

HIGHER LIFE EXPECTANCY AT LOWER COST: COUNTRIES WHICH OUTPERFORM THE UNITED STATES

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ABSTRACT

In this paper we identify countries that have better outcomes than the United States with respect to life expectancy. Using this sample of countries, relationships between the life expectancy outcomes and health care costs are examined, and we also test whether the extent of public financing has a significant impact on the results. In addition, the study compares the availability of important health care resources, such as doctors, nurses, hospital beds and medical equipment to the amount of funds allocated to health care. We conclude with a brief review of policies and system changes that might increase resource availability and efficiency in the United States.

JEL: I10, I18

KEYWORDS: life expectancy, health care cost, public finances, efficiency

INTRODUCTION

The challenge of improving health care availability and simultaneously constraining the financial resources expended represents one of the major political and economic issues facing the United States. The share of GDP devoted to health care has risen from 13.2% in 1996 to 15.3% in 2006 (OECD data), and the high costs have imposed a heavy financial burden on both consumers and businesses as well as federal, state and local governments. Unfortunately, the public debate on how to address the problem, for the most part, has been relatively narrow in its focus. Generally, the proposals which are debated in the media center on expanding insurance coverage to include large numbers of people who are currently uninsured. However, in order to reduce health care costs or to meet growing demands for medical services, much more than insurance reform or universal coverage will be required [See Seward (2007)].

One approach to gain some perspective on how to make health care more affordable is to examine the health care outcomes and costs among other developed nations. Are some countries more successful than others in achieving the same or better outcomes while spending less money? If so, the positive features of those nations may be adapted to improve the health care system in the United States. The good news in our results is that there may actually be many countries which might provide guidance on how costs can be cut with no adverse impact on life expectancy. In fact, it is quite possible that a variety of health outcomes beyond life expectancy can also be improved and, at the same time, expenditures might be significantly reduced below current levels.

The analysis in this paper is organized as follows: The section that immediately follows contains a discussion of relevant recent studies which have an international perspective on health outcomes and costs. Next, we present a data section in which countries that have better outcomes than the United States with respect to life expectancy are identified. Using this sample of countries we then examine if there are significant relationships between cost measures versus life expectancy and cost measures versus the extent of public financing of healthcare. The study also tests if the availability of important health care resources, such as doctors, nurses, hospital beds, medical equipment, and pharmaceuticals are correlated

to the amount of funds allocated to health care. The paper closes with some concluding remarks on countries which have performed particularly well in providing longer life expectancy at favorable costs. The discussion examines some of their features which might improve the U.S. system.

RELEVANT RECENT LITERATURE

Many papers and reports have been published which address various aspects of health care policy. Henderson (2005), in his textbook, provides an extensive and detailed examination of the health care system in the United States, and he also includes some international comparisons of outcomes and spending. The Organization for Economic Co-operation and Development (OECD) and The World Health Organization (WHO) compile and update a vast amount of useful international data on this subject, and they are the sources of statistics for many of the international studies in this area. Anderson, Frogner, and Reinhardt (2007) summarize and discuss OECD data for 2004, reviewing measures of health outcomes, cost, health care providers and facilities. Davis et al. (2007) compare the United States health care system against the systems of five other developed countries. Among the measures they utilize are cost, quality, access, administrative and procedural efficiency, equity, and healthy lives. They conclude that the United States performed relatively poorly based on most of their criteria. White (2007) examines important developments in the U.S. medical marketplace from 1993 to 2005 and details how the system malfunctioned, generating higher costs and reduced efficiency. The Pricewaterhouse Coopers Health Research Institute (2008) published a study which centers on delivering healthcare in the United States. In the report many sources of waste and inefficiency are identified and estimated.

Other studies focus on growth of health care expenditures. White (2007) compares the long-term (1970-2002) rates of real growth in health spending per capita in the United States and the OECD countries. He finds that annual excess growth was much higher in the United States (2%) versus the sample OECD countries (1.1%). A report by Kaiser Family Foundation (2007) compares the level and growth rate of health care spending in the United States with other OECD countries, and it finds that the 7% increase in the health share of GDP between 1980 and 2003 is larger than increases seen in other high-income countries. According to projections by the National Health Expenditure Accounts Projections Team (2008), health care spending growth was 6.7% in 2007. This means that the health share of GDP increased to approximately 16.3% in 2007 and the study projects that it will reach 19.5% of GDP by 2017.

Additional sundry research on health care costs include the following papers: Anderson et al. (2005) argue that the two most important reasons for higher U.S. health spending appear to be higher income and higher medical care prices. Reinhardt, Hussey, and Anderson (2004) examine reasons why U.S. health spending far exceeds the OECD countries with much older populations. Among the reasons are higher U.S. per capita GDP as well as a highly complex and fragmented payment system that weakens the demand side of the health sector and entails high administrative costs. Berwick, Nolan, and Whittington (2008) argue that it is feasible for the U.S. health care system to simultaneously improve the general health of the population, increase the quality of services that are provided, and lower the per capita costs.

