CAPITAL IN THE NATIONAL HEALTH ACCOUNTS

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Outline

List of abbreviations

ACES – Census Bureau's Annual Capital Expenditures Survey
AES – Asset and Expenditure Survey (Census Bureau)
AHA – American Hospital Association
ASM – Census Bureau's Annual Survey of Manufacturers
BEA – Bureau of Economic Analysis, U.S. Department of Commerce
BEA-K – BEA Capital Stock Program (which includes stocks, investment, and depreciation)
BLS – Bureau of Labor Statistics, U.S. Department of Labor
CFT – Capital Flow Table (part of BEA's Input-Output Table Program)
COFOG – Classifications of the Functions of Government (International classification system)
FRB – Board of Governors of the Federal Reserve
GAAP – Generally Accepted Accounting Principles
GDP – Gross domestic product
GF – Government Finances (survey of state and local governments conducted by Census Bureau)
GPDI – Gross private domestic investment
HCFA – Health Care Financing Administration, U.S. Department of Health and Human Services
HMOs – Health maintenance organizations
IP – Index of Industrial Production published by FRB
MCR – Medicare Cost Report (HCFA's administrative reporting program for hospitals and other health units)
NAICS – North American Industrial Classification System (adopted by Canada, Mexico, and the United States)
NHA – National Health Accounts (published by HCFA)
NHE – National Health Expenditures (this term is also used to refer to the NHA)
NIPA – National Income and Product Accounts (published by BEA)
OECD – Organisation for Economic Co-operation and Development
R&D – Research and development
SNA – System of National Accounts adopted by the United Nations and other international organizations
SSEL – Standard Statistical Establishment List (Census Bureau)
VPIP – Census Bureau Value of Construction Put-in-Place Survey

Preface

This paper was prepared as a part of a contract with the Health Care Financing Administration (HCFA). The contract sought recommendations on improving the coverage of capital in the National Health Accounts (NHA), such as recommendations on the addition of capital equipment and of human capital to the NHA. The paper is a fairly comprehensive overview of health capital: It considers various concepts of capital, such as new equipment and the existing stock of capital; it discusses various uses of capital; and it describes major sources of data on capital. It also evaluates these sources in terms of their coverage, statistical qualities, and other factors.

A broad range of sources is included even though some of them are not potentially viable as candidates for the NHA. The purpose here is to consider all options so that future research might be more productive.

A first draft of this paper was circulated by HCFA to a number of government agencies and to academic economists for comments and suggestions. Two papers were subsequently prepared (also under contract with HCFA) to supplement and improve the paper. These papers, prepared by Frank C. Wykoff and Jack E. Triplett, touch on a variety of subjects, but both of them focus on the appropriate measure of capital stock needed for productivity analysis.[1]

This version of the paper incorporates many of the suggestions by Wykoff and Triplett. However, this paper does not recommend that HCFA attempt to develop measures of the stock of capital appropriate for productivity at the present time. This author believes that the other ingredients needed to derive productivity measures for the health care industry, principally measures of real, or price adjusted, output of

the health industry will not be available in the near future. Thus, recommendations for this concept of capital are included only in the long-term recommendations section of the paper.

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The author assumes full responsibility for errors remaining in the paper. The opinions expressed are those of the author and not necessarily shared by the Health Care Financing Administration, Jing Xing Technologies, Inc., or any of the other organizations mentioned above. Estimates of health industry investment are referred to as "HCFA estimates" at various points in the paper, and they are proposed for the NHA in Part VII and shown in Table 9. These estimates are experimental and still under review by HCFA, and no decisions have yet been made as to their adoption in the NHA.

Introduction

Capital is rooted in the study of economics and in the study and measurement of national income and production. The major goal of economic production and economic endeavor is consumption to satisfy needs and wants. Investment in new wealth and productive resources, the available stock of such resources, and the degree to which existing wealth or resources are used up in the production process are considered essential factors in determining the ability of the economy to provide for future consumption.

The National Health Accounts (NHA) as currently published by the Health Care Financing Administration (HCFA) include current expenditures on health care in the United States as well as expenditures for research and for construction. However, these accounts do not cover capital in a comprehensive manner. Investment in equipment such as medical instruments, computers, and ambulances is not included. Nor do the health accounts include other measures that often fall under capital. For example, the accounts do not include the stock of existing capital (structures or equipment) that are available to provide health services. Also, they do not include the nation's investment in the education and training of health professionals and of other employees providing health services.

Executive summary

This paper surveys the uses of data on capital; the primary use is policy analysis. Part I discusses this use and how capital data are embodied in analytical tools such as measures of productivity and rates of return. Part II examines the definitions and concepts of capital, focusing on several systems of accounting including the System of National Accounts (SNA) adopted by several international organizations. The SNA capital account constitutes the broadest measure of capital of the accounting systems examined. Two concepts of capital are discussed: The flow of new capital or new investment in plant and equipment and the existing stock of capital at any point in time. Part III then relates the uses of capital data to the definitions and concepts discussed; this part of the paper narrows the concept of capital considered in the

remainder of the paper to "fixed capital,"—that is, to the flow of new investment and the stocks of existing structures and equipment.

Part IV summarizes various data sources available for measuring new investment in fixed capital. These sources include construction statistics, capital expenditures by business, and data on investment spending by government collected by the Bureau of the Census, statistical programs of the Bureau of Economic Analysis, data tabulated in an administrative program of the Health Care Financing Administration, and data from an annual survey conducted by the American Hospital Association. In some cases these sources also include measures of the stock of capital or capital "balances."

Part V evaluates these data sources in terms of various characteristics of the coverage and the data collection procedures used. The evaluations consider the quality of the data collection techniques, the frequency and timeliness of data, the availability of estimates in price-adjusted form, and the availability of data on the stock of existing capital. It also considers whether the sources cover the entire health services industry in the United States including government and whether detail is available by industry, asset type, or type of institution. This part of the paper concludes by comparing the levels and trends for alternative estimates of investment spending in health.

Part VI recommends the adoption of specific measures of capital as part of the NHA. It recommends the eventual inclusion of fixed capital expenditures, capital stocks, and depreciation in several valuations for the entire health care economy, and separately for the private sector and for government. The paper recommends short-term improvement of the NHA by publication of fixed investment estimates developed using data and procedures similar to those currently used by the Bureau of Economic Analysis. The paper then recommends the development of other improvements in the near future. Part VI concludes with long-term recommendations for future research. Part VII compares a proposed presentation of the NHA, as envisioned in the recommendations, with the accounts as they are structured at present.

Part I. Uses of Data on Capital

The measures of capital that are most relevant for the NHA depend on the uses and potential uses of the statistics. In other words, the measures should provide answers to policy questions or raw material for analyzing policy issues. This section of the paper reviews some of the major uses of data on capital. In addition to the study of policy issues, capital data play an important role in economic measurement in several areas: Productivity, capital depth or intensity, rates of return, and capacity and capacity utilization. Data on capital in the health services industry may also be useful for market analysis. These uses are also discussed below.

I-1. Study of policy issues

The most important use of data on capital in the NHA is for the study and analysis of policy issues. Such issues are addressed on a regular basis by HCFA, by other parts of the administrative branch of the Federal government, such as the Agency for Health Care Policy and Research, by Congress, and by other governmental and non-governmental groups. These policy issues can be as broad as making comprehensive evaluations of the viability and quality of the entire national health care system or as narrow as determining what types of investment in equipment would be most effective against specific medical problems. While the range of such policy issues is too wide to cover completely in this paper, three important issues are discussed here as representative examples.

The first is the question of how much of the nation's economy is involved in health care services—in other words, what share of the nation's production is accounted for by health care services, and is this proportion holding steady, increasing, or decreasing over time? One of the basic purposes of the NHA is to provide data to assess these types of issues. Thus, the NHA measure of total expenditures should be as comparable as possible to aggregate economic activity as measured by the gross domestic product (GDP) and some of the measures related to GDP, such as net domestic product. To accomplish this goal, the NHA should cover investment spending in the health care field in a manner comparable to GDP. Therefore, spending for investment in equipment, now missing from the NHA, should be added.

A measure of the net stock of capital in the health services industry would also be a valuable addition to the NHA. In order to maintain the ability of the health care system to deliver services at the same per-capita rate as in the past, the net stock of health capital in real, or price-adjusted terms, should expand at about the same rate as the population (or perhaps somewhat slower than the population growth if productivity is increasing).

A more comprehensive accounting of capital would move the NHA closer to a rigorous satellite account for health, making the NHA closely conform to the guidelines for satellite accounts in the SNA.[2]

Another example of a policy issue where analyses might be advanced by an improved measure of capital in the NHA is whether to expand health insurance in the United States to groups that are not now covered by such insurance. The cost of expanding health insurance is, to a large extent, dependent upon the capacity of the health care industry to provide additional services in the economy. And this capacity is, in part, dependent upon the capacity of the stock of capital in the industry. If excess capacity exists, the marginal cost of expanding coverage will be lower than if the health care industry is already straining to fill current demand.

Whether capacity in the health services industry is appropriate, deficient, or excessive may be a matter of whether the regional distribution is unbalanced rather than whether the levels of the national stock are adequate. In a country as geographically large and diverse as the United States, and a country that is changing dynamically, both excesses and shortages can be experienced at the same time that the national level of stock seems appropriate.

Another policy issue relates to how adequately current public health care payments, such as those under the Medicare and Medicaid Programs, cover the cost of capital as well as the cost of land, labor, and the other factors that contribute to the provision of health care services. If these payments cover the current expenses such as employee compensation but do not cover the cost of capital "used up" during the accounting period, they may be inadequate to sustain the health care industry into the future. If, on the other hand, they are more than necessary to cover both current costs and the cost of capital, they may be excessive and result in wasteful public spending and encourage excess capacity or in cost shifting between public and private funding. It is important, for example, that the Medicare payments for "capitated" health maintenance organizations (HMOs) properly reflect the capital costs of delivering health services to clients. Private health services provided under managed care arrangements should also cover both current and capital costs.

