Johns Hopkins *individualized* Health Initiative

Hopkins *inHealth*

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Vice Provost for Research  
Chair, Johns Hopkins Individualized Health Steering Committee  

May 16, 2012
Total Per Capita Medical Expenditures for OECD Countries

US Constant Dollars

Years


0 2000 4000 6000 8000

~ $1 trillion
Adult obesity – first of 10 reporting:
27.7% obese, 2 x the average rate

MRI+CAT total – first of 13 reporting: 319 per 1,000 person years, 2.5 x the average rate
1. How much does the US spend on medical services each year?

2. Who pays?

3. What do the dollars buy?
## National Health Expenditures by Type of Expenditure and Program: Calendar Year 2010

<table>
<thead>
<tr>
<th>National Health Expenditures</th>
<th>Health Consumption Expenditures</th>
<th>Investment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Personal Health Care</td>
<td></td>
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<tr>
<td></td>
<td>Physician Services</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hospital Care</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Physician and Other Professionals</td>
<td></td>
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<tr>
<td></td>
<td>Other Medical Expenditures</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Administration and Net Cost of Private Health Insurance</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total Outlet Sales of Medical Products</td>
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</tr>
<tr>
<td></td>
<td>Public Health</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Research</td>
<td>49,267</td>
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<td></td>
<td>Structures</td>
<td>41,136</td>
</tr>
<tr>
<td></td>
<td>Equipment</td>
<td>56,941</td>
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</table>

**Total National Health Expenditures:** $2,593,644,000,000

**SOURCE:** Centers for Medicare & Medicaid Services, Office of the Actuary, National Health Statistics Group.
$2,593,644,000,000

| Source: Centers for Medicare & Medicaid Services, Office of... |
The Nation’s Health Dollar, Calendar Year 2010: Where It Came From

Health Insurance 72%

Private Health Insurance 33%

Medicare 20%

Medicaid (Title XIX) Federal 10%

Medicaid (Title XIX) State and Local 5%

VA, DOD, and CHIP (Titles XIX and Title XXI) 4%

Out-of-pocket2 12%

Investment 6%

Government Public Health Activities 3%

Other Third Party Payers and Programs1 7%

1 Includes worksite health care, other private revenues, Indian Health Service, workers’ compensation, general assistance, maternal and child health, vocational rehabilitation, Substance Abuse and Mental Health Services Administration, school health, and other federal and state local programs.

2 Includes co-payments, deductibles, and any amounts not covered by health insurance.

Note: Sum of pieces may not equal 100% due to rounding.

The Nation’s Health Dollar ($2.6 Trillion), Calendar Year 2010: Where It Went

- Hospital Care: 31%
- Physicians and Clinics: 20%
- Prescription Drugs: 10%
- Dental Services and Other Professionals: 7%
- Government Administration and Net Cost of Health Insurance: 7%
- Investment: 6%
- Nursing Care Facilities and Continuing Care Retirement Communities: 6%
- Other: 14%

1 Includes Research (2%) and Structures and Equipment (4%).
2 Includes Durable (1%) and Non-durable (2%) goods.
3 Includes expenditures for residential care facilities, ambulance providers, medical care delivered in non-traditional settings (such as community centers, senior citizens centers, schools, and military field stations), and expenditures for Home and Community Waiver programs under Medicaid.

Note: Sum of pieces may not equal 100% due to rounding.

Why is U.S. health care so much more “expensive” but not more effective than in most OECD countries?

Older population?

More disease at a given age?

Higher priced disease management for a given disease?
Table 3. Old age dependency ratios in OECD countries: population aged 65 and over as a percentage of population aged 15-64

<table>
<thead>
<tr>
<th></th>
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<td>35.2</td>
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<td>33.5</td>
<td>38.4</td>
<td>36.8</td>
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<td>31.7</td>
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<td>50.1</td>
<td>46.0</td>
<td>46.0</td>
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<tr>
<td>Turkey</td>
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<td>16.4</td>
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<td><strong>Averages</strong></td>
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<td>Small countries</td>
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<td>35.1</td>
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<tr>
<td>Total OECD$^1$</td>
<td>19.0</td>
<td>19.8</td>
<td>21.2</td>
<td>23.5</td>
<td>28.8</td>
<td>34.4</td>
<td>36.9</td>
<td>35.4</td>
</tr>
</tbody>
</table>

$^1$ Unweighted average.
Source: OECD [1988a].

