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THE ECONOMIC IMPACT OF RACIAL HEALTH DISPARITIES
IN NORTH CAROLINA

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KEY POINTS

North Carolina's emerging knowledge economy is built on a foundation of what economists call human capital, the knowledge and capabilities of the labor force. Human capital, in turn, rests on two inter-twined pillars: (a) skills development through education, training, and work experience; (b) and good health which increases the value of acquired skills in the labor market.

But North Carolinians carry a heavy burden of illness and injury, which not only generates human suffering and shortens life but also imposes costs on the state economy in three ways: (1) private health insurance premiums for employees and their dependents are higher than they otherwise would be; (2) public insurance premiums for the elderly, children, and the poor are higher than they otherwise would be; and (3) worker productivity is much lower than it otherwise would be, diminishing economic output and the attainable standard of living.

Blacks and some other racial/ethnic minorities carry a heavier burden of illness and injury than non-Hispanic whites. Reducing black-white health disparity, especially in the incidence of obesity and diabetes, through preventative interventions and more efficient medical care delivery can reduce both business and health care costs.

Reducing such disparities is an achievable goal estimated to save North Carolinians \$516 million annually--\$290 million annually in direct and indirect costs for those who are employed and an additional \$226 million for those not in the active labor force.

Addressing racial disparities in health must be a core component of any strategy that seeks to enhance the state's ability to compete, thrive, and prosper in the continually evolving global knowledge economy.

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1.0 THE PRODUCTIVITY PROMISE OF GOOD HEALTH

1.1 Preamble

Over the past 100 years or so a halting mortality transition has been taking place. In 1900, most people died of infectious diseases, sometimes in waves of epidemics, often early in their lives. By the second half of the last century, infectious diseases were brought largely under control, only to be replaced by chronic diseases, such as diabetes and cancer, as the primary causes of death. Within the foreseeable future, chronic diseases could also recede and senescence – organ system frailty without any discernible external cause – may become the primary cause of death.¹ That development would maximize healthy life expectancy.

The control of infectious diseases allowed for more rational life planning. Life expectancy increased and the age at death became more predictable. Because a long life could be expected, even if not guaranteed, delayed gratification and investments in human capital – education and training – became both practical and generally rewarding.²

The control of infectious diseases also allowed for more rational family planning, setting off a century-long decline in fertility which was interrupted only by the anomalous baby boom following World War II. Fewer children meant more time and effort could be invested in raising each child. Health and skill development are opposite sides of the same human capital coin.³

The decline in fertility has resulted in the phenomenon of population aging as each cohort is replaced by one smaller than itself, staved off only by immigration. Although the numbers may be smaller, the productive power of each succeeding cohort can continue to grow with proper investment.

The combination of increased investment in skill development and declining fertility helped set off an unprecedented increase in American prosperity which was accentuated by the “demographic dividend” of a decreased proportional burden of young and old dependents as the baby boom generation moved

into their prime working years. Good health contributes to economic growth by allowing a larger number of lifetime work hours and by allowing people to be stronger and more alert while at work.

Several seemingly unrelated trends have put North Carolina and its economy on a collision course, however.

- First, the mortality transition is incomplete – possibly even stalled – leaving the state with a large, growing burden of chronic illness.
- Second, the “graying of North Carolina” is exacerbating inflation in the costs of health care, straining the state’s economy as large population cohorts reach the ages at which high medical costs are generated.
- Third, because of persisting, and by some measures growing, health and educational disparities, the “browning of North Carolina” hasn’t brought the needed competitive boost possibly because the direct and indirect impacts of illness and injury and of skill deficits may counteract the potential advantages of an enlarged labor supply. Despite the large and growing concern for the direct costs of illness and injury, the most serious portion of the burden is the lost life, productivity, and happiness caused by illness and injury.
- Fourth, the “flattening of the world,” means that an ever-broader swath of the North Carolina economy is exposed to global competition, leaving little capacity to shoulder excess business costs, whatever their source, even as the need for workforce quality and investments in human capital escalates.

For much of its history, North Carolina lagged behind the nation in acting upon the economic opportunities offered by improved health. Investments in education trailed the nation, reducing the appeal of its labor force. The modest quality of North Carolina labor did make the state an attractive location for declining industries searching for cost savings. Historically, as we discuss later in this report, North Carolina’s investments in human capital closed the income gap between the state and the nation until, approximately a decade ago, when the gap began to widen again.

The competitive advantages of a “race to the bottom” are increasingly small. Unfortunately, the labor force value proposition which for a while made North Carolina attractive to a limited range of sectors and firms also made overseas outsourcing

¹ James E. Fried (2000) “Compression of morbidity in the elderly,” *Vaccine* 18: 1584-1589; James E. Fried (1980) “Aging, natural death, and the compression of morbidity,” *New England Journal of Medicine* 303: 130-135.

² See, for example, Philippe Ariès (1981) *The hour of our death*, New York: Knopf; David Riesman (1950) *The lonely crowd: a study of the changing American character*, New Haven: Yale University Press.

³ Gary S. Becker (1964) *Human Capital*, New York: Columbia University Press; World Bank (1993) *World Development Report, 1993: Investing in Health*, Washington D.C.: The World Bank.

an attractive alternative once new labor markets began to open. In order to have a competitive economy in the 21st century, North Carolina will need to increase and broaden its stock of human capital, which rests on skills acquisition and good health.

Fortunately, emerging evidence suggests that the growing burden of illness and injury can be reduced by implementing two high-level strategies. Cost-containment steps and increased efficiency in health care delivery on the supply-side can reduce the direct costs of illness and injury. The thrust of the contemporary national debate on health care is centered on methods for containing medical treatment costs.

Interventions on the demand side to prevent or delay the onset of chronic illness can result in the compression of mortality into the upper ages. Evidence for the efficacy of some preventative interventions is mounting.

Reducing racial health disparities is a crucial aspect of health improvement to meet contemporary competitiveness needs. According to a recent North Carolina Institute of Medicine report, “North Carolina will not be able to make significant improvements in overall population health without addressing racial and ethnic disparities.”⁴ Addressing racial health disparities is an achievable first step in reducing the overall burden of illness and injury and an important component of a strategy to renew the state’s competitiveness, which suffered tremendously in the recent economic downturn.

1.2 Health and business costs

Health has become a major source of public and private worry for North Carolinians. Maintaining good health in the face of a shifting set of risks and paying for health care have become major concerns. The direct costs – the price of insurance coverage and out-of-pocket expenses – are central in the public discussion. But the indirect costs – the lost years of life and the reductions in full capability – also have continuing and very real effects by reducing human enjoyment of life and by impinging upon economic productivity.

Poor health increases direct business costs in two ways. First, rising health insurance premiums that cover employees and their families effectively increase the wage bill. A component of compensation, any increases in the costs of insured health care are tantamount to slower growth in take-home pay and sometimes result in a decrease in money wages for em-

ployees.⁵ Second, employers and their workers support health care for the uninsured and the partially insured through their Federal Insurance Contribution or FICA payroll taxes, which fund Medicare, Medicaid, and the Children’s Health Insurance Program (CHIP).

Poor health affects economic competitiveness in a more insidious way. Days of work lost due to illness or caring for others, injury or illness induced reductions in worker productivity, and attenuated investments in human capital all impact businesses. As we discuss below, half of the burden of disease and illness is borne by those in their prime working ages – 25–64 years old. If the direct costs of private and public health insurance affect the “price” of North Carolina labor, the indirect costs of productive time lost affects the “performance” portion of North Carolina’s “price-performance” value proposition to business.

It might be tempting to limit private and public coverage in order to reduce costs but doing so would quickly reduce real wages and productivity. That could provide a short term benefit but, because employees view this coverage as a portion of their immediate or deferred compensation, the long-term result could be a withdrawal of investment in skill upgrading and a reduction in work effort. Health is a much desired consumption good and an input to productivity. As the North Carolina economy becomes more knowledge-intensive in all sectors, employee discretionary work effort becomes a greater component of business success and, as all managers know, there is a large difference between working hard enough not to get fired and maximum sustainable effort.⁶

A combination of two strategies may be optimal: increasing the efficiency of health care delivery and reducing the need for care. Even though our system of health care provides us with highly desired outcomes, comparisons with other OECD countries suggest that our system of health delivery is indeed inefficient and thus could be a competitive burden. Moreover, many causes of illness and injury are preventable.

Reducing the need for expensive procedures and extended care may be the most effective way to cost-effectively boost health. These may entail investments outside the health care system, including, as two selected examples, improved road design to reduce the toll of automobile accidents and community

⁵ Office of Health Policy (n.d.) *Effects of Health Care Spending on the U.S. Economy*, Department of Health and Human Services, Assistant Secretary for Planning and Evaluation (<http://aspe.hhs.gov/health/costgrowth>). In addition, some public and private employers partially subsidize retiree health care.

⁶ See, for instance the dialogue about work motivation in the 1999 film, “Office Space.” Or, as George Carlin put it, “Most people work just hard enough not to get fired and get paid just enough money not to quit.”

⁴ North Carolina Institute of Medicine (2010) *Prevention for the Health of North Carolina: Prevention Action Plan*, October 2009, revised July 2010.

policing to reduce the level of lethal violence. Historically, public health, rather than medical care, has been responsible for the largest improvements in population health.

1.3 Our framework

In considering health, we were guided by a framework including genetics, environment, behavior, and treatment (Figure 1). We define health as a combination of longevity and illness-free days in a given year. Health capital – a stock of wellness which resists disease – is produced by a combination of inputs, including 1) medical care utilization; 2) lifestyle behaviors, such as diet, exercise, cigarette smoking, and alcohol consumption; 3) the living environment, including particulate matter in the air and water quality; and 4) genetics and physiological processes.⁷ Those investments help produce health outputs.

Ideally, we would examine disparities in inputs, health capital, and outcomes. Not all of these variables are readily observed, however, so we will concentrate on selected inputs (medical care and selected lifestyle behaviors, in particular) and disparities in outcomes, including mortality, a measure of total health outcomes, and selected medical conditions. We will give genetics and physiological processes scant attention despite their importance, simply because we found little information on relevant differences with respect to the major health risks. We mention, but do not fully address, environmental factors because we found little relevant data.

We place health in a larger framework of economic development. Many economists hold that the long-term prosperity of a region is based on demographic growth and productivity. Even though the North Carolina population is still growing, productivity growth will be the more salient of the two factors determining the state's economic future. Productivity is impacted by a range of factors but the most important of these may be the twin pillars of skills development (education and training) and good health which makes investments in skills development worthwhile by promising a long payback period (Figure 2). Many other factors have impacts but several of these, such as the availability of financial capital, may vary more strongly over time than geography.

Our primary focus in this report is on racial disparities in health outcomes. Both a cause and a manifestation of social

inequality, health disparities are a major source of cost for the state and an impediment to competitiveness, which justifies our strategic approach of assessing the problem through an economic lens. In exploring racial health differences, we concentrate on disparities between non-Hispanic Whites and non-Hispanic Blacks. Despite a sizeable population of Hispanics, American Indians, Asians, and some other groups, the numbers – sometimes even at the national level – are not large enough to support the detailed analysis needed to measure health disparities and their costs. Whenever feasible, we adapt national analysis, even if the North Carolina situation may differ somewhat. In many cases, reliable data are not available for the state.

We document the most important health disparities in North Carolina, calculate their impacts on health care costs, and estimate the effects of those disparities on the competitiveness of North Carolina labor, and therefore state employment growth. In doing so, we build on a considerable base of scientific and policy research. The national government has an active program measuring disparities in access to health care.⁸ The State of North Carolina has engaged in a broad effort to document disparities.⁹

1.4 Organization of the Study

Figure 3 provides an overview of the structure and organization of this report. We begin with an overview of U.S. health care costs (Section 2). Next we document the existence, costs, and economic impact of racial health inequality in North Carolina (Sections 3 and 4). Unfortunately, the data are not always sufficient to fully understand North Carolina's challenges. There are too few Asians and American Indians in North Carolina to support the extensive analysis needed to draw firm conclusions. Moreover, the national data on American Indians appear to be heavily influenced by the circumstances in the Western portion of the United States. As many of the State's Hispanic population are recent migrants from elsewhere, it is unclear how closely their experiences match those of the broader national Hispanic population. Policy concerns and practical limitations lead us to concentrate on the disparities between the state's non-Hispanic whites and its non-Hispanic Blacks. We conclude with recommendations to enhance North Carolina's economic com-

⁸ *National Healthcare Disparities Report (2010) Agency for Healthcare Research and Quality.*

⁹ *Health Profile of North Carolinians: 2009 Update, State Center for Health Statistics, May 2009* (<http://www.epi.state.nc.us/SCHS/pdf/HealthProfile2009.pdf>); *Racial and Ethnic Health Disparities in North Carolina - Report Card 2010, Update, State Center for Health Statistics, June 2010* (http://www.epi.state.nc.us/SCHS/pdf/MinRptCard_WEB_062210.pdf); and *North Carolina Minority Health Facts* (<http://www.epi.state.nc.us/SCHS/pubs/title.cfm>) for African Americans, Hispanics/Latinos, and American Indians.

⁷ Michael Grossman (1972) "On the Concept of Health Capital and the Demand for Health," *Journal of Political Economy* 80(2): 223-255. While the model used as a guideline here was developed in order to understand individual health choices, there is solid evidence that the underlying human capital model applies at the regional and national level. The stock of knowledge determines productivity while health determines how much time can be spent producing.

Figure 1
FRAMEWORK FOR CONSIDERING HEALTH

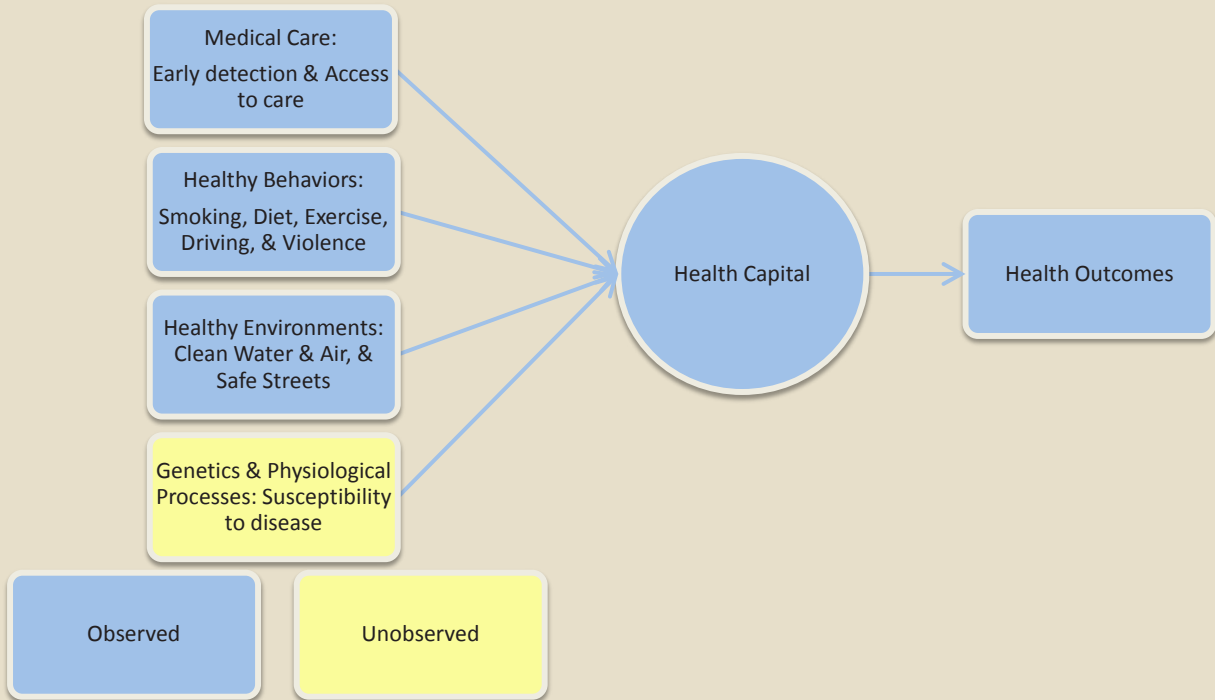
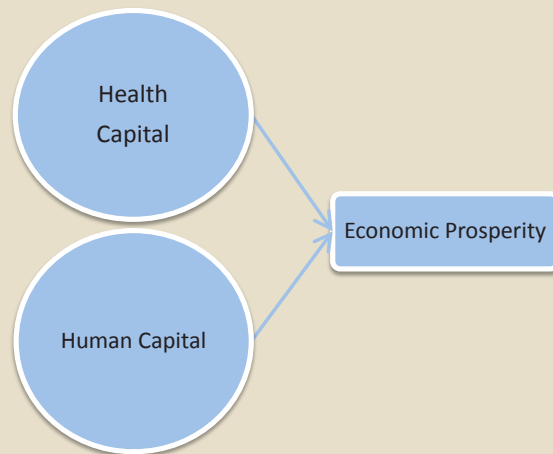


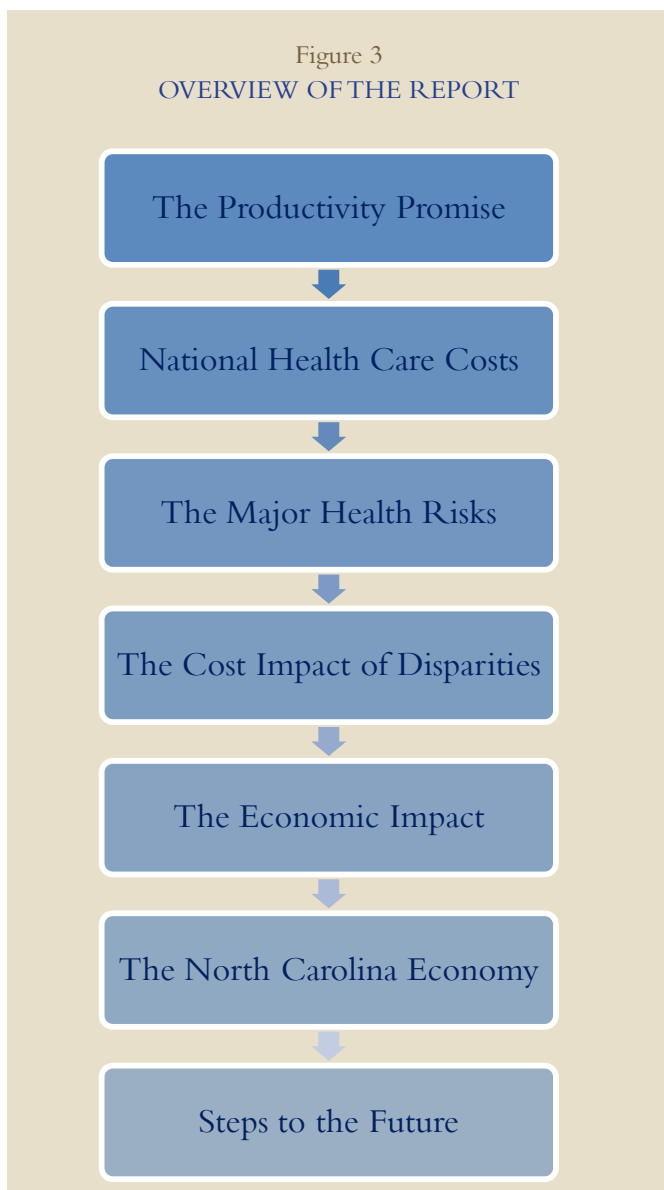
Figure 2
FRAMEWORK FOR CONSIDERING ECONOMIC DEVELOPMENT



petitiveness in the global marketplace through the reduction of health disparities (Section 5).