Our paper differs from previous studies, including those cited above, in that we confine our analysis to other health care systems which produce life expectancy outcomes equal to or superior to those of the United States. In all of the countries in our sample, which is a relatively large group of nations compared to many previous studies, services are provided at far lower cost both in terms of dollars and percentage of GDP devoted to health care. We also specify which of those systems appear to be particularly efficient in producing life expectancy at a relatively low cost.

Another differentiating feature of the study is an examination of the impact of public versus private financing of health care systems. Does the type of financing affect outcomes related to life expectancy or the costs of the system? A final set of inquiries is directed to estimating the potential increase in U.S.

health care resources if it adopted policies similar to other nations which might be regarded as more efficient. The analysis of the results suggests some areas where reforms may generate an expansion of health care services without substantially raising the total cost of the system.

DATA

Table 1 lists the 21 nations in the sample and the measures of life expectancy that are utilized in the analysis. The sources of the data are the OECD and World Health Organization. (Two OECD nations, Iceland and Luxembourg, were excluded because their populations were under one million.) We use two different sets of life expectancy statistics to provide a more comprehensive perspective. The “Life Expectancy (2006)” column provides the most recent information, with the statistics obtained from the OECD database. In a few isolated cases, the 2006 data were not available and estimates were made using prior year OECD data, World Health Organization estimates for 2006 and estimates available from the CIA *World Factbook*.

While not as recent, “Healthy Life Expectancy” statistics are perhaps the most meaningful indicator of outcomes. The most recent data, from 2003, were obtained from the World Health Organization website (2008), and they estimate the number of years of relatively good health which are associated with the population of each country. The order of listing of the nations in Table 1 is based on healthy life expectancy performance.

Table 1: Measures of Life Expectancy

| Country | Life Expectancy (2006) | Healthy Life Expectancy (2003) |
|-------------|------------------------|--------------------------------|
| Japan | 82.4 | 75.0 |
| Sweden | 80.8 | 73.5 |
| Switzerland | 81.7 | 73.0 |
| Italy | 81.0 | 73.0 |
| Australia | 81.1 | 72.5 |
| Spain | 81.1 | 72.5 |
| France | 80.9 | 72.0 |
| Canada | 80.5 | 72.0 |
| Norway | 80.6 | 72.0 |
| Germany | 79.8 | 72.0 |
| Austria | 79.9 | 71.5 |
| Netherlands | 79.8 | 71.5 |
| Finland | 79.5 | 71.5 |
| Greece | 79.6 | 71.0 |
| Belgium | 79.5 | 71.0 |
| New Zealand | 79.9 | 70.5 |
| U.K. | 79.0 | 70.5 |
| Denmark | 78.4 | 70.0 |
| Ireland | 79.7 | 70.0 |
| Portugal | 78.9 | 69.5 |
| U.S. | 77.9 | 69.0 |

Data source: Life expectancy data are obtained from the OECD, and healthy life expectancy from WHO. Table 1 provides a listing of the countries included in the study and measures of life expectancy.

Cost indicators utilized in this study include 2003 and 2006 statistics on health care spending per capita and percentage of GDP allocated to health care. One can reasonably argue that per capita spending is the better measure because it would more directly link to the quantity of resources purchased for the benefit of an individual’s health. However, given the evidence that the dollar costs in the United States are higher than in other countries, the U.S. data overstate the quantity of services received [See Anderson et al. (2003)]. Other nations may spend relatively high amounts relative to GDP, but the reported dollar amounts may understate the amount of care purchased. For this reason cost measures, both in dollars and as a percentage of GDP, are employed in deriving results.

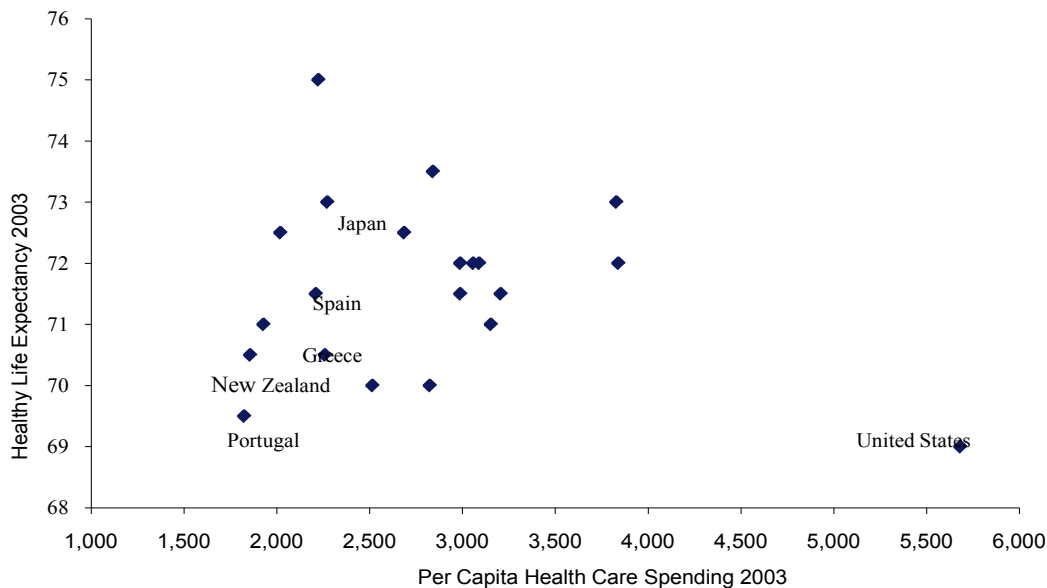
EXAMINATION OF RESULTS

This section contains many figures and a comprehensive table. The first set of figures examines the relationship between life expectancy and health care spending among the countries listed in Table 1. The next set of figures illustrates how that spending is linked to the extent of public financing among those nations. The last set of figures shows how the availability of doctors, nurses and hospital beds are tied to health care expenditures.