### Exhibit 9

**Disease prevalence in the United States is lower than in peer countries for most high-cost medical conditions**

<table>
<thead>
<tr>
<th>Health Care Expenditures by Disease Condition* ($ billion)</th>
<th>Disease Prevalence: United States vs. Peer Countries**</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>US Prevalence</strong></td>
<td><strong>Peer Countries</strong> at 100</td>
</tr>
<tr>
<td>Heart conditions</td>
<td>76.5</td>
</tr>
<tr>
<td>Trauma-related disorders</td>
<td>72.5</td>
</tr>
<tr>
<td>Cancer</td>
<td>68.7</td>
</tr>
<tr>
<td>Mental disorders</td>
<td>56.0</td>
</tr>
<tr>
<td>COPD***, asthma</td>
<td>53.8</td>
</tr>
<tr>
<td>Hypertension</td>
<td>42.3</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>34.3</td>
</tr>
<tr>
<td>Osteoarthritis/other joint disorders</td>
<td>34.2</td>
</tr>
<tr>
<td>Back problems</td>
<td>32.5</td>
</tr>
<tr>
<td>Other</td>
<td>288.5</td>
</tr>
</tbody>
</table>

* Includes 35 of 60 medical conditions surveyed by US Medical Expenditure Panel Survey; the costs of these diseases represent 35 percent of total US health expenditures.

** Peer countries are France, Germany, Italy, Spain, and the United Kingdom.

*** Chronic Obstructive Pulmonary Disease.

Source: Medical Expenditure Panel Survey, 2005; Decision Resources 2006; McKinsey Global Institute analysis

**Lower relative disease prevalence in the United States represents an estimated $57 billion to $70 billion in medical cost savings**
<table>
<thead>
<tr>
<th>Category</th>
<th>Percent of Medicare Expenditures</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effective or necessary care - sound evidence that treatment benefits far outweigh risks</td>
<td>15%</td>
<td>Vaccination; hip fracture repair</td>
</tr>
<tr>
<td>Preference-sensitive care - multiple options with different outcomes</td>
<td>25%</td>
<td>Early-stage breast cancer treatment</td>
</tr>
<tr>
<td>Supply-sensitive care - frequency of routine care of acute and chronic conditions</td>
<td>60%</td>
<td>Diabetes; Chronic heart failure</td>
</tr>
</tbody>
</table>
The data show that the United States spends more on health care than any other country. However, on most measures of health services use, the United States is below the OECD median. These facts suggest that the difference in spending is caused mostly by higher prices for health care goods and services in the United States.
The available evidence suggests that a substantial share of spending on health care contributes little if anything to the overall health of the nation, but finding ways to reduce such spending without also affecting services that improve health will be difficult. In many cases, the current system does not create incentives for doctors, hospitals, and other providers of health care—or their patients—to control costs. Significantly reducing the level or slowing the growth of health care spending below current projections will require substantial changes in those incentives.
Johns Hopkins *individualized* Health Initiative

Hopkins *in*Health

“a unique partnership that **combines the assets** of three Johns Hopkins Institutions:

- University
- Health System
- Applied Physics Laboratory

to discover and demonstrate how to more precisely measure each individual's health state and more effectively guide his health trajectory using prevention and treatment tailored to his unique characteristics and circumstances.
**Aircraft Track Process**

- **Initial Radar Measurements (radar echoes)**
- **Filtered (smoothed) “track” updates**
- **Smoothed track updates**
- **Symbol of type of aircraft**
- **Display of altitude**
- **Data:**
  - Track No. 1234
  - Position (x,y,z)
  - Speed and direction
  - Acceleration
  - Identification
Track State Analogies Lexicon