I-2. Productivity

Productivity is defined as output relative to inputs, with both output and inputs measured in real, or inflation adjusted, terms. Typically, economists focus on the rate of change in productivity rather than its level. The most basic formulation of productivity compares output with labor input. Output per hour of labor input is published on a regular basis for the U.S. economy and for major industries by the Bureau of Labor Statistics (BLS) of the Department of Labor. Quarterly measures of output per hour for the business, non-farm business, and manufacturing sectors of the economy and annual measures for more than 200 detailed industries are available from BLS. In 1983, BLS introduced "Multi-factor Productivity," which compares output to inputs of both labor and capital.[3]

In the early 1990's, BLS improved the "labor input" component of the multi-factor productivity series to reflect the increase in worker skills (as measured by the increased education and experience of workers in the labor force). Prior to this improvement, the BLS labor input measure focused solely on the time dimension of labor—the raw total number of hours of all workers. This improvement recognized that workers have different traits and skills that are not always interchangeable.

A 1990 advisory panel to HCFA recommended including training and education—that is, investment in "human capital"—in the capital investment category of the NHA. This paper recommends, instead, that the NHA incorporate, as an addendum, a measure similar to that used in the BLS labor input of the multi-

factor productivity measure. A more comprehensive description of the BLS procedure is included as appendix A to this paper.

I-3 Capital intensity

Capital intensity, or capital depth, is a measure of how important capital is relative to other factors of production in the economy or in an industry or business. Capital intensity can be gauged by examining the size or value of the stock of capital relative to production. The *Economic Report of the President* defines capital deepening as "the increase in the quantity or quality of capital per worker" and indicates that the embodiment of new technology in capital has a significant impact on productivity.[4]

Table 1 examines capital intensity as well as some of the other important economic relationships among production, capital investment, and labor in the aggregate economy and in the health industry (all tables appear at the end of the paper). Table 1 projects the annual requirements for new capital in future years based on the need for replacement capital, capital needed for expansion of the work force, and capital needed to continue capital deepening, or the expansion of capital per worker. The two columns of the table permit a comparison of the aggregate U.S. economy with that of the health industry. As is the case for most service industries, the capital intensity of the medical services industry is lower than that for the overall business economy. Notes following Table 1 show the sources and the derivations of the measures shown in the table.

I-4 Rates of return

Rates of return are important tools for business analysis. Rates of return can be calculated in several ways: profits as a percentage of revenues, profits as a percentage of equity, and profits as a percentage of invested capital. These measures aid in determining the viability of a business or an industry, but it is useful to have more than one of these measures available upon which to base decisions. If profits as a percent of revenues are lagging behind other businesses or other industries, managers or investors might conclude that alternative investments would be more profitable.

However, one would also want to know the rate of return on invested capital because the lower return on revenues may simply reflect differences in sales volume among industries. For example, suppose that the rate of return on *revenues* in the utilities industry is 6 percent and the rate of return on *revenues* in the health industry is 13 percent.[5] The rates of return on revenues reflect the cost structures of the two industries—that is, the profits remaining after compensation of employees, purchases from suppliers and other costs have been accounted for. But the rate of return on invested capital could indicate that a business in the utilities industry is viable even if the rate of return on revenues seems low. Thus, in the example above, if shifting from utilities to health caused the investor to take a lower profit per dollar of invested capital, the opportunity would probably be rejected.

Of course business decisions are usually more complicated than considering only the rates of return. Alternative investment decisions take into account many other factors, such as the risks of losses that might result from future shifts in tastes, production costs, or government regulation.

I-5. Capacity and capacity utilization

Capacity is the maximum level of production or output that a plant, industry, nation, or other entity can attain. This maximum usually takes into account the need for maintenance or other necessary downtime in production.

Capacity utilization is the proportion of the capacity that is engaged in production at any point in time. The Board of Governors of the Federal Reserve (FRB) publishes capacity utilization as an adjunct to the Index of Industrial Production (IP). The FRB capacity utilization measure covers mining, manufacturing, and utilities, the same industries as the IP. The measurement of capacity and capacity utilization is considerably easier in these industries because the units of output are more easily defined than they are in services, government, and financial industries.

For the health care industry, the American Hospital Association publishes data on number of hospital beds and their rate of utilization. Statistics on other medical equipment in use can be developed from production data published by the Bureau of the Census. For example, data on the number of dialysis machines and their usage rate would be useful to assess the health care industry's capacity to treat existing cases and expected cases of kidney disease. As indicated above under "Policy issues," however, the geographic distribution may be more relevant than the overall national capacity.[6]

I-6 Market analyses

Manufacturers and vendors of capital equipment in the health field would find data on the annual capital expenditure and annual stock of existing capital useful as a planning tool for future production, sales, and investment. Similarly, the segment of the construction industry that engages in or specializes in the construction of hospitals, nursing homes, and related facilities would find information on annual construction and the stock of existing structures of this type useful in their production, marketing, and investment planning.

Part II -- Definitions of Capital

It is useful to distinguish between two related measures of capital—"capital formation," or new investment in structures and equipment used in production or business enterprise; and the stock of existing capital (e.g., structures and equipment) available at some point in time.

Capital formation

Capital formation or new investment can be measured in more than one way. New investment can be measured *gross* or *net* of the current year's depreciation —the consumption of, or using up of, fixed capital in the production process. Similarly, measures of national production, expenditure, and income can also be measured gross or net of annual depreciation.

In the past, national accounts presentations have focused more often on the gross concept. While the gross concept includes some double counting of investment, it provides nonetheless, when combined with consumption spending, a measure of gross production in the economy. Thus, the national accounts focus on gross domestic product and gross national product. However, net product is theoretically and conceptually important in that it reflects production over and above that necessary to replace capital used up in production, and the net investment reflects the amount by which the productive capacity has expanded during the year. Gross investment includes both that used for replacement as well as that used for expansion. A net concept of income is also appropriate. Income net of capital used up during the year provides a superior measure of income earned while "keeping capital intact."

Concepts of capital stock[7]

There are several concepts of the stock of capital that are of interest. The simplest of these concepts is the gross stock of capital. Suppose that a business purchases a capital item, such as a hospital bed, during the year. This item would be included in the *gross stock* of capital owned by the business at the end of the year. If the business already had owned 100 hospital beds at the beginning of the year, and did not discard any during the year, the gross stock of hospital beds would be 101. The gross stock at yearend depends on both gross investment and discards (sometimes referred to as retirements or disposals) during the year.

For analytical purposes, it is convenient to value these 101 beds in dollar terms, and several choices are available. For example, we might want to value the beds at their individual acquisition prices (sometimes referred to as "historical cost"). Or, we might want to value them at what it would cost to replace them at today's prices. If we had the individual purchase prices (or a price index based on these prices and we knew when each bed was purchased), we could express the value in dollars at either acquisition or current cost. Or we could express them at the prices of a fixed period so that changes in the gross stock over time would not be affected by inflation. Whatever valuation we choose, the ability to express the stock of beds

in dollar terms allows us to combine them with other types of capital, such as hospitals, computers, and ambulances.

The *net stock* of capital is a measure of the wealth that is embedded in the capital. This is the value that the business might expect to realize if it sold the asset. Going back to the example above, a hospital bed purchased this year would be of greater value than one purchased last year because the bed purchased last year is not as likely to last as long as the bed purchased this year. The difference between the values of two assets that are identical except for their age is called depreciation. The net stock is the gross stock minus the accumulated depreciation. (The net stock can also be valued in acquisition cost, current cost, or constant cost as indicated for the gross stock above.) Depreciation in this context would be defined in a broad sense to include the remaining value of any assets that are discarded during the year.

A third concept of capital stock is the *productive capital stock*. The productive capital stock is the concept used in the measurement of multi-factor productivity, and it takes into account any deterioration that may occur between the period when capital was acquired and the current time period. Many capital items remain as productive throughout their lives as when they were new. Examples of this type of capital include hospital beds and computers. These assets would show no deterioration in the ability to produce services as they age. On the other hand, assets such as vehicles and buildings typically produce services less efficiently as they age; for example, they require more maintenance and therefore more "downtime." The productive capital stock is often expressed as the ratio of the current productive capabilities to the productive capabilities when they were new. This pattern or *profile* differs from depreciation discussed above for the net stocks.

In measuring multi-factor productivity, it is actually the flow of services provided by the capital that is of interest. That is, has the flow of services from the capital available during the year increased or decreased compared with the preceding year or with five years earlier? However, economists have not identified reliable methods of measuring these service flows so that they usually assume that the flow of services is proportional to the stock of productive capital.[8]

Other types of capital

Another type of capital other than fixed capital important to the production process is inventories, or stocks that support production in manufacturing, sales in trade, and services in many other industries. Broader definitions of capital can also refer to such things as works of art, gold bullion, jewelry, etc., that constitute a store of value, but that do not contribute directly to the production process. Capital can be further broadened to encompass "human capital," such as the education and experience embodied in a country's population, labor force, or student body. Finally, land and natural resources are sometimes considered capital, as are various financial assets, such as claims on (or ownership of resources in) other countries.

The range of possible definitions of capital are considered below under four accounting systems: the System of National Accounts adopted by the United Nations and other international organizations, the United States National Income and Product Accounts, Federal Government tax laws, and generally accepted business accounting principles.

II-1 System of National Accounts

The System of National Accounts (SNA) is a national accounting system accepted and endorsed by several international organizations (the Commission of the European Communities, the International Monetary Fund, the Organisation for Economic Co-operation and Development, the United Nations, and the World Bank). It was published in 1993 by an "Inter-Secretariat Working Group on National Accounts" representing these organizations.[9]

In the SNA, the capital account is defined very broadly. Assets recorded in the SNA balance sheets are economic assets: (a) over which ownership rights are enforced by institutional units, individually and collectively, and (b) from which economic benefits may be derived by their owners either by holding them or using them over a period of time. The benefits can be from the use of the assets in production or as a result of providing property income.

The SNA identifies two broad categories of assets, financial and non-financial. Financial assets are assets that entitle their owners to receive a payment or a series of payments from a debtor as specified in a contract between the owner and the debtor. Non-financial assets are subdivided into produced assets and non-produced assets.

Produced assets are defined as non-financial assets that have come into existence as outputs from production processes. Produced assets fall into three categories—fixed assets, inventories, and valuables. *Fixed assets* are defined as produced assets that are used repeatedly, or continuously, in processes of production for more than one year. *Inventories* consist of: (a) stocks of outputs that are still held by the units that produced them prior to their being further processed, sold, or delivered to other units or used in other ways; and (b) stocks of products acquired from other units that are intended to be used for immediate consumption or for resale without further processing. *Valuables* are items that have the economic benefit that they are unlikely to decline in value relative to the general price level. They consist of precious metals and stones, jewelry, works of art, etc.

Non-produced assets are those that are needed for production but have come into existence by means other than production. They include both naturally occurring assets, such as land and certain uncultivated forests and deposits of minerals, as well as certain intangible assets such as patented entities.

