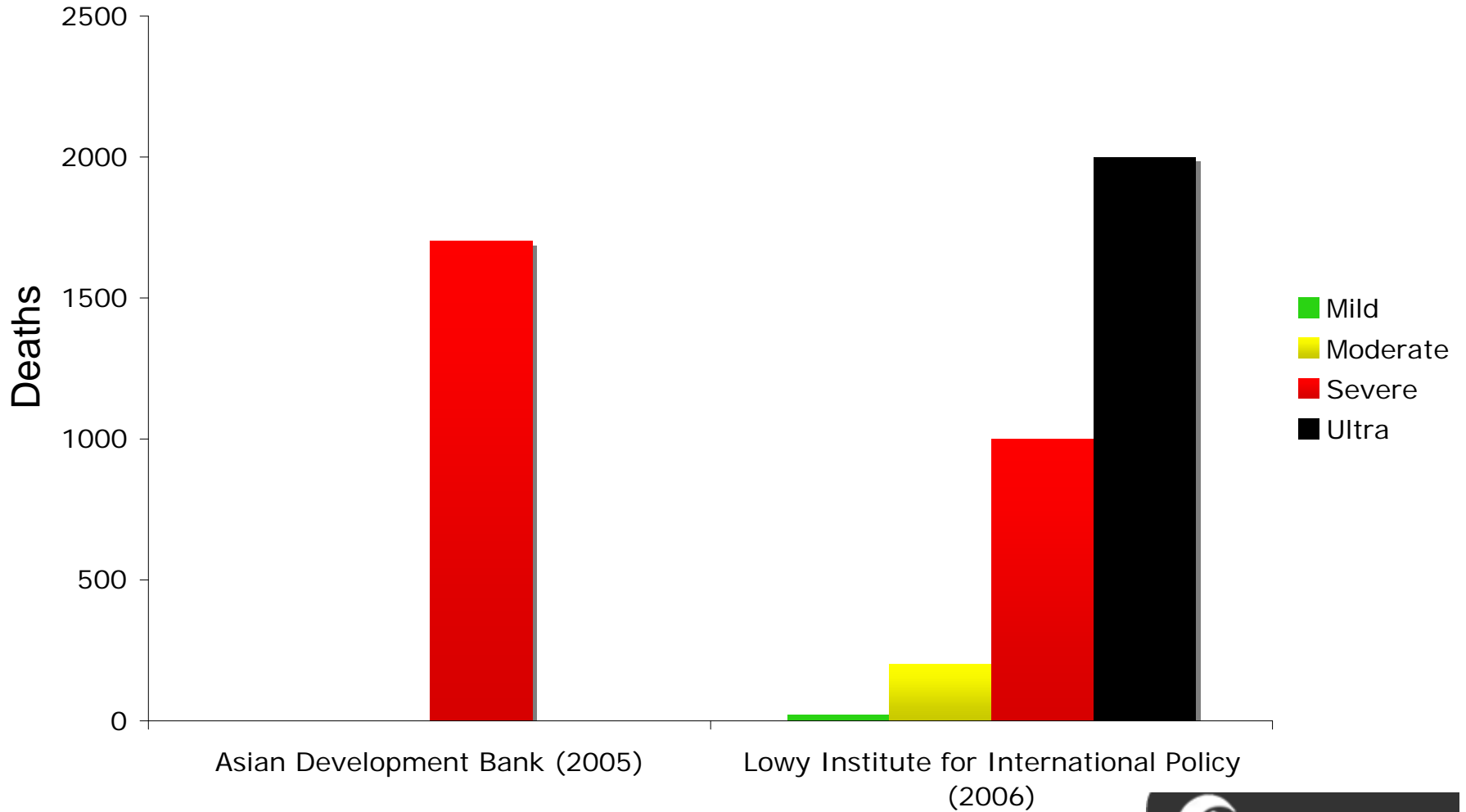
Non-Health Care Costs

- Productivity lost
 - Absence from work
 - Employee ill
 - Employee going to health provider
 - Employee must take care of relative
 - [Reduced productivity at work while ill]
 - **Premature death**