Historical Past
- location
- velocity
- acceleration
- accuracy uncertainties
- identification description

Filtered Present

Projected Future

Historical Past
- vital signs

Filtered Present
- lifestyle factors
- genetic markers (research updates)

Projected Future
- special clinical data
- Identification description
**Health Trajectory Track**

- **Patient A**
  - Birth data or new patient
  - In system
  - Medical test data
  - And lifestyle factors
  - Checkup
  - Smoothed data based on population
  - Medical issues
  - Remedial therapy
  - Continued follow-up
  - Projected health trend

- **Patient B**
  - Initial data
  - Diagnosis of heart condition
  - Monitoring
  - Surgery
  - Health index
  - Age

**JHU Proprietary**
Hopkins Strategy

• “Inside-out” strategy: learn how to track health to improve JH employee health and disseminate those methods and tools to others

• Eliminate medical errors including exposing patients to unnecessary treatments

• Armstrong Institute

• Promote individual responsibility for health including practicing healthy behaviors

• *intelligently* use health *information* to *individualize* health promotion, disease prevention, early detection, and appropriate treatment
Hopkins inHealth System-of-Systems Architecture

- Researchers’ Interface
- Practitioners’ Interface
- Payers’ Interface

- Data Security Validation
- Information Processing & Correlation Computing ‘Cloud’
- Research Database
- Established Practices
- Patient Database

- Protoyping Testbed Computing
- Capability Prototyping Interface
- Data Entry Interface

Feb 21, 2012 JHM Discussion
Population Data <= Individual Health Decision

40 year old woman with no family history of breast cancer:

1. Should she have a mammogram?
2. If positive mammogram, what is her likely health state?

Data from population of “similar” women

<table>
<thead>
<tr>
<th>Test result</th>
<th>Actual breast cancer status</th>
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<tr>
<td></td>
<td>Yes</td>
<td>15</td>
<td>985</td>
<td>1,000</td>
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<tr>
<td>Positive</td>
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<td>Negative</td>
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<td>5</td>
<td>8,995</td>
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<td>Total</td>
<td></td>
<td>20</td>
<td>9,980</td>
<td>10,000</td>
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</table>
Population Data <=> Individual Health Decision
Neuroimaging Example
What Hopkins *in*Health is NOT:

- Center
- Institute
- Building
- Replacement of a current project
- Merger of existing programs/projects
- Top down reorganization of existing programs/projects
- ….
What *Hopkins inHealth* IS intended to be:

1. *A clearly articulated, shared vision, and set of objectives* by which JHU, JHHS, APL can combine assets to contribute to the reform of the American health care system

2. *Small start-up and infrastructure investments* to support faculty at JHU, population health experts and clinicians at JHHS, and systems engineers at APL to begin to address HiH objectives who will raise the vast majority of funds to meet their common objectives

3. “*Grease and glue*” approach

4. Open sources methods and tools for advancing health
Why Johns Hopkins?

• JHU leadership in combination of basic bioscience, clinical science, population health, and data sciences
• JHM leader and trusted name in medicine
• JHHC: EHP, Priority Partners, USFHP → possibility of a new health-valued organization
• EPIC investment
• Genes to Society curriculum
• Bloomberg School of Public Health
• Systems Engineering at Whiting School and APL
• APL trusted agent to DoD with health care budget of $55B per annum

** Our future depends on becoming a leader in health as we are in medicine **
Main Points Once Again

• US spends $1 trillion (6% of GDP) more each year on its medical care system than it would as the second most expensive country in the world.

• We do not have more illness; we spend more to treat illnesses with similar prevalence. Yet, our population health is among the poorest in the developed world.

• Hopkins inHealth is an initiative to intelligently use health information to individualize health promotion, disease prevention, early detection and treatment.

• Johns Hopkins will create information tools, apply them within the JH populations, then communicate lessons learned and disseminate tools to improve population health while cutting into the $1 trillion of excess health spending.