BlueCross BlueShield of Tennessee

# Assessing the Value of Health Care in Tennessee

A White Paper Detail on the
Relationship of Investment and Return on Health Care Expenditures

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*Part of a Series of Special Industry Reports*
*From BlueCross BlueShield of Tennessee*

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*Rx for Pharmacy Costs in Tennessee*
*Health Plan Affordability in Tennessee*

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# More Medicine Can't Fix Everything

## Why More Money Won't Help

Americans want access to the best medical care available, and certainly, spending on health care in the United States reflects this desire. The U.S. currently spends more than any other nation on health care as a percentage of Gross Domestic Product. Money alone, however, cannot always provide all the answers for health care needs. In fact, to a certain degree, overspending may actually be harming the nation's overall health.

Many people seem to think that if there is even a remote possibility that a medical service may help someone, it should be used, despite mounting evidence that medical services can also be harmful.[1,2] The results of two studies in the 1990s imply that at least 44,000 and perhaps as many as 98,000 Americans die in hospitals each year as a result of medical errors.[3]

Could it be that overspending tends to be more a result of capacity, rather than need? In an earlier white paper in this series,[4] BlueCross BlueShield of Tennessee noted that Roemer's Law indicates that this may, indeed, be the case. The law states that, "The capacity to provide health care drives the demand for health care." Simply stated, Roemer's Law maintains that health care capacity is usually used, regardless of need. This premise was easily demonstrated in a study by J.E. Wennberg, professor of Epidemiology and of Community and Family Medicine at Dartmouth, who explored the relationship between hospital bed capacity and hospital expenditures per capita and found that where capacity was highest, cost was also high.[5]

High health care costs are worrisome for many reasons: 1) Employees tend not to sign up for health care coverage when costs are high;[6] 2) The additional cost burden for employers might force them to reduce their workforce or not offer coverage in order to remain cost competitive; and 3) Allocation of economic resources for health care reduces the amount of money available for other expenditures.

This paper looks at what happens when there actually may be too much health care capacity available and its effect on health care affordability.

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[1] Leape, L.L. "Can We Make Health Care Safe?" *Reducing Medical Errors and Improving Patient Safety: Success Stories from the Front Line of Medicine.* Findlay, S, Keefe, A, Eds. Washington, D.C. The National Coalition on Health Care and the Institute for Healthcare Improvement, 2000. p. 2 – 3.

[2] McGlynn, E.A., Brook, R.H. "Keeping Quality on the Policy Agenda." *Health Affairs.* (May/June 2001) 20(3): 82-90.

[3] Kohn, L., Corrigan, J, Donaldson, M., editors. *To Err is Human: Building a Safer Health System.* National Institute of Health. Washington, D.C. National Academy Press, 1999.

[4] *Health Plan Affordability in Tennessee.* BlueCross BlueShield of Tennessee. 2002.

[5] Wennberg, J.E., *The Dartmouth Atlas of Health Care.* The Trustees of Dartmouth College. The American Hospital Association. 1996.

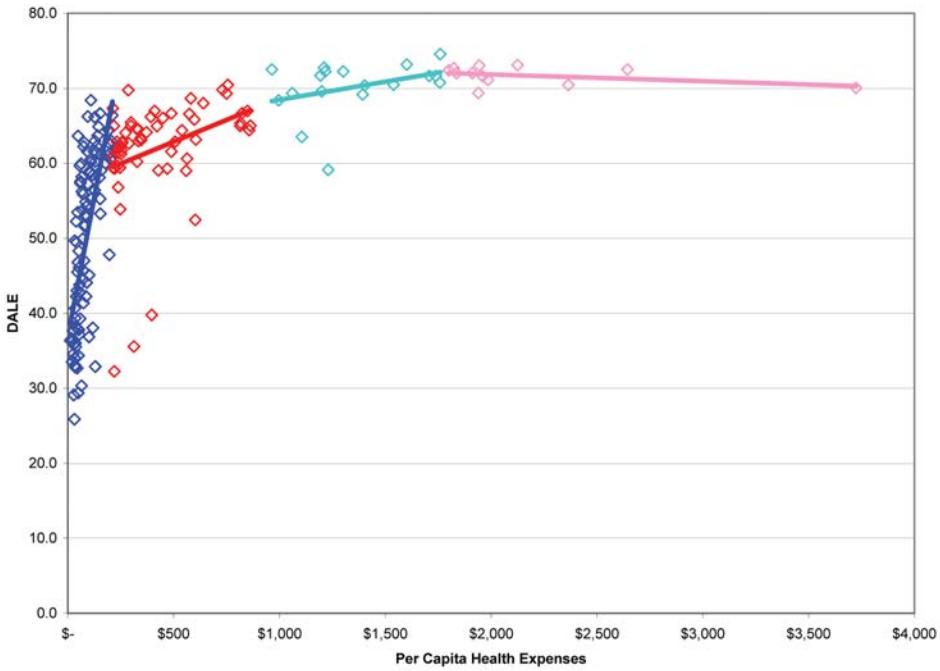
[6] Cutler, D.M. *Employee Costs and the Decline in Health Insurance Coverage.* Working Paper 9036. The National Bureau for Economic Research. July 2002.