II-2 United States National Income and Product Accounts

Various categories of investment are identified in the national income and product accounts of the United States (NIPAs). Gross private domestic investment (GPDI) is business investment including investment in new housing, which is treated as a business in the NIPAs. GPDI is divided into fixed investment and inventory investment. Fixed investment is further divided into non-residential investment and residential investment, and each of these is divided into structures and equipment. Non-residential fixed investment is sometimes referred to as "Business fixed investment." For business fixed investment, the boundary on the types of commodities included is somewhat loosely considered to be goods that have a useful economic life (or that contribute to production and generate income over a period) of more than one year. This definition generally corresponds to the definition of capital in the two other major types of accounting systems considered below. The differences between the NIPAs and both tax accounting and business accounting are related to conventions that have been established in the national accounts to ensure that the nation's production is properly measured. (In general, the differences between the NIPAs and both tax accounting and business accounting are the same as those between the SNA and these two accounting systems.)

Government investment in the NIPAs consists of government fixed assets that provide services for more than one year. These assets include government owned office buildings, hospitals, school buildings, other structures, and equipment, including military equipment such as aircraft and ships. Beginning with the comprehensive revision of the NIPAs that was released by the Bureau of Economic Analysis in early 1996, purchases of these assets by government have been separated out as capital and included in a separate account for which depreciation estimates are generated. The depreciation estimates, known as "Consumption of fixed capital" in the NIPAs, are now added to compensation of employees to determine the contribution of government to production (government product). Prior to that revision, only the compensation of government employees was included in government product.[10] The value of government product is understated in the NIPAs in that it does not include an estimate of a return on government investment as the capital is used.

II-3 Tax laws

In practice, the definition of structures and equipment in the national accounts corresponds roughly to what the Federal tax code considers to be "depreciable assets," but there are several notable exceptions. First, the tax laws permit amortization (another term for depreciation of specific asset types) of intangible assets, such as copyrights, contracts for services of players in professional sports leagues, patents, expenditures related to mergers and acquisitions, and business start-up costs. These items are not considered capital in national accounts (in the NIPAs and in most cases for the SNA). There are also a few other categories of expenditure that are subject to either depreciation or amortization in tax laws, but that are not considered

capital in national accounts. They are expenditures for motion picture films, rental videocassettes, and rental clothing. Expenditures for breeding, dairy, and work animals are considered to be capital in the SNA provided they are under direct control, responsibility, and management of institutional units (e.g., a business), but they are not considered to be fixed capital in the NIPAs.

Second, the NIPAs consider all vehicles purchased for business use to be fixed investment. Tax returns do not cover vehicles that are purchased by employees for business use and for which the employer reimburses the employee for that use. In the case of these vehicles and those purchased by the self-employed for "mixed" business and personal use, the NIPAs count the business share of the use as business investment. Also, vehicles purchased by businesses engaged in short-term rental of vehicles are usually not treated as capital by the business for tax purposes because they are sold before they are one year old, but these purchases are considered capital in the NIPAs. Similarly, vehicles used by automobile manufacturing companies and franchised dealers for promotional purposes (for example, dealers' cars used as "demonstrators") also fall into this category.

Third, all capital-type expenditures for oil well exploration and drilling and mine shafting are classified as investment in the NIPAs. In contrast, Federal tax laws permit such spending to be charged to current operating expense in the case of "dry holes." Dry holes are oil wells that have been determined from an engineering and business point of view to be "not productive." The NIPAs assume that all of the dry holes are necessary steps to yield a successful hole, and therefore all of the dry holes are classified as capital expenditures.[11]

In 1999 BEA added certain types of software to fixed investment. Specifically, prepackaged, custom, and own-account software that is not already embodied in purchases of equipment was added to the definition of investment. Some other types of software that provide production and income over a period longer than one year, such as prepackaged software embedded in the price of a computer, exploration costs involved in the search for mineral deposits, and the architectural and engineering costs embedded in the cost of new structures had already been included in NIPA fixed investment. In general, however, research and development expenditures (whether basic or applied, or by business or by government) are not reflected in investment in the national accounts.

II-4 Generally Accepted Accounting Principles (GAAP)[12]

Both the NIPA definition of fixed business capital and the Federal tax code are largely consistent with accounting principles that are generally accepted by the business community. These are accounting principles that receive substantive support of influential and recognized authoritative groups such as the American Institute of Certified Public Accountants, the Financial Accounting Standards Board, and the Securities and Exchange Commission.

An accounting principle that is relevant to capital is the *Matching principle*, in particular the matching of expenses to revenues. This principle supports the concept of capitalizing expenditures that provide production over more than one accounting period and of determining the depreciation related to capital expenditures as a "period cost" for each year over the useful life of the asset. If a business firm charged off the entire cost of an expensive machine or new structure in the year of the purchase, the charge would not be properly matched to the revenue for that year and subsequent years.

Another generally accepted principle is *Materiality*, which refers to the relative importance of an item on a company's books. This principle allows accountants to charge some expenditures to current expense that, while they may be for items that are used in production for more than one accounting period, (1) do not represent significantly large outlays, (2) are difficult to keep track of individually, and/or (3) are purchased in most accounting periods. Thus, in the NIPAs, for tax purposes, and under GAAP, spending for small hand tools, staplers, wastebaskets, and pencil sharpeners would be treated as current operating expenses and not as capital investment.

The materiality principle brings into focus one point of divergence of the NIPAs from both the tax code and GAAP. Some expenditure categories (such as books purchased by law firms) may be very significant

or *material*, and may provide service over a period of years for some businesses, but may be treated as current expense by other businesses. In the NIPAs, selected asset types are classified as investment purchases (in contrast to current operating expenses, or intermediate purchases) regardless of the type of business making the purchase.

Part III – Uses versus Definitions of Capital

This section of the paper evaluates the various definitions of capital presented in Part II in terms of the various uses of capital discussed in Part I. Table 2 provides a summary cross-classification of the uses and definitions. The rows display the various uses of capital data from Part I, and the columns show the major categories of capital included in the SNA, which contains the broadest concept of capital.[13] The cells of Table 2 display an "X" where a definition of capital has a strong relationship to that use of capital. These determinations are somewhat subjective, and the rationale for them is presented below.

The boundaries between the uses are not always clear and firm. For example, rates of return and capacity are closely related to policy issues. Policy issues, productivity, and rates of return may be the most important issues from the point of view of HCFA officials responsible for the administration of HCFA programs. Also, some of the uses (e.g., capital intensity) may be viewed as simply rearrangements of capital data rather than true "uses."

Policy issues: The range of potential policy issues is so broad as to encompass any definition of capital and, indeed, nearly any measure of economic activity. But some concepts of capital are much more likely than others to be relevant for examining policy issues. For example, financial holdings of for-profit hospitals may be an area of concern for regulatory agencies gauging the viability of firms in the industry or of the industry itself. Likewise, the adequacy (or excess) of fixed assets (plant and equipment) in the industry might also be a primary concern of Congress, of regulatory agencies, of investors, of special interest groups, and of the general public.

The stock of inventories would much less likely be a concern of these groups in evaluating health policy issues. Inventories in the health services industry (as in most service industries) are not as critical as they are in goods-producing industries (although several health related industries—pharmaceuticals, medical equipment, and medical apparatus—produce goods). It is even less likely that the other asset types (valuables, land, uncultivated forests, mineral deposits, and intangible assets) would be of major interest in policy issues affecting the health industry.

Productivity: For productivity, fixed capital, inventories, and land are flagged in Table 2. Part II of this paper indicated how the productive capital stock is used in the measurement of multi-factor productivity. The other uses of capital are not closely related to the measurement or analysis of productivity.

Capital intensity: Only fixed capital is flagged in Table 2 as a type of capital used in measuring capital intensity.

Rates of return: Several categories of capital are useful for measuring rates of return on capital—financial holdings, fixed investment, inventories, and land. Rates of return can be calculated using profits as the numerator and any of these measures, or a combination of them, as denominators. But it is unlikely that the other categories of capital (valuables or the other non-produced assets) would provide a meaningful basis for rates of return on capital.

Capacity and capacity utilization: The stock of fixed capital available is an important factor for determining the level of production capacity and, in turn, the rate of utilization of that capacity. Inventory levels and land may also be important determinants of capacity in some instances. It is unlikely that the other types of capital listed in Table 2 are important for these uses.

Market analyses: The final potential use of capital data discussed in Part I and shown in Table 2 is probably related to only two categories of capital—fixed capital and inventories. The other asset types are less likely to be sold to the health services industry in any significant quantity.

To summarize, the most important asset type for analyzing the uses appearing in Table 2 is fixed capital, followed by inventories, land, and by financial assets. The fixed-asset category appears in every row in the table; and even where the other three asset types do appear, fixed assets is likely to be a more important analytical variable. Therefore, the remainder of this paper focuses on fixed assets only.

Part IV--Sources of Capital Data

This section of the paper reviews the various sources of data on fixed capital, and the next section evaluates the quality and reliability of these data sources. While the purview of capital in this paper has been narrowed to fixed capital (that is, to plant and equipment), capital is considered to encompass both investment in plant and equipment and the stock of capital (both the net stock and the productive capital stock as defined earlier). Depreciation is also considered to be an important aspect in the measurement of capital.

As one reads the summary descriptions of the individual sources of data presented below, the following considerations about the classifications of data covering fixed investment should be kept in mind:

Investment and the stock of capital
All of the data sources described below provide data on new capital spending. Several of them also include statistics on end-of-year stocks or balances. Source IV-5 includes net capital stock and depreciation estimates that are derived in part from the investment flows, using a "perpetual-inventory" calculation. The report forms and tabulations underlying sources IV-6 and IV-7 include balances and they are discussed in the evaluation section of this paper.

Structures and equipment—the first source discussed below covers only structures and the second covers only equipment. The others cover both.

Asset and industry detail—some of the major sources provide data on capital by asset type and some provide data by the industry of the purchaser of the capital. In two cases, multiple data sources are used to convert capital by asset type into capital by industry. "Industry" has a number of meanings: It can refer to the industrial distributions of data for individual establishments or to the industrial distributions of data for individual companies that may consist of a number of different establishments in different industries. The measure of business activity used to classify establishments or companies also varies; a different statistical picture might be obtained depending upon whether receipts, employment, payroll, value added, or assets are used to classify or allocate reporters by industry. Finally, the industry structure can include or exclude government activities and the activities of nonprofit institutions.