Life Expectancy versus Health Care Expenditures

Figure 1 maps the combinations of healthy life expectancy and per capita health care spending which prevailed in 2003 (the most recent data). Five countries, Japan, Spain, Greece, New Zealand, and Portugal were particularly efficient in generating healthy life expectancy outcomes. No other nations produced comparable levels of healthy life expectancy at lower costs. A similar analytical approach and diagram is utilized in financial portfolio theory. Efficient portfolios of securities are essentially characterized as providing the highest returns given the underlying risk. They are collectively the best portfolios. In Figure 1 an “efficient frontier” would resemble a curve that could potentially connect the 5 efficient nations specified above. Nations on such an “efficient frontier” would provide the highest level of life expectancy given the underlying cost. For a much more detailed exposition of the efficient frontier concept, see Brigham and Ehrhardt (2008).

Figure 1: Healthy Life Expectancy vs Per Capita Spending 2003



Figures 1, 2, and 3 map measures of life expectancy versus health care expenditures among the 21 countries in our sample. The most efficient nations are labeled and the United States is also identified. The inefficiency of the United States is clearly visible in the figures.

The United States’ performance appears at the far right on the figure. Its position suggests that the efficiency of the U.S. system is quite poor. With a healthy life expectancy of 69 years (the lowest), it paid far more than every other country in the group.

Figure 2 also displays healthy life expectancy, but the cost measure utilized is the percent of GDP allocated to health care. In this case there are 4 nations which are particularly efficient: Japan, Finland,

the United Kingdom and Ireland. While there were differences in the composition of the most efficient countries in Figures 1 and 2, the United States remained highly inefficient with its location on the lower far right. The U.S. spent 15.1 % of GDP on health care, more than every other country in the sample.

Figure 2: Healthy Life Expectancy versus % GDP on Healthcare

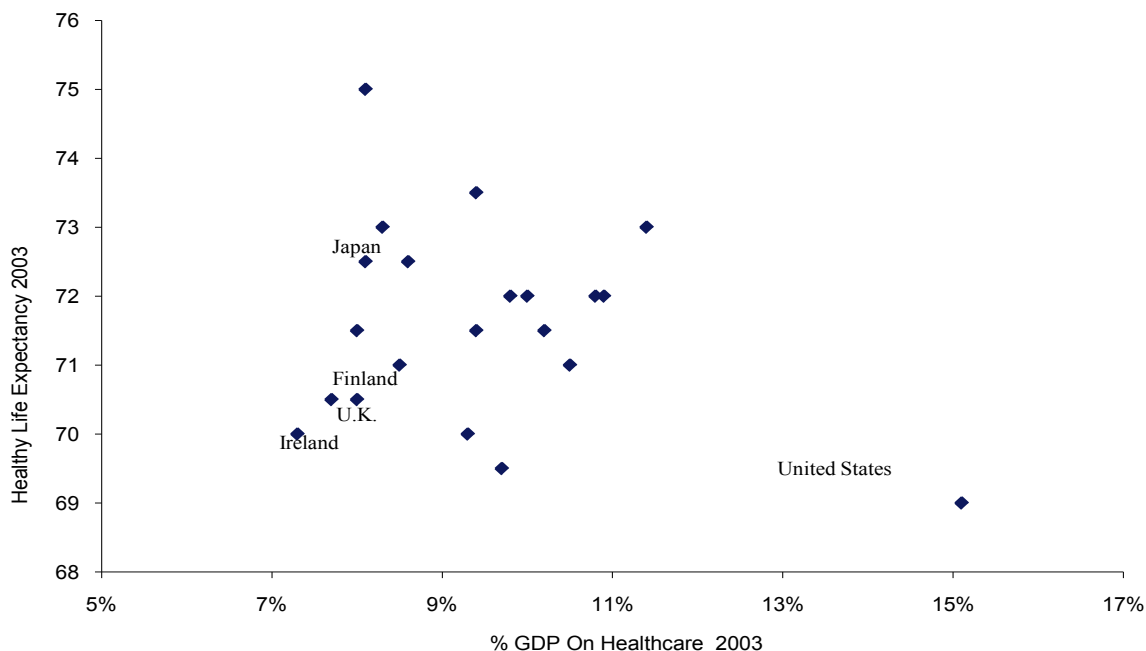


Figure 3 provides results utilizing the most recent OECD data: 2006 life expectancy and 2006 per capita health care spending. The efficient frontier includes Japan, Spain, New Zealand, and Portugal. As can be observed, the United States maintains its inefficient position at the far right of the figure. In none of the 3 figures was there a significant relationship between the amount spent and the life expectancy outcomes among the nations. This lack of significance prevailed with and also without the inclusion of the United States.

