Visualization and Analysis of a National Healthcare System

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Figure 1 - Published Many Eyes Wordle Healthcare Visualization, http://manyeyes.alphaworks.ibm.com/manyeyes/visualizations/healthcare-general

Abstract—This paper investigates the national healthcare debate in the United Status using visualization techniques with healthcare cost statistical analysis. The findings reveal that healthcare costs in the United States with the current system are amoung the highest internationally. In particular, these costs are higher when compared to countries with national programs and do not provide the universal coverage citizens in other countries enjoy.

Index Terms—National Healthcare, Information Visualization, Healthcare, Politics, Government

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1 Introduction

According to the Census Bureau the number of uninsured Americans, including millions of children, is at an all-time high [1] and growing each month because of the dismal economy and the erosion of employer-based insurance. The number of uninsured children is particularly troubling due to state and local governments drowning in debt and scaling back or eliminating services to those who can least afford it. A viable national healthcare system is a top priority of the Obama administration as well as making headlines in newspapers across the country. This issue has vast social and economic ramifications to the present generation as well as to future generations of Americans. This paper will provide analysis and visualization of the seemingly endless amount of data regarding core issues of the national healthcare debate in the United States.

A major component of our paper will investigate the average cost of healthcare in the United States while comparing those costs incurred in other nationalized countries. In addition, we will address how individuals pay out of pocket expenses in the form of insurance premiums, payroll deductions, and co-pays in the U.S. versus countries such as Japan and Canada whose citizens are supported by their national healthcare systems with tax dollars. On average, Americans pay $803.00 out-of-pocket annually (barring any unforeseen medical crises) for heathcare [11].

Can the United States implement a national healthcare system for all Americans without a loss in service for those who are currently insured by their employer and can it be accomplished with a cost-effective model? The baseline question of this paper is can a United States healthcare system supported by the government via tax dollars actually work? How will a successful healthcare system be measured? What is our worst-case scenario if this system were to fail?

The ubiquitous amounts of data related to this topic can cause more confusion than provide answers to the questions posed above. By visualizing the data on how healthcare is implemented and provided to people around the world, a clearer picture will be revealed for the type of system that will work best here in the United States. Using the latest information visualization techniques to sift through the vast data sets on healthcare, the goal is to reveal a system that brings together all stakeholders and without leaving anyone feeling cheated on this most important subject.

With the current healthcare system in a shambles, a better question might be- can we afford not to do it? It seems many groups

in the healthcare industry are more concerned with keeping everything status quo no matter how high the bills are for the average person. There is no shortage of misinformation promulgated within the United States- much of it by powerful Washington lobbyists- about how badly a disconnected national healthcare system would function. Insurance lobbyists have already put ads together portraying Americans being denied doctor visits or forced to wait months for an appointment all due to some unsympathetic government bureaucrat. Tying together all of these disparate loose ends via information visualization will go a long way in providing some answers.

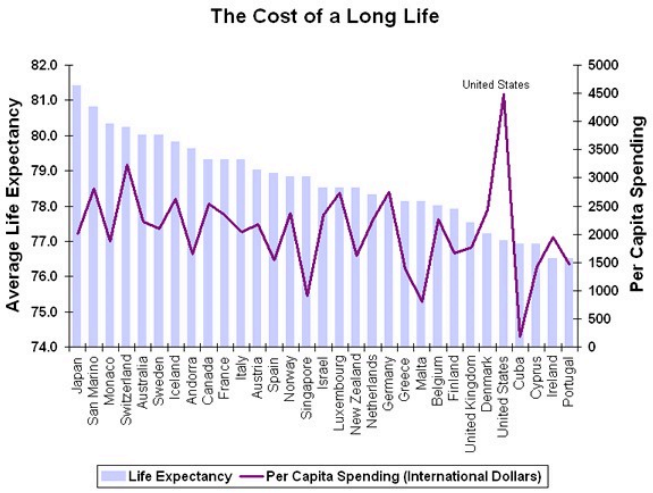

Figure 2 - The Cost of a Long Life from http://www.oldamericancentury.org/charts.htm

2 HEALTHCARE AROUND THE GLOBE

A consistent deterrent precluding the Unites States from a national healthcare system, according to organizations such as insurance companies and pharmaceutical companies, is the huge price tag that will come in providing healthcare to all American citizens [2]. Without question, national healthcare is accompanied by billions upon billions of dollars in costs which someone has to pay - doctors, nurses and hospitals will not work and give away services for free. By researching how other industrialized countries developed their national healthcare, the United States can learn what works and what does not in terms of formulating its own unique model to insure all citizens are covered.