Using industry and owning industry—In classifications of assets by industry, the asset types can either be assigned to the using or to the owning industry. Most companies own the assets they use, but some companies, particularly in the transportation industry, lease assets. Health services companies also use capital owned by others. For example, some structures are rented from companies primarily engaged in the real estate industry. As will be discussed later, the Capital Flow Table classifies investment goods according to the industries that use them. In contrast, the BEA capital stock estimates classify capital under the owning industry. For all of the data sources considered, assets involved in capital leases are included as investment by the using industry (lessee).

Source of reporting—there are two generic reporting sources for data—the company or entity making the capital investment (the purchaser) and the entity producing or supplying the capital goods (capital goods producer or manufacturer).

Statistical and administrative sources—statistics can be tabulated in a purely statistical operation or they can be tabulated as part of an administrative program of a government (e.g., as part of the tax collection process or the regulation of pubic utilities), or they can be some combination of the two. Statistical data sources often have an advantage over administrative sources in that there is a greater degree of freedom to collect data that conform to the desired economic concept. Also, to the extent that

respondents believe that reports will be held confidential by the agency collecting the data, there may be less incentive to misreport in statistical programs. However, there are still some constraints—e.g., statistical programs are limited to what respondents can reasonably be expected to have available as part of their operating records. The major disadvantage of statistical data sources is their relatively high cost.

The administrative sources are usually very cost effective in that the marginal cost of tabulating the data (in excess of the existing administrative costs) is usually small compared to statistical sources. Use of existing administrative sources also minimizes the reporting burden on businesses and others who otherwise might be required or asked to respond in a separate survey. There are often strong incentives for compliance with reporting requirements in administrative programs (e.g., penalties or fines). On the other hand, the type or amount of information that can be collected using administrative sources may be limited. Constraints can be imbedded in laws affecting the administration of the programs or they can result from fact that the administrators of the program might view the statistics as only a secondary or low priority goal.

Measurement errors—Data from nearly every statistical source contains errors. Errors can arise from a very wide variety of causes. Sampling errors can be identified where the statistics are derived from a scientific (probability) sample. In a complete census, the sampling error would be zero. But there are usually errors in the statistical universe. For example, it is difficult to maintain a comprehensive list of all of the hospitals in the United States as statistical "births" and "deaths" take place on a regular basis. Errors can also result from inability to obtain information about all entities in the sample; "inability or unwillingness on the part of the respondents to provide correct information; response errors; definition difficulties; differences in the interpretation of questions; mistakes in recording or coding the data; and other errors of collection, response, coverage, and estimation for nonresponse."[14]

Statistical programs for fixed investment data

The remainder of this section of the paper describes the various data sources from which fixed investment estimates are derived. Part V evaluates these data sources. Tables 3-6 provide more information on the data sources including the types of detail available for each source.

IV-1. Value of construction put in place

The Bureau of the Census collects data on the value of new construction put in place (VPIP) monthly. For private non-residential buildings, the data are from the Bureau's Construction Progress Reporting Survey. This survey uses three sources of information for identifying projects: Data from a contract awards survey conducted by the F.W. Dodge Division of McGraw-Hill Information Systems Company; building permit notifications for a sample of projects in parts of Hawaii; and a sample of areas not covered by either building permit systems or reported by Dodge.

After projects are selected, Census sends a form requesting data on the estimated total cost of the project divided between overhead costs (architectural, engineering, and miscellaneous costs) and direct costs, such as expenses for labor and materials. Census then uses a "shuttle" form to collect the direct costs monthly until the project is completed. The direct costs collected from the shuttle forms are also used to distribute, by month, the overhead costs of the project. Census adjusts the results of the survey upward by 28 percent to account for undercoverage of projects not reported to Dodge (the Dodge reports are limited to projects of $50,000 or more). This adjustment is based on periodic studies that compare the Dodge data with building permits data. The same 28-percent adjustment is made to each individual type of structure.

At any one time, about 840 projects are included in the Census sample for the hospital and institutional category out of a universe of about 5,950 buildings. The hospital and institutional category includes hospitals, sanatoria, convalescent and rest homes, nursing homes, orphanages, and similar establishments for prolonged care, and surgical or outpatient clinics associated with a hospital. The hospital and institutional category also includes the types of buildings mentioned above that are associated with religious institutions. But buildings that are used primarily for doctors' offices are classified as "office buildings" and are excluded from the hospital and institutional category, and there is no breakdown available for office buildings by industry of use. Census also publishes annual estimates for a breakdown

of the hospital and institutional category into "Hospitals, clinics, and infirmaries" and "Nursing homes, rest homes, and related buildings." In addition to the Hospital and institutional and Office buildings categories, Non-residential buildings include Industrial, Commercial, Religious, Educational, and Miscellaneous buildings.

Census also collects construction put in place estimates for state and local governments using the F. W. Dodge sample frame as described above for private non-residential buildings. The state and local sample includes about 300 projects at any point in time in the hospital category out of a universe of about 1,650, and the adjustment for "undercoverage" is only 5 percent for each state and local government type of structure. For the Federal Government, Census gathers data directly from government agencies or from budget documents. Health categories other than "hospitals" are not available.

The VPIP does not provide estimates by industry or estimates of the stock of capital. The detail available in the VPIP is limited to the structure types indicated above.

IV-2. Commodity-flow procedure

The commodity-flow procedure is calculated by the Bureau of Economic Analysis (BEA) largely with data from the Census Bureau.[15] The procedure combines several data sources to produce estimates of equipment purchases (it is also used in the NIPAs to estimate personal consumption expenditures for benchmark years). The commodity-flow procedure is the primary method for estimating NIPA private investment in equipment. It is also sometimes known as an input-output procedure because the methodology is similar to that used in Input-Output Tables (more discussion of input-output appears in section IV-4 below).

The starting data source for the commodity-flow procedure is manufacturers' shipments, collected at 5-year intervals (for years ending in 2 and 7) in the *Census of Manufacturers* and annually in the *Annual Survey of Manufacturers* (ASM), both conducted by the Bureau of the Census. The ASM is a sample drawn from the establishments identified in the Census of Manufacturers. Both of these sources include two types of shipments data—all shipments out of an industry regardless of the product (in other words, including secondary products) and shipments of products of the industry itself (primary products only) on a "wherever made" basis. The latter "product" shipments are considered more appropriate than the "industry" shipments for measuring fixed investment in that they provide a "cleaner" measure of investment by asset type.

Shipments data are classified according to the *Standard Industrial Classification* (SIC) *Manual: 1987.*[16] The SIC includes 1-, 2-, 3- and 4-digit classifications and the Census Bureau extends the SIC to 5- and 7-digit systems to provide a more detailed identification of product detail. The Census of Manufacturers provides nearly complete coverage of manufacturing establishments located in the United States (the 50 States and the District of Columbia). Zero employee firms and in some cases small employee firms (varies by industry) are not included. However, BEA adjusts its estimates upward to account for these small firms.

(Note that a new classification system has replaced the SIC. In many cases, the new system will be used beginning with data for 1997. Appendix B of this paper compares the new system, the "North American Industrial Classification System" (NAICS) with the SIC for the private health services industry. The appendix was extracted from the Census Bureau's website.)

In the commodity-flow procedure, the shipments data are "adjusted" using statistics from a variety of sources to yield investment in new equipment by private business in the United States. The commodity-flow calculation is as follows:

(Manufacturers' shipments + Imports - Exports - Government purchases) + Margins = Private investment in equipment.

Imports are added because they are goods available for investment; exports are subtracted because they do not contribute to investment in the United States. Government purchases are subtracted because they are alternative uses for (or statistical leakage of) capital goods outside of the private business sector.

(However, they would not be subtracted if the goal were to identify all investment in the United States of a particular capital good, such as x-ray machinery whether it is purchased by government or by private entities.) Margins include the costs of transportation, taxes (sales and excise) and the retail and wholesale mark-ups. Many types of capital goods do not move through retail and wholesale channels and are ordered by and shipped directly to the purchaser.

The level of detail by type of asset available from the commodity-flow procedure is approximately that shown in the CFT (see Table 5A). The commodity-flow procedure, as implemented by BEA, does not yield estimates of investment by the health industry or estimates of the stock of capital. However, estimates of both of these are derived using this and other sources (see IV-5 below).

IV-3. Annual Capital Expenditures Survey

The Annual Capital Expenditures Survey (ACES) is a survey of companies in industries covered by the quinquinial Economic Censuses conducted by the Census Bureau (for 1992, censuses were conducted for Manufacturing; Retail trade; Wholesale trade; Service industries; Transportation, communications and utilities; Finance, insurance, and real estate industries; Mineral industries; and Construction industries). ACES was published for 1992 through the latest survey for 1998.[17] The 1998 survey included about 34,000 companies with one or more employees and about 12,000 non-employee businesses.

While ACES is collected on a company basis, the Census Bureau requests that companies separate capital expenditures along divisional lines or lines of business. This is accomplished by use of the Census Bureau's Standard Statistical Establishment List (SSEL). The SSEL is an establishment database containing records for each physical entity in the United States, including information on company ownership. In ACES, companies are asked to provide data by industry for all of their establishments, using a combination of 2-digit and 3-digit SIC categories. Both sample selection and classification by industry are based on payroll. Nonetheless, Census can only classify the companies with employees by industry, and even for these, a small portion of their capital expenditures cannot be distributed by industry. A footnote to Table 4 shows the 3-digit SIC categories published separately in ACES. Also, see appendix B, which shows the NAICS classifications for private health industries.

Beginning with the 1998 survey, and scheduled for every fifth year thereafter, ACES collects detailed information on types of structures and equipment. This detail enables users to evaluate the quality of the survey in the light of other information available, such as the commodity flow results described above. Table 6 shows the detail for the private health services industry. No data are published for 3-digit industries by asset type.

The ACES includes all capitalized costs for new and used structures and equipment chargeable to fixed asset accounts for which depreciation or amortization accounts are ordinarily maintained.[18] For projects lasting more than 1 year, gross additions to construction-in-progress accounts are included even if the asset has not yet been put into use or depreciated. For capital leases, the company using the asset (lessee) is asked to include the value of the asset in the year in which the lease is entered. Capital expenditures include capitalized leasehold improvements and capitalized interest charges on loans used to finance capital projects.

The ACES report forms include entries for beginning and end-of-year gross asset values and reconciling items (e.g., assets acquired by acquisition and merger and assets removed by disposition and retirements) for the company submitting the report. However, these statistics are not collected in the industry and type-of -asset detail described above.