2.0 U.S. HEALTH COSTS AND THE ECONOMY

In this section of the report, we provide the critical background and context for our analyses of health disparities in North Carolina. We present a contemporary snapshot of U.S. health care cost and finance, analyze trends in U.S. health care costs and payments over the past decade with projections for the future, and then situate U.S. health care within the broader context of other developed economies.



2.1 Snapshot of health care cost and finance

According to the latest available data from the Centers for Medicare and Medicaid Services, the direct costs of health care in the U.S. (including personal medical expenses, administration, public health, research, and investment in structures and equipment) totaled an estimated \$2.486 trillion—roughly \$8,086 per capita and 17 percent of GDP—in 2009. In constant, inflation adjusted 2000 dollars, this amounts to an estimated life time expenditure of \$316,579 per person, the equivalent of 15% of a four year college graduate’s expected life-time earnings and 30% of the expected life-time earnings of a high school dropout.¹⁰

Of the nearly \$2.5 trillion spent on health expenditures in 2009, \$2.3 trillion (93.7 percent of the total) was devoted to health care consumption, \$111 billion (4.5 percent) to investments in equipment and structures, and \$45 billion (1.8 percent) to medical research (Table 1). Of the total health care consumption expenditures, \$2.1 trillion (84.1 percent of the total) went to services and supplies while \$163 billion (6.6 percent) was absorbed by administration with the bulk of the administrative costs being generated by private health insurers.

Over 50 percent of health expenditures (\$1.3 trillion) go to hospitals, physicians, and clinical care. Prescription drugs account for \$250 billion (10.1 percent) and that source of cost has been rising quickly. The remaining health care consumption expenditures are spread over several categories.

Health care expenditures were supported by \$299 billion out-of-pocket funds (12.0 percent of the total), \$1.8 trillion in public and private insurance (71.1 percent), \$186 billion from other third-party payers (7.5 percent), \$77 billion in public health funding (3.1 percent), and \$156 billion in investment funds (6.3 percent). Details are provided in Table 2. Private health insurance contributed \$801 billion (32.2 percent), Medicare contributed \$502 billion (20.2 percent), and Medicaid \$374 billion (15.0 percent). A wide range of other sources contributed the remainder of the funding. Overall, 44 percent of national health care spending is financed by government, 28 percent by households, 21 percent by private businesses, and 7 percent by other private sponsors.¹¹

Private health insurance is financed by participant premiums. Much of the private health insurance is employer-based with both employee and employer nominally making contribu-

¹⁰ Lifetime earnings based on U.S. Census Bureau (2002) “The Big Payoff: Educational Attainment and Synthetic Estimates of Work-Life Earnings.”

¹¹ Health and Human Services (n.d.) “Sponsors of Health Care Costs: Private Business, Households, and Governments, 1987-2009.”

Table 1
NATIONAL HEALTH EXPENDITURE BY TYPE OF SERVICE, 2009

	<i>(Millions)</i>	<i>(Percent of total)</i>
Total National Health Expenditures	\$2,486,293.2	100.0%
Health Consumption Expenditures	\$2,330,063.8	93.7%
Personal Health Care	\$2,089,862.3	84.1%
Total Hospital Expenditures	\$759,074.2	30.5%
Total Physician and Clinical Expenditures	\$505,887.6	20.3%
Total Dental Services Expenditures	\$102,221.9	4.1%
Total Other Professional Services Expenditures	\$66,780.9	2.7%
Total Home Health Care Expenditures	\$68,263.5	2.7%
Total Non-Durable Medical Products Expenditures	\$43,259.7	1.7%
Total Prescription Drug Expenditures	\$249,903.6	10.1%
Total Durable Medical Equipment Expenditures	\$34,877.5	1.4%
Total Nursing Care Facilities and Continuing Care Retirement Communities	\$136,970.7	5.5%
Total Other Health, Residential, and Personal Care Expenditures	\$122,622.7	4.9%
Total Administration and Total Net Cost of Health Insurance Expenditures	\$162,988.5	6.6%
State and Local Administration Expenditures	\$9,528.7	0.4%
Federal Administration Expenditures	\$20,283.1	0.8%
Net Cost of Health Insurance Expenditures	\$133,176.7	5.4%
Public Health Activity	\$77,213.0	3.1%
Research	\$45,323.0	1.8%
Total Structures and Equipment	\$110,906.5	4.5%
Structures	\$48,972.1	2.0%
Equipment	\$61,934.4	2.5%

Source: Centers for Medicare & Medicaid Services, National Health Expenditure Accounts, 2009

tions to the premiums. Along with retirement provisions and other benefits, both of these payments are components of total employee compensation and are counted as such in compiling national economic accounts. Somewhat analogous to retirement benefits, health care is largely paid for when young and consumed later in life.

Overall, Medicare pays for 61.1 percent of medical expenses for those aged 65 and older in the U.S. Medicare, like Social Security, is an inter-generational transfer financed by a payroll deduction of 2.9 percent (1.45 percent withheld from the worker and a matching 1.45 percent paid by the employer) from wages, salaries and other employment compensation. Medicare helps pay for inpatient care in hospitals and other facilities (Part A), physicians and other outpatient care (Part B), and prescrip-

tion drugs (Part D). Coverage is also available through health maintenance organizations (Part C). Ongoing supplemental premiums are required for some aspects of coverage.

The Federal portion of Medicaid and State Children's Health Insurance Program (CHIP) – North Carolina Health Choice (NCHC) for Children – are also financed through the same payroll deductions which support Social Security and Medicare. Both Medicaid and CHIP are means-tested programs which are limited to certain income levels. While CHIP is an inter-generational transfer like Medicare, Medicaid is largely an intra-generational redistribution to those with low income.

Similar to inter-generational transfers like Social Security, financing for the public health insurance is sensitive to the rela-

Table 2
NATIONAL HEALTH EXPENDITURE BY SOURCE OF PAYMENT, 2009

	<i>(Millions)</i>	<i>(Percent)</i>
Total National Health Expenditures	\$2,486,293.2	100.0%
Out of pocket	\$299,344.9	12.0%
Health Insurance	\$1,767,416.3	71.1%
Private Health Insurance	\$801,190.1	32.2%
Medicare	\$502,288.7	20.2%
Medicaid (Title XIX)	\$373,940.7	15.0%
Federal	\$246,983.5	9.9%
State and Local	\$126,957.2	5.1%
Total CHIP (Title XIX and Title XXI)	\$11,118.5	0.4%
Federal	\$7,822.1	0.3%
State and Local	\$3,296.3	0.1%
Department of Defense	\$36,499.0	1.5%
Department of Veterans' Affairs	\$42,379.3	1.7%
Other Third Party Payers and Programs	\$186,089.6	7.5%
Worksite Health Care	\$4,443.2	0.2%
Other Private Revenues	\$83,816.0	3.4%
Indian Health Services	\$3,155.7	0.1%
Workers' Compensation	\$39,637.1	1.6%
General Assistance	\$7,123.5	0.3%
Maternal/Child Health	\$3,034.5	0.1%
Federal	\$585.2	0.0%
State and Local	\$2,449.3	0.1%
Vocational Rehabilitation	\$506.1	0.0%
Federal	\$393.4	0.0%
State and Local	\$112.7	0.0%
Other Federal Programs	\$7,274.0	0.3%
SAMHSA	\$3,249.7	0.1%
Other State and Local Programs	\$29,389.4	1.2%
School Health	\$4,460.4	0.2%
Public Health Activity	\$77,213.0	3.1%
Federal	\$11,525.0	0.5%
State and Local	\$65,688.0	2.6%
Investment	\$156,229.5	6.3%
Research	\$45,323.0	1.8%
Structures & Equipment	\$110,906.5	4.5%
Total CMS Programs (Medicaid, CHIP and Medicare)	\$887,347.9	35.7%

Source: Centers for Medicare & Medicaid Services, National Health Expenditure Accounts, 2009

tive size of working age (and their earning power) and dependent aged (and their consumption needs) population groups. As the large Baby Boom cohort moves out of the prime working ages and possibly into retirement, the finance of public insurance, like Social Security itself, will be impacted. Furthermore, as fertility continues to decline, each succeeding cohort will be smaller than the previous, leading to population aging and increasingly unfavorable dependency ratios.¹² The trend towards an unfavorable dependency ratio implies the full use of the available labor force is an increasingly pressing economic imperative.

2.2 Trends in U.S. health care costs and payment

Rising from approximately \$27.3 billion in 1960 to an estimated \$2.486 trillion in 2009, the direct costs of health care in the U.S. are projected to total \$4.638 trillion by 2020.¹³ For the respective years, this amounts to an estimated \$148, \$8,086, and \$13,709 per person annually. Relating these expenditures to the total economy, direct costs increased from 5.2 percent of national GDP in 1960 to an estimated 17.6 percent in 2009 (the latest available data) to a projected 19.8 percent by the end of this decade (Figure 4).¹⁴

The rate of growth in health care expenditures has abated recently. But expenditure growth is expected to accelerate as the economy recovers and as insurance coverage expands in 2014 as a consequence of the enactment of the Affordable Care Act.¹⁵ Again, the spending increase will be counteracted somewhat by the improvement in health status. Over the next decade, annual average health spending growth is projected to outpace economic growth by 1.1 percent.¹⁶

Health care costs have risen for several reasons.¹⁷ First, greater access to private and public health insurance coverage, especially in the 1960s, increased the intensity of use of health services. Second, high prevalence of specific risk behaviors and diseases among some segments of the population and sharp in-

creases in the share of the population entering the life cycle phase in which health care costs are high (i.e., population aging) are also partly responsible for increased costs. Finally, while inefficiencies in medical care delivery and financing have created unnecessary costs,¹⁸ inflation probably has been the most important factor driving cost increases in most years (Figure 5).

Since the 1990s, health care spending has increased at a faster rate than has GDP, inflation, and population. While rapidly rising health care spending is thought to lower the rate of economic growth and raise inflation, such spending, as suggested above, may also have a positive impact on the economy by improving health status, thereby reducing the impact of illness and injury on overall economic productivity.¹⁹

The sources of payment for health care have changed dramatically over the past several decades (Figure 6). As recently as the 1960s, over 40 percent of health care costs were paid out-of-pocket. Of course, many health care needs may have gone untreated and aggregate health suffered. In the decades since, private insurance (much of it employer-based) increased as a source of payment but its proportional contribution to expenditures has been stable at approximately one-third for over two decades. Much of the rest of health care costs are financed through taxes. The government's role in paying for health care has increased markedly since the 1960s with the establishment of Medicare in 1965 and continues to do so albeit at a more modest rate than it has in the past. Medicaid's contribution to total health expenditure is growing and will likely increase as a consequence of the broadened coverage mandated by the Affordable Care Act. Charity has fallen proportionately as a source of payment, from 30 percent of the total to less than 20 percent today, but its proportional contribution may also be stabilizing.

The financial contribution from the combination of out-of-pocket payments for health care and premiums for private health insurance has declined from 50 percent to 40 percent over the last two decades. Nevertheless the real cost has increased. Premiums for private health insurance have been increasing much faster than the rate of inflation. American households spend an estimated average 4.8 percent of their income on health care.²⁰ However, given the concentration of individual health care costs in relatively short time periods, treatment often stresses household finances. For those with lower incomes,

12 James H. Johnson, Jr., (2011). "In the Dependent Danger Zone," *News and Observer*, September 18, available at <http://www.newsobserver.com/2011/09/18/1493991/in-the-dependent-danger-zone.html>.

13 Figures produced by Centers for Medicare and Medicaid Services.

14 Centers for Medicare and Medicaid Services (2010) *National Health Expenditure Projections 2010-2020*, <https://www.cms.gov/NationalHealthExpendData/downloads/proj2010.pdf>

15 Sean P. Keehan, Andrea M. Sisko, Christopher J. Truffer, John A. Poisal, Gigi A. Cuckler, Andrew J. Madison, Joseph M. Lizonitz, and Sheila D. Smith (2011) "National Health Spending Projections Through 2020: Economic Recovery And Reform Drive Faster Spending Growth," *Health Affairs* 30: (8) 1594-1605

16 Centers for Medicare and Medicaid Services (2010) *National Health Expenditure Projections 2010-2020*, <https://www.cms.gov/NationalHealthExpendData/downloads/proj2010.pdf>

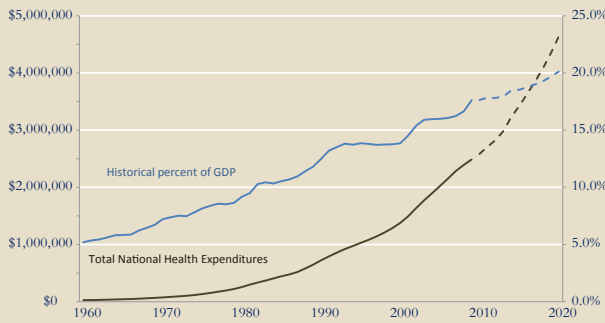
17 Office of Health Policy (n.d.) *Effects of Health Care Spending on the U.S. Economy*, Department of Health and Human Services, Assistant Secretary for Planning and Evaluation (<http://aspe.hhs.gov/health/costgrowth>).

18 Kaiser Family Foundation (2009) *Health Care Costs: A Primer*, March.

19 Department of Health and Human Services, Assistant Secretary for Planning and Evaluation ASPE, (2005) "Effects of Health Care Spending on the U.S. Economy," <http://aspe.hhs.gov/health/costgrowth>

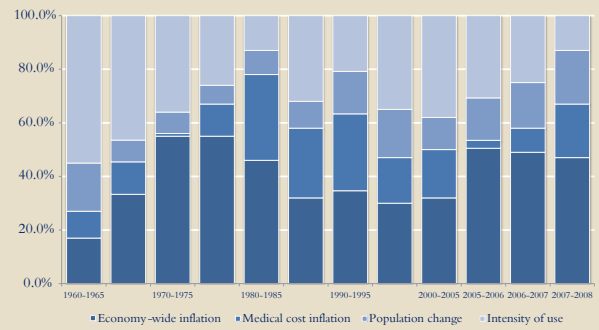
20 Department of Health and Human Services, Assistant Secretary for Planning and Evaluation ASPE, (2005) "Effects of Health Care Spending on the U.S. Economy."

Figure 4
U.S. NATIONAL HEALTH EXPENDITURES
CURRENT DOLLARS AND AS
PERCENTAGE OF GDP, 1960-2020



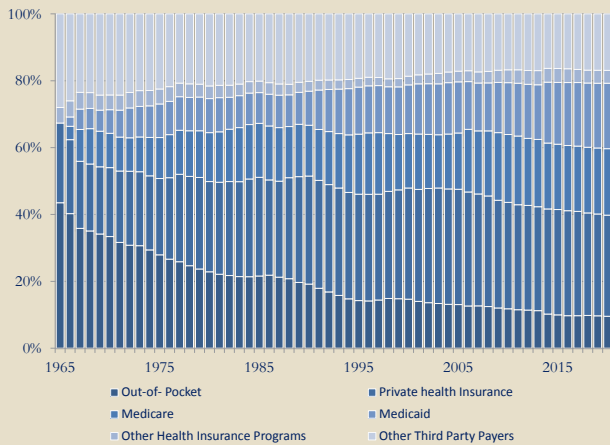
Source: Kenan Institute calculations based on AHRQ (health expenditures) and CBO (GDP) data

Figure 5
SOURCES OF
CHANGES IN U.S.
HEALTH CARE COSTS



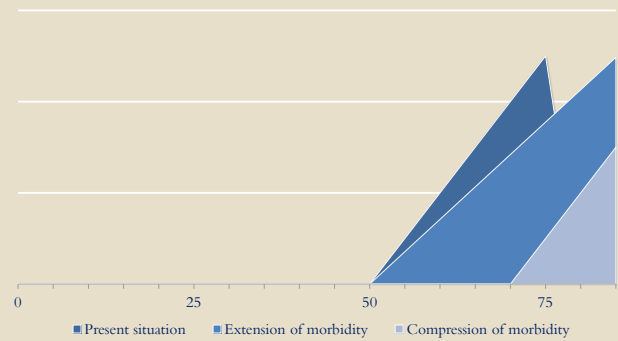
Source: Health, United States 2010, Table 124

Figure 6
SOURCE OF PAYMENT
FOR TOTAL U.S. HEALTH
EXPENDITURES



Source: National Health Expenditure data

Figure 7
STYLIZED MODELS OF
MORBIDITY OVER
A LIFETIME



Source: after Fried (1980)

even routine care often implies trouble paying the bill. Eighteen percent of those aged less than 65 were in households where the combined impact of health insurance premiums and out-of-pocket expenses was greater than 10 percent of after tax income. Among families below the poverty line, 28 percent were in that situation.²¹

The strain of out-of-pocket expenses on families reinforces the need to contain costs. Because they have generally lower incomes, minority families can be especially impacted. Unfortunately, the cost trends promise increased stress.

2.3 Distribution and demography of U.S. health care spending

Health care spending is concentrated on a minority of persons. Specific medical conditions and episodes have an impact. Almost half of all health care spending in any given year (49 percent in 2002) goes to treat just 5 percent of the population while the most expensive 1 percent of the population is responsible for approximately one-fifth of health care costs.²² At the same time, half the population spends little or nothing on treatment in any given year. While year-to-year smoothing reduces the concentration of spending, about one-fourth of those in the top 1 percent of spenders in one year, are in that same category the next year. Over longer periods of time, substantial leveling takes place, suggesting the role of acute conditions, emergency care, and successful treatment regimens in driving spikes in expenses.

The 15 most expensive health conditions account for approximately 44 percent of the expense. Patients with multiple chronic conditions may cost up to seven times as much as those with only one chronic condition but those with chronic conditions tend not to have their costs concentrated in any one year. Nevertheless, those with one or more of five major chronic illnesses – mood disorders, diabetes, heart disease, asthma, and hypertension – tend to have other conditions and illnesses. When considered together, the approximately 25 percent of the population which suffer from these conditions account for about half of the total annual costs.²³

Demographic variables also have an impact. In general, as people age, they consume more health care services. Children, those 0–18 years old, consume approximately half as much

health care on a per capita basis as the overall average (Table 3). Young adults (to age 44) consume less than two-thirds the overall per capita average. Those 45–55 are approximately at the average level, 55–64 year olds are 1.5 times as expensive, 65–74 year olds average twice the overall average, 75–84 year olds 3.1 times, and 85+ year olds consume almost 5 times the overall per capita average. As noted above, within a lifetime, an individual can expect to spend \$317,000 on health care (2000 constant dollars).²⁴ Half of that will be spent after age 65. Another 30 percent will be spent between ages 40 and 64. Of course because there are fewer older Americans, those 65 and older were responsible for just over one-third of the total spending. As the baby boom cohort increasingly moves into the ages in which health care costs are high, the impact of health care for the older population will be magnified unless the onset of chronic diseases can be sufficiently compressed into the last years of life.

