Considerations in Estimating the Economic Burden of Genital Herpes Infection

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Overview

• Economic (e)valuation of preventive interventions.
  – Utilitarian frame, and why health is different.
  – Cost-effectiveness, benchmarks.

• Genital HSV infections:
  – Existing estimates of burden and costs.
  – Limitations of current estimates.

• Approaches to monetizing health utilities.
  – ENB, contingent valuation, conjoint analysis.
The Dismal Science

• **Economics:** “The branch of social science that deals with the production and distribution and consumption of goods and services and their management.”
  - [http://wordnetweb.princeton.edu](http://wordnetweb.princeton.edu)

• **Health economics:** treat health as a “good”.
Utilitarianism

• **Philosophical framework** that justifies many policy decisions in Western democracies:
  – Jeremy Bentham (1748-1832): “Greatest happiness to the greatest number.”

• Competing philosophical views: libertarianism, socialism, post-modernism.

http://www.ucl.ac.uk/Bentham-Project/who/bentham_ucl
Traditional Cost-Benefit Analysis

• Sometimes called “objective” economic analysis.
  – Evaluate (monetized) costs and benefits of program.
  – If net “cost-beneficial” (i.e., generates wealth) → adopt.

• Health is different (“welfarist” view).
  – **Indirect evidence:** Medicare dialysis coverage, “danger pay”, tort law.
Cost-Effectiveness Analysis

• Economic analyses that evaluate cost to purchase a (marginal) unit of health gained or marginal case prevented.
  – Sometimes called “subjective” economic analyses.
  – **Cost-utility analysis:** subset of cost-effectiveness analyses utilizing scaled, preference-based metrics of health outcome.
    • Allows comparison of economic attractiveness across multiple health states.
      – E.g., spend $ on hypertension prevention or HSV vaccination.
      – More on this below.
NEVER CHOOSE

COST EFFECTIVE?

COST EFFECTIVE?

ALWAYS CHOOSE

[Laupacis et al., CMAJ 1992]
Cost-effectiveness ratio?

Intervention “dominated”

WHO Benchmark = < 3 x per capita GDP per “life year”.

Cost-effectiveness ratio?

Intervention cost saving

- Cost +

- Health +
Efficient Frontier

Source: J Mandelblatt et al., JAMA 2002
Estimating Costs

• **Costing** involves 3 steps:

  1. **IDENTIFY** costs (e.g., medical visits, drug costs, travel time).
  2. **MEASURE** costs (how MANY medical visits, how MUCH drug and travel time).
  3. **VALUE** costs (what are those visits worth in £,¥,€$).

• “**Societal perspective**”: all costs, no matter to whom they accrue [Russel LB et al., JAMA 1996].
Economic Analysis II: Evaluating Health Gains

1. "Cases prevented": can’t compare gains across health states.

2. **Survival** = crude metric, “life year” gains.
   - Can’t evaluate attractiveness of preventing non-lethal diseases.
   - Ignores *quality* of survival.

3. Prefer *generic*, *scaled* metrics that can be used as “*quality weights*” for varying health states.
   - Alphabet soup: QALY, HALE, DALY, HYE.
E.g., health state characterized by breathlessness with activity, difficult to climb stairs or walk briskly, ankles are often swollen and sore, awoken in the night by feeling of breathlessness, need to take pills twice a day in order to avoid worse shortness of breath, pills may lead to frequent sensation of light-headedness. Expected survival = 10 years.
Thought Problem

• Identify **costs** and **health impacts** associated with HSV infections.
  – Would components of cost differ in high-, middle-, and low-income countries?
  – Would relative magnitude of costs and health impacts differ?
  – Might preventive interventions be considered cost-effective in some countries but not others?
HSV-2 prevalence by age in Africa among non–high-risk and higher risk populations (A, B respectively) by country and study.

Smith J S, Robinson N J J Infect Dis. 2002;186:S3-S28

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## Estimated Global Age-Specific Incidence

Table 4. Global estimates of the incidence of the herpes simplex virus type 2 infection, in 2003. Incidence in millions (percentage per population)

<table>
<thead>
<tr>
<th>Age in years</th>
<th>Females (percentage)</th>
<th>Males (percentage)</th>
<th>Both (percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15–19</td>
<td>4.3 (1.5)</td>
<td>2.7 (0.9)</td>
<td>6.9 (1.2)</td>
</tr>
<tr>
<td>20–24</td>
<td>2.7 (1.0)</td>
<td>2.1 (0.8)</td>
<td>4.8 (0.9)</td>
</tr>
<tr>
<td>25–29</td>
<td>1.9 (0.8)</td>
<td>1.7 (0.7)</td>
<td>3.5 (0.7)</td>
</tr>
<tr>
<td>30–34</td>
<td>1.4 (0.6)</td>
<td>1.4 (0.6)</td>
<td>2.9 (0.6)</td>
</tr>
<tr>
<td>35–39</td>
<td>1.1 (0.5)</td>
<td>1.2 (0.5)</td>
<td>2.3 (0.5)</td>
</tr>
<tr>
<td>40–44</td>
<td>0.8 (0.4)</td>
<td>1.0 (0.5)</td>
<td>1.8 (0.4)</td>
</tr>
<tr>
<td>45–49</td>
<td>0.6 (0.3)</td>
<td>0.8 (0.4)</td>
<td>1.4 (0.4)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>12.8 (0.8)</strong></td>
<td><strong>10.8 (0.6)</strong></td>
<td><strong>23.6 (0.7)</strong></td>
</tr>
</tbody>
</table>