IV-4. Capital Flow Table

BEA uses data from the economic censuses and other sources to prepare Input-output Tables and Capital Flow Tables (CFT) for the United States.[19] The "basic" input-output tables show the flow of commodities (both goods and services) from one industry to another. They are analytic tools for estimating the relative impacts of shifts in final demand for commodities (e.g., specific types of consumer spending or government purchases) on industry output. Benchmark input-output tables are published at 5-year

intervals corresponding to the Economic Census years. Following the publication of the basic I-O table, BEA develops and publishes a subset of the table that includes only the flows of capital (structures and equipment) from one industry to another.[20]

The derivation of the 1992 CFT included the following operations:

1. Data on total expenditures for capital items for each industry are compiled primarily from the economic censuses and from the Census Bureau's Annual Capital Expenditures Survey.

2. Investment expenditures for specific types of assets (step 1) are then allocated to the appropriate industries. Because most asset types are used by more than one industry, most of the distributions are made in proportion to an unpublished occupational-employment-by-industry matrix provided by the Bureau of Labor Statistics, Office of Employment Projections. This procedure embodies the assumption that asset types are correlated with related occupational employment; for example, anesthesia apparatus and blood transfusion equipment is allocated on the basis of the number of health technicians and technologists and of surgical technologists in various industries. In some cases, all of a particular asset is allocated to a single industry.

3. The resulting asset-type investments are summed to industry totals and compared with the industry totals established in step 1 in order to evaluate the industry controls. After any adjustments suggested by these differences are made, the resulting industry totals are adjusted to the total value of the investment by asset type using an iterative balancing procedure to insure that all column and row totals are consistent with the initial control totals (described in step 1).

4. Transportation costs and trade margins are estimated and added in order to adjust the results to purchaser prices, the appropriate valuation for depreciable capital spending by business.

The level of detail available in the CFT is shown in Table 5A and Table 5B. No estimates of capital stocks or depreciation are available in the CFT. Also, no detail by industry purchasing the capital is available below the Hospital and Other health services categories shown in these tables.

IV-5. BEA's capital stock, depreciation, and investment estimates

The Bureau of Economic Analysis (BEA) capital stock, depreciation, and investment program consists of a set of estimates that are derived largely from the four sources described above.

The first step is the derivation of investment flows; that is, the dollar value of investment purchases for the health industry by type of asset. Investment "controls" by asset type for all private industries combined are produced from a variety of sources, but based mainly on the VPIP and commodity flow estimates described above. The CFT data on the mix of assets purchased by industry for benchmark years (1963, 1967, 1972, 1977, 1982, 1987, and 1992) and interpolations and extrapolations for other years are used as a first approximation of the assets purchased by each industry.[21] The CFT investment flows are adjusted from an "industry-of-use" to an "industry-of-ownership" basis for the capital stock work using information on leasing from a trade source and other data. In addition, investment by nonprofit institutions serving individuals is reclassified to the real estate industry.

Next, industry investment series are derived from a variety of sources. For the health services industries these series consist of the Capital Expenditures Survey taken as part of the Census of Services Industries for 1982, the asset and expenditures survey taken as part of the Census of Services Industries for 1987 and 1992 and ACES and other sources for the remaining years. Then, an iterative statistical procedure is employed to balance to the all-industry asset controls while adhering closely to the industry series.

Capital stock and depreciation are derived from the resulting investment flows for asset types within each 2-digit SIC industry using a perpetual inventory procedure.[22] The specific steps in this procedure are as follows.

1. Gross investment flows are deflated to constant dollars using annual price indexes appropriate to the gross investment for each specific asset. For structures, the price indexes are based on a variety of deflators such as cost indexes from trade sources. For equipment, the deflators are based largely on components of the Producer Price Index published by the Bureau of Labor Statistics.[23] Step 2 is then calculated in terms of the resulting constant-dollar series.

2. Depreciation and net stocks are calculated as weighted averages of past investment for each asset.

A. Depreciation is defined as the decline in value due to wear and tear, obsolescence, accidental damage, and aging. The assumption underlying BEA's methodology is that depreciation approximates patterns shown in asset prices of used structures and equipment in resale markets. Empirical evidence on prices of used assets shows that the decline in prices for most types of assets approximates a geometric pattern; that is, a pattern where equal percentage depreciation rates are applied for each year of the asset's remaining life.[24]

B. Net stocks are calculated as the cumulative value of past gross investment less the cumulative value of past depreciation.

3. The depreciation and net stocks in step 2 are "reflated" to current costs. The reflators used are the same as the deflators applied in step 1, except that their timing is adjusted to the end of the year for net stocks. The end-of-year reflator is derived as the average of the deflator for the fourth quarter of the reference year and the first quarter of the following year. For depreciation, the reflators are the same as the deflators—that is, they reflect the average prices of new assets purchased for a given year.

4. The resulting depreciation and net stocks of assets are aggregated to industry totals and subtotals in both current cost (results of step 3) and in real terms (results of steps 2).

A set of calculations similar to what is described above is also calculated using as inputs to the process the gross investment flows before deflation. This provides a set of depreciation and net stock estimates valued at acquisition cost (historical cost).

IV-6. Medicare Cost Report Program

The Medicare Cost Report (MCR) is an extensive set of data collected annually by the HCFA from hospitals and other providers of medical services. The cost data in these reports are generally provided separately for the various components of the hospital health care complex (e.g., hospital, skilled nursing facility, and outpatient rehabilitation facility). However, a "Worksheet" in the MCR covering capital items applies to the entire hospital complex. MCRs are also filed by stand-alone skilled nursing facilities and home health agencies. Worksheet A-7 includes the following categories of capital: Land improvements, buildings and fixtures, building improvements, fixed equipment, and movable equipment. For each of these categories, the questionnaire covers beginning and ending balances, new assets purchased and donated, and disposals and retirements. The questionnaire covers both new and used assets, but does not distinguish between new and used assets purchased.

The MCR capital worksheet is not edited for accuracy as are statistical and operating data. No imputations are made for capital data that are not reported, and no follow-ups are made to reporters to fill in data gaps. No tabulations of capital are published by HCFA as part of the program. The data are simply available as a file of separate reports on HCFA's mainframe computer for their employees and other approved researchers to access and to develop tabulations. And a fair amount of learning on the part of users is required before tabulations can be generated. Finally, the file can change from time to time as more reports are received for a fiscal year, at least for the most recent fiscal years.

Some data have been tabulated for this study. They are described and presented in Part V.

IV-7. American Hospital Association Survey

The American Hospital Association (AHA) conducts an annual survey of hospitals in the United States.[25] All hospitals are surveyed, and the response rate is about 90 percent. However, not all of the information requested in the survey is completed by all of the hospitals that respond. For some key items, the AHA uses various estimating techniques to impute for missing reports or missing data cells for institutions that submit partial reports. In some cases these imputations are based on reports for the same hospital for earlier years, and in some cases they are based on related data that are reported for the same year

The survey contained information on fixed investment for some years but the capital-related questions are no longer included in the survey. In addition, the structure of the questions had changed somewhat over the period covered. For 1980 and for 1983-85, capital expenditures included the following breakdowns: land, buildings and improvements, fixed equipment, movable equipment, and construction in progress. For 1990-93, the AHA included a more articulated capital account with beginning and ending balances; additions and transfers in; and retirements, disposals and transfers out. In the breakdown by type of capital asset, however, fixed and movable equipment were combined in to a single category for this later period. For all years, both new and used equipment are included but not separately identified.

A serious problem with the AHA data for 1990-93 was that none of the components of annual investment were "estimated" for responses left blank by the respondents. The only variable that included estimation was end-of-year balances for each category of capital. Year-to-year changes in these balances provide some indication of trends in new investment for the early 1990's, but these changes understate new investments in that the changes are reduced by the value of "retirements, disposals, and transfers in."

IV-8 Survey of Government Finances

The Bureau of the Census conducts a census every 5 years (in years ending in "2" and in "7" in accordance with the economic censuses) of all government units in the United States. In addition, the Bureau conducts annual surveys of all of the state governments and a sample of local governments. For example, the Survey of Government Finances (GF) sample drawn from the 1987 Census of Governments included all county governments with a population of greater than 50,000; all municipal and township governments with populations of over 25,000 and all school district governments with enrollments greater than 5,000. Smaller governments in each of these categories are sampled. Federal government data are derived by Census from the Budget of the United States and related documents.

Data are classified as investment in separate "hospital" and "health" categories as follows: Capital outlays include direct expenditures for contract or force-account construction of buildings and other improvements, and purchases of equipment, land and existing structures, and for payment of capital leases. Capital also includes amounts for additions, replacements, and major alterations to fixed works and structures. Construction includes facilities that are integral parts of structures. Equipment includes apparatus, furnishings, motor vehicles, office machines, and the like having an expected life of more than 5 years.

As is the case with many of the data sources described in this part of the paper, GF reports may be filed for fiscal years that differ from the calendar years. However, fiscal years for states differ dramatically from the calendar year. Most are from July 1 through June 30, and the four states that do not (plus the District of Columbia) have fiscal years that are close to that time period.[26] Local governments vary but their fiscal years tend to end more around the end of September.

Hospitals are classified separately as "Own" hospitals, which are administered directly by the government concerned, and "Other" hospitals, where governments provide hospital services in private hospitals or other government hospitals. Nursing homes are included under "Public welfare" unless they are directly associated with a government hospital.

Health includes outpatient health services, other than hospital care, including: Public health administration; research and education; categorical health programs; treatment and immunization clinics; nursing; environmental health activities, such as air and water pollution control; ambulance service if provided separately from fire protection services; and other public health activities such as mosquito

abatement. School health services provided by health agencies (rather than school agencies) are included here. Sewage treatment operations are classified under sewerage.

Capital outlays include direct expenditures for contract or force-account construction of buildings, roads, and other improvements, and purchases of equipment, land, and existing structures, and for payments on capital leases. Payments on operating leases are excluded.

The detail on investment available from GF is limited to "Construction" and "Other capital." Equipment purchases are reported separately only for the 50 states and 49 large general-purpose governments. The functional categories covering health are "Hospitals" and "Other health." No data on capital stocks are available. The GF was published by the Census Bureau through fiscal year 1990-91; later fiscal years are available on the Census Bureau's website.