Figure 7 provides a schematic overview of three broad hypotheses concerning the incidence of illness over a lifetime. One hypothesis offers hope for long-term cost reduction. The “present situation,” although simplified, is broadly consistent with the pattern of chronic illness described in this report. Constituting a second hypothesis, some researchers fear that improved medical care will only prolong life at the cost of reducing the quality of life – possibly leading to little or no more quality-adjusted life years – while incurring growing societal costs for treatment and care.²⁵ A third “compression of morbidity” hypothesis, referred to above, maintains that average life span is not increasing substantially. Therefore, delaying the onset of chronic illness effectively compresses poor health into a few years before death when organ senescence becomes an unavoidable development, increasing the quality of life while limiting medical costs. The feasibility of achieving the “compression of mortality” scenario depends critically on the efficacy of preventative measures and on personal non-medical investments in health. As we discuss later in this report, the trends are not comforting.

2.4 U.S. health care costs and outcomes in context

The overall efficiency and effectiveness of the state and national health system is critical to good health and economic competitiveness. The U.S. pays more for health care than any other major developed country. Compared to countries with comparable age distributions and similar levels of prosperity, the U.S. devotes a significantly larger proportion of its GDP

21 Jessica S. Banthin, Peter Cunningham and Didem M. Bernard (2008) “Financial Burden of Health Care, 2001–2004,” *Health Affairs*, 27: 188–195.

22 Mark W. Stanton (2006) “The High Concentration of U.S. Health Care Expenditures,” *Research in Action*, Issue #16, ARHQ.

23 Bernard Friedman, H. Joanna Jiang, Anne Elixhauser and Andrew Segal (2006) “Hospital Inpatient Costs for Adults with Multiple Chronic Conditions,” *Medical Care Research Review* 63: 327.

24 Berhanu Alemayehu and Kenneth E. Warner (2004) “The Lifetime Distribution of Health Care Costs,” *Health Services Research* 39(3): 627–642.

25 Olshansky SJ, Rudberg MA, Carnes BA, Cassell CK & Brody JA (1991) Trading off longer life for worsening health: the expansion of morbidity hypothesis. *Journal of Aging and Health* 3 (2) 194–216.

Table 3
PERSONAL HEALTH CARE EXPENDITURES, BY AGE: UNITED STATES, 2004

	<i>Total (\$b)</i>	<i>Percent of total</i>	<i>Annual amount per capita</i>	<i>Percent of average</i>	<i>Lifetime per capita expenditure</i>	<i>Percent</i>
Year	2004		2004		2000	
All Ages	\$1,551	100%	\$5,276	100%	\$316,579	100%
Under 19 years	206.0	13.3%	2,650	50.2%		7.8%
19-44 years	368.7	23.8%	3,370	63.9%		12.5%
45-54 years	217.2	14.0%	5,210	98.7%		31.0%*
55-64 years	227.8	14.7%	7,787	147.6%		
65-74 years	197.1	12.7%	10,778	204.3%		36.5%**
75-84 years	208.9	13.5%	16,389	310.6%		
85 years and over	125.4	8.1%	25,691	486.9%		12.1%

Source: CDC Health, United States, 2010 and Alemayhu and Warner (2004)
(Data are compiled from various sources by the Centers for Medicare & Medicaid Services)
* 40-64 Years of age, **65-84 Years of age

to health care expenses (Figure 8). The U.S. spends 35 percent more per capita than Switzerland, its closest major rival, and 50 percent more than Germany (Figure 9).²⁶

Unfortunately, the U.S. does not receive a proportionate benefit from the extra spending. Life expectancy at birth (a good overall measure of the effectiveness of the health care system) is lower in the U.S. than in several countries which spend less per capita (Figure 10). Other measures of health status lead to the same conclusion that the U.S. pays more for health care and receives less benefit than other developed economies. The combination of high health care costs, disappointing health outcomes, and unfavorable trends imply that North Carolina and the entire U.S. may be at a growing competitive disadvantage for knowledge-intensive work requiring high investments in human capital with a strong constraint on overall cost whether in research and development, financial services, or manufacturing.

On the other hand, these comparative results suggest that cost-effective reform is achievable. If advanced Asian countries and Western European countries are able to maintain relatively high standards of health at more moderate cost, North Carolina should be able to do the same.

3.0 Health Risks and Disparities in North Carolina

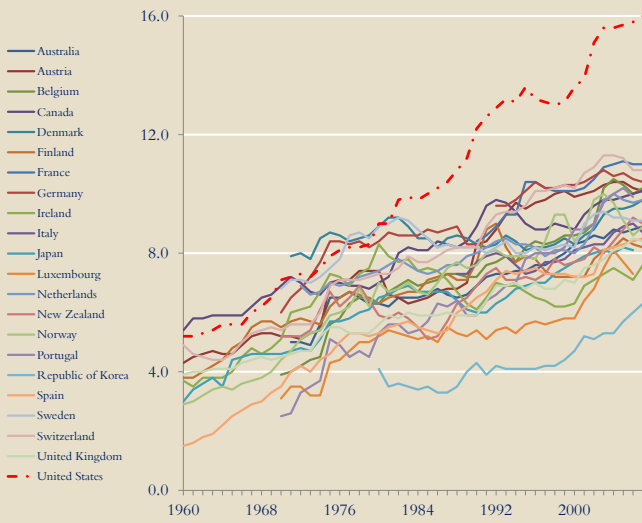
North Carolina health care expenditures have generally followed national trends. Per capita expenditures on personal health care (research, administration, and several other components of health care expenditures benefit the entire nation and are not included in state-wide tallies) have risen in approximate tandem with nation-wide trends (Figure 11). Per capita expenditures are somewhat lower than the national average (\$6,444 vs. \$6,815) as of 2009 (the latest available data) but they have grown somewhat faster than the national average (6.0 percent vs. 5.3 percent annually) over the past two decades. As in the national case, an increasing portion of the state's GDP (14.8 percent for North Carolina compared to 14.9 percent for the U.S.) has been devoted to health expenditures (Figure 12).

Figure 13 provides an overview of one aspect of North Carolina's growing health care burden. The number of Medicaid enrollees in North Carolina has been growing for the last two decades. Moreover, the percentage of North Carolinians covered has increased for many of those years.

Despite the spending, the U.S. government's Agency for Healthcare Research and Quality rates North Carolina's health care quality as "average" (Figure 14). The details are more nu-

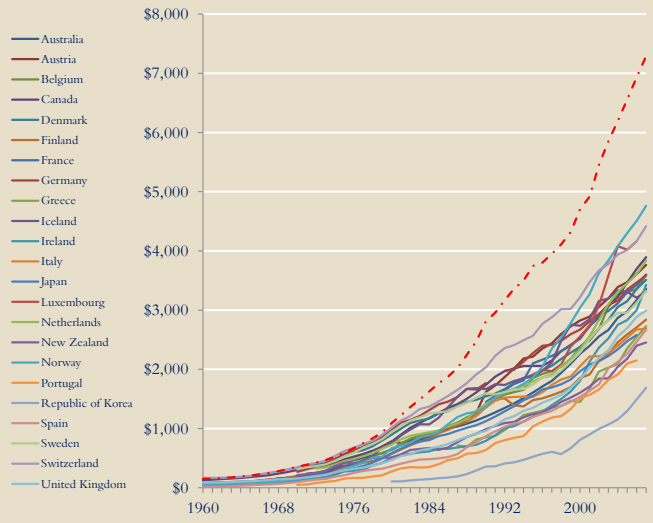
²⁶ The OECD calculates health care costs slightly differently than the U.S. government, so OECD figures for the U.S. differ somewhat from U.S. figures.

Figure 8
TOTAL HEALTH EXPENDITURE AS A SHARE OF GDP, SELECTED OECD COUNTRIES



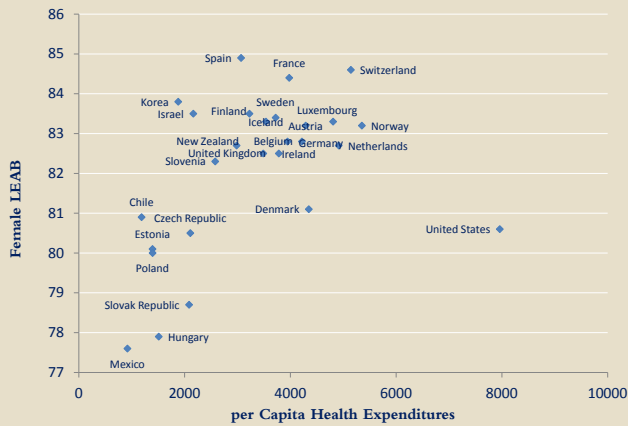
Source: Health, United States, 2010

Figure 9
TOTAL PER CAPITA HEALTH EXPENDITURE, SELECTED OECD COUNTRIES



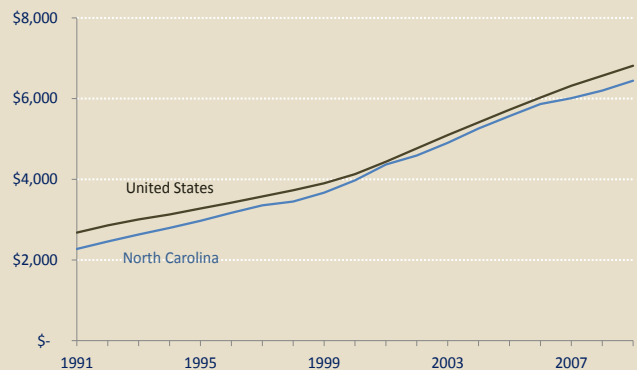
Source: CDC, Health, United States, 2010

Figure 10
HEALTH EXPENDITURE AND FEMALE LIFE EXPECTANCY AT BIRTH, SELECTED OECD COUNTRIES



Source: CDC, Health, United States, 2010

Figure 11
U.S. AND NORTH CAROLINA PERSONAL HEALTH CARE COSTS PER CAPITA (CURRENT DOLLARS)



Source: Kenan Institute calculations based on BEA data

anced, however, with the state’s care being rated strong in some areas and weak in others. Unfortunately, while some areas of care have been improving, others are worsening. According to a North Carolina Institute of Medicine report, “North Carolina is close to the bottom in state rankings (40th out of 50 states and the District of Columbia) in terms of life expectancy at birth. North Carolina is also 38th in years of life lost, 36th in the number of deaths per 100,000, and 36th in terms of overall health rankings. The burden of chronic disease and other preventable ills in our state is skyrocketing. As our health worsens, costs to both the individual and the system as a whole are rising.”²⁷ These conditions are not conducive to marketing North Carolina as a preferred location for doing business in an economy which requires broad engagement with specialized knowledge.

Against this backdrop, in the remainder of this section, we focus on the immediate or underlying causes of these costs. Toward this end, we rely on state and adapted national data to outline the major health risks facing North Carolinians over their lifetimes. As noted above, detailed data at the state and sub-state levels are not readily available, so we need to rely, at least provisionally, on adaptations of national data for some of our analysis.

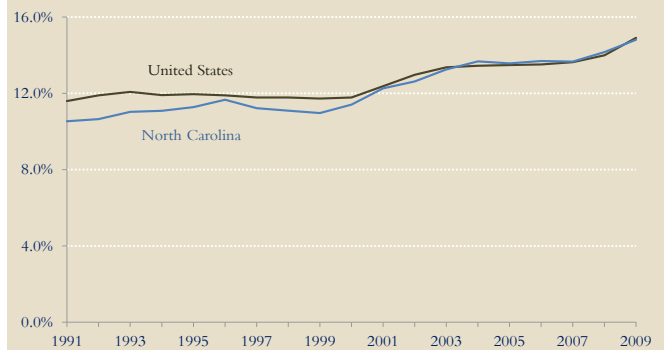
North Carolinians face a complex array of health risks. Not all of these are easily quantified. We focus on two broad measures of health risks: mortality and disability-adjusted life years lost to illness and injury. Death is the most serious risk to health, so we begin there, but mortality statistics do not fully account for the years of life lost or for the years of partial to nearly full impairment which reduces human enjoyment and economic productivity alluded to in Figure 7. Therefore, we consider one of a family of measures designed to summarize such impact by cause. Both measures of health burden mentioned focus on the indirect costs of disease and injury – the lost enjoyment of life and the implied loss of productivity. The impacts of some other risks are harder to quantify. Allergies, for example, result in few deaths, few disabilities, and only modest medical care costs. Yet they can make large numbers of people feel miserable for extended periods of time and reduce on-the-job productivity without generating significant absenteeism.

3.1 Mortality

North Carolina’s mortality rate (839.3 per 100,000 residents) was 4.4 percent higher than the national rate (803.6 per 100,000 residents in 2007 (the latest data available). Life expectancy at birth for all North Carolinians (77.3 years) was

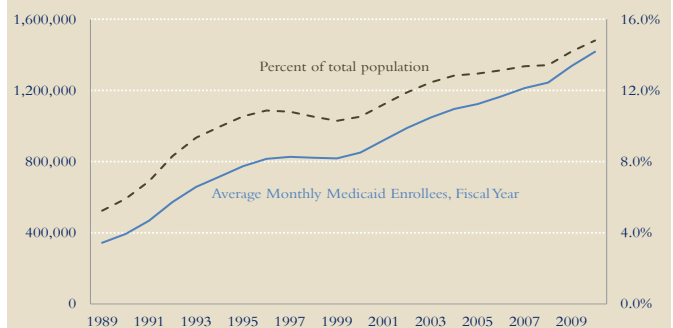
²⁷ North Carolina Institute of Medicine (2010) *Prevention for the Health of North Carolina: Prevention Action Plan*, October 2009, revised July 2010.

Figure 12
U.S. AND NORTH CAROLINA PERSONAL HEALTH CARE COSTS AS PERCENT OF GDP



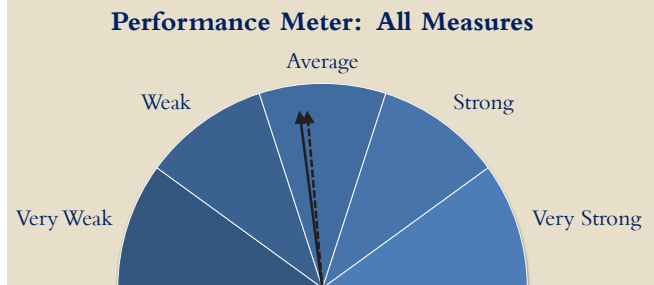
Source: Kenan Institute calculations based on BEA data

Figure 13
AVERAGE MONTHLY NORTH CAROLINA MEDICAID ENROLLEES, 1989–2010



Source: Health Profile of North Carolinians

Figure 14
NORTH CAROLINA DASHBOARD ON HEALTH CARE QUALITY COMPARED TO ALL STATES, OVERALL



Source: AHRQ, State Dashboards, 2010

slightly lower than for all Americans (77.9 years). Figure 15, which charts age-specific mortality rates for the U.S. and North Carolina, shows the familiar “bathtub” pattern of mortality – high immediately after birth, low for several years, and rising soon after middle age. (Reducing infant mortality therefore has a large impact on life expectancy.) The age-specific mortality rates for North Carolina are generally higher than the corresponding national rates but are similar.

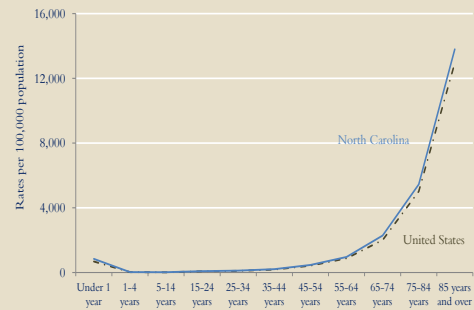
The differences are partially the result of somewhat different population compositions for the nation and the state. Life expectancy for white males was 75.9 years and 75.5 years for the nation and state, respectively. It was 80.8 and 80.7, respectively, for white females; 70.0 and 70.1 for black males; and 76.8 and 77.2 for black females.²⁸ Hispanic life expectancy at birth for the nation was 78.2 and 83.4 for males and females, respectively. Comparable figures are not available for Hispanics at the state level for North Carolina. U.S. blacks suffer a mortality disadvantage compared to U.S. whites. But because North Carolina blacks enjoy a small advantage and North Carolina whites have a small disadvantage compared to their national comparison groups, mortality disparities are somewhat narrower in North Carolina than in the nation as a whole. Since the national and state statistics are sufficiently close, we use national data to represent North Carolina experiences. Because data on other population groups are sparse, as noted previously, we omit them from much of the discussion.

Figure 16 charts the estimated national life table survivor curves for males and females, non-Hispanic whites, non-Hispanic blacks, and Hispanics in 2007. Each curve represents the number surviving until each age out of a cohort of 100,000 births. As is typical of almost all populations, females have higher life expectancies than males and a higher proportion survive until each age.

There are clear differences by racial/ethnic group. African-Americans are less likely to survive at every age than whites with the effect being particularly noticeable for males. Hispanics fare better than whites. The experience of all groups changes over time but because Hispanics have only recently become a major population group in the U.S., and especially in North Carolina, mortality statistics could be unstable. Several have hypothesized a “healthy migrant” effect which will trend towards poorer health over the next several years. The relatively healthy status and the potential trend point to the impact of behaviors on health.

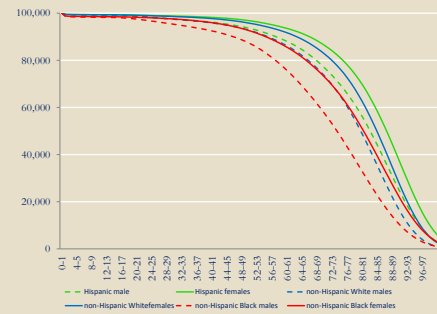
²⁸ In these calculations, Hispanics can be of any race.

Figure 15
MORTALITY RATES BY AGE, U.S. AND NORTH CAROLINA



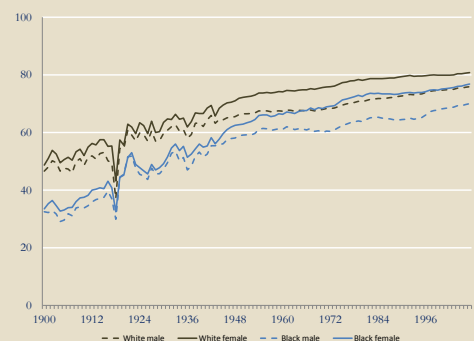
Source: North Carolina State Center for Health Statistics

Figure 16
SURVIVOR CURVES BY SEX AND RACE/ETHNICITY, U.S., 2007



Source: Elizabeth Arias (2011) U.S. Life Tables, National Vital Statistics Reports, Volume 59, Number 9

Figure 17
TRENDS IN LIFE EXPECTANCY FOR THE U.S. BY SEX AND RACE



Source: Center for Disease Control, U.S. Life Tables

Figure 17 summarizes the trends in life expectancy by race/ethnicity and gender for the period 1900 to 2007. It shows gradual convergence in male and female life expectancy by race – but also continued disparities. Convergence was more rapid in the first half of the last century but has continued at a reduced pace since then. Moreover, gender differences in the rate of improvement have emerged. Black women are making steadier progress towards parity in life expectancy than their male counterparts.