## The Law of Diminishing Returns

In economics, the law of diminishing returns basically states that if one factor of production is increased while the others remain constant, the overall returns will relatively decrease after a certain point.[7] This appears to be the case when it comes to health care spending. In particular, once health care spending has reached a set amount of investment ($1,760 per capita), the statistics suggest that life expectancy actually begins to decrease (**Figure 1**).

**Figure 1**

**Nations of the World**




The chart in **Figure 1** shows the per capita health expenditures and life expectancy for 191 nations of the world, as reported by the World Health Organization (WHO).[8] The vertical axis represents disability-adjusted life expectancy (DALE); that is, life expectancy adjusted for the average time spent with disability. The horizontal axis represents per capita health expenditures. The U.S. is represented in **Figure 1** by the right-most data point, because the U.S. health system is the world's most expensive.

A continuous relationship exists between health status and the level of investment in health care. The levels of investment result in a return that is intuitive, in that one would expect that an initial investment would cause the greatest increase in life expectancy,

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[7] *The Columbia Encyclopedia*, Sixth Edition. Columbia University Press. 2002.

[8] "World Health Organization Assesses the World's Health Systems." World Health Organization Press Release, WHO/44, June 21, 2000. Geneva, Switzerland. Available at: http://www.who.int/inf-pr-2000/en/pr2000-44.html.

while subsequent investments would not increase it as dramatically. There are four distinct phases to the relationship between health expenses and life expectancy:

1) The steep portion of the graph (in blue) shows where the increase in life expectancy is significant and the investment level is low;

2) A less steep portion (in red) shows where the investment level is increased by 300 percent, but the life expectancy increase drops by 90 percent of the Phase 1 value, a diminishing return.

3) A less steep portion still, (in aqua) shows where investment increases to 840 percent of the Phase 1 value and life expectancy increases by just four percent of the Phase 1 increase. The return is thus diminishing further.

4) The declining portion (in pink) shows where disability-adjusted life expectancy begins to decrease as investment increases to 1,900 percent of the Phase 1 value.

This fourth phase confirms that at a point – in this case, at about 50 percent ($1,760) of the U.S. per capita expenditures on health care – increasing investment in health services and the resulting intensity of medical services begins to be associated with a reduction in health status as measured by life expectancy.

This 50 percent figure, where the reduction in health status begins, is consistent with other estimates of the portion of health care costs that actually contribute to improved health.[9,10]

**Table 1** illustrates the point made in **Figure 1** by showing the additional life expectancy purchased by investing an additional $1 in health care for different levels of per capita health expenses.

**Table 1**
**The Law of Diminishing Returns in Health Care Spending**

| Per Capita Health Expenses | Additional Investment | Increase in Life Expectancy |
|---|---|---|
| $0 to $210 | $1.00 | 45 days |
| $211 to $900 | $1.00 | 4.3 days |
| $901 to $1,760 | $1.00 | 1.76 days |
| $1,761 to $3,724 | $1.00 | -0.43 days |

Source: WHO 2002
Available at: http://www.who.int/inf-pr-2000/en/pr2000-44.html.

[9] Bloom, Bernard S. "Value for Money in Health and Medical Care Services." *The American Journal of Managed Care*. March 2002.
[10] Hertzberg, Jeffrey. "Defined Contribution Plans Do Not Change Basic Market Distortions in U.S. Health Care." *Information Technology*. October 2001.

At higher levels of investment, the additional life expectancy purchased decreases until – at an investment level above $1,760 per capita – life expectancy decreases. What this means is that, on average, at the health care spending levels that exist in the United States, the return in life expectancy is either zero or, actually, negative.

There is good news:

- Increased spending on health care can help significantly up to a point;
- The point at which additional spending ceases contributing to increased life expectancy is clearly identifiable; and
- There is opportunity for improvement in the U.S.