## Selected Estimates of Economic Burden of HSV

<table>
<thead>
<tr>
<th>Author (Year)</th>
<th>Country</th>
<th>Estimate ($Million, 2010)</th>
<th>Data Source</th>
<th>Cost Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tao (2000)</td>
<td>USA</td>
<td>$321</td>
<td>Georgia Medicaid, MarketScan</td>
<td>MD visits, drug costs.</td>
</tr>
<tr>
<td>Szucs (2001)</td>
<td>USA</td>
<td>$2,041</td>
<td>DPS pharmaceutical database, physician survey.</td>
<td>Inpatient and outpatient medical care, laboratory testing, drug costs, neonatal infections, time and travel, and lost wages.</td>
</tr>
<tr>
<td>Fisman (2002)</td>
<td>USA</td>
<td>$2,682*</td>
<td>Literature derived, synthesized using mathematical model (based on NHANES)</td>
<td>As with Szucs.</td>
</tr>
</tbody>
</table>

*Range of uncertainty from $1.04 to $13.1 billion.

¶Inflation-adjusted to 2010 USD using Medical Care Services component of US CPI. U.S. health spending = $2.6 trillion in 2010; upper bound estimates ~0.5% of spending.
Limitations of Existing Cost Estimates

1. Single country (USA), billings databases (sensitivity, first vs. subsequent visits).
2. Uncertainty on perinatal and neonatal disease.
3. All exclude impact on HIV (PAR%, clinical course).
4. Cross-sectional estimates ignore externalities of transmission (future stream of infections) thus underestimate benefit of prevention.
Limitations of Existing Cost Estimates (2)

5. How should unrecognized infection be valued?


– 50% of those with +HSV-2 serology, no history of GH, have classical GH. [Langenberg et al., Ann Intern Med, 1989]

– Potential negative health impacts of providing stigmatized diagnosis?
Health related quality of life in genital herpes: a pilot comparison of measures

D N Fisman

Background: Genital herpes (GH) is a common sexually transmitted infection. Novel tools for the control of GH (for example, tests and vaccines) are emerging, but optimal assessment of the cost effectiveness of such interventions requires scaled, preference based estimates of the impact of GH on health related quality of life.

Methods: We provided self administered interviews to 39 individuals with recurrent GH recruited from an STD clinic and a GH support group in southern Ontario, Canada. Health preference estimates were generated using visual analogue scales (VAS), a time-tradeoff approach (TTO) and the Health Utilities Index Mark-II (HUI-II). Quality of life was also assessed with the Recurrent Genital Herpes Quality of Life scale (RGHQoL).

Results: Average (SD) health values for asymptomatic and symptomatic genital herpes were 0.89 (0.21) and 0.89 (0.22) using TTO, and 0.76 (0.30) and 0.71 (0.30) using VAS. Health utility estimates generated with HUI-II for transient symptomatic and asymptomatic health states were 0.93 (0.08) and 0.80 (0.16). Log transformed health value estimates exhibited convergent validity when compared to RGHQoL, as did health utility estimates for symptomatic GH. Utility scores for symptomatic GH increased (improved) with increasing age; no other subject characteristic was predictive of preference weights.

Conclusions: Preference based measures of health related quality of life can be elicited with relative ease in
Source: Fisman, Sex Transm Infect 2005
Modeled Clinical Course of RGH

Convergent Validity with RGHQoL

Ln(HUI-II Utility, GH Outbreak)

Recurrent Genital Herpes Quality of Life Score

Source: Fisman, Sex Transm Infect 2005
Limitations of Utilities

• Genital HSV—brief recurring episodes, decline in frequency over time.
  – Representation using QALY or HALE may not adequately capture dysutility.
  – WTP more appropriate? [Gafni and O’Brien, Pharmacoeconomics 1999].

• **Expected Net Benefit** = ΔU*WTP − ΔC
• Estimate WTP directly→contingent valuation, conjoint analysis.
Contingent Valuation

- A methodology used in environmental economics to assign values to abstract or **intangible** goods via WTP.
  - Wildlife, water purity, recreation, etc.
- More recent applications to healthcare:
  - Needlestick prevention, IVF, autologous blood transfusion.
- Valuation based on acceptance of “bids”.
  - “Take-it-or-leave-it” approach used to avoid anchoring biases and framing effects.
Unpublished Data from HRQoL Study*

WTP to Avoid Symptomatic GH (Vignette)

*Caveat emptor.
Conjoint Analysis

• Market research tool used for testing consumer preferences.
• Recent application to health: value different characteristics of prevention programs and (dys)utility of health states.
• Can estimate “part-worth” utilities and WTP.
Conjoint Analysis

- Flavour
- Cost
- Brand
- Calories
- Featured on Oprah

Slide courtesy of Dr. Vicky Ng, University of Guelph
Conjoint Analysis

Stigma

Cost to Avoid

Concern for Partner

Discomfort

Depressed Mood

[Image source: Wikimedia commons]
Summary

• **Multifaceted** nature of HSV-related disease makes economic evaluation challenging.
  – Existing economic estimates largely derived from high-income countries.
  – Suggest this is a costly health issue, likely underestimates.

• Need better estimates to help prioritize prevention interventions, assess *attractiveness* of emerging health technologies (e.g., vaccines).

• Combination of **tangible** and **intangible** elements in HSV experience makes WTP a potentially useful research tool.
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