Table 4 provides an overview of selected mortality statistics for North Carolina by race/ethnic group and gender. The population base for some groups is small, leading to the possibility of statistical unreliability, despite being averaged over a five-year period. Because the age distribution of each group differs, the rates have been standardized to reflect what they would be using the 2000 population as a base.

Heart disease, cancer (particularly lung cancer), cerebrovascular disease (stroke), and lower respiratory diseases – all chronic conditions – are the most important causes of death in North Carolina. The death rates vary by race/ethnicity and by gender, however. In one case (lower respiratory disease), non-Hispanic whites have a significantly higher mortality rate and, in three other cases (lung cancer, unintentional injuries, and suicide), somewhat higher mortality rates, but in many cases, the cause-specific mortality rates are higher for non-Hispanic blacks. Blacks have higher mortality rates for heart disease and most forms of cancer, stroke, diabetes, and nephritis (kidney disease). The black mortality rate due to homicide is more than twice the state-wide average. American Indians also have elevated mortality rates for several causes, including motor vehicle accidents, as do Hispanics. Including gender differences further complicate the pattern of disparities.

Infant mortality in North Carolina has declined significantly over the last several decades, from 12.6 per 1,000 live births in 1988 to 7.0 in 2010. The mortality rate for black infants has declined over that time period, from 19.8 per 1,000 live births in 1988 to 12.7 in 2010, but still remains stubbornly high – now more than twice as high as among whites (Table 5). Hispanic infant mortality rates are comparable to those of non-Hispanic whites, as are those of other groups collectively. Although much improved, North Carolina's infant mortality rate is still substantially higher than the overall U.S. rate (6.1) and much higher than that found in multi-racial Singapore which has the World's lowest recorded infant mortality rate (2.3).

Comparing mortality rates, life expectancy, and causes of

death among racial groups indicates continuing health disparity between blacks and whites. The persisting disparity in infant mortality rates indicates a critical area of concern. Nevertheless, evidence for disparity stretches across the life span, particularly for males.

3.2 Disability-adjusted life years (DALYs)

Death is clearly the most serious health risk. But impairment, while less serious, is still an onerous health burden. Because the median age at death can be over 70 in developed countries, such as the U.S., a summary measure including the impacts of premature death as well as the impacts of impairment is needed to characterize health status. Such a measure may lose some richness of detail but facilitates public policy decisions regarding health investments.

The disability-adjusted life year (DALY) is a summary health measure capturing the overall disease burden by combining mortality and morbidity into a single, overarching measure. A measure of the indirect costs of disease and disability in terms of personal time, the DALY is a sum of the average number of Years of Life Lost (YLL) and the number of Years Lost to Disability (YLD). One DALY is equal to one year of healthy life lost.²⁹ The equation for computing this statistic is as follows:

$$\text{Disability-Adjusted Life Years (DALY)} = \text{Years of Life Lost (YLL)} + \text{Years Lost to Disability (YLD)}$$

where

YLL = Years of life shortened compared to benchmark population; and

YLD = years living with disability * degree of impairment

Assessing the number of years of life lost can seem somewhat arbitrary. Japanese life expectancy statistics are often used as the realistic best case baseline for measuring premature death, because the Japanese have achieved the longest life expectancies of any large population. Some causes of death result in more years of life lost because they tend to occur at younger ages. Deaths to people in their 80s, for instance, shorten life but much less than one which occurs around age 20 or at birth. Because society values the young productive ages more highly than other ages, the measure is adjusted to reflect that preference. Because a benefit in the near future is valued more than the same benefit in the distant future, the value of each year is

²⁹ The number of Quality-Adjusted Life Years (QALYs) plus the number of Disability-Adjusted Life Years (DALYs) sum to the maximum possible life years.

Table 4
NORTH CAROLINA 2006-2010 AGE-ADJUSTED DEATH RATES BY RACE/ETHNICITY AND SEX

Cause of Death:	<i>White, non-Hispanic</i>		<i>African American, non-Hispanic</i>		<i>Other Races, non-Hispanic</i>		<i>Hispanic</i>		<i>Overall</i>
	Male	Female	Male	Female	Male	Female	Male	Female	
All Causes	954.5	674.3	1249.5	808.3	650.3	478.1	311.2	233.5	819.0
Diseases of Heart	233.0	140.9	285.8	175.7	148.7	102.7	55.7	36.9	184.9
Acute Myocardial Infarction	52.9	28.7	55.9	35.7	38.2	23.0	10.5	6.6	39.2
Other Ischemic Heart Disease	108.0	53.6	121.1	63.2	71.4	43.0	29.7	15.4	77.3
Cerebrovascular Disease	44.9	43.6	71.4	60.1	39.6	30.0	13.1	15.2	47.8
Cancer	224.6	149.3	302.9	166.6	145.7	103.2	66.0	61.2	183.1
Colon, Rectum, and Anus	18.4	12.4	29.0	18.5	9.0	9.9	7.4	5.4	16.0
Pancreas	11.7	8.9	16.1	13.4	4.8	6.9	N/A	5.0	10.7
Trachea, Bronchus, and Lung	76.1	43.7	90.9	32.7	47.2	24.6	12.7	8.6	55.9
Breast	--	21.9	--	30.7	--	11.7	--	6.7	23.4
Prostate	20.4	--	59.4	--	18.2	--	9.5	--	25.5
Diabetes Mellitus	22.2	14.4	51.3	42.5	25.0	25.5	11.2	7.1	22.5
Pneumonia and Influenza	21.5	17.3	24.1	15.8	11.1	9.0	5.8	7.1	18.6
Chronic Lower Respiratory Diseases	58.7	46.4	45.1	21.1	27.4	15.6	6.8	7.5	46.4
Chronic Liver Disease and Cirrhosis	13.8	6.0	11.2	5.1	7.5	5.2	6.8	N/A	9.1
Septicemia	13.7	11.5	23.7	18.8	10.6	7.6	5.3	4.9	13.7
Nephritis, Nephrotic Syndrome, and Nephrosis	19.7	12.5	42.4	34.6	18.0	15.3	7.1	5.4	18.9
Unintentional Motor Vehicle Injuries	23.6	9.9	27.1	7.9	24.2	10.4	23.6	7.3	16.7
All Other Unintentional Injuries	42.2	23.0	31.7	13.1	25.6	12.5	15.0	6.2	28.6
Suicide	23.9	6.7	8.6	1.5	10.8	4.7	7.4	1.7	12.1
Homicide	4.6	2.2	25.6	5.2	13.0	3.4	13.0	2.6	6.6
Alzheimer's disease	23.3	32.5	20.9	27.6	17.3	21.1	--	9.7	28.5
Acquired Immune Deficiency Syndrome	1.7	0.4	20.2	9.8	N/A	--	4.1	--	3.9

Source: N.C. Department of Health and Human Services, 2012 County Health Data Sheet

Table 5
TREND IN NORTH CAROLINA INFANT MORTALITY RATES BY RACE/ETHNIC GROUP

<i>Year</i>	<i>Total Rate</i>	<i>White Non-Hispanic</i>	<i>Af. Am. Non-Hispanic</i>	<i>Other Non-Hispanic</i>	<i>Hispanic</i>
1988	12.6	9.6	19.8	7.8	10.5
1989	11.5	8.7	17.8	9.4	8.7
1990	10.6	8.2	16.5	9.1	6.3
1991	10.9	8.0	17.3	11.8	9.3
1992	9.9	7.2	16.4	8.1	7.2
1993	10.6	8.1	17.0	10.2	5.1
1994	10.0	7.7	16.6	7.2	5.4
1995	9.2	6.9	15.8	7.7	5.0
1996	9.2	7.4	15.5	6.0	3.3
1997	9.2	7.1	15.6	9.1	4.8
1998	9.3	6.8	17.5	7.3	3.7
1999	9.1	6.7	15.6	9.2	7.8
2000	8.6	6.6	15.6	6.7	4.6
2001	8.5	6.3	15.9	8.3	4.9
2002	8.2	5.9	15.6	5.3	5.8
2003	8.2	5.9	15.6	5.2	6.4
2004	8.8	6.6	16.9	8.8	4.7
2005	8.8	7.0	16.3	7.7	4.5
2006	8.1	6.2	15.1	5.6	5.4
2007	8.5	6.2	15.0	8.5	6.6
2008	8.2	6.0	14.7	7.5	6.0
2009	7.9	5.5	15.8	4.7	5.7
2010	7.0	5.3	12.7	5.2	5.0

Source: North Carolina State Center for Health Statistics

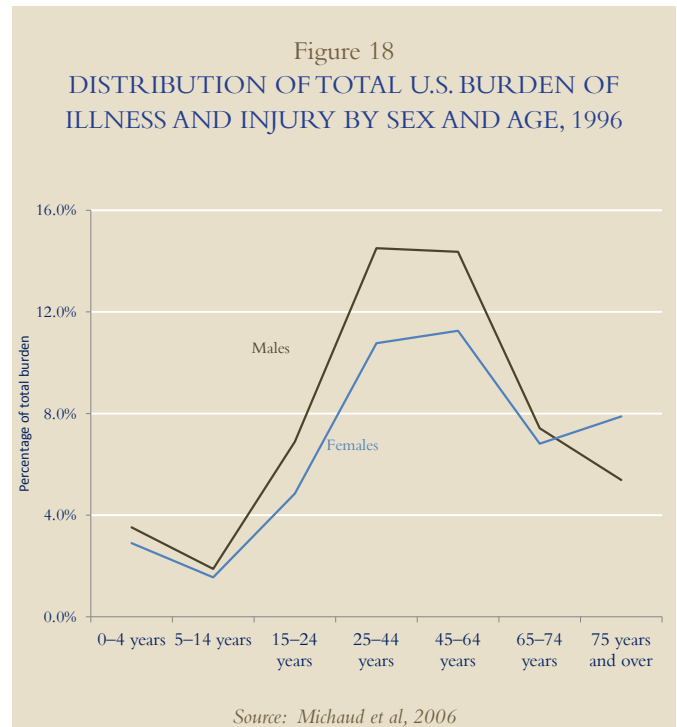
discounted (at 3.0 percent per year).³⁰

The calculations to compute YLDs depend upon the incidence of particular illnesses and injuries, their duration, age of onset, severity, and the degree of disability incurred. Incidence, duration, and age of onset are measured by large-scale health surveys. The degree (weighting) of disability is estimated by asking expert and non-expert panels to identify health trade-offs. These weighting estimates have proven fairly consistent across countries and panels. While some technical and philosophical aspects of calculating DALYs are controversial, one of their advantages is an explicit recognition of societal policy preferences. The measure is robust with respect to parameter assumptions.

The prevalent patterns of death and disease result in each death being linked to an average of 14.3 DALYs. Premature death is responsible for 55 percent of the loss, on average. Disability accounts for the remaining 45 percent. Overall, North Carolina's DALY rate is approximately 131.64 per 1,000 residents. Whites (130.27) and Hispanics (73.32) have lower rates. Blacks (164.27) have a higher rate.³¹ The Hispanic statistics are based on limited data and the recent migration of large numbers of Hispanics to our state means that mortality is low in this young population.³²

Figure 18 summarizes the distribution of the total burden of illness and injury by gender and age based on mid-1990s data. Males carry a somewhat heavier burden than females. Approximately half the burden is shouldered by men and women in their prime working years (ages 25 through 64), suggesting the potential economic productivity benefits of improved health.

Consistent with our discussion of the ongoing mortality transition above, approximately 80 percent of the DALYs are the result of non-communicable (chronic) diseases; 10 percent due



to communicable disease; and 10 percent due to injury. Table 6 and Table 7 summarize our estimates of the 20 leading causes of DALYs along with their decomposition into deaths (YLL) and years lost to disability (YLD) for North Carolina. Because the data source uses a somewhat different classification of medical conditions than that used in the previous table, close comparisons between the tables are not possible.

Here also, heart disease, lung cancer, cerebrovascular disease, and respiratory diseases account for a large proportion of deaths but the proportion of years of life lost is not quite as large. Depression, alcohol use, arthritis, and dementia are major causes of years lost to productivity-reducing disability despite having a less important role in mortality. Accordingly, several of these are prominent sources of disability-adjusted life years lost. Heart disease is still prominent but, by this measure, motor vehicle accidents, depression, alcohol use, and HIV are major health problems.

Table 8 and Table 9 summarize our estimates of selected leading causes of DALYs for North Carolina males and females, respectively, by race/ethnic group. Data availability limit us to whites, blacks, and Hispanics. Not only are there disparities in the level of burden but the causes differ by gender and race. Traffic accidents are a more prominent source of DALYs for males than females. Depression weighs more heavily on

³⁰ C.L. Murray (1994) "Quantifying the burden of disease: The technical basis for disability-adjusted life years," *Bulletin of the World Health Organization* 72 (3): 429-445 provides methodological detail.

³¹ See <http://www.epi.state.nc.us/SCHS/data/minority.cfm> for a discussion about the strengths and weaknesses of data on North Carolina minority health.

³² We stress that these are initial estimates based on a combination of 2006-2010 mortality and analysis of the national population based on the mid-1990s. The small base used in generating the North Carolina estimates could also lead to unreliable investments. A more complete analysis fully based on contemporary North Carolina data could yield somewhat different results. Matthew T. McKenna, Catherine M. Michaud, Christopher J.L. Murray, and James S. Marks (2005) "Assessing the Burden of Disease in the United States Using Disability-Adjusted Life Years," *American Journal of Preventive Medicine* 28: (5) 421. Catherine M Michaud, Matthew T McKenna, Stephen Begg, Niels Tomijima, Meghna Majmudar, Maria T Bulzacchelli, Shahul Ebrahim, Majid Ezzati, Joshua A Salomon, Jessica Gaber Kreiser, Mollie Hogan, and Christopher J.L Murray (2006) "The burden of disease and injury in the United States 1996," *Population Health Metrics* 4: 11

Table 6
LEADING CAUSES OF DALYS FOR NORTH CAROLINA WITH CORRESPONDING
YLDS, YLLS, AND DEATHS, MALES 2006-2010

<i>DALY rank</i>	<i>Cause</i>	<i>DALY</i>	<i>(%)</i>	<i>YLD</i>	<i>(%)</i>	<i>YLL</i>	<i>(%)</i>	<i>Deaths</i>	<i>(%)</i>
1	Ischaemic heart disease	60,878	10.5%	4,726	2.0%	56,152	16.4%	8,923	23.5%
2	Road traffic injuries	35,498	6.1%	8,856	3.7%	26,643	7.8%	1,102	2.9%
3	Alcohol use	25,851	4.4%	22,990	9.6%	2,861	0.8%	177	0.5%
4	Chronic obstructive pulmonary disease	25,211	4.3%	14,647	6.1%	10,563	3.1%	2,042	5.4%
5	Lung trachea or bronchial cancer	25,205	4.3%	1,085	0.5%	24,120	7.0%	3,162	8.3%
6	Dementia and other degenerative and hereditary central neurologic disorders	19,122	3.3%	16,619	7.0%	2,503	0.7%	701	1.8%
7	Cerebrovascular disease	18,780	3.2%	8,833	3.7%	9,947	2.9%	1,755	4.6%
8	Self-inflicted injuries	18,198	3.1%	269	0.1%	17,963	5.2%	875	2.3%
9	Unipolar major depression	16,598	2.8%	16,598	6.9%	-	0.0%	-	0.0%
10	Diabetes mellitus	16,805	2.9%	8,441	3.5%	8,365	2.4%	1,065	2.8%
11	Homicide and violence	15,570	2.7%	2,248	0.9%	13,322	3.9%	466	1.2%
12	Osteoarthritis	15,362	2.6%	15,327	6.4%	35	0.0%	-	0.0%
13	Drug use	14,550	2.5%	13,561	5.7%	954	0.3%	35	0.1%
14	Congenital abnormalities	14,479	2.5%	8,405	3.5%	6,074	1.8%	212	0.6%
15	Asthma	10,700	1.8%	9,641	4.0%	1,059	0.3%	71	0.2%
16	Cirrhosis of the liver	9,815	1.7%	2,131	0.9%	7,684	2.2%	594	1.6%
17	Conditions arising during perinatal period	9,676	1.7%	494	0.2%	9,182	2.7%	283	0.7%
18	HIV/AIDS	9,477	1.6%	3,759	1.6%	5,718	1.7%	249	0.7%
19	Colon or rectum cancer	6,557	1.1%	974	0.4%	5,609	1.6%	790	2.1%
20	Prostate cancer	5,727	1.0%	1,893	0.8%	3,834	1.1%	887	2.3%
Total from top 20 causes		374,060	64.2%	161,496	67.6%	212,588	61.9%	23,387	61.6%
Total from all causes		582,468	100.0%	239,072	100.0%	343,396	100.0%	37,959	100.0%

DALYs, disability adjusted life years; YLDs, years lost to disability; YLLs, years of life lost.
Source: Kenan Institute calculations based on SCHS data and McKenna, Michaud, Murray, and Marks (2005)

Table 7
LEADING CAUSES OF DALYS FOR NORTH CAROLINA WITH CORRESPONDING
YLDS, YLLS, AND DEATHS, FEMALES 2006–2010

<i>DALY rank</i>	<i>Cause</i>	<i>DALY</i>	<i>(%)</i>	<i>YLD</i>	<i>(%)</i>	<i>YLL</i>	<i>(%)</i>	<i>Deaths</i>	<i>(%)</i>
1	Ischaemic heart disease	39,434	7.7%	4,154	1.6%	35,246	13.9%	8,342	21.6%
2	Dementia and other degenerative and hereditary central neurologic disorders	32,451	6.4%	27,139	10.5%	5,313	2.1%	1,856	4.8%
3	Unipolar major depression	31,526	6.2%	31,526	12.2%		0.0%		0.0%
4	Chronic obstructive pulmonary disease	28,976	5.7%	16,760	6.5%	12,168	4.8%	2,273	5.9%
5	Cerebrovascular disease	22,391	4.4%	10,928	4.2%	11,463	4.5%	2,652	6.9%
6	Lung trachea or bronchial cancer	18,545	3.6%	877	0.3%	17,635	7.0%	2,225	5.8%
7	Osteoarthritis	17,795	3.5%	17,725	6.9%	35	0.0%	35	0.1%
8	Diabetes mellitus	15,903	3.1%	8,646	3.4%	7,257	2.9%	1,073	2.8%
9	Breast cancer	13,778	2.7%	1,712	0.7%	12,039	4.8%	1,257	3.3%
10	Road traffic accidents	13,758	2.7%	4,016	1.6%	9,771	3.9%	450	1.2%
11	Alcohol use	14,327	2.8%	13,521	5.2%	806	0.3%	35	0.1%
12	Asthma	12,681	2.5%	11,209	4.3%	1,471	0.6%	140	0.4%
13	Congenital abnormalities	12,330	2.4%	7,181	2.8%	5,149	2.0%	210	0.5%
14	Conditions arising during the perinatal period	7,706	1.5%	560	0.2%	7,181	2.8%	210	0.5%
15	Lower respiratory infections	6,831	1.3%	350	0.1%	6,515	2.6%	1,611	4.2%
16	Post-traumatic stress disorder	6,796	1.3%	6,796	2.6%	-	0.0%	-	0.0%
17	Panic disorder	6,375	1.2%	6,375	2.5%	-	0.0%	-	0.0%
18	Bipolar disorder	5,780	1.1%	5,780	2.2%	-	0.0%	-	0.0%
19	Colon or rectum cancer	5,566	1.1%	904	0.4%	4,686	1.9%	737	1.9%
20	HIV/AIDS	4,824	0.9%	1,953	0.8%	2,870	1.1%	120	0.3%
Total from the top 20 causes		317,772	62.2%	178,114	69.0%	139,606	55.2%	23,227	60.2%
Total from all causes		510,844	100.0%	258,038	100.0%	252,806	100.0%	38,607	100.0%