# The Law of Diminishing Returns in Tennessee

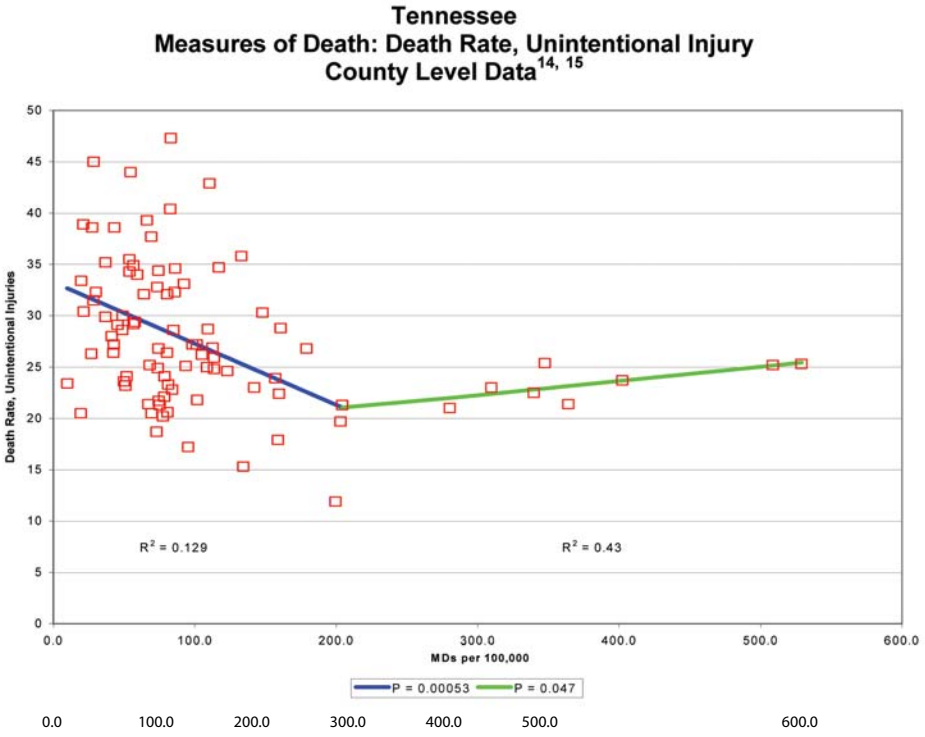
If Tennessee were plotted in **Figure 1**, it would be further to the right than the U.S., because Tennessee's per capita health expenditures are higher and its disability-adjusted life expectancy is lower. Since the relationship between income and health care expenditures is direct, **Figure 1** also provides insight into the effect of income on life expectancy.

It is especially easy to see this inverse relationship in terms of dollars spent on physicians in Tennessee. In 1998, the state spent $1,149 out of a total of $3,808 per capita personal health spending just on physicians and other professionals, ranking it 12th in the nation.[11] Unfortunately, such significant investing in physicians didn't assure better outcomes for patients.

For example, there is a significant association between increasing mortality rates when it comes to unintended injury* and increased access to physicians, specifically, at access levels up to 200 physicians per 100,000 in Tennessee (**Figure 2).** [12,13]

**Unintended injury does not include homicide or suicide.*

**Figure 2**




[11] Martin, Anne, et al. "Health Care Spending During 1991-1998: A Fifty-State Review." *Health Affairs* July/August 2002. 21(4): 112-26. Available at http://my.premierinc.com/all/advocacy/issues/107th/2002/budget/health-spending-91-98-0702.pdf.
[12] Tennessee Department of Health. 1999 Licensed Physicians per County. 2000.
[13] The Community Health Status Indicators Project. Health Resources and Services Administration.
[14] Tennessee Department of Health. 1999 Licensed Physicians per County. 2000.
[15] The Community Health Status Indicators Project. Individual county information available at: http://www.communityhealth.hrsa.gov.

An increase of 10 physicians per 100,000 is associated with a decline in mortality of 0.6 deaths per 100,000. At access levels greater than 200 physicians per 100,000, there is a significant association between an increasing mortality rate and additional access to physicians. An increase of 10 physicians per 100,000 at this greater-than-200-physicians-per-100,000 level is associated with an increase of 0.14 deaths per 100,000.