An important qualification regarding the analysis should also be clearly stated at this point. Even though OECD data are widely used to make international comparisons (as in the studies cited earlier), to the extent that those OECD country cost statistics have not been properly measured or adjusted, the results could be distorted. However, unless OECD data are grossly inaccurate, it would appear that the United States has a rather costly system in relation to the outcomes. Moreover, studies on efficiency using different methodology, such as the Pricewaterhouse Coopers Health Research Institute (2008) report cited earlier, are consistent with our findings, for they conclude that the U.S. health care system is exceptionally inefficient.

Impact of Public versus Private Share of Spending

Another set of financial questions relating to health outcomes pertain to the method of financing health care: specifically, the balance between public and private funding. Is there a relationship between public versus private financing of health care and either life expectancy outcomes or measures of a country’s health care costs?

An initial set of simple regression tests was performed to determine if there was a statistically significant relationship between the percentage of health care publicly financed and each of the two life expectancy

measures. Data from 2005 were utilized in the tests because 2006 public financing statistics were unavailable for many of the nations. In neither of those tests was the degree of public financing statistically significant. These results are shown in Table 2.

Figure 3: Life Expectancy vs. Per Capita Health Care Spending 2006

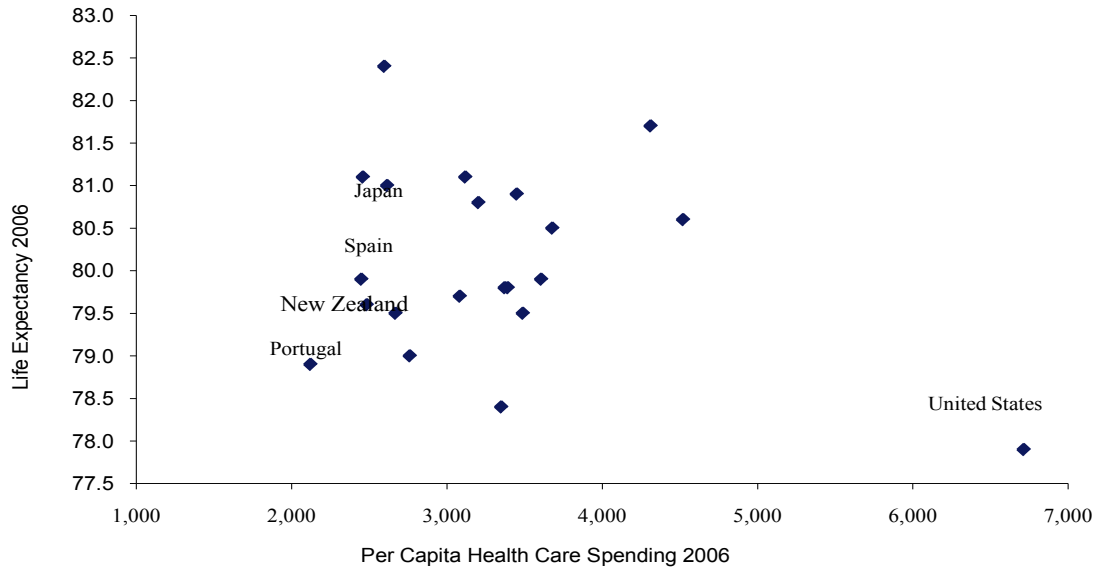


Table 2: Life Expectancy and Cost Data vs. Public Financing

| Dependent Variable | Constant | Coefficient of Public Financing | R-square |
|-------------------------|---------------------|---------------------------------|----------|
| Life Expectancy | 78.48 (42.18)*** | 0.0219 (0.87) | 0.04 |
| Healthy Life Expectancy | 68.93 (28.75)*** | 0.036 (1.12) | 0.06 |
| Per Capita Spending | 6,892 (4.91)*** | -50.94 (-2.69)** | 0.28 |
| % GDP Spending | 17.73 (8.47)*** | -0.109 (-3.88)*** | 0.44 |

Source of the data for the variables: OECD and WHO

The numbers in the parentheses are t-statistics.

*** significant at the 1% level.

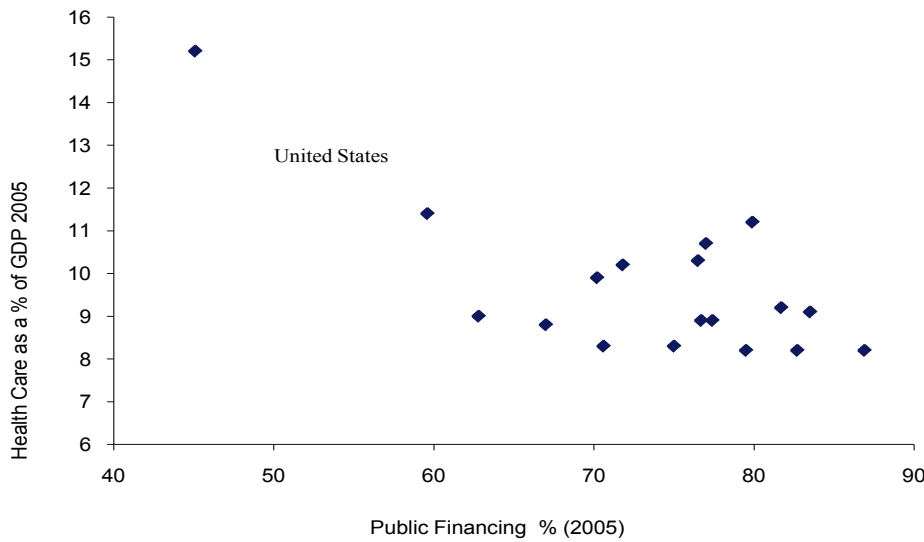
** significant at the 5% level.