DALYs, disability adjusted life years; YLDs, years lost to disability; YLLs, years of life lost.
Source: Kenan Institute calculations based on SCHS data and McKenna, Michaud, Murray, and Marks (2005)

Table 8
LEADING CAUSES OF DALYS FOR NORTH CAROLINA, MALES 2006–2010 BY RACE/ETHNICITY

DALY rank	Whites			Blacks			Hispanics		
	Cause	DALY	%	Cause	DALY	%	Cause	DALY	%
1	Ischemic heart disease	53,624	11.5%	Homicide and violence	11,722	7.6%	Road traffic injuries	2,234	7.8%
2	Road traffic injuries	29,431	6.3%	Ischemic heart disease	9,936	6.4%	Homicide and violence	1,515	5.3%
3	Chronic obstructive pulmonary disease	22,234	4.8%	Alcohol use	8,287	5.4%	Ischemic heart disease	1,588	5.5%
4	Lung cancer	21,419	4.6%	Road traffic injuries	7,686	5.0%	Alcohol use	1,409	4.9%
5	Alcohol use	19,498	4.2%	HIV/AIDS	5,910	3.8%	Chronic obstructive pulmonary disease	1,017	3.5%
6	Self-inflicted injuries	16,102	3.4%	Lung cancer	5,456	3.5%	Congenital anomalies	988	3.4%
7	Cerebrovascular disease	14,991	3.2%	Perinatal conditions	5,234	3.4%	Unipolar major depression	964	3.4%
8	Unipolar major depression	13,851	3.0%	Cerebrovascular disease	5,076	3.3%	Osteoarthritis	939	3.3%
9	Osteoarthritis	13,460	2.9%	Diabetes mellitus	4,754	3.1%	Cerebrovascular disease	877	3.1%
10	HIV/AIDS	5,575	1.2%	Congenital abnormalities	3,598	2.3%	HIV/AIDS	678	2.4%
Total from the top 10 causes		210,185	44.9%		67,658	43.8%		12,210	42.6%
Total from all causes		467,600	100.0%		154,303	100.0%		28,662	100.0%

Source: Kenan Institute calculations based on SCHS data and McKenna, Michaud, Murray, and Marks (2005)

Table 9
LEADING CAUSES OF DALYS FOR NORTH CAROLINA, FEMALES 2006-2010 BY RACE/ETHNICITY

DALY rank	Whites			Blacks			Hispanics		
	Cause	DALY	%	Cause	DALY	%	Cause	DALY	%
1	Ischemic heart disease	32,809	8.1%	Ischemic heart disease	8,975	6.5%	Unipolar major depression	1,646	7.7%
2	Dementia	28,445	7.0%	Unipolar major depression	6,908	5.0%	Dementia and other degenerative central nervous disorders	1,633	7.7%
3	Chronic obstructive pulmonary disease	25,510	6.3%	Cerebrovascular disease	6,559	4.8%	Chronic obstructive pulmonary disease	1,049	4.9%
4	Unipolar major depression	25,383	6.3%	Diabetes mellitus	5,652	4.1%	Osteoarthritis	988	4.6%
5	Cerebrovascular disease	17,538	4.3%	Alcohol use	4,548	3.3%	Ischemic heart disease	967	4.5%
6	Lung cancer	16,046	4.0%	HIV/AIDS	4,996	3.6%	Cerebrovascular disease	845	4.0%
7	Osteoarthritis	15,188	3.8%	Perinatal conditions	4,548	3.3%	Congenital anomalies	776	3.6%
8	Diabetes mellitus	11,789	2.9%	Asthma	3,684	2.7%	Diabetes mellitus	763	3.6%
9	Breast cancer	11,258	2.8%	Breast cancer	3,386	2.5%	Road traffic injuries	684	3.2%
10	Road traffic injuries	11,169	2.8%	Road traffic injuries	3,054	2.2%	Alcohol use	682	3.2%
Total from the top ten causes		195,136	48.3%		52,310	38.2%		10,034	47.1%
Total from all causes		404,055	100.0%		137,096	100.0%		21,304	100.0%

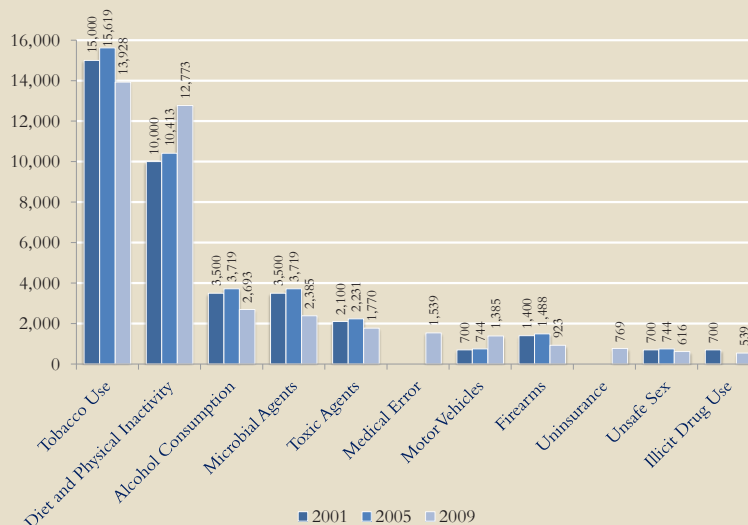
Source: Kenan Institute calculations based on SCHS data and McKenna, Michaud, Murray, and Marks (2005)

Table 10
ACTUAL CAUSES OF DEATH IN THE UNITED STATES IN 1990 AND 2000

Actual Cause	1990		2000	
	No.	(%)	No.	(%)
Tobacco	400,000	19.0	435,000	18.1
Poor diet and physical inactivity	300,000	14.0	365,000	15.2
Alcohol consumption	100,000	5.0	85,000	3.5
Microbial agents	90,000	4.0	75,000	3.1
Toxic agents	60,000	3.0	55,000	2.3
Motor vehicle	25,000	1.0	43,000	1.8
Firearms	35,000	2.0	29,000	1.2
Sexual behavior	30,000	1.0	20,000	0.8
Illicit drug use	20,000	(<1)	17,000	0.7
Total	1,060,000	50.0	1,159,000	46.7

Source: Mokdad, Marks, Stroup, and Gerberding (2004)

Figure 19
PREVENTABLE DEATHS IN NORTH CAROLINA,
SELECTED CAUSES AND YEARS AND AGE, 1996



Source: Health Profile of North Carolinians

females. HIV/AIDS, homicides and violence, and alcohol use weigh heavily on black males. HIV/AIDS and alcohol use also weigh heavily on black females. Traffic accidents, homicides and violence, and HIV/AIDS are the primary sources of burden for Hispanic males. Recent advances in the treatment of HIV/AIDS have resulted in fewer premature deaths but the incidence rate has not been decreasing. Nationally, homicide rates have been generally decreasing, as have vehicular accident rates.

Several of these causes of death result in a disproportionate portion of the DALYs because they either tend to occur at the younger ages or because the deaths tend to be preceded by a period of disability and a need for continuing health care. The evidence suggests that mortality can be further delayed and the quality of life improved during the added years. The level and sources of lost life and health (DALYs) indicate significant health disparities in North Carolina. Given the central role of chronic diseases in causing death and disability, we now examine the impact of underlying conditions which often reflect personal investments in health.

3.3 The health burden and specific risk factors

The preceding analysis estimated the loss of life and disability due to specific medical conditions. In order to engage in effective preventative action, the risk factors underlying those medical conditions need to be identified. Fortunately, some research into the ultimate causes of death has been completed. We rely on that research here.

Attributing deaths to underlying causes, particularly when behaviors and exposures are related to deaths only after a long period, is fraught with difficulty. Nevertheless, there is broad agreement on a methodology to do so on a statistical basis for large populations. Such analyses do not always assess the impact of multiple behaviors or exposures on death and they cannot consider all causes because the etiology of some conditions are not well understood. On the basis of accumulated epidemiological and clinical evidence, they are effective in identifying the most important correlates of the major causes of death.

“Many of the diseases [which are responsible for the DALYs that impact young and middle adulthood] have recognized behavioral determinants such as tobacco use, sedentary lifestyles, obesity-inducing diets, high-risk sexual behaviors, and excessive alcohol consumption.”³³ Altering the salient behavior patterns has the potential to increase the number of highly productive

³³ Matthew T. McKenna, Catherine M. Michaud, Christopher J.L. Murray, and James S. Marks (2005) “Assessing the Burden of Disease in the United States Using Disability-Adjusted Life Years,” *American Journal of Preventive Medicine* 28: (5) 422.

years available in the North Carolina labor force.

The information in Table 10 suggests that a small number of malleable behaviors and exposures ultimately cause approximately half of U.S. and North Carolina deaths.³⁴ Smoking and the combination of poor diet and physical inactivity (caloric imbalance) alone account for approximately one-third of all deaths. Comparing across decades, although the deaths attributable to smoking are declining slowly, those attributable to poor diet and insufficient physical activity appear to be on the rise. Increases in obesity may not yet be fully reflected in death rates.

Figure 19 provides supplemental information on the trends in preventable deaths in North Carolina. Tobacco usage, poor diets, and sedentary lifestyles are responsible for the largest number of preventable deaths. Tobacco use, as a cause of death, appears to be on a slow, halting downward trend. On the other hand, unhealthy eating habits and physical inactivity appear to be on an accelerating upward trajectory in the last several years.

Available North Carolina data suggest considerable racial/ethnic variation in some mortality and morbidity risk factors. Table 11 summarizes some of this information. We concentrate on black-white differences. The figures in the top panel of the table indicate that blacks have higher risk factors for infant mortality likely because larger numbers of babies are born to young mothers who may have limited resources to care for the child during and after pregnancy and because they are less likely to seek pre-natal care.³⁵ Blacks are much more likely to be affected by STDs than the state population as a whole. HIV/AIDS remains a major cause of years of life lost and years lost to disability. Except for smoking, blacks have higher incidences of the risk factors most linked to chronic diseases and the ensuing deaths. Except for high blood pressure, each of the risk factors has been linked to behavioral factors. Chronic diseases and injuries with well-understood risk factors are the largest contributors to mortality differentials. Those risk factors include alcohol use, smoking, obesity, and elevated blood pressure, cholesterol, and glucose.³⁶

We were not able to obtain good trend data on each of those risk factors but we were able to review the national trends

³⁴ Ali H. Mokdad, James S. Marks, Donna F. Stroup, and Julie L. Gerberding (2004) “Actual Causes of Death in the United States, 2000,” *Journal of the American Medical Association* 291 (10): 1238-1245 plus corrections.

³⁵ It should be noted here that Hispanics have higher teen pregnancy rates and are less likely to seek care than Blacks. But Hispanic infant mortality rates are not high by North Carolina standards.

³⁶ Christopher J. L. Murray, Sandeep C. Kulkarni, Catherine Michaud, Niels Tomijima, Maria T. Bulzacchelli, Terrell J. Iandiorio, and Majid Ezzati (2006) “Eight Americas: Investigating Mortality Disparities across Races, Counties, and Race-Counties in the United States,” *PLoS Medicine* 3(9): 1513-1524.

Table 11
NORTH CAROLINA INCIDENCE AND RISK FACTORS BY RACE AND ETHNICITY

	<i>Total</i>	<i>White, Non-Hispanic</i>	<i>African American, Non-Hispanic</i>	<i>American Indian, Non-Hispanic</i>	<i>Other Races, Non-Hispanic</i>	<i>Latino/ Hispanic</i>
Maternal/Child Indicators, 2005–2009	Rate/%	Rate/%	Rate/%	Rate/%	Rate/%	Rate/%
Percentage low birthweight births (<2500 grams)	9.1	7.7	14.5	10.8	8.6	6.3
Percentage births to moms <18 years of age	3.8	2.4	6.3	6.9	1.5	5.0
Percentage Late/No Prenatal Care (After 1st trimester/no care)	16.8	10.4	23.4	21.3	14.4	29.5
Percentage births where Mother smoked prenatally	11.0	14.5	10.1	23.6	2.4	1.2
Teen pregnancy rate per 1,000 population (Ages 15-19)	62.0	42.1	84.7	88.8	58.6	145.8
Communicable Disease Rates, 2009	Rate	Rate	Rate	Rate	Rate	Rate
Adult/Adolescent HIV Disease	22.5	7.7	69.7	11.5	6.8	28.8
Adult/Adolescent AIDS Cases	12.6	3.9	41.2	4.6	4.7	15.2
Chlamydia	474.2	112.0	1009.3	528.3	114.1	368.7
Gonorrhea	160.6	24.0	449.1	183.8	22.8	44.4
Early Syphilis: Primary, Second- ary & Early Latent	10.2	3.2	34.2	6.5	2.7	5.7
Behavioral Risk Factors, 2009	Rate	Rate	Rate	Rate	Rate	Rate
Adults with high blood pressure	31.6	31.4	40.8	36.3	23.1	13.3
Adults who smoke	20.4	20.1	20.2	36.7	22.8	18.2
Adults who are obese	30.2	27.6	42.9	33.1	27.0	23.3
Adults who engage in no leisure time physical activity	26.5	24.4	35.1	33.0	19.6	26.4
Adults in fair/poor health	18.1	15.5	24.2	21.5	13.7	29.4
Adults diagnosed with diabetes	9.6	8.5	15.6	12.7	7.1	4.9

Source: North Carolina State Center for Health Statistics
<http://www.epi.state.nc.us/SCHS/pdf/NCPopHealthDataByRaceEth10152010.pdf>

for selected risk factors in order to gain perspective on the likely impacts on North Carolina health and health costs. Figure 20 indicates that obesity is a relatively recent phenomenon which has been accelerating since the beginning of the last quarter of the last century. The percent of adults who can be classified as obese according to the body mass index has risen from 15 percent in 1975 to approximately 35 percent in the last decade. Although lower, extreme obesity has followed a similar upward trend. Recent measurements hold out the hope that the increases in obesity and extreme obesity may be abating.

The measure for obesity has become standardized over the past years. The measures for smoking are less consistent. Figure 21 provides a “glass half full” overview of national trends in smoking. The decrease in the prevalence of adult smoking has been dramatic, falling from over 40 percent in 1960 to approximately 20 percent today. However, there are indications that the decrease has slowed and has possibly approached a plateau.

Figure 22 charts a rapid rise in the incidence of diagnosed diabetes over the last two decades. The incidence of diabetes has risen from about four percent of the population in the early 1990s to nearly 9 percent in 2010. The trend appears to lag the increase in obesity by several years.

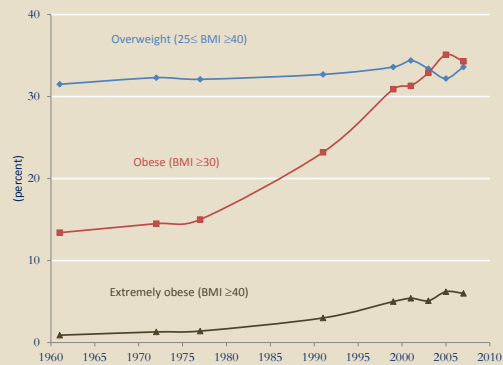
These trends provide partial insight into the drivers of poor health and of health care costs. Just a few years ago, a health care needs forecaster may very well have missed the possibly stalling decline in smoking, the rapid rise in obesity, and the ascent of diabetes. These have imposed new unexpected sources of costs on the system of health care. At the same time, the U.S. system of health care seems ill-equipped to meet the challenges of the newly rising health risks.

3.4 The geography of health risks and disease incidence

Health and health disparities vary by location. In order to place North Carolina in national context, we examine state and, where available, county variations in selected risk factors and disease incidence. We also examine trends in county-level mortality rates within North Carolina to understand patterns of convergence and continued disparity.

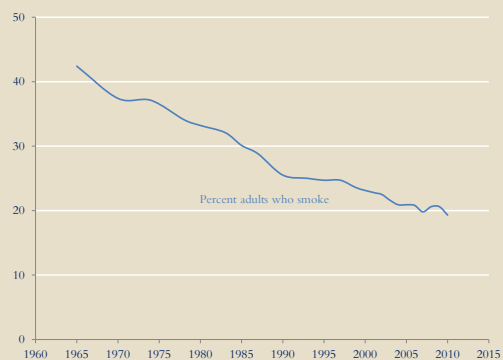
North Carolina is considered to be part of the nation’s “stroke belt,” Figure 23 supports this view. For people ages 35 and older, North Carolina and Alabama tied for the fourth highest death rate due to stroke in 2000–2006 in the country -- 125 deaths per 100,000 population. Arkansas, South Carolina, and Tennessee were first, second and third, respectively in stroke-related deaths.

Figure 20
TRENDS IN U.S. OBESITY, PERCENT ADULTS MEETING SELECTED BMI CUTOFFS



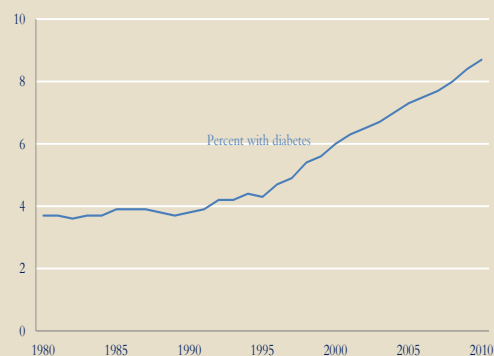
Source: CDC Behavioral Risk Factor Surveillance System

Figure 21
TRENDS IN U.S. SMOKING, ADULTS WHO REPORT SMOKING



Source: CDC Behavioral Risk Factor Surveillance System

Figure 22
TRENDS IN THE INCIDENCE OF DIABETES



Source: CDC Behavioral Risk Factor Surveillance System

Figure 24 charts the incidence of obesity by U.S. county. With 27.3 percent of the North Carolina adult population estimated to be obese, the state ranks slightly above the national average. Examining the racial differences suggests a more nuanced view, however. For non-Hispanic whites, the obesity rate is 24.4 percent (slightly lower than the national average for whites), for non-Hispanic blacks, the rate is 41.0 percent (higher than the national average for blacks), and for Hispanics the rate is 23.1 percent (lower than the national advantage for Hispanics). Nationally, and somewhat more so within the state, obesity is concentrated among blacks.