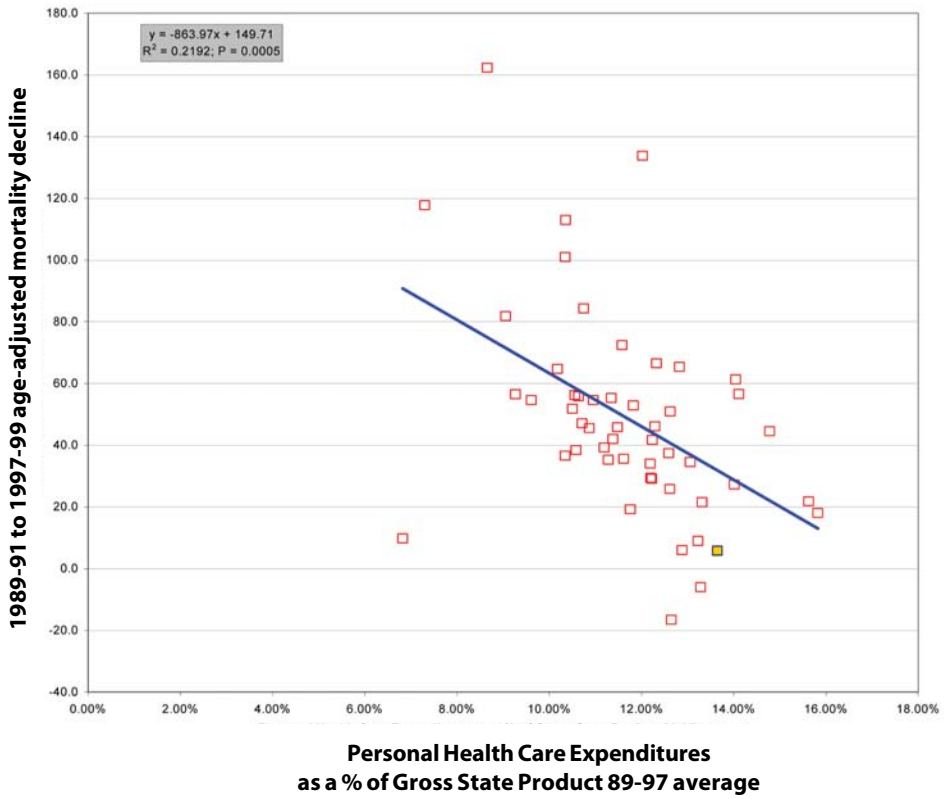
**Figure 2** well illustrates the diminishing returns of investment in health care. Using the number of physicians as the level of resources invested, the chart shows that investment beyond a point – or excessive investment – results in no further improvement in health and can result in a decline in life expectancy for Tennesseans.

The pattern is the same for other measures of mortality as well. For example, using mortality due to coronary heart disease, there is a decline of 0.2 deaths per 100,000 (P= 0.03) with each additional physician up to 200 per 100,000, when the change in mortality with additional physicians becomes zero.

The National Center for Health Statistics' information on states (**Figure 3)** confirms the diminishing returns associated with increased levels of investment in health care.

**Figure 3**

**State Level Data**



The vertical axis reflects the mortality changes from two three-year averages (1989-91 and 1997-99),[16] while the horizontal axis shows health expenditures as a percent of gross state product.[17] The average life expectancy for each state is displayed as a red box, with Tennessee represented by an orange box. The chart shows that as health care expenditures increase, mortality not only doesn't improve, but actually increases. In states where health care spending is lower, better improvements in health status are seen.

**A Case History Example**

> A 52-year-old white male presented to the ER following a crush injury to the lower left leg, which extended through the knee joint. The orthopedic service was consulted and a decision was made, in conjunction with the patient's wife, to attempt to salvage the leg, rather than to perform an above-the-knee amputation (AKA).
>
> The surgery, though extensive, was uneventful and resulted in the placement of hardware in the tibia and a primary repair of a laceration to the popliteal artery by the vascular surgeon who was consulted intraoperatively. Three days post-operatively, the patient began spiking fever to 102° F. A sepsis workup was undertaken with methicillin resistant staph aureus (MRSA) cultured from both wound and blood. Appropriate antibiotics were begun, the wound was re-opened, hardware was removed, and the leg was placed in external traction.
>
> On the fifth postoperative day, the patient complained of the sudden onset of severe shortness of breath. A workup revealed multiple pulmonary emboli (blood clots in the lungs). Anticoagulation was begun.
>
> On the eighth postoperative day, the patient experienced the sudden onset of hematemesis (vomiting blood). Emergency gastroscopy revealed hemorrhage from gastric stress ulcers.
>
> After multiple transfusions and reversal of anticoagulation, the bleeding was brought under control. Unfortunately, during the night, the patient suffered a massive pulmonary embolus and expired.

This case illustrates the potential downside of "too much" medical care. Had this individual undergone an immediate AKA, he would likely have been ambulated early and avoided the blood clot formation that ultimately led to his demise. He would have been fitted for a prosthesis and lived a near normal life. Certainly, amputation is not a benign procedure, but had this patient's doctor decided on this course of action in the beginning, the patient would have been in the hospital for a shorter period of time, which would have decreased his chances of being exposed to a staph infection.

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[16] Table 29. *Health, United States, 2001.* The National Center for Health Statistics.
[17] State Health Accounts, State of Provider. CMS (HCFA).

During the Vietnam War, physicians learned that airway preservation, respiratory adequacy, and hemodynamic stabilization are the keys to survival of a major injury. And though miraculous techniques are performed today when it comes to limb-saving surgery, there is still a downside to the procedure, which includes the risk of complications and even death. In other words, going beyond the basics carries significant risk, and for the unfortunate few, more medical care is definitely not better.