Figure 3 provides a snapshot of other countries costs per person as of 2006 [3]:

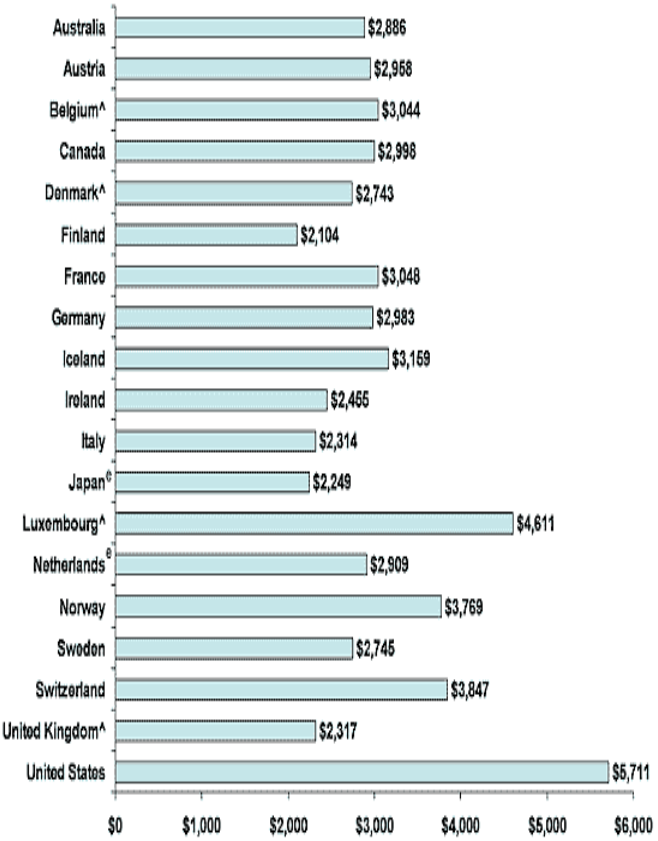

Figure 3 - Organisation for Economic Co-operation and Development. OECD Health Data 2006, from the OECD Internet subscription database updated October 10, 2006. Copyright OECD 2006, http://www.oecd.org/health/healthdata

For comparison, what follows is a synopsis of how Japan, the United Kingdom and Canada fund their programs.

2.1 Japan

By spending just 6.6% of its total gross domestic product on healthcare, Japan comes in well under the United States which is 13.4% [4]. How can Japan afford spend so much less and do so much more effectively versus the United States? Japan employs universal healthcare – virtually all citizens are covered no matter what their medical status is past, present or future. Japan's government is greatly involved in regulating the financing and operation of the healthcare system; however, the actual services provided to the citizens are left to those professionals in the medical field.

Japan boasts the longest life expectancy and lowest infant mortality rate of the 24 member countries in the Organization for Economic Cooperation and Development. Participation in their healthcare system is compulsory. On average, individuals in Japan spend $389.00 annually on out-of-pocket healthcare costs [11].

The cost of Japan's universal healthcare system is financed by a combination of payroll taxes paid by employers and employees and by income-based premiums paid for those that are self-employed.

2.2 Canada

In Canada the national healthcare system is often referred to as "Medicare" and ensures all citizens have reasonable access to hospital and doctors on a prepaid basis. Instead of having a single national plan upon enacting the *Canada Healthcare Act*, the Canadian government implemented a program comprised of thirteen different but interlocking provincial and territorial health insurance plans. All thirteen plans have certain distinct features but also share

common attributes. This system prides itself on providing equality and solidarity for all citizens of Canada.