Predicted Worldwide Economic Cost of Pandemic Flu Under Different Scenarios

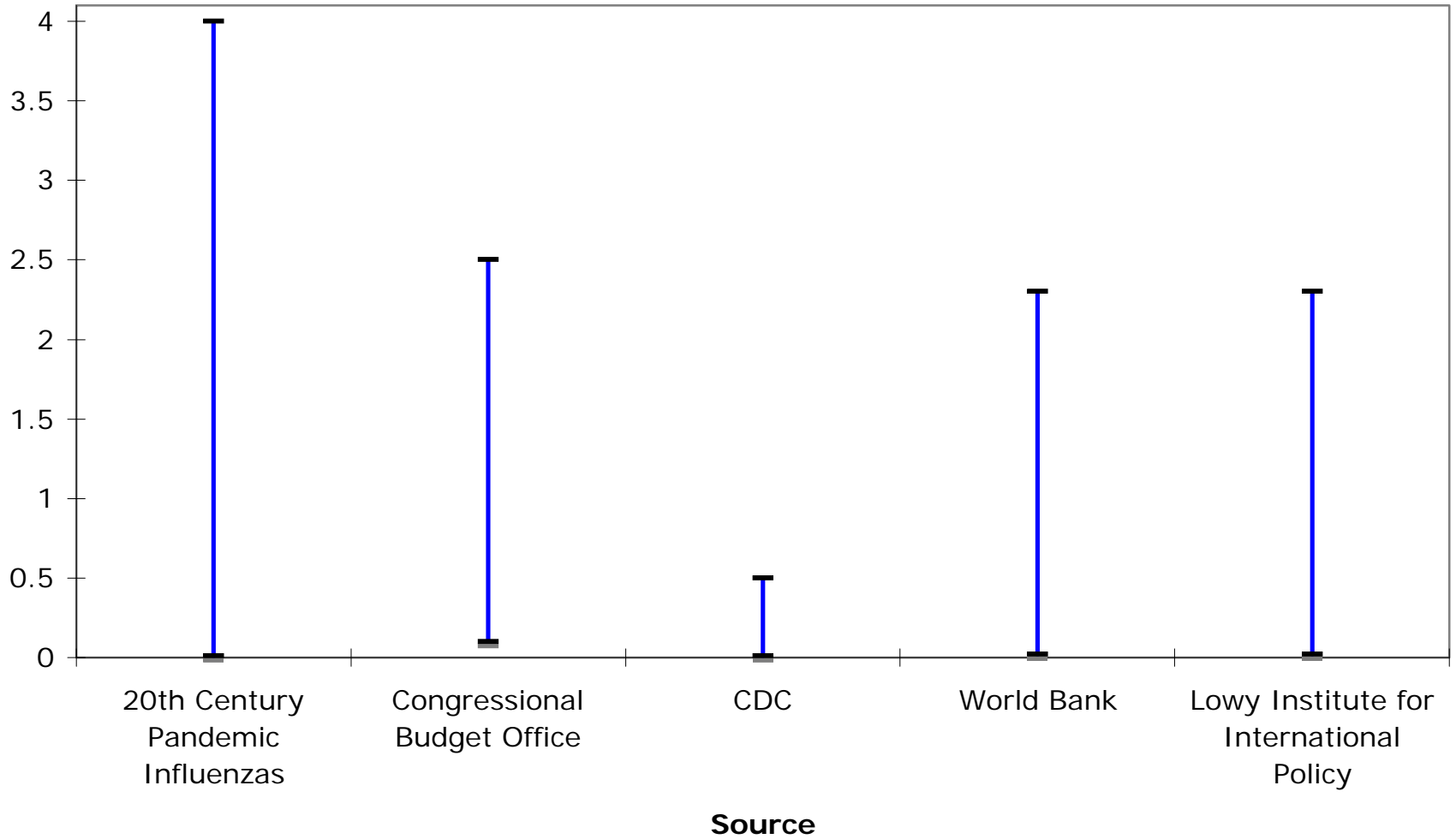


Predicted Number of Deaths in the United States from Pandemic Influenza

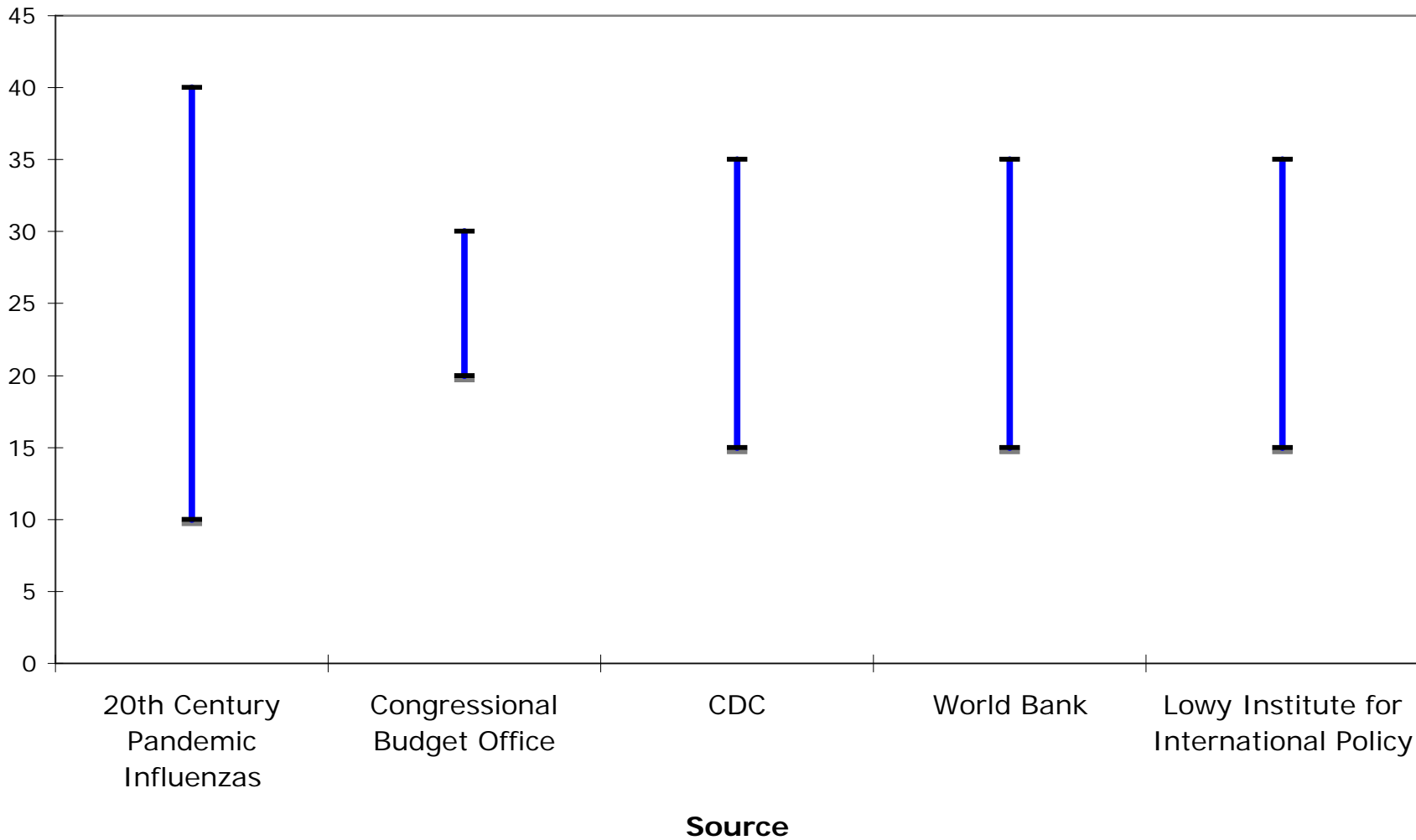


Source

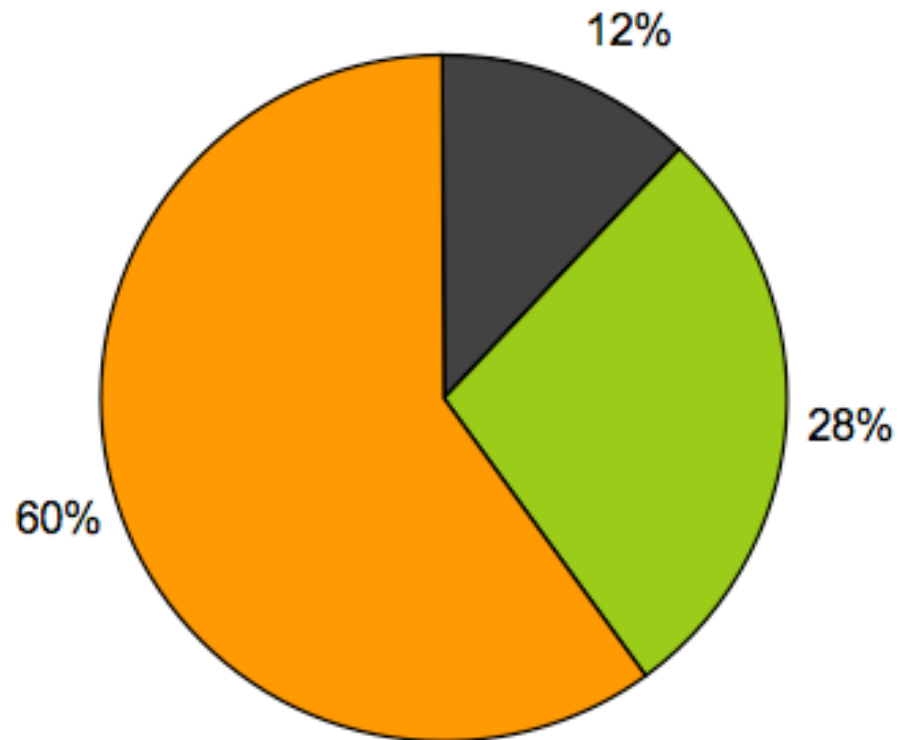
Assumed Case Fatality Rates Compared to Observed Rates from 20th Century Pandemic Influenzas



Assumed Gross Attack Rates Compared to Observed Rates from 20th Century Pandemic Influenzas



Efforts to avoid infection cause most of the costs during a pandemic



Part of economic impact due to:

■ Mortality ■ Illness and Absenteeism ■ Efforts to avoid infection

Conclusions

- Annual Seasonal influenza outbreaks have substantial societal costs
- Pandemics of influenza, especially those with high mortality rates and easy person-to-person transmission will result in huge global economic costs and societal disarray.
- In Pandemics, majority of societal costs results from fear of transmission and behavior change to allay transmission

Economic Measures for Comparison of Value of Interventions

- Cost-benefit
- Cost-effectiveness
- Cost-utility

These Depend on Data for

- Epidemiologic Outcome
- Health Care Utilization
- Work loss, productivity, out of pocket expenditures

Why conduct Cost-effectiveness & Cost-benefit Analyses

- Goal of health system: optimal health for **ALL**
- Limited resources
- Decisions on allocation must be made – rationing inevitable
- Cost-effectiveness & -benefit analyses compare the costs of interventions with health and societal benefits