This table shows the regression results on life expectancy, healthy life expectancy, per capita spending, and % GDP spending using % public financing as an independent variable. An example of the estimated simple regression model is:

$Life\ Expectancy = a + b (\% \text{ Public Financing}) + \text{error term}$

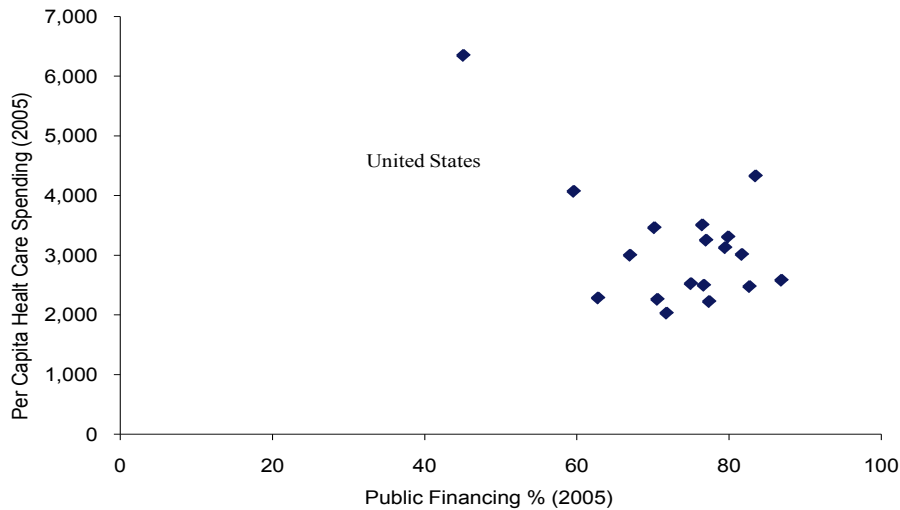
A second set of regression tests were performed to determine if there was a relationship between the extent of public financing and either per capita spending or the percentage of GDP allocated toward health care. The purpose of these statistical tests was to determine whether or not systems which are heavily publicly financed are more expensive. The results, also in Table 2, show that there was a statistically significant relationship at the .01 level for the percentage of GDP and at the .05 level for per capita spending. However, higher public financing was associated with lower costs rather than higher costs. The data on costs and the extent of public financing are shown in Figures 4A and 4B. The figures indicate that the reason for the negative relationship is attributable to the high costs of the U.S. system which had the lowest public financing percentage.

Figure 4A: Total Expenditure on Health Costs (% GDP) versus Public Financing



Figures 4A and 4B illustrate that except for the effect of the United States, there is no significant relationship between public financing and health care expenditures. When the U.S. is included, there is a significant negative relationship.

Figure 4B: Per Capita Health Care Spending versus Public Financing



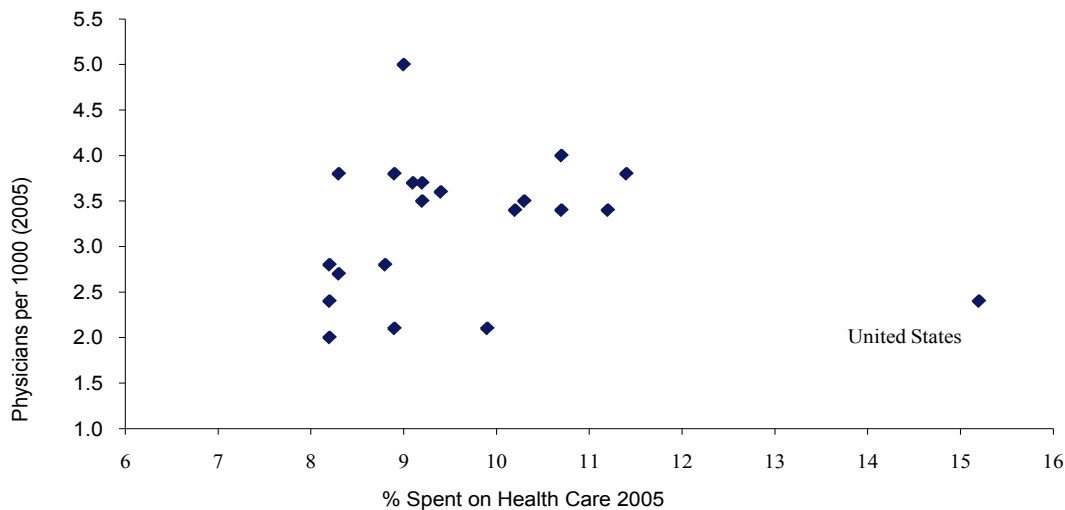
A third set of statistical tests on health care costs and public financing was performed with the U.S. excluded from the sample. Without the U.S there was no statistically significant relationship between costs and public financing, which is discernable in observing Figures 4A and 4B. The negative correlation between costs and public financing, observable in the latter figures, does not imply that additional public financing will necessarily improve the efficiency of the health care system in the United States. It is quite possible that the U.S. system can be improved without reliance on a larger government role. At the same time, there is certainly no statistical evidence in our study that more public financing would have a detrimental impact on costs, and it should be noted that all of the other countries in the sample have some form of universal health care coverage.