Interestingly, there was nothing "inappropriate" in the care of the patient described above. The physicians (a total of six by the end of the case: orthopedics, vascular surgery, internal medicine, infectious disease, gastroenterology, and pulmonology) were each acting according to acceptable professional standards. This would not qualify as one of the Institute of Medicine's 44,000 to 98,000 cases of death due to medical errors.[18] The patient, however, is still dead.

**Additional Support**

A report in the *New England Journal of Medicine*[19] confirmed that more medical care is not always better. The study reported the results of reconstruction versus amputation after severe leg injury for 569 patients. After the initial hospitalization, 25 patients who had undergone reconstruction surgery then underwent amputation (12 at three months, six by six months, and seven after six months). Those patients undergoing reconstruction had four times the occurrence of additional surgery and were more likely to require additional hospitalization (47.6 percent versus 33.9 percent), even though the injuries for those undergoing amputation were much more severe as measured by bone loss, soft tissue damage, pulse deficit and lack of sensation in the injured extremity.

More is not always better.

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[18] Kohn, Linda T., et al. *To Err is Human. Building a Safer Health System.* Institute of Medicine. Committee on Quality Health Care in America. National Academy Press. Washington, D.C. 2000.

[19] Boose, M.J., et al. "An Analysis of Outcome of Reconstruction or Amputation of Leg-Threatening Injuries." *N Engl J Med* 2002. 347:1924-31.

## Higher Spending/Poorer Results

Elliott S. Fisher, M.D., and H. Gilbert Welch, M.D., both with the Center for the Evaluative Clinical Sciences, Dartmouth Medical School, suggest that there are two levels of decision making in medical care that can result in harm to health: 1) the decision about whether to use a discrete diagnostic or therapeutic intervention, and 2) decisions about whether to add system capacity, such as deciding to purchase another scanner or hire an additional physician.[20] As proof, they cite a randomized trial[21] that looked at the influence of copayments on utilization and outcomes of health care, and found that those patients who had no copay received about 40 percent more care than those who had a copay. Moreover, the trial showed that although the patients without copays received more care, they had no improvement in function and actually had more pain, worry and restricted activity days than those patients with a copay.

Fisher and Welch also cited other studies which demonstrate harm from too much medical care:

1. A randomized trial of 2,422 pregnant women at risk for premature labor who were monitored more often by their physicians and given drugs to slow their labor. The results found adverse effects in seven percent of the recipients of the drugs with no reduction in low-birth-weight infants.[22]
2. A randomized trial of 1,727 patients who were given medication to treat asymptomatic or mildly symptomatic ventricular arrythmias following heart attack. The results found that there was a 2.5 times higher death rate in the group receiving the medication and a 3.6 times higher death rate due to arrythmia.[23]
3. A randomized trial of 1,018 patients with coronary artery disease who were treated by angioplasty or medical therapy. The results found that those who had angioplasty had a relative risk of dying that was 1.92 times higher than for those who did not have the procedure.[24]

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[20] Fisher, E.S. and Welch, H.G. "Avoiding the Unintended Consequences of Growth in Medical Care." *JAMA*. 1999. 281(5):446-53.
[21] Newhouse, J.P. *Free for All: Lessons from the RAND Health Insurance Experiment.* Cambridge, Mass: Harvard University Press. 1993.
[22] Dyson, D.C., Danbe, K.H., Bamber, J.A., et al. "Monitoring Women at High Risk for Preterm Labor." *N Engl J Med*. 1998. 338(1):15-19.
[23] "The Cardiac Arrythmia Suppression Trial (CAST) Investigators. Preliminary Report: Effect of Encainide and Flecainide on Mortality in a Randomized Trial of Arrythmia Suppression After Myocardial Infarction." *N Engl J Med*. 1989. 321:406-12.
[24] "RITA-2 trial participants. Coronary angioplasty versus medical therapy for angina: the second Randomised Intervention Treatment of Angina (RITA-2) Trial." Lancet. 1997; 350:406-412.

Fisher and Welch concluded that there were four underlying causes to the risk of harm from too much medical care:

- People expect more care to mean better care.
- There is excessive extrapolation of results from narrow studies to broad deployment, when no proof is available that it is warranted for all circumstances.
- Disease is treated the same whether the cases are mild or severe.
- The effect of additional system capacity on health outcome is not studied.

Barbara Starfield, MD, MPH, in an editorial in the *Journal of the American Medical Association*,[25] suggested that the harmful effects of health care account for a significant proportion of the lower life expectancy in the United States compared to other industrialized nations. The harmful effects, she notes, are deaths from medical errors, from hospital acquired infections, from adverse effects of medication unrelated to errors and from unnecessary surgeries. Starfield also noted the potential role of income in accounting for poorer health, as well as how higher primary care physician to population ratios and lower specialty physician to population ratios are associated with better health outcomes.