The Bureau of Economic Analysis also publishes government gross investment data for health on a regular basis in the *Survey of Current Business* as part of the NIPA's. For state and local governments, BEA estimates are based largely on GF data. BEA subtracts out a fixed percentage for land and existing assets and converts the GF data from fiscal years to calendar years. BEA recently reconfigured its spending by function to conform to the international Classifications of the Functions of Government (COFOG). Under this system "Health" includes the functions of Social services and Income maintenance as well as Hospitals and Other health.[27] A major difference between the BEA and Census estimates is the inclusion of software in the former.

Part V--Evaluation of Data Sources

This part of the paper evaluates the various sources of data on fixed investment described above in terms of their suitability for use in the NHA. Part VI and appendix C recommend the use of specific sources for measuring and monitoring capital estimates in the NHA.

Quality of sample

Table 3 summarizes some of the statistical characteristics of the various sources. A fundamental consideration in evaluating sources of capital is the quality of the statistical measurement for each source. There are many types of errors as indicated in Part IV above. However, most aspects of these errors cannot be evaluated; there is little information from the sources on the extent of errors because the organizations that produce the statistics often have no way of knowing the effect of these errors on the statistics.

One part of the measurement error that can sometimes be measured is the sampling error. The sampling error can only be calculated if the data are collected in a probability sample.[28] As the first column of Table 3 indicates, the VPIP, ACES, and GF are based on probability samples. However, the universe covered by the VPIP survey excludes a significant part of construction activity. The estimates are adjusted upward by a fixed percentage for every period (for example, by 28 percent for private non-residential buildings) to account for small projects not covered by the Dodge Contract Awards data. This adjustment for non-coverage could have a significant negative impact over time on the accuracy of the estimates.

The manufacturers' shipments data, the main ingredient in the commodity-flow procedure, are based on a virtual complete count in census years (e.g., 1992 and 1997) so that sampling is not an issue. Data for other years are based on the ASM, which is also a probability sample. The ASM covers all manufacturers above a certain size and uses sampling for smaller manufacturers. However, many other data sources are involved in the commodity-flow estimation procedure (for example, export and import data) so that the sample type used in the table to describe the estimates is "hybrid." The shipments data for the latest 2 years, however, are usually based on a monthly sample of companies (with some divisional reporting) that is not a probability sample. In addition, the shipments available from the monthly sample are industry-based rather than product-based and are available only in a greatly reduced level of detail.

Two other data sources described—the CFT and the BEA capital stock program—are also labeled as hybrid. The CFT is only calculated for census years and much of the source data are therefore largely

based on universe counts. However, the data used to allocate the investment flows by industry is very limited. The BEA capital stock program embodies data from each of the three sources shown above it in Table 3 and is therefore of similar statistical quality.

I have labeled the sample type for the next two categories in Table 3—the HCFA Medicare Cost Report and the AHA survey—as "Self-selecting." For these two data sources, an institution is included in the tabulation only if a response is received from the institution. The MCR is likely to be filed by most hospital-type institutions each year because it is a requirement for these institutions to be reimbursed by the government for their Medicare expenses. A study by Jing Xing Technologies, Inc. tabulated for HCFA indicated that about 85 percent of the 6,900 hospital-type institutions covered in the 1997 Census of Service Industries filed MCRs with useful revenue data. The MCR data set does not impute for missing institutions or for items not reported by institutions that submit a report. The AHA annual survey yields about a 90 percent overall response rate, with a similar percentage of the universe reporting expense data (that is, about 85 percent of the 6900 institutions in the universe).[29] For the AHA annual survey for 1992, about 25 percent of the value of the end-of-year balance of the investment categories was estimated by the AHA rather than reported by hospitals. The AHA makes estimates for non-response by an institution and for missing cells for key items, but the missing capital items were, for the most part, not estimated in the 1990-93 period.

It is difficult to conclude that any one of the sources described above is superior in statistical quality. A reasonable approach would be to take several of the better sources into account in developing a set of investment data for health and continue to encourage improvement in all of the data sources. A set of investment statistics for health services has been prepared for this project that uses data from the first four sources shown in Table 3 for private industries and the last source for government health investment. In addition, these investment estimates utilize many of the procedures developed for the BEA capital stock program. Appendix C provides more details on the sources and procedures used.

Frequency and timeliness

The second column of Table 3 shows the frequency with which the data are available. All estimates are available annually except the CFT, which is normally published every 5 years. The VPIP is estimated monthly, and the annual estimates are the sums of the months. The commodity-flow estimates are available quarterly, but the quarterly estimates are based on a somewhat abbreviated methodology. In any case, as discussed later, this methodology does not directly yield estimates of investment for the health industry. Rather, this data source is included because it is a basic input into the BEA capital stock estimates that are also analyzed in this paper.

The third column of Table 3 indicates the timeliness of the estimates; that is, how up to date they are. Note that three of the data sources—VPIP, the commodity-flow estimates, and the BEA capital stock data—are available through 1999. However, the equipment estimates underlying the BEA estimates for the latest 2 years are based on less detailed quarterly data. The ACES and the MCR are available through 1998, and both the CFT and the AHA survey are outdated by at least 6 years. The AHA capital data are outdated because the capital questions were dropped from the survey after 1993.

The frequency and timeliness characteristics sharply reduce the options available for current data on capital. Estimates that are available annually are needed for the current presentation in the NHA. Also, to be viable, the annual estimates should become available in a reasonably timely manner. Thus, they should be available to HCFA no later than the second calendar quarter of the year following the reference year. These two considerations suggest that the VPIP survey, the commodity-flow data, and the BEA capital stock program are the best sources for current estimates. As indicated in the preceding section, however, using information from several sources seems to be judicious; thus, HCFA could make use of data from the MCR in the future even if they lag by one or two years, especially if data on the stock of capital could be developed to serve as benchmarks.

Timing of reporting

The fourth column of Table 3 presents the timing at which investments are recorded. This characteristic indicates how closely the data reflect the point at which assets are placed in service and available for use in production. Placed-in-service timing is desirable for most of the uses of capital data. For example, for measuring productivity, capital intensity, or capacity utilization, one would want to consider the capital already installed and in use and to exclude the capital that is likely to come on line in the next year or two. For example, for a building that takes 3 years to build, the data reflect part of the investment in each of the 3 years on a "put-in-place" basis; under a "placed-in-service" basis, the investment data would record the entire building as investment in the year of completion.

Unfortunately, none of the sources are clearly measured on a placed-in-service timing basis. The name of the Census Bureau's put-in-place survey reflects its timing. The commodity-flow estimates, because they largely are based on manufacturers' shipments, are on a "delivery" basis. Delivery timing would precede placed-in-service timing to the extent that equipment requires on-sight installation. The other sources are listed as "hybrid." The ACES and GF structures are on a put-in-place basis and equipment is on a delivery basis. The CFT and the BEA capital stock program are based on the first two sources and thus are also hybrid. The HCFA Medicare Cost Report and the AHA survey are probably also hybrid.

Price-adjusted measures

Column 5 of Table 3 indicates that three of the sources provide "real," or price-adjusted, measures of investment. These three are the VPIP survey, the commodity-flow procedure, and the BEA capital stock program. The latter data set is based to a large extent on the first two programs, and basically the same price indexes are used in the deflation.[30]

Two cautions are noted regarding price-adjusted measures. First, many of the available price indexes for adjusting capital goods are deficient in that they do not adequately take account of changes that are related to technological improvements; and the rate of technological improvement in medical capital has been very dynamic. When technological improvements occur, it is difficult if not impossible to adjust the price measures so that an appropriate deflation of the current-dollar aggregate investment measures can be determined. For example, an improved X-ray machine may greatly improve the diagnostic and surgical capabilities of medical staff and thereby constitute a true price decrease instead of an increase that might be observed in the reported price of the new machine over its predecessor.

Second, the broader range of technological improvements in medical science, including developments in capital equipment but also those in surgery, treatment, pharmaceuticals, and other areas are very difficult to embody into price measures. Thus, it is likely that trends in the available price indexes for medical care could be overstated and trends in real, or price adjusted, output of the medical industry may very well be understated. The resulting misstatement of the growth of output renders the measurement of productivity change especially difficult. Some of the current research in this area may result in future improvements, but it is difficult to say how long that might take. For example, current research involves the identification and measurement of "outcomes" of medical treatment (such as added years of productive life). Consideration of these issues is well beyond the scope of this paper. Because the fruition of this research is probably far in the future, I have placed the productivity needs for capital a little lower on the scale of capital needs and included recommendations on this subject only in the long-range category (see "Productive capital stock" below).

Availability of data on "stocks"

The final column of Table 3 shows that only three data sources include data on end-of-year capital "balances." The BEA capital stock program yields end-of-year stocks as part of the estimating process, and these stocks are consistent with the investment flows because they are generated from them. The MCR and the AHA survey contain end-of-period balances. However, these balances are "Book values." That is, they reflect the acquisition prices of assets and therefore a mix of prices and valuations over a period of years. They would not serve, therefore, as adequate benchmarks for capital stock measures. The MCR

may provide a useful tool for collecting benchmarks or censuses of the levels of health industry assets under consistent valuations, but this would involve new questions specifically designed for this purpose and perhaps special record keeping for respondents.

Productive capital stock

As indicated in Part II, "Definitions of capital," a concept of capital stock used for multi-factor productivity measurement is called the "Productive capital stock." The productive capital stock involves a "deterioration profile" that depicts the remaining productivity level of the stock of capital in use at any given time. It would be difficult, if not impossible, to measure the productive capital stock from statistical surveys alone. The BLS, in measuring multi-factor productivity, assigns deterioration profiles or "efficiency profiles" to various types of capital goods.

The measurement of productivity in the health services industry to the same degree of accuracy as BLS achieves in measuring multi-factor productivity for the entire economy requires much better data than now exist. For example, a systematic model of how to measure health industry output would be required. Greatly improved measures of price change, with allowances for quality changes also are needed (for example, for structures used in the health industry, for prescription drugs, and for output of the health industry services). As a result, the measurement of the productive capital stock is considered beyond the scope of this paper, and I recommend support for productivity measurement as a long-term recommendation in Part VI.

Coverage

Table 4 compares the coverage of the data sources. Three types of coverage are considered: Whether the data sources cover the private health industry, government, or both; whether they cover structures, equipment, or both; and the part of the health industry or the assets or types of institutions covered. The VPIP, the MCR, and the AHA Survey cover both the private and the government "health industry." GF covers only government. The other sources cover only the private health industry.