Resource Availability

In Figures 5-7 we present data on the quantity of critical health care resources provided by each of the nations in the sample together with the associated measures of health care spending. In other words are there any relationships between the availability of these critical tangible resources and the allocation of financial resources to healthcare. In Figures 5A and 5B we examine the number of physicians (per 1,000 population) compared to per capita health care spending and compared to the percentage of GDP devoted to health care. Figures 6 and 7 present data in a similar format for nurses and hospital beds. In Figures 6 and 7 all cost data are on a per capita basis, but similar findings would prevail if costs were measured as a percentage of GDP.

Figure 5: Panel A Physicians versus Per Capita Spending and Panel B Physicians vs Per Capita Spending

Figure 5A: Physicians versus % GDP spent on Health Care



Figures 5A, 5B, 6, and 7 map measures of expenditures versus the quantity of important health care resources: physicians, nurses, and hospital beds. Generally, there is no significant relationship between spending and the quantity of those resources.

Figure 5B: Physicians versus Per Capita Spending

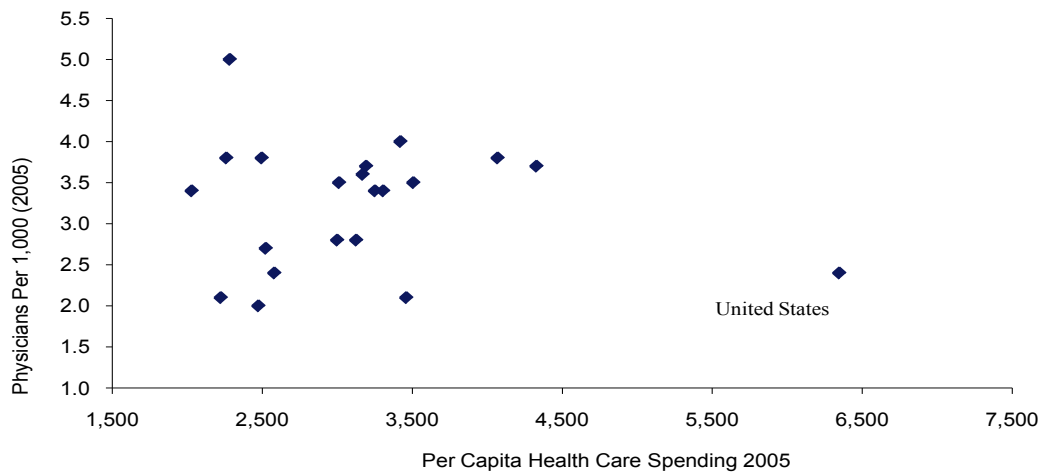
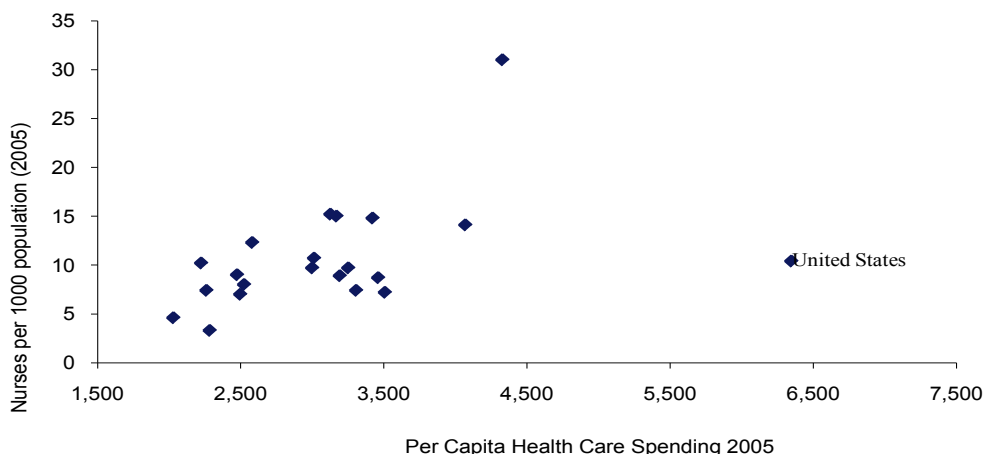