**Medicare Study**

In February 2003, an article in the *Annals of Internal Medicine* made the point quite clearly that spending more on health care does not guarantee better results, and may, in fact, actually do harm.[26, 27] The researchers divided the United States into 306 health care markets to determine how much money was being spent on Medicare patients in each of these areas. They then studied 614,500 Medicare patients throughout the country with hip fractures, 195,400 with colorectal cancer and 159,500 with heart attacks, who were hospitalized between 1993 and 1995. What they found was that the quality of care in the higher spending regions of the country was no better on most measures and was worse on several preventive care measures.

Case in point: The preventive measure of simply giving a patient with acute Myocardial Infarction (MI) aspirin, which the American Heart Association estimates could save thousands of lives annually. Yet, the researchers found that patients with acute MI who were treated in the areas with the highest quintile of spending were less likely to receive aspirin at admission or discharge than patients in the other quintiles **(Figure 4)**. The researchers also found that patients with acute MI who lived in regions with higher expenditure indices were significantly less likely to receive exercise testing and angiography as well.

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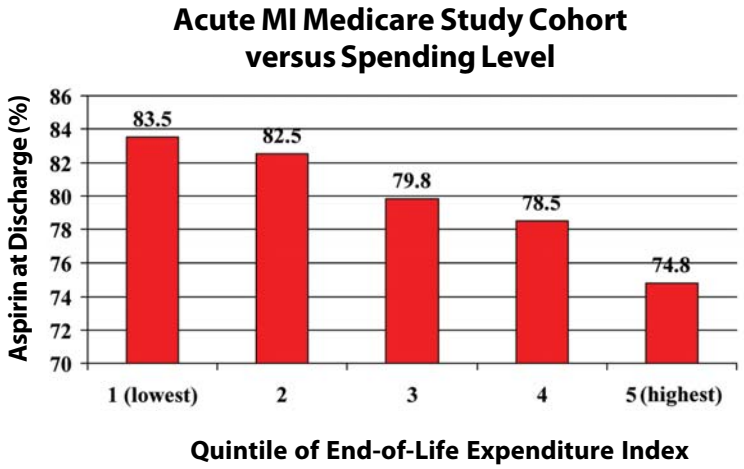
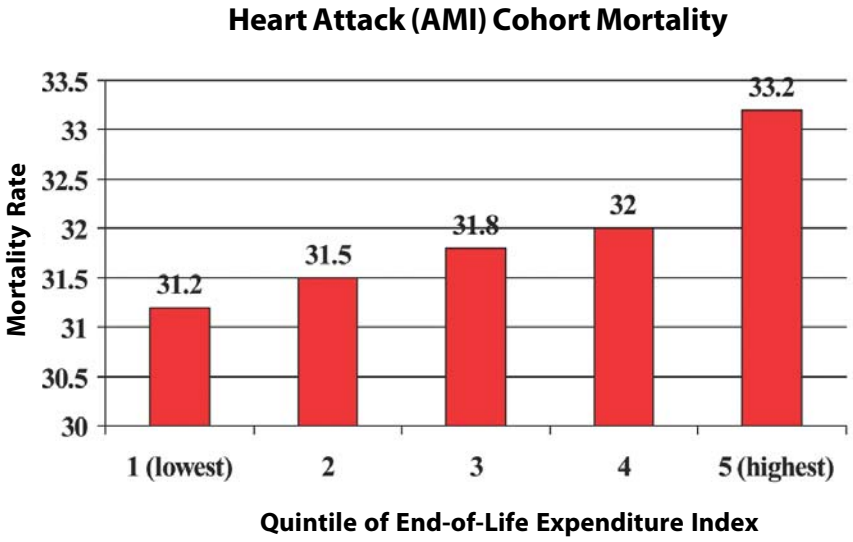
[25] Barbara Starfield. "Is US Health Really the Best in the World?" *JAMA*, July 26, 2000. Vol 284, No. 4. 483-485.
[26]Fisher, E.S., Wenberg, D.E., et. al. "The Implications of Regional Variations in Medicare Spending. Part 1: The Content, Quality, and Accessibility of Care." *Annals of Internal Medicine.* 18 Feb. 2003. 138(4): 273-87.
[27] Fisher, E.S., Wenberg, D.E., et. al. "The Implications of Regional Variations in Medicare Spending. Part 2: Health Outcomes and Satisfaction with Care." *Annals of Internal Medicine.* 18 Feb. 2003. 138(4): 288-99.

**Figure 4**




Moreover, the mortality rate for heart attack was also highest in those regions that spent more **(Figure 5)**. This suggests that treatment intensity due to overuse of services may result in a lower quality of care.