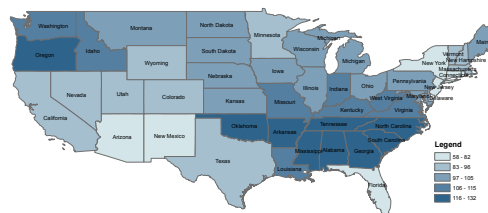
In several of the state's counties, the incidence of diabetes is substantially higher than the national average. Socioeconomic status and race can partially account for the disparities but much of the difference is not well understood. Figure 25 provides an overview of the prevalence of diabetes by U.S. county. Diabetes in North Carolina, diagnosed in 9.8 percent of the adult population, is slightly more prevalent than the national rate of 9.2 percent. Again, examining racial differences suggests a more nuanced view. For non-Hispanic whites, 9.1 percent are affected by diabetes (higher than the national average for whites), for non-Hispanic blacks, the rate is 14.6 percent (somewhat higher than the national average for blacks), and for Hispanics the rate is 5.3 percent (significantly lower than the national advantage for Hispanics). Nationally, and somewhat more so within the state, diabetes is concentrated among blacks.

The incidence of several chronic conditions has been linked to the level of physical activity – or lack of it. Figure 26 maps the percent of residents who are not physically active by U.S. county. North Carolina ranks in the middle. Much has been made of the unhealthy effects of diet and fast food but a broader research program has traced obesity to a change in the source of caloric intake to fats and oils which appears to be closely tied to an increase in income and to a change in the nature of work.³⁷ Much of the decline in physical activity over the past several decades has been tied to our collective movement out of agriculture to manufacturing to services. Today, our jobs simply require less physical effort. We document these changes for North Carolina below.

Aside from a high incidence of deaths by stroke, North Carolina appears to be somewhat slightly higher on the risk factors and incidences examined than the national average. These comparisons suggest that North Carolina is not now seriously disadvantaged in comparison with the national average. At the

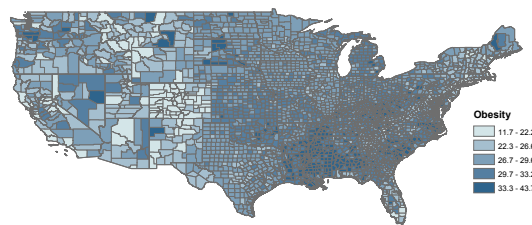
³⁷ Barry M. Popkin (1999) "Urbanization, lifestyle changes, and the nutrition transition," *World Development* 27: 1905-1916.

Figure 23
DEATH RATE DUE TO STROKE
AMONG U.S. STATES



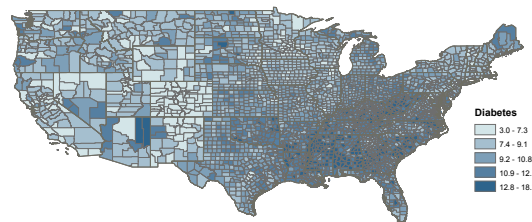
Source: CDC, Division for Heart Disease and Stroke Prevention

Figure 24
INCIDENCE OF OBESITY
AMONG U.S. COUNTIES



Source: Kenan Institute analysis of Centers for Disease Control and Prevention: National Diabetes Surveillance System dat

Figure 25
INCIDENCE OF DIABETES
AMONG U.S. COUNTIES



Source: Kenan Institute analysis of Centers for Disease Control and Prevention: National Diabetes Surveillance System dat

same time, these comparisons also suggest that relatively modest interventions can result in significant improvements.

We now turn to examining in-state variations in mortality. Figure 27 shows the age-adjusted death rate for North Carolina counties for the 1989–1993 period. Several years of data are used to generate more stable estimates. The rate is age-adjusted so that the age composition of the county population does not influence measure. The age-adjusted death rate for North Carolina during that period was 9.7 deaths per 1,000 residents. The figure shows significant variation around that overall average. In particular, the counties of the eastern portion of the state often had high death rates as did one in the far western portion of the state.

Figure 28 shows the age-adjusted death rate for North Carolina counties for the 2006–2010 period. More recently, the age-adjusted death rate for North Carolina was 8.2 deaths per 1,000 residents, again with considerable variation among counties. The pattern of variation follows approximately the same pattern as in the earlier period but with some signs of overall improvement and both a degree of convergence and a measure of continuing disparity. The differences among county death rates reflect several factors, including the economic well-being of the county and the common health practices. The age-adjusted death rate shows a significant correlation with percent of the population which is black ($r = .482$).

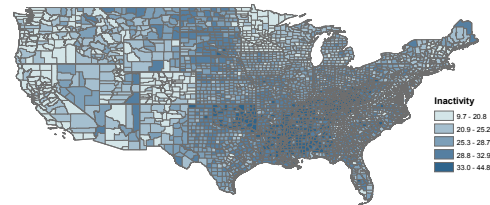
Racial health disparities in exposure to environmental hazards may help drive the mortality differentials. The State Center for Health Statistics’ Health Profile of North Carolinians, cited above, reports that environmental health risks vary by place and race. North Carolina’s large-scale hog operations are more heavily concentrated in regions with a high percentage of non-white residents.³⁸ Hazardous waste sites are frequently located in areas which have a disproportionate representation of minorities, especially blacks.³⁹ In addition, there is some evidence that low income and minority communities may be more likely to be adversely impacted by EPA rulings.⁴⁰

38 Wing S, Cole D, Grant G. (2000) “Environmental Injustice in North Carolina’s Hog Industry,” *Environmental Health Perspectives* 108(3):225–231.

39 A 1980s political mobilization surrounding the location of a hazardous waste disposal site in Warren County which resulted in the 1987 publication of the United Church of Christ’s report, *Toxic Wastes and Race*, is sometimes credited with spawning the national environmental justice movement (<http://dissidentvoice.org/2007/05/25th-anniversary-of-the-warren-county-pcb-landfill-protests/>). Much of the evidence surrounds the correlation between waste sites and a disproportionate representation of minorities among nearby residents.

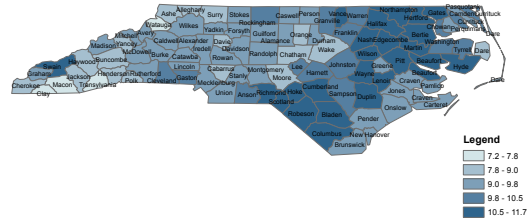
40 Miranda ML, Keating MH, Edwards SE. (2008) “Environmental Justice Implications of Reduced Reporting Requirements of the Toxics Release Inventory Burden Reduction Rule,” *Environmental Science and Technology* 42(15):5 407–5414.

Figure 26
INCIDENCE OF PHYSICAL INACTIVITY
AMONG U.S. COUNTIES



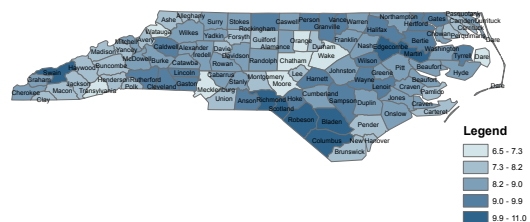
Source: Kenan Institute analysis of Centers for Disease Control and Prevention: National Diabetes Surveillance System data

Figure 27
AGE-ADJUSTED DEATH RATE BY
COUNTY, 1989–1993



Source: North Carolina State Center for Health Statistics

Figure 28
AGE-ADJUSTED DEATH RATE BY
COUNTY, 2006–2010



Source: North Carolina State Center for Health Statistics

The evidence is unclear on whether geographic disparities are diminishing. With respect to mortality, specific counties give evidence for convergence, while in other cases, the disparities seem to persist.

3.5 Differences in wellness across the life span

Using national data, we estimated the proportion of adults who are healthy by age and race. Figure 29 charts the proportion of those who reported no physical, social, or cognitive limitations due to health in the pooled MEP survey described above. (The variable is based on respondents not reporting poor health, poor mental health, physical limitations, activity limitations, social limitations, or cognitive limitations.) Using the same data source, Figure 30 documents gaps in the proportion of adults not reporting having been diagnosed with a major chronic disease: that is, no cancer, diabetes, hypertension, incidences of stroke, heart disease, or pulmonary problems. In both cases, there is a continuing decline in health beginning with young adulthood. The limitations and chronic diseases do not always generate ongoing costs and they do not always interfere with economic productivity but they do suggest a need for early intervention.

The pattern of racial/ethnic differences varies between indicators. Non-Hispanic whites are less likely to report limitations than non-Hispanic blacks or Hispanics. Hispanics are less

likely to have reported being diagnosed with a chronic disease. Explaining this pattern is challenging. Even though there is little difference in the incidence of the occurrence of at least one chronic disease between blacks and whites, whites are less likely to report limitations. Perhaps there are subtle differences in investments in health which may vary by race.

4.0 ASSESSING THE IMPACT OF HEALTH DISPARITIES ON THE NORTH CAROLINA ECONOMY

In the previous section, we surveyed the impact of illness and injury on individuals. In this section, we concentrate on the impact on their pocketbooks. As discussed above, the direct financial costs of treatment can impose large burdens on families and the economy. In this analysis, we rely on national data. Equivalent data are not available separately for North Carolina. We utilize data from the ongoing Medical Expenditure Panel Study (MEPS), pooling the samples from the 2007-2009 (the latest available) waves of the survey in order to increase the reliability of our estimates. In using these data we make the strong (but largely justified) assumption that North Carolina expenditure patterns mirror those of the nation as a whole.

4.1 Health care expenditures by medical condition

Table 12A summarizes information on the direct costs of



Table 12 A

TOTAL EXPENSES, PERCENT DISTRIBUTION, VISITS, PATIENTS, AND AVERAGE COST FOR SELECTED CONDITIONS, UNITED STATES, 2008

<i>Condition</i>	<i>Total expenses (\$ million)</i>	<i>Visits to Offices and Hospitals</i>	<i>Unique Patients Treated</i>	<i>Average Annual Cost per Person Treated</i>
Heart conditions	95,577.04	68,013	23,234	\$ 4,114
Trauma-related disorders	74,291.00	135,399	33,140	\$ 2,242
Cancer	72,157.41	75,221	15,480	\$ 4,661
Mental disorders	72,101.80	144,740	37,799	\$ 1,907
Osteoarthritis and other non-traumatic joint disorders	56,968.71	114,882	35,054	\$ 1,625
COPD, asthma	53,698.83	91,450	46,493	\$ 1,155
Hypertension	47,380.86	79,137	55,197	\$ 858
Diabetes mellitus	45,895.05	64,077	21,158	\$ 2,169
Hyperlipidemia	38,603.35	56,567	44,401	\$ 869
Back problems	34,978.67	110,852	17,896	\$ 1,955
Normal birth/live born	34,550.73	42,053	6,046	\$ 5,715
Disorders of the upper GI	27,230.23	21,168	22,521	\$ 1,209
Skin disorders	24,150.74	39,072	21,976	\$ 1,099
Other CNS disorders	20,404.72	50,863	15,504	\$ 1,316
Kidney Disease	19,859.23	30,887	4,243	\$ 4,681
Cerebrovascular disease	18,835.25	11,467	3,684	\$ 5,112
Systemic lupus and connective tissues disorders	18,774.31	56,694	14,626	\$ 1,284
Residual Codes	18,410.98	22,080	19,108	\$ 964
Other circulatory conditions arteries, veins, and lymphatics	17,555.43	14,549	5,517	\$ 3,182
Infectious diseases	16,202.13	23,992	16,527	\$ 980

Source: MEP data

Table 12 B
 TOTAL EXPENSES, PERCENT DISTRIBUTION, VISITS, PATIENTS, AND AVERAGE COST
 FOR SELECTED CONDITIONS, UNITED STATES, 2008

<i>Condition</i>	<i>Total expenses (\$ million)</i>	<i>Percent Distribution by Type of Service</i>				
		<i>Hospital Outpatient or Office-based Provider Visits</i>	<i>Hospital Inpatient Stays</i>	<i>Emergency Room Visits</i>	<i>Prescribed Medicines</i>	<i>Home Health</i>
Heart conditions	95,577.04	17.7	56.5	7.6	10.2	8.0
Trauma-related disorders	74,291.00	41.4	39.1	13.3	3.0	3.3
Cancer	72,157.41	54.9	33.7	0.7	7.1	3.6
Mental disorders	72,101.80	25.8	13.6	1.4	40.9	18.3
Osteoarthritis and other non-traumatic joint disorders	56,968.71	38.1	26.4	0.9	22.0	12.5
COPD, asthma	53,698.83	24.6	24.4	5.7	38.0	7.4
Hypertension	47,380.86	27.5	13.1	3.6	45.0	10.8
Diabetes mellitus	45,895.05	24.7	10.6	1.0	52.4	11.3
Hyperlipidemia	38,603.35	23.4	3.5	0.3	70.3	2.6
Back problems	34,978.67	51.3	35.9	2.0	8.7	2.1
Normal birth/live born	34,550.73	22.1	75.5	1.3	0.5	0.6
Disorders of the upper GI	27,230.23	22.1	17.3	5.2	54.1	1.4
Skin disorders	24,150.74	29.9	45.0	4.0	15.7	5.3
Other CNS disorders	20,404.72	57.9	19.6	3.8	11.2	7.6
Kidney Disease	19,859.23	47.1	30.3	5.9	8.1	8.4
Cerebrovascular disease	18,835.25	9.5	48.3	4.9	6.2	31.0
Systemic lupus and connective tissues disorders	18,774.31	57.9	13.8	5.1	15.2	8.0
Residual Codes	18,410.98	28.8	32.3	1.6	26.9	10.5
Other circulatory conditions arteries, veins, and lymphatics	17,555.43	26.6	59.3	5.1	4.1	4.9
Infectious diseases	16,202.13	22.9	40.0	5.2	28.1	3.7

Source: MEP data

the 20 most-expensive illnesses in the United States which account for nearly three-fourths of national health care treatment costs. Heart conditions dominate and, if related conditions such as hypertension (high-blood pressure) and hyperlipidemia (high cholesterol) – the two most prevalent treated conditions – are included, the spending impact reaches almost 20 percent of the total. Trauma-related disorders, primarily due to automobile accidents and violence, are the second-most expensive source of medical costs. Cancer ranks third. Cancer carries the highest annual average cost per person treated, however. Mental disorders, the third most commonly treated condition and the reason for the greatest number of office and hospital visits, ranks fourth. As noted above, mental disorders account for a negligible number of deaths but a significant proportion of the time lost to disability. The distribution of North Carolina treatment costs are analogous to the distribution of national costs.

Not all medical expenses are the result of illness or injury. Healthy births are responsible for \$35 million in medical expenses annually.

The structure of costs differs across conditions (Table 12B). For healthy births, 75.5 percent of the expenses are due to hospital inpatient stays while only 3.5 percent of expenses are for hyperlipidemia (high blood cholesterol). In that case, 70 percent of expenses are due to prescribed medicines. These results suggest that the problem of health costs is actually several problems.

4.2 Medical cost disparities

For more detailed analyses of medical costs, we used the three-year (2007, 2008, 2009) combined sample of responses to the Medical Expenditure Panel Study mentioned above. We created this combined sample to obtain more reliable estimates of the source of costs.

Figure 31 summarizes average per capita personal medical costs by age and gender for the U.S. Although males tend to generate fewer medical costs than females, per capita costs are higher among men surviving until age 70 or higher.

Figure 32 charts average annual per capita medical costs by age group and race. From their mid-20s onward, blacks generally incur higher per capita medical costs than whites (and the age-smoothed trendline of expected per capita costs is always higher). In the North Carolina case, assuming national patterns of conditions, costs, and health care access, reducing the disparities in spending would result in an estimated \$95,134 in lifetime savings per person. Of that total, \$39,327 would be saved before

age 65 and \$55,807 beginning at age 65 (when Medicare begins covering much of the expense).

Table 13 summarizes available information on personal medical costs and the sources of payment. Blacks rely on public sources of health care financing to a significantly greater degree than whites. Whites self-pay for 17.2 percent of their expenses which average \$8,372.45 per capita while blacks self-pay for \$7,315.75. Blacks are also less likely to have their expenses covered by private insurance. Because blacks tend to earn lower income, and are thus more likely to rely on public sources of health care funds, reducing black-white health disparities would decrease lifetime public health care costs by approximately \$55,038 per person. Of that total, \$14,514 would be before age 65 and \$40,524 after age 65. The pattern of costs over the lifetime suggests that merely increasing early detection and treatment might create significant savings.

4.3 Insurance premiums and worker productivity

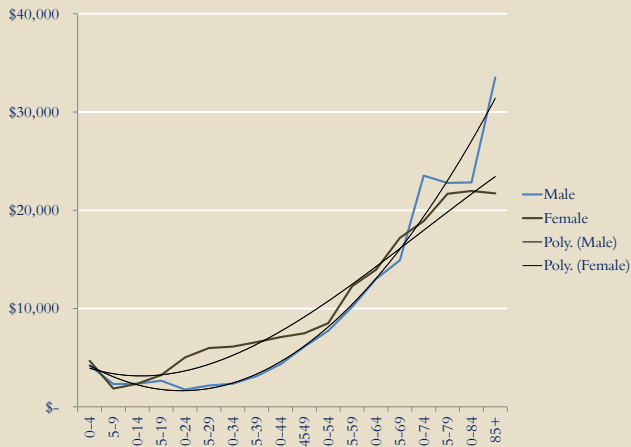
All medical costs have an impact on insurance premiums and may impact productivity. In this section of the report, we focus on the potential impact of reducing black-white disparities in several well-researched risk factors. We analyze the impact of risk factors because they are an additional step away from costs. In doing so, we are not implying that illness can be prevented, merely that the rates of illness can be reduced to comparable levels.

Table 14 summarizes the estimated savings in health costs to the North Carolina economy which could be realized if the incidence of selected health risks among major race/ethnic groups could be made to equal those of non-Hispanic whites for the state's labor force. The analysis was performed on four key groups: non-Hispanic whites, non-Hispanic blacks, Hispanics, and others (mainly Asians and American Indians) for each gender separately.

The analysis is based on several data sources. Population estimates are derived from the combined 2008–2010 American Community Survey data for North Carolina. Because we are interested in the combined impact of direct and indirect costs of differentials in the risk factors, we include the employed population in our analysis. We focus on six prominent risk factors for which we have incidence data and impact information. These are hypertension, high blood glucose (diabetes), high cholesterol, obesity, low physical exercise, and smoking.