Maintaining the roles and adhering to the responsibilities of Canada's healthcare system are shared between the federal and provincial-territorial governments. The federal government's cash contributions to the local provinces occur only after they meet the criteria and conditions specified under the *Canada Healthcare Act*.

Canada's healthcare spending as of 2007 was just over $160 billion which is 10.6% of its gross domestic product. Canada's interconnected provincial, territorial and federal governments pay 71% of the costs associated with the healthcare for all Canadians. The remaining 29% of the costs are provided by a public and private financing 'mix'. On average, individuals in Canada spend $472.00 annually on out-of-pocket healthcare costs [11].

2.3 The United Kingdom

The national healthcare system in the United Kingdom is referred to as the "National Healthcare Service" or NHS. This publicly funded system has similarities to Canada in the way it relegates much of the responsibility for governance back to the individual countries making up the United Kingdom. Individuals in the United Kingdom pay no out-of-pocket expenses for healthcare.

The UK system dates back to 1948 original comprised of three services providing for England and Wales, Scotland and Northern Ireland. The UK healthcare system makes no distinction for patient residents of one country in the United Kingdom needing treatment in another. The system is interconnected for financial matters as well as processing any required paperwork. Total spending for healthcare is 8.4% of the gross domestic product in the UK [5, 6].

3 Health Care Industry's Economic Status and Forecast

The Obama Administration's Council of Economic Advisors (CEA) recently published *The Economic Case for Health Care Reform* which outlines the Administration's case and plan for reforming the deteriorating health care industry. The report contains economic figures on the current impact of health care expenditures and future estimates of these figures if the current issues are not confronted and changed. The report also surveys inefficiencies in the current system and critical elements necessary for successful health care reform. While these figures are staggering and present a grim outlook for the healthcare industry and the economy, opponents question the validity of the findings and the methods used to arrive at their conclusions [7].

3.1 Obama Administration Report Findings

The findings from the CEA present the following economic impacts of the health care reform proposal [7]:

- Lowering the annual growth rate of health care costs by 1.5% will increase real gross domestic product (GDP) by nearly 8% by 2030.
- The typical family of four will realize an increase in income of $2,600 (in 2009 dollars) by 2020 and over $10,000 by 2030.
- Slowing the growth rate in health care costs will prevent increases in the Federal deficit budget
- Slowing the growth rate in health care costs will lower the unemployment rate by one-quarter of a percentage point (consistent with inflation) or 500,000 per year for a number of years.
- Expanding health insurance coverage to the currently unemployed will increase net economic well-being by approximately $500 billion each year the effect is in place.
- Healthcare reform will increase labor supply and eliminate barriers to job mobility and "level the playing field" between companies of all sizes.

The Obama Administration ascertains that healthcare expenditures currently account for 18% of GDP with that rate rising to 34% by 2040. These figures imply that a smaller fraction of take home pay will be in the form of salaried compensation with more contributing to healthcare premiums. In addition, the upward healthcare expenditure trends will adversely affect Federal, State and Local budgets as more government dollars will be needed to cover Medicaid and Medicare for the aging population. According to the report, this increase would account for approximately 15% of GDP by 2040 (Figure 4). Lastly, there are currently 46 million uninsured Americans with that number expected to reach 72 million by 2040 if the current healthcare and economic landscape does not drastically change [7].

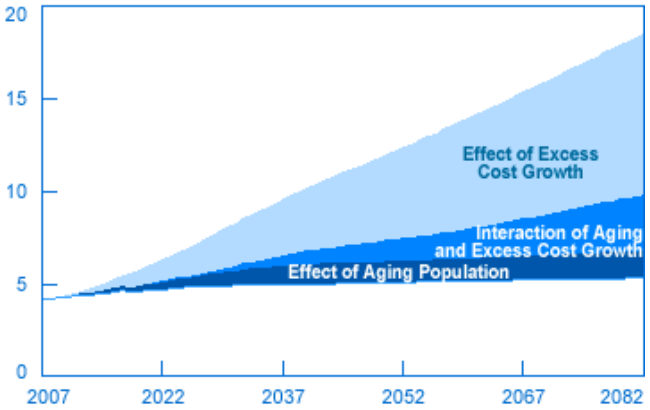

Figure 4 - Project Growth in Federal Spending on Medicare and Medicaid (Percentage of GDP)

3.1.1 Economic Impact of Slowing Healthcare Costs Expanding Healthcare Coverage

The CEA considers the economic impact of implementing the Administration's reform initiatives. Their findings in the report indicate the following potential economic impacts [7]:

- The American standard of living would improve through more efficient processes leading to improved productivity of goods and services.
- Lowering the rate of growth in healthcare costs will limit its contribution the budget deficit and result in an increased national federal savings.
- The initiatives will lower the unemployment rate.