**Figure 5**




Overall, the study found that the differences in spending throughout the United States were not due to differences in prices of medical services or differences in average levels of illness or socioeconomic status, but were related to the "overall quantity of medical services provided and the relative predominance of internists and medical subspecialists in high-cost regions."[28]

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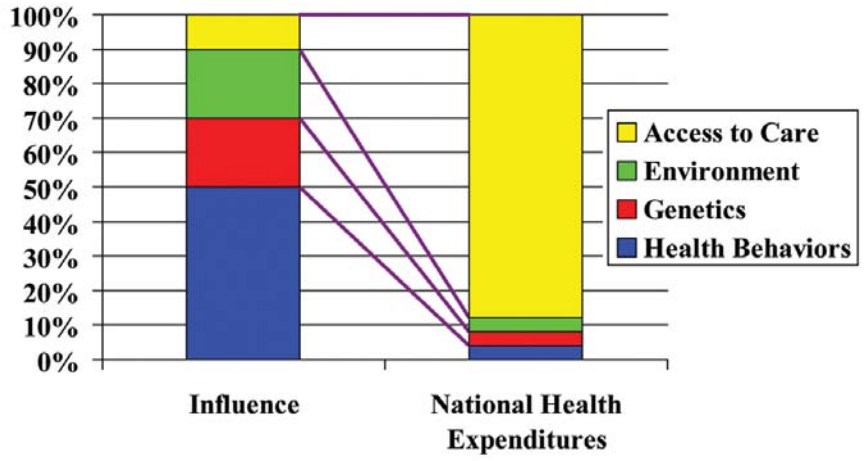
[28] Ibid. 273.

## The Factors That Influence Health Status

What are the main factors that actually influence health status? Keeping terminology consistent with the law of diminishing returns framework, this question could be reworded to "What are the factors of production for health?" The four most influential elements seem to be access to care, environment, genetics and health behaviors. How much each one actually influences health and the amount we pay for each, however, seems to be skewed.

**Figure 6**

**Health Status**




*Sources: Redrawn from, Rovner, J, "Health and Health Care 2010: The Forecast, The Challenge" Supplement.Center for Disease Control. University of California at San Francisco, Institute for the Future*

As **Figure 6** makes clear, on the one hand, access to health care represents a potential influence of only about 10 percent on health status; yet, this is an area where 88 percent of our national health expenditures are allocated. Health behaviors, such as diet, negative behaviors, fitness levels, etc., on the other hand, have the potential to affect health status by approximately 50 percent, making them a major influence. Yet, less than five percent of our health care dollars go to address these behaviors. Environment and genetics each tend to influence health status by 20 percent, but again, very little money is allocated for these factors.

Spending so much money on access ends up supporting the theory that medical services can fix problems that could possibly have been corrected or reversed early on with better preventive care. Instead of focusing so heavily on access, more emphasis should be placed on the other three factors, but exactly how could that be accomplished?

## How Can We Improve Health?

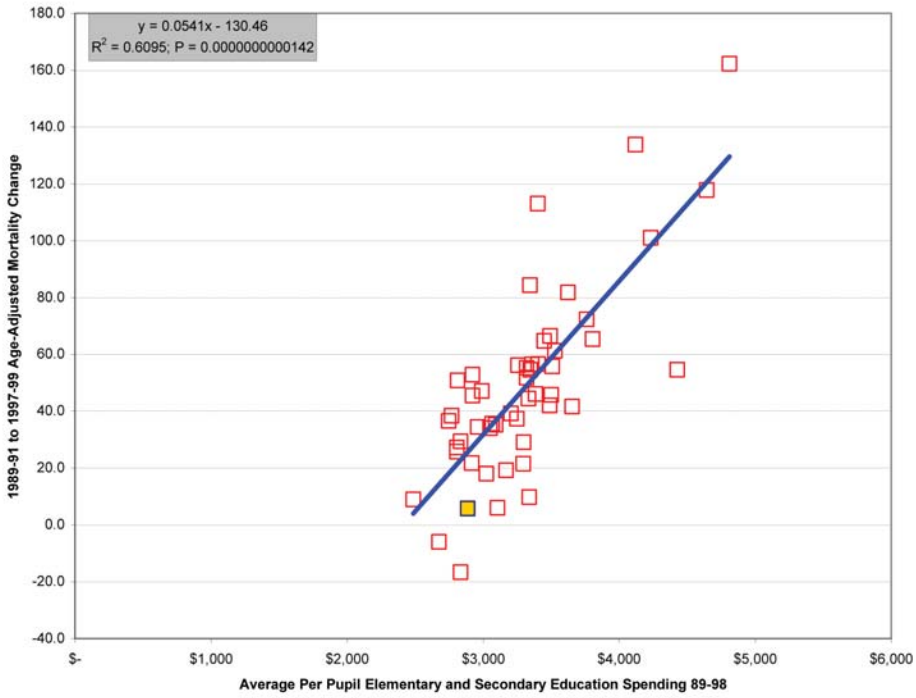
There could easily be a myriad of strategies to address these issues, two of them being additional investment in education and more emphasis on personal health behaviors.