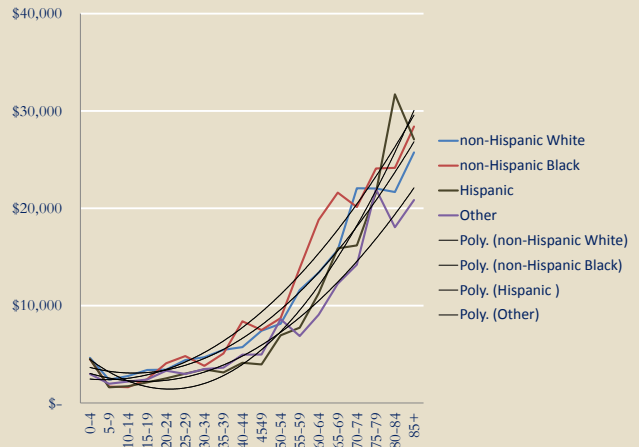
We apply national incidence rates calculated from the Medical Expenditure Panel Study (MEPS) for the years 2007–

Figure 31
AVERAGE ANNUAL MEDICAL COSTS BY
AGE AND SEX



Source: Kenan Institute analysis of 3-year MEP data

Figure 32
AVERAGE ANNUAL MEDICAL COSTS BY
AGE AND RACE/ETHNICITY



Source: Kenan Institute analysis of 3-year MEP data

Table 13
SOURCE OF HEALTH CARE COST PAYMENT BY SEX, AND RACE/ETHNICITY, 2008

	<i>All people</i>	<i>Males</i>	<i>Females</i>	<i>White, Non-Hispanic</i>	<i>Black, Non-Hispanic</i>	<i>Hispanics</i>	<i>Others</i>
Total Health Care Expenditure	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Total Amount Paid By							
Self/Family	16.1%	15.4%	16.6%	17.2%	10.1%	14.5%	15.2%
Medicare	22.9%	22.6%	23.2%	23.3%	25.0%	20.3%	18.1%
Medicaid	9.5%	8.4%	10.3%	6.6%	21.0%	20.7%	10.5%
Private Ins	42.3%	42.3%	42.3%	44.4%	31.6%	33.4%	46.7%
VA	1.7%	3.6%	0.3%	1.7%	3.0%	0.7%	1.2%
Tricare	0.9%	0.9%	0.9%	1.0%	0.8%	0.4%	0.6%
Other Federal	0.2%	0.2%	0.2%	0.1%	0.2%	0.2%	1.2%
Other St/Local	1.0%	1.1%	1.0%	0.8%	1.7%	2.3%	1.1%
Workers Comp	1.2%	1.7%	0.9%	1.1%	2.1%	1.3%	1.1%
Other Private	2.2%	1.8%	2.5%	2.2%	2.3%	2.9%	1.4%
Other Public	0.6%	0.7%	0.5%	0.4%	0.7%	1.4%	1.6%
Other Sources	1.2%	1.3%	1.2%	1.1%	1.7%	1.8%	1.3%

Source: MEP dat

Table 14
DIRECT, INDIRECT, AND TOTAL HEALTH CARE COST SAVINGS IF MINORITY
INCIDENCE DISPARITIES WERE ELIMINATED (20-64 YEAR OLDS)

		<i>Hypertension</i>	<i>Diabetes</i>	<i>Cholesterol</i>	<i>Obesity</i>	<i>Physically active</i>	<i>Smoker</i>
Direct cost savings							
Black	Male	\$19,359,916	\$25,445,931	\$2,782,306	\$10,374,115	\$(5,689,662)	\$(191,508)
	Female	\$64,651,037	\$33,722,675	\$(217,004)	\$28,709,841	\$(45,641,793)	\$(1,952,016)
		\$84,010,953	\$59,168,606	\$2,565,302	\$39,083,957	\$(51,331,455)	\$(2,143,523)
Hispanic	Male	\$(5,475,825)	\$5,079,274	\$366,309	\$1,454,840	\$(22,170,324)	\$(2,008,965)
	Female	\$1,055,409	\$5,686,470	\$110,905	\$2,162,446	\$(11,269,971)	\$(1,418,791)
		\$(4,420,416)	\$10,765,744	\$477,214	\$3,617,286	\$(33,440,295)	\$(3,427,757)
Other	Male	\$(1,053,825)	\$2,565,973	\$(174,605)	\$(2,544,146)	\$(2,035,937)	\$(350,504)
	Female	\$(1,205,397)	\$1,332,228	\$73,731	\$(2,642,919)	\$(3,741,911)	\$(741,456)
		\$(2,259,223)	\$3,898,201	\$(100,874)	\$(5,187,065)	\$(5,777,849)	\$(1,091,960)
Indirect cost savings							
Black	Male	\$1,625,423	\$2,057,607	\$(177,487)	\$2,639,621	\$(1,277,250)	\$(64,423)
	Female	\$4,878,393	\$2,441,621	\$24,776	\$6,672,619	\$(11,448,859)	\$(3,433,096)
		\$6,503,816	\$4,499,228	\$(152,710)	\$9,312,241	\$(12,726,109)	\$(3,497,519)
Hispanic	Male	\$(378,327)	\$362,030	\$(23,142)	\$280,472	\$(5,364,562)	\$(3,630,868)
	Female	\$69,831	\$355,661	\$(5,516)	\$443,256	\$(2,488,896)	\$(2,330,637)
		\$(308,496)	\$717,690	\$(28,658)	\$723,728	\$(7,853,459)	\$(5,961,505)
Other	Male	\$(134,409)	\$259,903	\$12,371	\$(914,183)	\$(761,826)	\$(967,446)
	Female	\$(102,881)	\$118,660	\$(7,915)	\$(740,426)	\$(1,228,050)	\$(1,715,698)
		\$(237,291)	\$378,563	\$4,456	\$(1,654,609)	\$(1,989,877)	\$(2,683,144)
Total cost savings							
Black	Male	\$20,985,339	\$27,503,538	\$2,604,820	\$13,013,736	\$(6,966,912)	\$(255,930)
	Female	\$69,529,430	\$36,164,296	\$(192,228)	\$35,382,461	\$(57,090,652)	\$(5,385,112)
		\$90,514,769	\$63,667,834	\$2,412,592	\$48,396,197	\$(64,057,564)	\$(5,641,042)
Hispanic	Male	\$(5,854,152)	\$5,441,303	\$343,166	\$1,735,312	\$(27,534,887)	\$(5,639,833)
	Female	\$1,125,240	\$6,042,131	\$105,389	\$2,605,702	\$(13,758,867)	\$(3,749,428)
		\$(4,728,912)	\$11,483,434	\$448,556	\$4,341,013	\$(41,293,754)	\$(9,389,261)
Other	Male	\$(1,188,235)	\$2,825,877	\$(162,233)	\$(3,458,329)	\$(2,797,764)	\$(1,317,950)
	Female	\$(1,308,278)	\$1,450,888	\$65,816	\$(3,383,345)	\$(4,969,962)	\$(2,457,154)
		\$(2,496,513)	\$4,276,764	\$(96,418)	\$(6,841,675)	\$(7,767,725)	\$(3,775,104)

Source: Kenan Institute analysis of combined data sources

2009 in order to improve the reliability of our estimates for incidence for five-year age groups in each of the population categories mentioned in the previous paragraph. The incidence rates for the selected risk conditions sometimes vary by population groups and they can have different age trajectories. Non-

Hispanic whites do not always have the lowest incidence rates of the factors indicating heightened risk of chronic disease. Asians (included in the “other” category) often have the lowest risks. For some conditions, Hispanics also show lower levels of risk factors than non-Hispanic whites. We include the results for

Hispanics and others in the tables but do not discuss the results in detail.

We use the factor incidence rates based on the pooled national MEPS data in combination with the Census data on population to calculate the number of North Carolina workers who are at high risk of incurring health issues which require treatment and reduce their productivity through absenteeism (remaining home from work) and presenteeism (coming to work but being less than fully productive). Not all of those at high risk incur costs in any given year. Moreover, those with lower risk on a particular factor may still incur costs. Therefore, we use the cost differential between low and high-risk individuals to calculate the direct and indirect costs of heightened risk.⁴¹ These include the increase in direct treatment costs and the indirect costs implied by additional absences and reduced productivity on the job.

In order to calculate the impact of health disparities, we perform a baseline analysis of costs using 1) estimates of North Carolina employees by age, gender, and ethnic/racial group, 2) national risk factor incidence rates which are specific to age, gender, ethnic/racial group, and work force status, 3) per person costs of treatment, absenteeism, and presenteeism differentials from a study of a national Fortune 500 firm, and 4) Census estimates of North Carolina hourly wage rates which are specific to age, gender, and ethnic/racial group to calculate the costs of absenteeism and presenteeism. That baseline analysis is compared to calculations wherein the age, gender, and ethnic/racial group-specific risk-factor incidence rates for non-Hispanic blacks, Hispanics, and others are replaced by the age-gender incidence rates for non-Hispanic whites.

The table suggests, for example, that North Carolina should be able to save approximately \$90.5 million per year in hypertension-related medical costs and lost productivity by reducing the prevalence of hypertension among the state's black workers between the ages of 20 and 64 to the levels found in the non-Hispanic white population. Of those costs, \$84 million are in the form of reduced treatment costs and \$6.5 million are in the form of increased productivity. Reducing the prevalence of diabetes among black employees to the level of equivalent non-Hispanic whites could save the state's economy nearly \$64 million annually. Increasing the prevalence of physical exercise among black employees to the level of equivalent non-Hispanic whites could save \$64 million. Other conditions can also de-

liver savings. Because the source of the cost differentials by risk factor held other influences constant, the savings add for a total of nearly \$275 million for the racial disparities in the risk factors examined. Closing the black-white health disparities gap for all employed blacks aged 20 and above would extend the savings to \$290 million annually. Eliminating the disparities among the non-working adult population would add another \$226 million in direct medical cost savings. Reducing the incidence of these risk factors in the population as a whole would generate additional savings.

4.4 Direct impacts on business

By mid-decade, before the current ongoing economic crisis hit, health care costs had taken center stage as a source of rising business costs. Mid-decade, 60.4 percent of the U.S. population was covered by employment-based health insurance with employees contributing an average of \$3,137 for individual coverage and \$7,289 for family coverage annually. (By 2010, the coverage had declined to 56.3 percent of the U.S. population.⁴²) According to a Kaiser Hewitt survey, increasing retiree health costs also figured prominently as a cost concern for the firms which offered them.⁴³ In the face of rising costs, many had begun shifting costs to employees, most frequently for newly hired employees.

Insurance premiums are the most direct evidence of the costs of health care on employers. Table 15 summarizes recent evidence on the impact of insurance premiums on labor costs. Health insurance costs average 11.4 percent of total compensation for state and local government and 7.5 percent for private sector employers. Total compensation includes wages and salaries, provisions for retirement benefits, health insurance premiums, and other non-cash benefits. Although the evidence is partial, the better jobs appear to not only pay better but also to include more provisions for employer-based health care. In addition to the health insurance premiums described in the table, employers need to make contributions to public insurance through payroll taxes.

Table 16 summarizes cost data looking beyond employer health insurance premiums on business costs. The estimate of the costs of direct medical coverage is somewhat higher in this table, most likely because administration and other costs are included and because the data were compiled from a sample of somewhat larger than average firms. Once all costs are consid-

⁴¹ Kowlessar NM, Goetzel RZ, Carls GS, Tabrizi MJ, Guindon A. (2011) "The relationship between 11 health risks and medical and productivity costs for a large employer," *Journal of Occupational and Environmental Medicine* 53:468-477.

⁴² Bureau of the Census (2010) *Income, Poverty, and Health Insurance Coverage in the United States: 2010* (P60-239)

⁴³ 2006 Kaiser/Hewitt Retiree Health Benefits Survey (<http://www.kff.org/medicare/upload/7587.pdf>)

Table 15

EMPLOYERS' COSTS PER EMPLOYEE-HOUR WORKED FOR TOTAL COMPENSATION, WAGES AND SALARIES, AND HEALTH INSURANCE, BY SELECTED CHARACTERISTICS: UNITED STATES, 2010

<i>Characteristic</i>	<i>Total compensation per employee-hour worked</i>	<i>Wages and salaries as a percent of total compensation</i>	<i>Health insurance as a percent of total compensation</i>
State and local government	\$39.81	65.9	11.4
Total private industry	27.73	70.6	7.5
Industry:			
Goods producing	32.42	66.7	8.9
Service providing	26.77	71.6	7.2
Occupational group:			
Management, professional, and related	48.80	70.7	6.2
Sales and office	21.77	71.6	8.6
Service	13.71	75.4	6.7
Natural resources, construction, and maintenance	31.10	68.0	8.0
Production, transportation, and material moving	23.72	66.8	9.9
Census region:			
Northeast	32.13	69.0	7.5
Midwest	26.75	70.0	8.3
South	24.72	71.8	7.2
West	29.52	71.1	7.1
Union status:			
Union	37.16	61.6	11.8
Nonunion	26.67	72.0	6.8
Establishment employment size:			
1-99 employees	22.84	73.6	6.4
100 or more	33.33	68.2	8.4
100-499	28.55	70.0	8.3
500 or more	39.76	66.5	8.5

Source: CDC, Health United States 2010 from BLS National Compensation Survey

Table 16
EMPLOYER HEALTH CARE COSTS AS A PROPORTION OF TOTAL EMPLOYEE COMPENSATION, 2009

<i>Direct Costs</i>	<i>U.S.</i>	<i>Canada</i>
Medical coverage	11.2	4.0
Workers' compensation	1.0	0.7
Unplanned absence including incidental sick pay	2.0	1.0
Short-term disability	1.0	1.0
Long-term disability	0.5	1.0
<i>Indirect Costs</i>		
Health management programs including financial incentives	0.7	0.4
Overtime	2.8	2.8
Workstation modification/job accommodation	0.5	0.5
Replacement workers	2.0	1.2
Total	21.70%	12.60%

ered, the business impact can be considerably larger than the already substantial insurance premiums suggest. Once supplemental and indirect medical costs are considered, the estimate nearly doubles to 22 percent of total employee compensation. As a point of comparison, the costs for Canadian employers are included. Even if nominal wages were the same, U.S. employers would still be at a cost disadvantage.

Source:

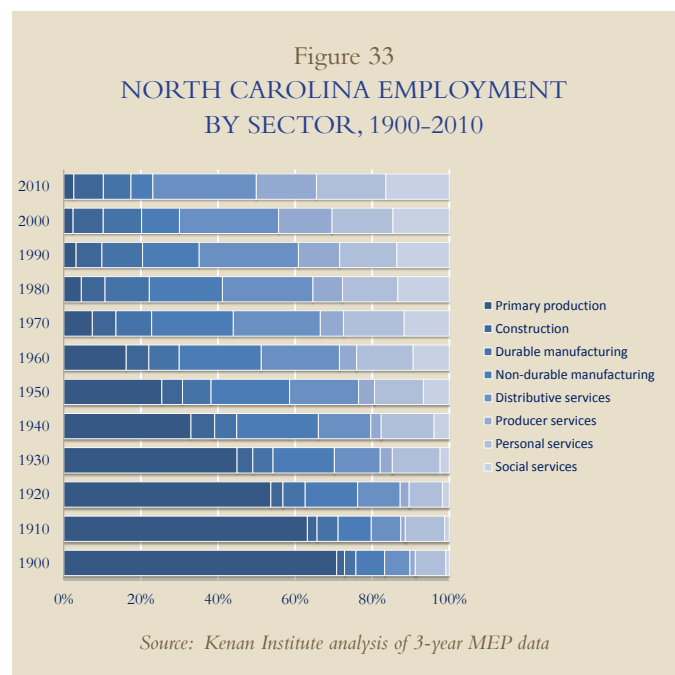
Accordingly, the state has successfully implemented two broad economic development strategies supporting direct business costs. The state has supported the development of human capital through education and training. The state has also supported the infrastructure development needed to minimize the costs of moving products to markets. The state has also worked to keep business taxes low.

4.5 Labor costs and competitiveness

The competitive realities facing North Carolina businesses continue to shift, requiring a fresh approach to human resources. These competitive realities demand both skills upgrading and careful attention to overall costs.

For many decades, as we discuss below, North Carolina found itself with a surplus of workers with low skills but an even greater demand for them on the part of mature manufacturing, and more recently producer service, industries searching for cost savings. The state has long specialized in providing low cost environments for sectors with slowing growth and declining profit potential. The market niche for locations for such industries with low skill requirements has largely eroded within the United States. Other opportunities have emerged, however.

Two major types of direct costs have been important in determining North Carolina's economic competitiveness over the past century: the costs of producing a good or service and the costs of transporting that good or service to the consumer.



As the broader competitive landscape has changed, so have the demands on government, possibly requiring both higher public investment and greater fiscal responsibility. Health is a critical component of that consideration. Below, we review the sectoral changes in the North Carolina economy and the occupational shifts that has required. We then identify the value proposition of good health to the North Carolina economy and how it helps increase return on investment.

4.6 Sectoral evolution of economic competitiveness

Following national trends with a slight lag, NC's economy has undergone a fundamental structural transformation over the last century. At the most general level, North Carolina has evolved from an agrarian to a manufacturing to a service-oriented economy over the past century. This restructuring is reflected in the sectoral shifts in employment depicted in Figure 33. In 1900, 71 percent of the state's labor force was engaged in agriculture. Agriculture remained an important source of employment in North Carolina until around 1980. But throughout this 80 year period agriculture's share of total employment slowly gave way to employment growth in manufacturing and other industry sectors.

The rise of manufacturing employment in North Carolina was directly and indirectly related to its strengths in agriculture. Technological advances in agriculture freed labor that otherwise would have been in the fields and led to employment growth in three transformative activities: tobacco products, cotton and textile products, and wood and furniture products – the former “big three.” Cigarette manufacturing leveraged the state's strength in tobacco production. Textile and apparel manufacturing built on the state's base as a cotton producer. And furniture took advantage of the state's abundant supply of timber.

Employment in these three industries grew as railroads initially and the Interstate highway system subsequently made North Carolina labor more competitive than labor in other regions of the country, especially the Northeast. These industries together with employment growth in distributive services – workers responsible for moving these finished goods to market – were the mainstay of the North Carolina economy until the 1980s, when production began to shift to low-cost competitors offshore, idling plants and workers in the state.

Agriculture and the growth of these transformative industries gave the state its strengths in banking and finance, and, via the strong universities they engendered, were indirectly responsible for recent employment growth in producer services.

Paralleling the emergence of a creative class of producer service workers has been employment growth in personal and social services—industry sectors that address the education, health care, recreation, and entertainment needs of the state's population. Today, the North Carolina economy is more diverse and more service-based than it has ever been (Figure 34).

In terms of contribution to state GDP, all major sectors of the North Carolina economy have grown over the last several decades but, as Figure 35 shows, manufacturing decreased in importance, down to 20 percent of the state's GDP in 2008 (12 percent of the national economy). And like the rest of the nation, producer services grew in importance over the last four and a half decades, in North Carolina from 14 to 31 percent of the economy (from 21 percent of the national economy to 34 percent).

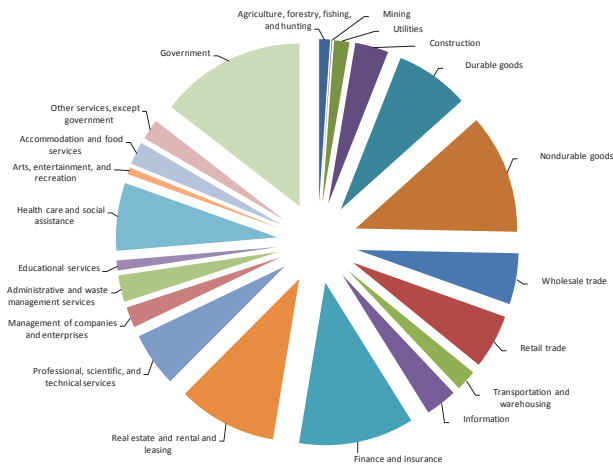
North Carolina began and ended the 1963–2008 period more heavily dependent upon manufacturing than the nation as a whole, however. In 1963, manufacturing accounted for 41 percent of the state's economy (27 percent of the national economy) and together with farming and other forms of primary production nearly half. Where North Carolina also differs from the nation as a whole is in durable manufacturing. While non-durable manufacturing dropped from 33 to 12 percent of the state's GDP (due, in part, to declines in apparel and tobacco), durable manufacturing has maintained an approximate 8 percent share of the state's economy.