The coverage of structures and equipment was discussed earlier for these sources

In terms of coverage by industry, type of asset, and type of institution (last column of Table 4), all of the sources except GF cover all or part of capital purchases of SIC 80 (i.e., the private health services industry). The VPIP series covers several "social service" institutions (e.g., orphanages) not classified in SIC 80. On the other hand, the VPIP series excludes office buildings used primarily as doctors' offices, which are classified in a VPIP "office buildings" category, which does not provide any indication of industry of use. ACES also covers SIC 830, "Social services institutions."

Both the HCFA Medicare Cost Report and the AHA survey cover hospitals as well as establishments related to the hospital complex (e.g., skilled nursing facilities). Separate Medicare Cost Reports (not tabulated for this study) cover "free-standing" skilled nursing facilities and "free-standing" home health agencies.

Availability of detail

Another aspect of coverage is the level of detail that is available from a data source. Industrial detail for the private health services industry is available in the ACES data set. As explained in the "Notes" to Table 4, seven categories of detail below the 2-digit SIC (3-digit and combinations of 3-digit) are available beginning with 1997 with somewhat less detail available for earlier years. Both the CFT and the BEA capital stock data break down the health industry into hospitals and the balance of the private health services industry. In the case of the CFT these estimates are published (see Tables 5A and 5B), and in the case of the capital stock program they are available on an unpublished basis.

Other available detail by type of asset or by type of institution or by ownership of institutions for the various data sources are shown in the final column of Table 4 and in the "Notes" to that table. The detail

available for the Census construction put-in-place estimates is by type of structure. For the commodity-flow estimates detail is by asset type.

The GF investment data are classified under functional categories, and the "Social services and income maintenance" function includes Public welfare, Hospitals, Health, and Other. Within each of these four categories, separate data are available for Construction and Other where the later category includes purchases of land, used structures, and equipment (these three not available separately).

Boundaries of fixed investment

Another characteristic relating to coverage is what determines the boundary of fixed investment for an individual data source. That is, how is the determination of what is included in and excluded from investment made? For the construction put-in-place survey, this determination is identical to the determination by type of structure as discussed above and as shown in Table 4. In the commodity-flow procedure, in the CFT, and in the BEA capital stock program, this determination is by asset type. Table 5A and Table 5B show the breakdown of asset types in the CFT for the private health industry for 1992. Table 5A also indicates the approximate equipment and structures types that underlie the BEA capital stock data.

For the other sources—the Annual Capital Expenditures Survey, the HCFA Medicare Cost Report, the AHA Annual Survey, and Government Finances—the companies, nonprofit institutions, and government units that own or use the capital and file reports in these programs determine what is included as capital. While some instructions on what to include is provided to the respondents, the instructions differ from one source to another, some are more specific than others, and the degree to which respondents read and follow reporting instructions is usually not known.

It is difficult to come to a judgement as to whether the "fixed-set-of-assets" approach of the first three sources or the "respondent-based" approach of the latter four is more favorable. In some ways, the determination by the respondent may be better than a consistently defined group of assets and in some ways it may be worse. A clear picture of the infrastructure of assets devoted to health services suggests focussing on a specific set of assets. On the other hand, accountants in the industry may tend to become aware more rapidly of new equipment and new medical technology and to be more conscious of the materiality of newly purchased assets than analysts focusing on a specific list of assets.

ACES provides a data source where these two aspects of boundaries of fixed investment can be reconciled. With the availability of the 1998 data on asset distribution, we can begin to bridge between ACES and the BEA sources with asset distributions.

One weakness in particular in the CFT procedure is the allocation by industry of capital assets based on the occupational-employment-by-industry matrix. This step might introduce some circularity into the capital measures for the health industry and thus impart bias in relating capital to variables associated with labor input.[31] This weakness is also reflected in the BEA capital stock data, but to a smaller extent because the capital stock data utilize only the asset mix within industries from the CFT.

Comparison of levels

Tables 7 and 8 compare the levels and percentage changes of data developed from the various sources discussed above. Table 7 focuses on the private health care industry and Table 8 focuses on hospitals only. Tables 7A and 8A contain levels and Tables 7B and 8B contain percentage changes. Also, both tables contain a combined Structures and equipment total as well as Structures and Equipment separately. The VPIP data are only available for the structures part of Table 7.

In addition to private hospitals, Table 8 also has an aggregation for Private and State and local government hospitals for the purpose of comparing the MCR and AHA data. As indicated above, no data are shown for the commodity-flow procedure because data by industry of purchaser are not available from this source.

The years presented in the tables reflect the availability of data that can be compared with one another from the various sources examined. The ACES data are available for 1992-98, the MCR data for 1992-97, and the unpublished BEA capital stock data (abbreviated hereinafter as BEA-K) for 1982-98 (the MCR for 1998 is now available but it was not tabulated for this study.) The AHA data are available for 1980 and 1982-85 (not shown); estimates for 1992-93 were derived as the difference between end-of-period balances from the AHA. These differences are understated as a measure of (gross) new investment because "retirements, disposals, and transfers out" are subtracted in transiting from beginning to end-of-year balances in the AHA data. The VPIP is available for all years, and the CFT is usually available at five-year intervals (see appendix C).

MCR estimates were tabulated specially for this paper. In order to impute for institutions that filed an MCR, but that did not fill in the capital worksheet (Worksheet A-7), responses with zero entries in "Ending balances" were considered to be "non-reported" for the entire worksheet and subject to imputation. In other words, if an institution's MCR showed no ending assets, it was assumed that it did not report at all in Worksheet A-7.

The imputation was based on the aggregate relationship of new acquisitions to ending assets for reports where ending-asset values contained non-zero responses. For 1994, for example, 5.8 percent of the health care complexes did not report a total ending balance. Imputations were made separately for each of 13 separate "Type of control" categories (for example, "Proprietary, corporate" and "Governmental, county"). For each of these types, the capital spending for the entities that did not report on this worksheet were assumed to have the same fixed investment spending as entities with the same asset size that did report fixed investment. For 1994, the procedure added about 2½ percent to the reported investment. The procedure did not adjust the estimates to true universe levels because no fixed investment imputation was made for facilities that did not file a report.

Table 7 shows data from four sources for the private health services industry. The ACES data cover only new structures and equipment. Expenditures for the purchase of used assets were also available in the ACES, but were excluded. Covering used as well as new assets could introduce a fair amount of double counting where the used assets were purchased from another health services industry. Exclusion of used assets is consistent with the other sources shown in this table, which cover new purchases only.

The BEA-K series shown in Table 7 is not the same as the series published by BEA for the private health industry. In BEA's published estimates, capital is classified according to the industry owning the capital rather than the industry using the capital. Thus, some investment used by the health industry would be classified in the real estate and rental industries. Another convention used by BEA shifts capital purchased by nonprofit institutions to the real estate industry. In the BEA-K estimates shown, the nonprofit capital has been added back based on unpublished data from BEA.

The CFT shows the highest level in Table 7A for structures and equipment combined. The fact that a data source yields a higher estimate is not necessarily an indication of greater or less accuracy. The higher estimate could result from a biased procedure for imputing for missing reports. As indicated under "Quality of sample" above, it is difficult to come to firm conclusions about which data set is more accurate.

The ACES data are below the BEA-K series for all years. The ACES data through 1995 covered only firms with 5 or more employees. Beginning with 1996, the ACES covered firms with 1 or more employees. I have adjusted the 1992-95 estimates upward based on the relationship between these categories in 1996 (this adjustment was needed only for Table 6; for the hospital aggregation in Table 7, there was no difference between investment for those with 1 or more employees and those with 5 or more for 1996). For 1997, adding the used asset purchases would increase the level of the ACES estimates from $38,968 million (Table 7A) to $41,616 million, bringing the ACES series up from 98 percent of the BEA-K series to 105 percent. (However, as stated above, this addition would probably introduce double counting.) Allocating a proportionate share of the capital expenditures serving more than one industry, which is also available in the ACES publication, would increase the ACES by only about 0.4 percent.

However, adding a proportionate allowance for capital expenditures by "zero employee" firms could make a substantial difference in the ACES levels. These firms account for nearly 10 percent of capital expenditures for all private industries. Thus, adding a proportionate share to the private health industry (new capital only) would bring the level of the series for 1998 from 98 percent to more than 107 percent of the BEA-K estimate.

The BEA-K estimates are higher than the ACES estimates for structures and equipment combined, but the levels have been converging over the 1992-98 period. The difference in levels is more than accounted for by equipment. The VPIP structures series is below both the BEA-K and the ACES series.

Table 8A shows hospital investment data from the MCR, AHA, ACES, and CFT. For the first two of these, an aggregation of the private and state and local government is shown; then the MCR is shown with the ACES and CFT for the private sector hospitals. For the only two overlap years, the MCR and AHA show a mixed picture with the AHA slightly higher in 1992 and the MCR higher in 1993; the AHA is higher in both years for structures, and the MCR is higher in both years for equipment. For private hospitals, the ACES exceeds the MCR for every year (1993-97); the excess is more than accounted for by structures.

Direct comparisons of the state and local category are not available. This category was not available for the AHA data compiled for this study. State and local government tabulations are available only for MCR, but the tabulation prepared for this study does not include stand-alone Skilled nursing facilities and Home health agencies (although it does include such entities that are part of a hospital complex). The Government Finances-BEA estimates are not available separately for hospitals.

Comparison of trends

Table 7B compares the year-to-year percentage changes in the ACES and BEA-K measures for the period 1992-98, based on the levels presented in Table 7A. The structures part of the table also includes percentage changes for VPIP. The changes, which reflect changes in prices as well as quantities, exhibit some very large differences from year to year. It is often tempting to impugn an economic time series because it is erratic. But in the case of data on investment, it may be a mistake to do so because investment spending is by its nature erratic. In any case, the ACES and the BEA-K structures and equipment totals show about the same degree of volatility for the 1992-97 period (measured as the average percentage change without regard to sign).

The long-term trend (1992-98) shows ACES increasing nearly twice as rapidly as the BEA-K series, with the difference attributable mostly to the equipment component. The ACES is generally considered to have had start-up problems in the earlier years, and these may have affected equipment more than structures. The ACES equipment level is 88 percent of the BEA-K measure in 1998, up from 74 percent in 1992.

Table 8B compares the ACES and MCR trends for private hospitals only. For structures and equipment combined, the MCR series increases about 1½ times as rapidly as the ACES series for 1993-97 (hospitals were not separately available in the MCR for 1992). This difference is more than accounted for by structures where the MCR increases about 2½ times as rapidly as the ACES.