3.1.2 Economic Impact of Expanding Healthcare Coverage

According to the report, the CEA determined that economic impact of expanding insurance coverage will lead to the following economic impacts [7]:

- The cost-benefit analysis indicates an increase in economic well-being for the uninsured is greater than the cost to insure them.
- Expanding healthcare coverage will lead to an increase in the labor supply as healthier employees lead to decreased costs for disability and absenteeism which could contribute to more productivity. The cumulative effect is an improvement in the condition and effectiveness of the labor market.

3.2 Opponents to Healthcare Reform Report Findings

Those that oppose the Obama Administration's findings question the economic impact and financial viability of the National Healthcare Plan.

3.2.1 Congressional Budget Office (CBO) Testimony

While the Congressional Budget Office (CBO) may support the overall initiative, analysts are not convinced that the cost for the program is sustainable and capable of achieving the desired economic effects.

In a March 10, 2009 testimony to Congress, CBO Director, Douglas W. Elmendorf, offers preliminary cost analysis for the proposed healthcare reform. In his testimony, Elmendorf describes important facts and considerations when determining the feasibility of the Administration's reform proposal. Some of these facts are in step with the Administration's figures and some differ. The facts that differ include [8]:

- The majority of the dramatic increase in healthcare costs and growth rate have stemmed from the development of new treatments and medical technologies leading to enhanced benefits and the improving lives. These enhanced benefits have contributed to the increasing insurance costs and premiums. This effect is in sharp contrast to the Administration's hope that an increase in medical technology spending will help lower the growth rate in healthcare costs and spur innovation through greater efficiencies.
- Contradictory to the Administration's figures on the healthcare cost burden, the CBO estimates that current federal spending on Medicare and Medicaid will rise from approximately 5% of GDP in 2009 to more than 6% by 2019 and about 12% by 2050. These figures are less than the 15% of GDP by 2040 as quoted by the Obama Administration in their report findings.
- The rapidly rising cost in healthcare has significantly contributed to the number of uninsured Americans. As health insurance premiums rise at faster rates than total compensation, Americans are will give up other goods and services in order to obtain healthcare insurance.

The evidence retrieved by the CBO suggest that the federal share of healthcare spending "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"

The CBO found that since medical technology was central to the rising cost of healthcare spending, reducing this spending will likely mean the slowing of innovation and new treatments. Once again, this finding undercuts the primary initiative of the Administration which is to increase the spending on medical technologies. It will be the Administration's challenge to find methods for increasing spending on technology initiatives while curtailing associated costs.

According the CBO testimony, the following figures represent the current and future healthcare expenditures [8]:

- Healthcare spending and related expenditures will account for approximately 18% of GDP in 2009 equating to roughly $2.5 trillion with this share expected to grow to more than 20% by 2018.
- Healthcare expenditures per capita are expected to rise from $8,000 to $13,000 over that same time period.
- The CBO concluded that the rising costs of healthcare represent the biggest challenge to balancing the federal budget.

3.3 Opposition in the Media

Aside from the statistical figures and numbers that the Administration has offered to the public, other analysts and pundits want a public discourse to discuss the real cost of healthcare. What do these numbers truly represent and who will ultimately pay for proposed reform?