For several decades, these sectoral transformations worked to the benefit of the state's citizens. For much of the last century, the combination of attention to production costs and social development led to dramatic improvements in the number and well-being of North Carolinians. However, the nature of the competitive environment has changed and those improvements have stopped, partly due to the rise of freer international trade, partly due to technological advance, and partly due to other reasons. North Carolina income has been on a downward trend compared to the nation as a whole for the last decade – despite the rapid growth in population and employment for much of that time period. Comparing state per capita income to the equivalent national measure shows a very rapid rise beginning well over a half century ago but which has, by now, set the state back over two decades (Figure 36). North Carolina is again on the path to becoming a poor state.

4.7 Skills evolution of competitiveness

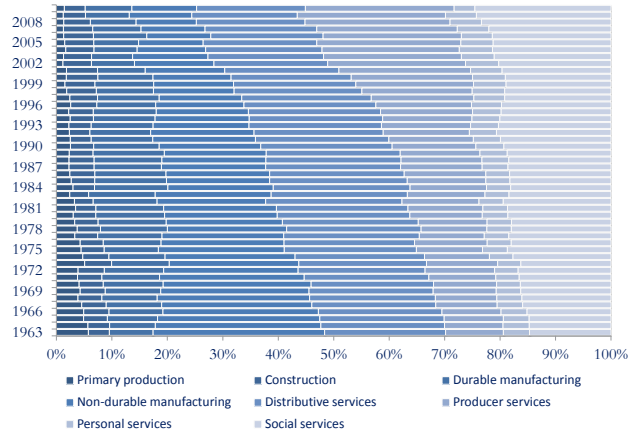
Given the traditionally high concentration of jobs in agriculture and old-line manufacturing, workers with relatively

Figure 34
SECTORAL CONTRIBUTIONS TO
NORTH CAROLINA STATE GDP



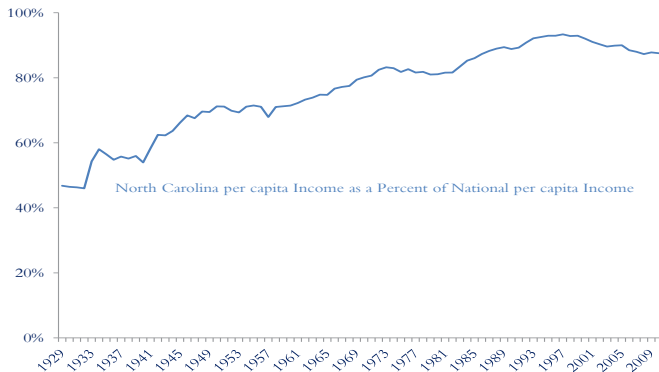
Source: Kenan Institute analysis of 3-year MEP data

Figure 35
NORTH CAROLINA GDP BY SECTOR,
1963-2010



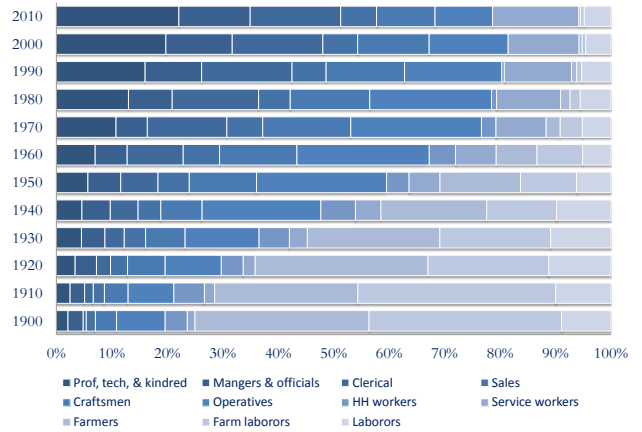
Source: Kenan Institute analysis of 3-year MEP data

Figure 36
NORTH CAROLINA PER CAPITA INCOME AS A
PERCENT OF NATIONAL PER CAPITA INCOME



Source: Kenan Institute analysis of 3-year MEP data

Figure 37
NORTH CAROLINA EMPLOYMENT BY
OCCUPATION, 1900-2010



Source: Kenan Institute analysis of 3-year MEP data

low skill levels, such as operatives, were over-represented in the state's occupational distribution for much of the 20th century (Figure 37).⁴⁴ However, as North Carolina lost much of its manufacturing base toward the end of the last century, a surplus of workers was created who either migrated elsewhere in search of suitable employment or remained in place as unemployed or underemployed workers performing available low skill jobs. At the same time and coincident with previously described changes in the industry mix, the proportion of the labor force with higher skills – workers engaged in professional, technical, and managerial occupations – has grown dramatically. These skilled individuals are often migrants from other states and immigrants from overseas.

As the state has been shifting to a new economy based on the new “big five” – technology, pharmaceuticals, financial services, food processing, and vehicle parts, a transformation in skill needs has been in progress.⁴⁵

A shift within manufacturing from labor-intensive to capital-intensive industries requiring that labor transform from mill hands to skilled machine operators;

A shift within the non-agricultural sector from manufacturing to trade, service, and government employment implying an occupational conversion from blue collar to white collar work; and

A shift within the agricultural sector from small farms relying extensively on tobacco income to larger firms diversifying into many commodities but specializing heavily in hogs and poultry processing which has been tied to the rise of contract farming.⁴⁶

Each of those transitions has had similar implications for the state's labor needs. Each has resulted in increasingly knowledge-intensive production with greater investment in each employee – even if the occupations are very different. The returns to the knowledge gained (personal and public investments in human capital) need to be amortized over a long career. At the same time, the pressure on costs has perhaps never been more intense as advanced telecommunications and sophisticated transportation systems make global competition a reality for nearly every

⁴⁴ The categorization of occupations is admittedly arbitrary. Many occupations have undergone profound changes over last century. Using a consistent coding, Figure 4 does not reflect those shifts.

⁴⁵ Michael L. Walden (2008) *North Carolina in the Connected Age: Challenges and Opportunities in a Globalizing Economy*, Chapel Hill, The University of North Carolina Press.

⁴⁶ Bill Finger (1997) “Making the Transition to a Mixed Economy” *North Carolina Insight* 4-18, December.

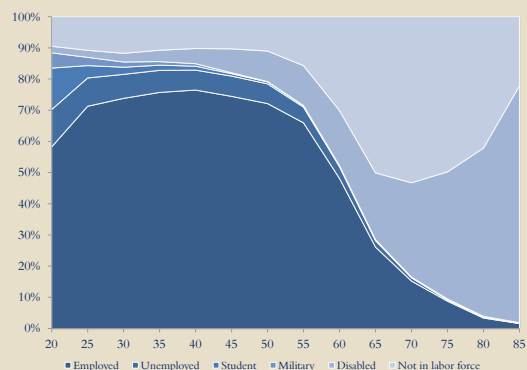
segment of the labor force and economy. This competition has severely limited North Carolina's ability to compete in markets where low-skill labor is an important component of production cost and it is beginning to place restrictions on the remuneration of highly-skilled labor.

Educational upgrading is part of the response to labor force needs. North Carolina has overcome its serious education deficit just a few decades ago. The proportion of North Carolina and U.S. adults who have completed three key levels of schooling – grade school, high school, and college – has been converging with national averages since 1960, achieving approximate parity a decade ago.

However, using spending as an indicator, North Carolina seriously lags the nation in investments in human capital. Recent figures released by the National Education Association put the state in 45th place, spending an estimated \$8,303 per elementary and secondary school pupil compared to a national average of \$10,826.⁴⁷ South Carolina ranks approximately 35th. The latest available data from the Census of Government indicate that North Carolina state and local governments spend 83 percent as much per capita on elementary and secondary school education as the national average. Capital spending on education (school construction) is 82 percent of the national average despite population growth rates which have far exceeded the national average. (At the same time, per capita spending on health care and hospitals outpaces the national average.) Compared to the national average, North Carolina under-invests in

⁴⁷ *Charlotte Observer* “N.C. is no leader in education spending,” 20 June 2011.

Figure 38
LABOR FORCE STATUS OF THE ADULT NORTH CAROLINA POPULATION



Source: Kenan Institute analysis of Census data

the key competitiveness factor of the 21st century and over-spends on treating threats to human capital after the fact.

4.8 Economic dividend of minority health parity

The knowledge economy is built on the twin pillars of knowledge acquisition and health which allows that knowledge to be both augmented and applied over long periods of time. Unfortunately, by the time they are in their mid-50s, the North Carolina labor force begins moving out of employment due to disability, employment dislocation, and voluntary retirement, reducing the returns on the investment in skill development for both individual and public. This movement out of the labor force is occurring despite impending delays in Social Security and other retirement entitlements, exacerbating trends in the demographic dependency ratio.

Figure 38 graphs the labor force status of the North Carolina population by age. Although we use a sample of those surveyed during 2008-2010, the trend towards early labor force withdrawal has been underway for over a decade.⁴⁸

Because half of the burden of illness and injury, as well as virtually all of the cost, falls on those aged 25-64, poor health and an inefficient health care system often rob the state's economy of capable employees and entrepreneurs – frequently when their accumulated knowledge is at its peak. Not only are increased insurance premiums and higher payroll taxes a burden on all workers, chronic illnesses and other ailments reduce pro-

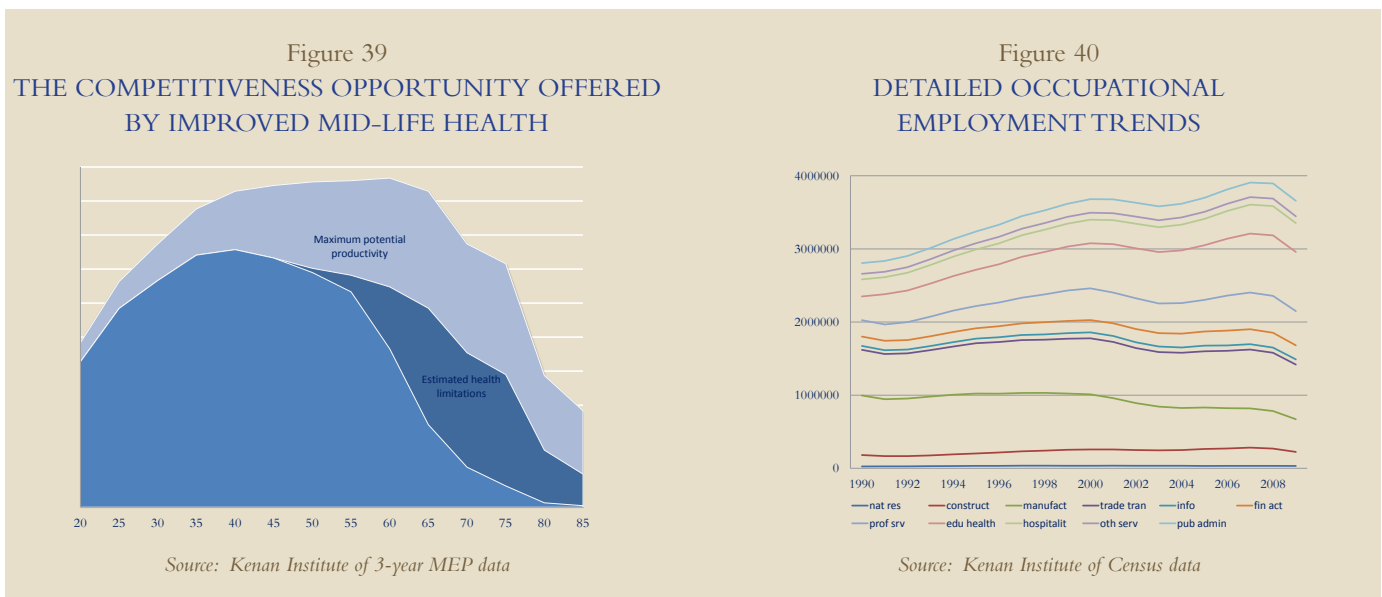
ductivity and creativity.

The state's economy is affected even if those in their 50s and 60s remain employed. Wages across a range of occupations tend to peak in middle age reflecting the productive power of accumulated capability and energy. Unfortunately, as productivity potential peaks in middle age, the burdens of chronic disease and health limitations on capabilities begin increasing, reducing productivity through absenteeism, presenteeism, and a reduction of work effort.

Figure 39 schematically illustrates the opportunities implied by delaying the onset of illness to later in the life course. Based on actual earnings data, the upmost curve illustrates the potential full productivity benefits of a fully employed labor force over the course of a career. As human capital theory suggests, earnings and productivity rise as knowledge accumulates but also decrease as people age and may cease to accumulate skills and capabilities. Labor market inefficiencies of all sorts subtract from that potential. More pertinently, health issues begin to decrease productivity potential by early middle age. The promise of addressing health risks, beginning with the sometimes significant minority health disparities is that the North Carolina labor force can be more productive in their middle ages benefitting both themselves and the state's economy while counteracting the effects of population aging.

A knowledge-based economy implies that wages will increase over one's career as skill increases with experience. This is, in fact, the general pattern for many broad occupational

⁴⁸ Stephen J. Appold (2004) "How much longer would men work if there were no employment dislocation? Estimates from cause-elimination work life tables." *Social Science Research* 33: 660-680.



groups at different levels of schooling. The changing nature of the global economy implies that, in order to maintain a high standard of living, the North Carolina economy will need to develop the requisite labor force skills and will need to utilize them. The slowing growth rate of the population together with the graying of the population means that it will be increasingly important to use all human resources available to the best extent possible. That also implies lengthening the period of maximum productivity. That also implies that the growing minority populations will be increasingly needed to fill crucial economic roles.

4.9 A short term complication

Many in the state see health care as an employment growth sector, compensating for the loss of other sectors of employment. For the state, on the basis of the percentage of the labor force, the growth of health care employment has been a near-perfect substitute for the decline of manufacturing employment. To a large extent, medical care employment has become North Carolina's social safety net. Figure 40 highlights the sectoral changes in employment in increasing detail. The growth of health care employment over the last decade can be seen as compensating for the decline in manufacturing.

Durham, Chapel Hill, and a few other locations within the state have clearly benefited from NIH's decade-long "doubling program" to increase funding for health-related research. Although slowing in real terms, such investment, totaling approximately 1.5 percent of U.S. health care spending, is not the main basis for the employment hopes, however. Treatment is. This source of employment growth is not likely to be sustainable as the costs imposed on the rest of the economy continue to mount.

The need for health care employment as a social safety net replacing manufacturing employment highlights one of the obstacles to transitioning to a new competitive knowledge economy. In the short term, health care generates sorely needed employment opportunities. Over the longer term, however, the costs implied by such employment impose a substantial drag on the competitiveness of the North Carolina economy. Planning for the stabilization and possible decline of health care spending and employment needs to be a component of a comprehensive North Carolina competitiveness plan.

5.0 CONCLUSIONS AND RECOMMENDATIONS

The state's renewed competitiveness depends upon, among other factors, making the North Carolina labor value proposition as attractive as possible. In the past, that often meant supplying a mainly low-skill labor force at the lowest possible cost. Over the last several decades, that need has been generally better served by moving operations overseas. North Carolina can renew its prosperity by becoming a cheaper place to buy high-skill and, especially, mid-skill, labor. A mid-skill labor force whose capabilities complement each other appears to be a competitive resource which is difficult to reproduce.

Without ignoring the still substantial non-Hispanic white working age population, due to ongoing fertility and migration trends, North Carolina's potential labor pool will be increasingly grey and brown. Those segments of the labor pool will need to be more adequately tapped. Much as the oil industry, which originated in western Pennsylvania and migrated around the world in search of ever larger pools of reserves, has learned to extract energy from the remaining domestic sources, North Carolina needs to learn how to cost-effectively extract an increasing amount of productivity from the available labor reserves. Developing human capital on the twin pillars of skills acquisition and health is a promising strategy to accomplish that goal.

There is evidence suggesting that improving health is a needed first step.⁴⁹ Non-medical investments in health, including good nutrition and exercise, reducing smoking and alcohol consumption are central.

Unfortunately, if there is evidence of a virtuous circle of health, education, and wealth, there is also growing evidence of a vicious cycle of decline. There is mounting, though not conclusive, evidence that the growing income inequality in America is at least partially responsible for the developing health crisis of decreased personal investments in health, escalating medical costs, and the resulting decline in wellness and work preparedness.⁵⁰

According to a recent College of Occupational and Environmental Medicine editorial, "The time has come to accept the fundamental reality that the impending budgetary squeeze,

⁴⁹ E.g., David E. Bloom and David Canning (2000) "The Health and Wealth of Nations," *Science* 287(5456): 1207-1209; T. Paul Schultz (2003) "Human Capital, Schooling and Health Returns," Yale University, April.

⁵⁰ S. V. Subramanian and Ichiro Kawachi (2004) "Income Inequality and Health: What Have We Learned So Far?" *Epidemiologic Reviews* 26: 78-91.

the current health crisis, and the workplace are inextricably linked.”⁵¹ Cost-effective interventions addressing minority health disparities are an important first step towards building a competitive state economy in the 21st century.

We outline a three prong strategy of labor force upgrading through improved health, reversing a spiral of decline.

Enhancing government-led efforts aimed at promoting the prevention of disease are a good first step. In this regard, we merely relay a recent enumeration of ten recommended priorities for prevention which hold government accountable for protecting the health of Americans.⁵²

- Promoting Disease Prevention
- Combating the Obesity Epidemic
- Preventing Tobacco Use and Exposure
- Preventing and Controlling Infectious Diseases
- Preparing for Potential Health Emergencies and Bio-terrorism Attacks
- Recognizing the Relationship Between Health and U.S. Economic Competitiveness
- Safeguarding the Nation’s Food Supply
- Planning for Changing Health Care Needs of Seniors
- Improving the Health of Low-Income and Minority Communities
- Reducing Environmental Threats

A second prong expands firm-based steps to control health care costs by promoting wellness. These show promise but it is unclear how far these interventions can be scaled up at what cost and effectiveness.

A third prong recognizes that good health depends upon the many actions and behaviors of individuals concerning exercise, nutrition, and medical care who regard good health as both a consumption and as an investment good. Policy makers need to focus on two aspects of individual decision-making in

particular. The first is the process of making decisions and the need for nudges and pushes in the direction actors recognize as being in their own best interest.⁵³ The second, more fundamental, issue is recognizing that investments in health are affected by incentives. The most important of these may be the rewards to good health which may be, in turn, impacted by economic opportunities.

⁵¹ *Special Committee on Health, Productivity, and Disability Management (2009) “Healthy Workforce/Healthy Economy: The Role of Health, Productivity, and Disability Management in Addressing the Nation’s Health Care Crisis: Why an emphasis on the Health of the Workforce is Vital to the Health of the Economy,” Journal of Occupational and Environmental Medicine 51(1): 114-119.*

⁵² *Trust for America’s Health (<http://healthyamericans.org/pages/?id=126>)*

⁵³ *Richard H. Thaler and Cass R. Sunstein (2009) Nudge: Improving decisions about health, wealth, and happiness, New York: Penguin Books, rev.*



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