Transparent Criteria for Resource Allocation

Cost-effectiveness of Influenza Vaccine

- Assumptions differ
- Defined populations
- Question of comparability to other populations

Cost Perspectives

Health insurance

Health care costs

Provider

Hospital, clinic, physician

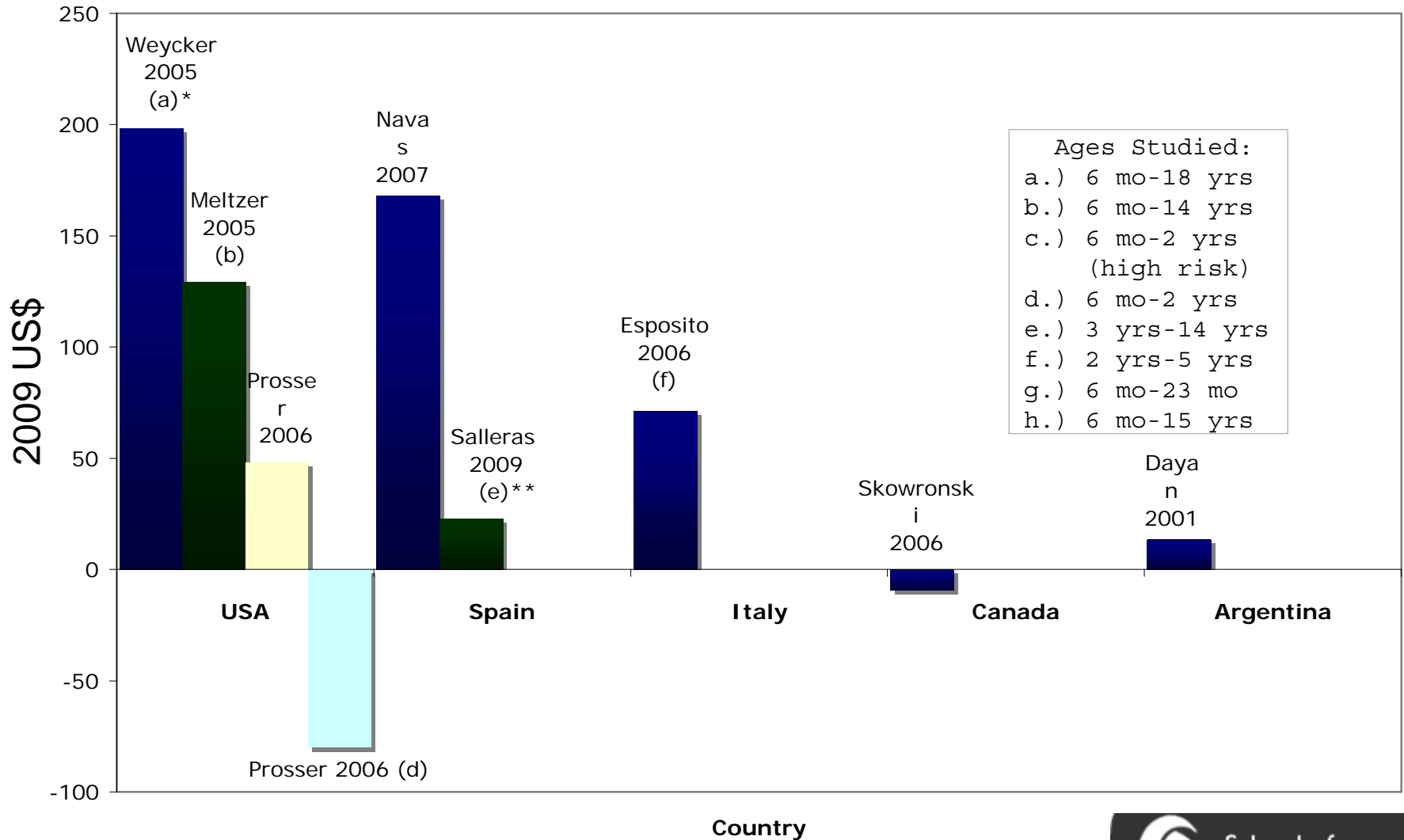
Individual

Out of Pocket expenses, Absence from work/school

Society

Health care costs, Out-of-Pocket, Lost productivity

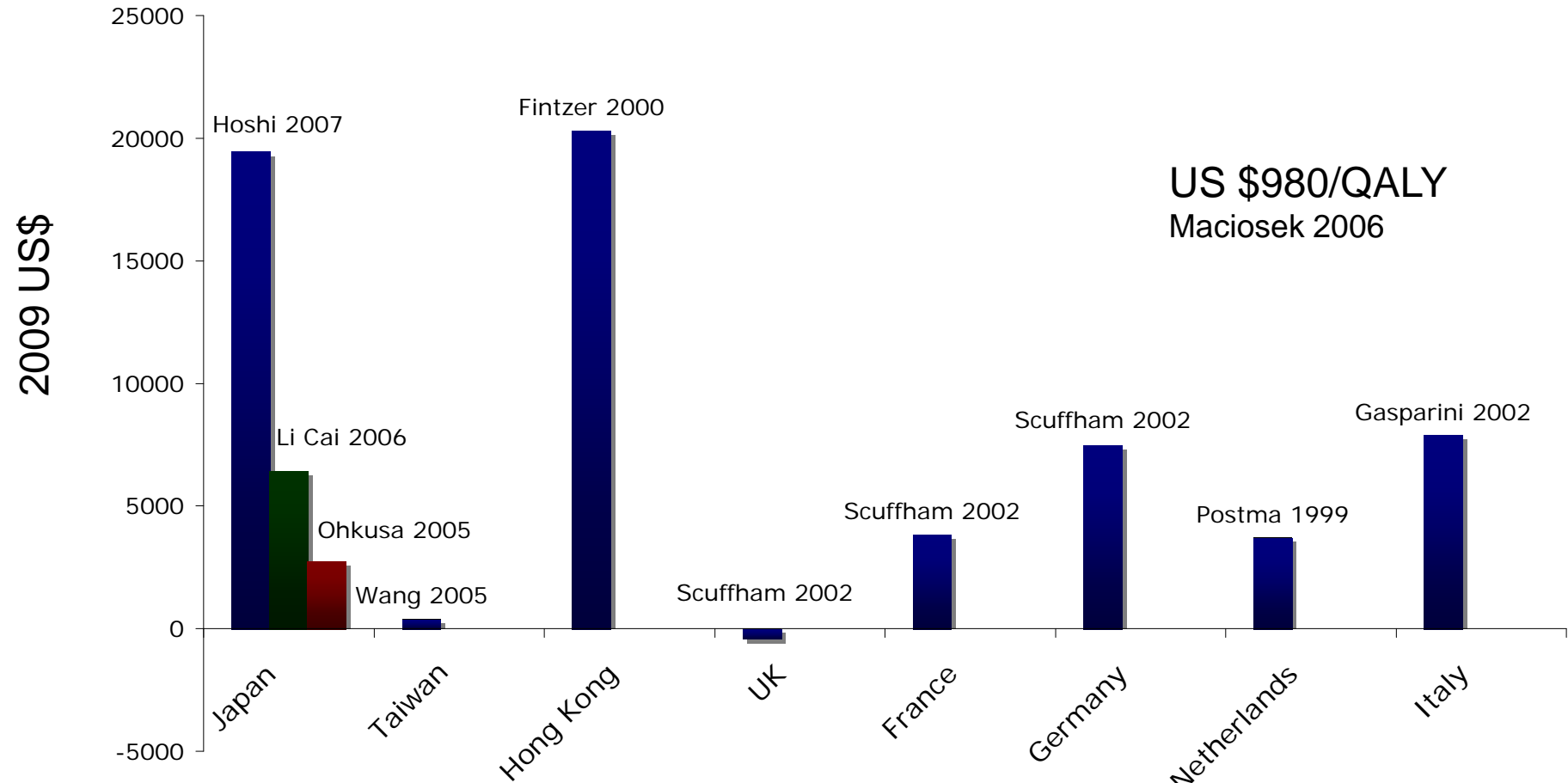
Cost savings per child of influenza vaccination