### Education

The issue of education is of particular importance in Tennessee, where the state ranks last in education spending per capita among the states.[29, 30] This is a serious problem, because there is a strong association between change in mortality and per-pupil spending for elementary and secondary education.

**Figure 7**

**Average Per Pupil Elementary and Secondary Education Spending 1989-98**[31, 32]




The relationship between investment in education and improvement in mortality rates[33] is highly significant **(Figure 7**–Tennessee is represented as the solid orange box).

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[29]Total expenditures for public elementary and secondary education by function and state. U.S. Department of Education, Office of Educational Research and Improvement, National Library of Education.
[30]Current expenditures per pupil in fall enrollment in public elementary and secondary schools. U.S. Department of Education, Office of Educational Research and Improvement, National Library of Education.
[31]National Center for Education Statistics.
[32]National Center for Health Statistics.
[33]CDC Health United States Series. 2000.

Tennessee appears near the bottom of the chart in level of education investment and in age-adjusted mortality change. Certainly, it appears that additional investment in education could have the potential to improve health in Tennessee.

**Personal Behaviors**

According to the health status data presented in **Table 2**, health behaviors have the potential to influence health status by 50 percent, and the latest figures certainly support that finding:

Being overweight (Body/Mass Index of 25-29.9) increases yearly health care costs by $125, while being obese (BMI over 30) adds an additional $395, smoking an extra $230, and problem drinking $150.[34]

A study involving 6,000 life-years of UAW/Chrysler employees over a three-year period[35] found that claims costs were significantly higher for people who had unhealthy lifestyles:

**Table 2**

| Health Risk | Percentage Higher Claims Costs |
|---|---|
| Smokers | 31% |
| Unhealthy eating habits | 41% |
| Stress | 24% |
| Employees outside healthy weight range | 143% higher hospital inpatient utilization |

Changing people's behavior is the ultimate preventive care and is something that everyone can do for himself/herself.

[34]"Cost of Obesity, Drinking, Smoking and Growing Older. National Center for Policy Analysis." *Daily Policy Digest. Health Issues/Preventative Medicine.* April 19, 2002.

[35]Anderson, D., et al. "Health risks and behavior: their impact on medical costs." Unpublished research report prepared for the Chrysler Corporation and the International UAW Union by the StayWell Company and Milliman & Robertson, Inc. Milwaukee, 1995.

# Summary

More money alone won't help. It is unlikely that additional investment in health care can result in improved health. Since only 10 percent of health status is affected by access to health care, it is likely to be much more important and effective to focus on the factors that affect 90 percent of the health status.

Factors that may benefit the state the most in terms of bettering the health of its citizens can also, in the long run, improve their lives as well. A commitment to education, an effort to educate people about how their own behaviors impact their health care costs and what they can do to participate in creating overall improvements in their state of health can all contribute significantly to reducing health care costs in the state.

BlueCross BlueShield of Tennessee is a uniquely Tennessee company, focused on this state and the well-being of everyone who lives here. Our employees live, work, raise families and share in all this state has to offer. As a company, we value the communities and resources we share and serve. And as a responsible corporate member of the larger community – the state itself – BlueCross BlueShield of Tennessee believes it has a responsibility to present the information in this report in order to help raise public awareness and to facilitate discussion to help this state deal with its high health care costs. The problem of health care costs in Tennessee is serious and to solve it is going to take new ways of thinking. Money alone is not the answer. There are, however, three questions that can help direct our thinking:

**What outcomes should we expect in return for our health care dollars?**

If Tennessee spends more money than the national average and more than any other country in the world, we should have the right to expect that the health data for our citizens surpasses those of these other places.

**Do we spend our health care dollars on the right services and tools?**

Currently, it does not appear that we do. We invest heavily in giving people access to medical care, but access only accounts for about 10 percent when it comes to health status. Money spent on environment and, especially, health behaviors impacts health status much more, and yet we only spend approximately 12 percent of our health care dollars on these strategies.

**Are there ways to reduce health care costs and improve health that fall outside the medical field?**

Absolutely. Education is one of the most important areas where we can make a difference. Based on the data we have presented in this report, spending on education is

associated with significantly better mortality improvements. It is reasonable to assume that improved educational attainment is the cause of the improved mortality, although that is not specifically addressed in this paper. Since Tennessee's educational system is rated so low in terms of per capita spending, this is an area that is ripe for exploration.

Asking and answering the questions, however, is only the first step. Implementing change, of course, is always harder. But the health of Tennesseans is worth the challenge.

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