Figure 6: Nurses versus Per Capita Spending

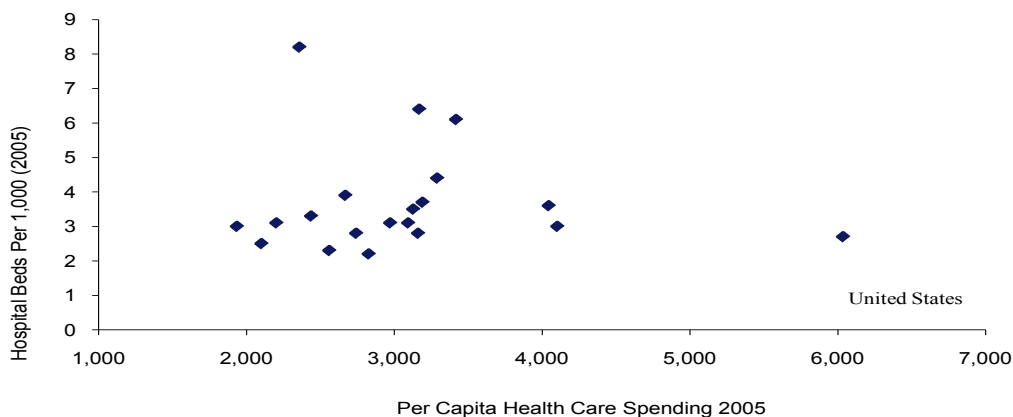


In Figures 5-7 the United States, at the far right, is visible as the high cost outlier in all of the cases. In none of the cases is there a significant relationship between financial expenditures and the quantity of resources acquired. However, if one excludes the United States, there is a significant positive relationship in the number of nurses and per capita spending.

A final set of interesting questions relates to the supply of health care resources in the United States assuming it was as efficient as the other countries in providing those resources. An estimate of U.S. resource potential is made under the following scenario:

1. The U.S. adopts appropriate policies in line with the other nations in our sample.
2. If it spends the same percentage of GDP on health care it will be able to provide the same level of resources per capita as the average of those other nations.
3. If it spends more than those other nations as a percent of GDP it will generate a corresponding increase in those resources.

Figure 7: Hospital Beds versus Per Capita Spending



In Table 3 Column (2) and (3) show statistics on the number of physicians, nurses, hospital beds, CT scanners, and MRI units per capita based on 2005 data. Column (2) displays the data for the other countries in the sample and column (3) shows the existing U.S. numbers. Under the scenario described above it is presumed that the United States system could replicate the 3.3 physicians per capita of the other nations if it made the necessary reforms and spend the same percentage of GDP as those other nations. However, as shown at the top of the table, the ratio of “% GDP toward Health Care for the U.S.”

to the “Average % GDP toward Health Care for Other Countries” was 1.62. Therefore, under the scenario, it is presumed that the U.S. could provide 62% more than the 3.3 in column (2). In other words, the U.S potential would be 5.3 physicians per 1,000 of population. That number is 121% larger than the 2.4 physicians per 1,000 of population which actually prevailed in the United States. The number of nurses, hospital beds and CT scanners is also larger than existing U.S. levels but the number of MRI units in this country would actually decline under the projections.

Table 3: Estimate of U.S. Resources under Alternative System

| (1) Resource | (2) Average Other Countries | (3) U.S. (Actual) | (4) = (2) x 1.62 U.S. (estimated Potential) |
|---|-----------------------------|-------------------|---|
| Physicians (Per 1,000 population) | 3.3 (N=20) | 2.4 | 5.3 |
| Nurses (Per 1,000 population) | 10.7 (N=20) | 10.4 | 17.3 |
| Hospital Beds (Per 1,000 population) | 3.7 (N=19) | 2.7 | 6.0 |
| CT (Per million population) | 23.8 (N=18) | 33.1 | 38.6 |
| MRI (Per million population) | 10.7 (N=18) | 26.5 | 17.3 |

Year of Data: 2005

Average % GDP toward Health Care for Other Countries 9.4%

% GDP toward Health Care for U.S. 15.2%

Estimated Multiplier for the U.S. system with efficiency reforms: $(15.2)/(9.4) = 1.62$

N: number of other nations in each of the resource categories

The purpose of Table 3 is to indicate if the U.S. was as efficient or as productive as other countries, it might be able to provide a higher level of physicians, nurses, and hospital beds.

To the extent that the scenario described above is unrealistic, the estimated numbers in column (4) are inaccurate. Assuming the scenario is too optimistic the “correct” projected statistics should actually fall somewhere between the current existing U.S. numbers in column (3) and those estimated in column (4).

Issues of Quality of Resources

An important issue which has not yet been addressed in conjunction with the discussion on resources is that there are no adjustments for quality in the statistics. If those quality adjustments could be measured, it is likely that the apparent U.S. deficit in health care resources, given the expenditures, would not be as great. In Table 3 the data show that the U.S. presently lags the other countries in doctors, nurses and hospital beds per capita, despite the high expenditures [column (2) versus column (3)] but it exceeds those other countries in CT scanners and MRI equipment. If one adjusts for quality, the effective disparity in doctors, nurses and hospital beds would likely be reduced. In other words, the true value of the services performed in the United States may exceed the true value of similar services provided in other countries. It is also possible that there are other resources available to consumers of U.S. health care which are not discussed in this report, and they might add significant value to the U.S. system.