For example, President and CEO of the Pacific Research Institute, Sally Pipes, argues against the claim by the Administration that the rising costs for healthcare are responsible for decimating American corporation in the global economy. Pipes points to other recent testimony from CBO Director, Elemendorf to members of the Senate when he affirmed that "the costs of providing health insurance to their workers are not a competitive disadvantage to U.S. –based firms" [9]. Pipes further disputes the need for government sponsored insurance off the premise that that uninsured Americans shift costs to private payers when the "avail themselves of the health-care safety net", leading to a sharp rise in private sector healthcare premiums. She again points to a December, 2008 report from the CBO that clearly states that universal coverage through an expanded government role will increase total costs, premiums and/or taxes, not reduce them. The CBO testimony also debunked the notion of the uninsured shifting costs by stating that "the effect of uncompensated care on private-sector payment rates appear to be limited [9].

Andrew Rettenmaier from the National Center for Policy Analysis looks at different methods of forecasting to come up with an alternate conclusion. Rettenmaier's model assumes that GDP will grow in the future as it has previously and will incorporate projections based on an aging population [10].

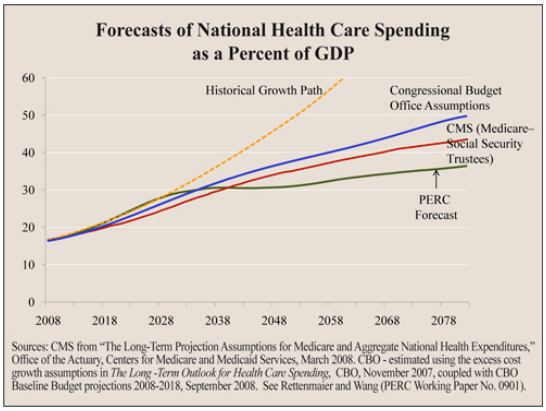

Figure 5 Forecast of National Healthcare Spending as a % of GDP

According to this model, these are the forecasted findings:

- Personal consumption on nondurable goods will decline as a share of GDP from 20.8% in 2008 to 17.6% in 2085.
- Durable goods will increase from 7.2% to 7.9% as a percentage of GDP for the same time period.
- Consumption of other services will rise from 30.1% to 34.9%.
- Personal consumption of medical care services will rise from 12.5% of GDP to 27.6%.

From these forecasts, Rettenmaier concludes that if healthcare expenditures and spending for personal consumption continue to rise at the pace they have in the past, investment will decline, and economic growth will come to a standstill. The remedy for this problem is to develop a system based on choice and a re-alignment of the healthcare system based on market-driven incentives [10].

4 Discussion

The Obama Administration is challenging the establishment with an aggressive initiative to thwart the rising costs of healthcare and provide insurance to all Americans. While most are in agreement that the current healthcare system is in dire need of reform, the Administration's reform plan makes many financial assumptions that are being challenged inside and outside of government agencies. Contradictory figures from the CBO may impede progress and ultimately kill the program, similar to the CBO's effect in denying a similar initiative for healthcare reform during the Clinton Administration in 1994. Questions stem around disputable

facts on the healthcare expenditures and their effect on the overall economy, whether further investment in medical technologies will reduce costs, and whether all Americans will be insured (even with a requirement mandate). Analysis indicates that the Obama Administration should consider other options for insuring all Americans and consider incentive programs and phased implementation that will provide feedback on efficient and inefficient aspects of the healthcare system. There appear to be too many questions, disparities and interpretations of the Administration's reform bill that render its immediate implementation questionable.

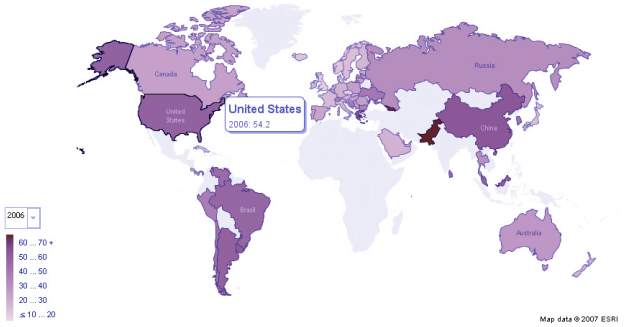

Figure 6 - 2006 National Healthcare Costs for Industrialized Countries. Many Eyes visualization from WHO statistical data.