*The only study that includes a model of the spread of infection

** Costs calculated from the perspective of the family rather than the society

Cost Per Year of Life Saved for a Comprehensive Vaccination Program for the Elderly (65+)



US \$980/QALY
Maciosek 2006

Country



Vaccination in Working Adults

- Not cost-saving
- Probably cost-effective in some groups, namely health workers
- Wide variation in results because of inconsistencies in methods and data
- Almost all studies in USA

Cost-effectiveness & Cost-benefit: Difference in Assumptions & Methods

- Vaccine costs - \$3-25
- Health care costs – charge-to-cost ratios, HMO, different countries, medical price inflation vs CPI
- Vaccine Efficacy - 18-90%
- Epidemiologic parameters – mortality, morbidity, health care utilization, transmission, herd immunity
- Cost Perspective – health care vs. society vs. family; inclusiveness of costs
- Study type – Cost-Effectiveness, -Utility, -Benefit

Cost-effectiveness & Cost-benefit: Difference in Assumptions & Methods

- Country (almost all in industrialized nations)
- Study Method – Clinical trial, model (deterministic, stochastic, Monte Carlo simulation, population dissemination)
- Target group (children, elderly, high risk, health care workers, pregnant women, ...)
- Rigor of methods, e.g., sample size
- Year of study – 1990s to present

Challenges – Should These Costs (and Benefits) Be Included

- Attribution of Effects – long term, other projects simultaneous
- Measuring and valuing outcomes – Qaly's, but does not include effects on individuals not directly targeted by the program, e.g.,
 - herd immunity
 - creation of an informed public,
 - reassurance
- Incorporation of equity considerations

Modified after Weatherly et al. 2009

Other Costs

- Containment when outbreak occurs
- What is the appropriate value of loss of time from work?
- Better Health leads to Higher Wealth – LDC's
- Identifying intersectoral costs and consequences & Incorporating externalities – ripple effects in economy as expenditure in some sectors reduce expenditure in others e.g.
 - Improve housing, decrease illness & injury, decrease health care costs
 - Increasing the amount of water available may increase hygiene and decrease disease, but largest effect may be release time for drawing water for women and girls
 - Prohibition in the US was a health success but enormous subsequent social costs
 - HiB and rotavirus vaccines empty hospital beds in Mexico then used for diabetes and heart disease

Cost-effectiveness of Other Vaccines

Vaccine	Target group	Ds	Economics
7 Routine childhood vaccines	0-15 months	1-4	Cost-Savings B/C 5-16
Pneumococcal conjugate	0-15 months	4	\$80,000/Life-yr saved (2000 US)
Meningococcal conjugate	11 yr olds	1	\$120,000/Life-yr saved (2003 US)
Rotavirus	2-6 mo	3	\$200,000/Life-yr saved (2005 US)
Human Papilloma Virus	12 yr olds	1	>\$45,000/QALY (2006 US)

Conclusions

Influenza vaccine is quite cost-effective

- In some markets, less costly but more health gain than other vaccines
- Child and adolescent vaccination appears to save societal costs
- Vaccination of elderly \ll \$50,000/QALY
- Vaccination of working adults – only some groups

Conclusions – Influenza Vaccine

- Undervalued as a health intervention.
- Essential to make these benefits known
- No information about developing countries
 - Different seasonal pattern – would manufacturing costs be lower

Acknowledgments

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