Nevertheless, one cannot ignore the fact that all of the other nations did have better life expectancy outcomes, even if their physicians, nurses, equipment, or pharmaceuticals might have been below U.S. regulatory standards. Furthermore, these outcomes were produced with less expensive health care systems. The existence of those better outcomes in the other nations suggests that there is a possibility that the U.S might benefit by producing and providing a larger quantity of resources, serving additional people at lower cost, despite the risk that there might be a potential reduction in average quality.

Pharmaceutical Expenditures

A few comments should also be made regarding pharmaceutical spending, for that spending comprises a sizeable portion of total health care expenditures. In Table 4 three measures of pharmaceutical expenses for the United States and other countries in our sample are presented. In the first column those expenses are shown as a percentage of total health care expenditures. The United States, at 12.4%, is somewhat under the average of the other nations. However, if one measures drug expenditures based on percent of GDP or dollars per capita, there is a greater amount of U.S. spending on drugs. Because there is no quantity or quality index in our numbers, and due to differences in the composition of drugs used in different countries, no clear inferences other than the metrics on spending can be drawn from Table 4.

CONCLUDING OBSERVATIONS

The features of the other health care systems with better outcomes can provide models and ideas for reforms in the United States. In some cases improved outcomes may come from efficiencies in the system of training health care providers. Government mandates relating to occupational licensure and government regulations on the education and the training of physicians have raised the costs and restricted the supply of medical doctors [See Federal Trade Commission and Department of Justice (2004)]. To some extent this problem is being recognized in the U.S., and new programs for doctors of nurse practice are being launched [See Landro (2008)].

All of the other countries included in our study had higher reported levels of public financing compared to the U.S., and yet, their health care expenses were lower. Those nations did not have the high costs relating to the impact of malpractice litigation, such as additional expenditures on medical tests and procedures as well as insurance and legal costs [See Henderson (2005)]. In addition, they did not have the restrictive training issues and other expensive features associated with the U.S. system [See White (2007)]. Although there are flaws and shortcomings in other nations, they generated better life expectancy outcomes, and they also performed better based on other gauges of health not discussed in this paper.

Table 4: Pharmaceutical Spending (2005)

| | Pharmaceutical Cost as a % of Total Health Care Expenditures* | % GDP toward Drugs | Per Capita on Drugs (\$) |
|----------------------------|---|--------------------|--------------------------|
| Japan | 19.8% | 1.62% | 490 |
| Sweden | 13.7% | 1.26% | 413 |
| Switzerland | 10.5% | 1.20% | 427 |
| Italy | 20.3% | 1.81% | 507 |
| Australia | 14.2% | 1.25% | 426 |
| Spain | 22.4% | 1.86% | 506 |
| France | 16.7% | 1.87% | 552 |
| Canada | 17.2% | 1.70% | 595 |
| Norway | 9.1% | 0.83% | 394 |
| Germany | 15.1% | 1.62% | 491 |
| Austria | 12.0% | 1.24% | 421 |
| Netherlands | NA | NA | NA |
| Finland | 15.8% | 1.31% | 399 |
| Greece | 18.5% | 1.67% | 422 |
| Belgium | 16.9% | 1.81% | 578 |
| New Zealand | 12.5% | 1.11% | 278 |
| U.K. | NA | NA | NA |
| Denmark | 8.6% | 0.81% | 273 |
| Ireland | 10.9% | 0.89% | 341 |
| Portugal | 21.6% | 2.20% | 438 |
| U.S. | 12.4% | 1.88% | 787 |
| Average excluding the U.S. | 15.3% | 1.45% | 442 |

Data Source: OECD Health Data 2008. * % total expenditure on pharmaceuticals and other medical non-durables The 2005 data for Netherlands and U.K are not available.

Additional actions, beyond the scope of this paper, that are critical in order to improve outcomes include modifications in diet, lifestyle, and other behavioral activities. Such changes were very important in improving health performance in Finland [See Koskinen, Aromaa, Huttunen, and Teppen (2006)]. In the United States, due to the increased incidence of obesity, with its damaging health effects, there have been some new policy initiatives. Examples include school districts that have prohibited sale of foods and beverages regarded as unhealthful and replacing them with better alternatives.

Based on political, economic, and cultural factors, some foreign health care systems may have more features which are suitable for import into the United States. Such items must obviously be considered in order to obtain public support for any new policies. If one were to strictly use the efficient frontiers in Figures 1-3 as the basis to select nations for such policies, Japan would rank high on the list. Japan was the only country on all 3 of the efficient frontiers, and it also has the highest measures of life expectancy shown in Table 1. In addition, Japan's health care system provides services to a rather large population of older people: 21.6% of its residents are 65 or older compared to only 12.7% of those who live in the United States [See CIA World Factbook website (2008)]. Other nations which were situated on at least one of the efficient frontiers include Spain, Greece, New Zealand, Portugal, Finland, the United Kingdom and Ireland, and they might also provide insights to increase efficiency.

Given the continuing aging of the U.S. population, the demand for health care services is likely to grow on a per capita basis. This will aggravate stresses in the health care system and place additional pressures on costs. Clearly, change is inevitable, and poor planning can create a chaotic environment. However, there are promising opportunities for policy makers to look abroad, assess what is most likely to work well in the United States and implement reforms that will improve the performance of the U.S. system.

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