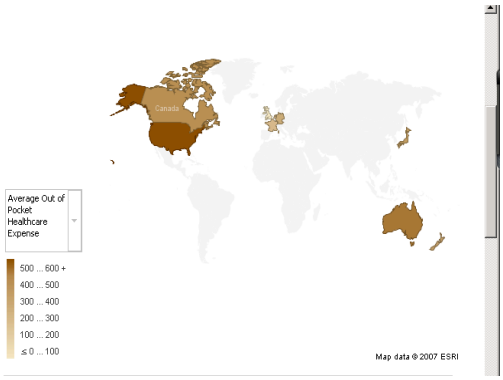

Figure 9 - Average Out-of-Pocket Healthcare Expense for Individuals. ManyEyes visualization from MNpublius statistical data.

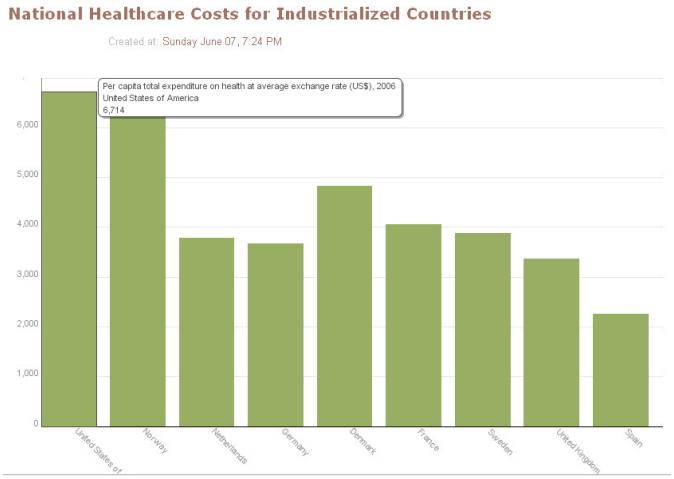

Figure 7 - 2006 National Healthcare Costs for Industrialized Countries. Many Eyes visualization from WHO statistical data.

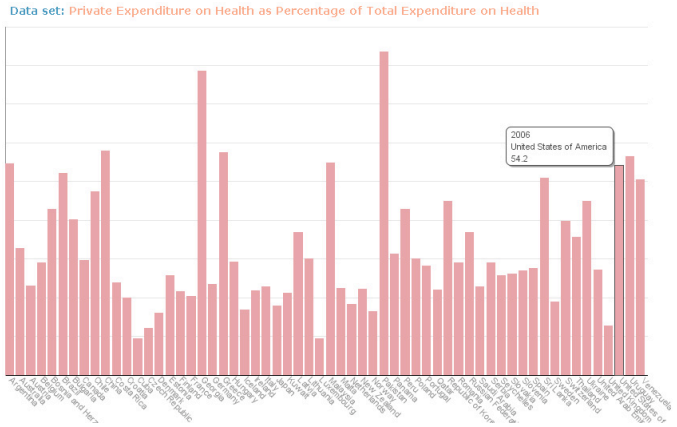

Figure 8 - 2006 Private Expenditure on Health as Percentage of Total Expenditure. Many Eyes visualization from WHO statistical data

Using data from United Nations and World Health Organization sites, we uploaded and created data sets in IBM's Many Eyes visualization application. Two visualizations, Figure 7 and Figure 8, clearly indicate that the United States spends just as much, if not more, as other countries with national healthcare, and still falls short in providing total coverage. This does not include Medicare which acts as a quasi-national healthcare system for the senior population only.

Using statistical data from MNpublius, a visualization was created showing the average out-of-pocket healthcare expense for individuals in countries around the world [11]. On average, countries that have some form of nationalized healthcare have a lower out-of-pocket expense than the United States.

5 Conclusion

The visualizations provided underscore the premise that money, while playing a huge role in developing a national healthcare system, should not be the sole deciding factor in developing a comprehensive healthcare strategy. The billions of dollars currently being spent on overpriced drugs produced en masse by powerful pharmaceutical companies combined with the superfluous administrative costs charged by insurance companies would go a long way in securing a system which would cover many more U.S citizens than the small minority in the present employer based system.

Interestingly, the countries with the lowest average out-of-pocket expense for the individual all share a nationalized system of healthcare.

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