Part VI--Recommendations

This part of the paper offers recommendations to HCFA on what capital data should be included in the NHA. Two major recommendations are shown in the first section below. The short-term recommendations that follow elaborate on the major recommendations and indicate some improvements and refinements. HCFA should be able to implement some of these short-term recommendations in 2001, but some may require more time and resources. HCFA should complete these expansions as soon as practicable within the next few years.

The final section provides long-term recommendations some of which may require significant resources to research and implement. They are provided as a framework for future research.

Major recommendations

1. In 2001 HCFA should publish a more comprehensive measure of capital than is now available in the NHA.

2. The capital measures should *eventually* cover the following:

A. New investment, net stock at yearend, and depreciation.

B. Measures at acquisition prices, in price-adjusted dollars, and at current cost (for new investment, only valuation at acquisition prices and in price-adjusted dollars are needed because acquisition cost and current cost are identical).

C. All health care capital in the United States, with detail available separately for private, Federal government, and state and local government.

Short-term recommendations

3. For the next publication of the NHA (in 2001), HCFA should publish a set of investment estimates for the private health services industry using methodology similar to that used in the BEA capital stock estimates. The methodology should differ from that underlying the BEA estimates in three major respects. First, the HCFA estimates should be on "industry of use" rather than "industry of ownership" basis. Second, the HCFA estimates should include the investment of nonprofit institutions; this type of investment is classified in the real estate industry in the BEA's published estimates (the unpublished BEA estimates in Table 7 include the nonprofit investment in the health industry). Third, the procedures underlying the BEA estimates involve some steps for "balancing" to all-industry asset investment controls. In contrast, the HCFA estimates should contain no such balancing steps; the resulting estimates should provide a more appropriate measure of health industry investment for HCFA's purposes.

The procedures underlying the HCFA private estimates also differ from the BEA estimates in a number of minor ways. A more detailed description of the HCFA procedures appears in appendix C.

4. For the next publication of the NHA, HCFA should also publish a set of new fixed investment estimates for the government, separately for (1) Federal government and for (2) state and local government. Both the Federal and state and local government estimates should be the Government Finances-BEA estimates shown in Table 9. These estimates are reasonable for this purpose. They are timely and comprehensive and have the potential for providing investment flows on a price-adjusted basis as well as for providing capital stock and depreciation estimates in both current dollars and in real terms.

5. HCFA should develop a set of commodity-flow calculations following the procedures outlined earlier using data on manufacturers' shipments, exports, imports, and other data to estimate government equipment purchases by type of asset. The resulting estimates should be used to allocate the government equipment estimates discussed in the above recommendation to facilitate the calculation of real investment flows and current-dollar and real depreciation and capital stock estimates.

6. For both the private and government estimates, HCFA should publish structures and equipment separately. The private structures component is superior to the private component in the presently published HCFA construction series in that the proposed series includes an allocation of "office buildings" to the private medical industry.

7. HCFA should experiment with breaking out the flows of new investment recommended above by 3-digit (or combinations of 3-digit) SIC using data from the ACES. Although the ACES data are used, along with other data, to develop the HCFA estimates proposed in recommendation 3, the two sets of estimates are not identical. Therefore, HCFA should limit the proposed industry breakdowns to sidebar presentations.

Long-term recommendations

8. Addenda to the NHA should show counts (rather than dollar values) of the stock of assets of certain types of structures and equipment (e.g., hospitals, magnetic resonance imaging equipment, and CT scan equipment), rather than their dollar value. These data could be developed using a commodity-flow procedure such as the one described in this paper, except that only quantities (i.e., not dollar values) of the selected equipment would be counted. HCFA should use these investment flows along with information on average service lives (based on expert opinion where appropriate) to estimate the stock of available equipment in the economy.

9. HCFA should conduct research on measuring employment and hours of work in the health industry adjusted for education and experience of the work force (i.e., human capital). The Bureau of Labor Statistics procedures described in appendix A could provide the framework for this research. BLS was not able to estimate these measures by industry because labor skills are very portable between industries. But HCFA could develop measures of the number of college degrees and level of experience of various parts of the medical profession even though all of the qualified personnel are not actively engaged in the medical profession. The U.S. Office of Education publishes the annual number of degrees (bachelors, masters, and doctors) by field of study and by sex in the *Digest of Education Statistics*. The table includes more than 30 programs in the health professions. Persons with these degrees are less likely than most occupational categories to be employed outside of their industry, especially if medical research (private and government) is counted as part of the industry. The methodology would have to allow for increases in degrees due to immigration and decreases due to retirements and deaths, which would undoubtedly involve statistical assumptions. Also, source data on work experience in the health industry would be required. HCFA should <u>not</u> integrate a measure of "human capital" (labor input adjusted for education and experience) into the HCFA capital account. This category of expenditure has not traditionally been included with capital, it would be difficult to determine how to add it to capital, and it would tend to dilute capital in the NHA. Also, for similar reasons, I recommend separating any measures of research and development expenditures from capital in the NHA. These recommendations are consistent with both the SNA and the OECD manual on the health satellite accounts (see endnote 2).

10. HCFA should initiate a formal program of publishing aggregate estimates of capital (and perhaps other data) from the Medicare Cost Report Program. While the MCR contains a wealth of information, the data are difficult to access or to assess. In general, publication of formally edited, reviewed, and documented aggregates by a skilled staff would improve the program and allow users to better evaluate the results vis-à-vis other available data sources. The results of this effort along with ACES data should be used to monitor and improve the estimates published by HCFA

As part of this effort, the capital account of the MCR (Worksheet 7) should be carefully edited for reasonableness, follow-up telephone interviews should be used to verify unreasonable results, and imputation procedures should be developed for non-responses to the capital worksheet where follow-up responses cannot be obtained. These imputations could be based on relationships exhibited in data reported for similar institutions that do report the capital account. Or, the imputations could be based on other scientific procedures. HCFA should consult experts in their agency as well as experts in Federal government statistical agencies to determine the optimal imputation procedures. HCFA also should develop questions that provide statistics on the stock of medical capital. Once reliable levels are established, they should be used to benchmark the investment and capital stock estimates proposed in recommendation 3 above.

11. HCFA should initiate or support research to develop improved statistics to enable the measurement of productivity change in the private and government health industries. These improvements should include the development of models for the measurement of health industry output and the measurement of price changes that take into account technological improvements and the "outcomes" of medical services (such as the change in the average number of years of healthy life) rather than simply inputs (such as the number of hospital stays). This research should also include the development of efficiency profiles for various types of capital used in the medical industry and the development of improved measures of price change for capital used in the medical industry.

Part VII – Proposed Presentation for the National Health Accounts

Table 9 compares the presently published structure of the NHA with the structure proposed in this paper. The first 10 lines of the table are taken from "Health Spending in 1998: Signals of Change" published in the January/February 2000 issue of *Health Affairs*. The proposed presentation begins with line 11, which includes the word "Gross" to reflect the double counting that is inherent in combining consumption spending for health services with gross investment. Lines 12 through 15 are identical to the presently published lines. Line 16 is the same as the "Research" line (line 7) in the presently published NHA; however, the title has been changed slightly to reflect the fact that the coverage of this category (government and nonprofit) is consistent with the coverage of research in GDP. That is, private industry research is not a separate expenditure category in GDP, but it is instead embodied in the output of goods and services of the business sector. Appendix D discusses research and development spending in gross domestic product.

Lines 17-23 show gross fixed investment; structures and equipment are shown separately for private investment, and can be developed for each of the government lines (Federal and state and local). Lines 24 and 25 show the trends in gross health expenditures and in gross health expenditures as a percentage of GDP. These rates of growth and shares of GDP are very similar to the presently published numbers shown in lines 9 and 10.

Next the proposed presentation displays depreciation charges followed by net health expenditures and net investment. Depreciation charges are the deductions in transiting from gross health expenditures to net health expenditures and in transiting from gross fixed investment to net fixed investment. Government estimates are not yet available but they are proposed for inclusion in the NHA as they become available. These lines as well as the lines showing gross fixed investment should also be available in real, or price-adjusted, form for inclusion at a later time.

The more comprehensive presentation proposed for the future in the NHA provides for the later expansion from the widely used "gross" measures of expenditures and investment comparable to the nation's gross domestic product to the more conceptually desirable "net" measures of expenditures and investment as well as for measures of the stock of capital. These changes will move the NHA closer to conformity with the guidelines for satellite accounts in the SNA.

The availability of the net stock measures eventually will enable HCFA to conform even more closely with the international guidelines by presenting a table that integrates stocks and flows. BEA recently released such a table for the overall economy.[32]

Appendix A. Summary of BLS Procedure for Adjusting Labor Input for the Growth in Education and Experience

As discussed in Part I of this paper, the Bureau of Labor Statistics improved its measure of multifactor productivity in the early 1990's by "adjusting" labor input, one of the basic inputs considered in multifactor productivity, to account for the changes in the composition of the labor force. The material in this appendix is adapted from a report on that work, *Labor Composition and U.S. Productivity Growth, 1948-90*, (BLS Bulletin 2426, December 1993, by Larry Rosenblum). This BLS study built onto earlier research by Edward F. Denison, Dale Jorgenson, Frank Gallop, Barbara Fraumini, and Peter Chinloy.[33]

The labor-input component used in measuring productivity had traditionally focused on only the time dimension of labor input. Differences in the effectiveness of an hour of labor input were not taken into account. The effectiveness of labor can change due to a wide variety of factors: more or less effort on the part of the worker, a change in the capital available to the worker, or changes in the education and experience of the work force.

To measure labor input adjusted for education and experience, BLS separately weighted changes in the distribution of hours of workers in various education and experience strata by each group's share of employee compensation. Because the contribution of a worker's hour to output cannot be directly observed, the BLS measure uses hourly compensation as a proxy for differences in contribution to production. Using a wide variety of data sources, including the *Current Population Survey* and the decennial censuses, BLS developed annual matrixes of hours consisting of 7 levels of education and 72 work experience levels for men and women separately.[34] Hourly rates of compensation also are constructed for each year. These compensation measures are econometrically constructed in an effort to eliminate other factors, such as the proportion of part-time workers, from distorting the impact of the desired elements of labor composition, education, and experience.

The table below shows the average years of education and experience for men and women in the private business economy for selected years.

Year	Education		Experience	
	Men	Women	Men	Women
1950	9.2	10.2	19.1	12.5
1960	10.2	10.5	19.8	13.4
1970	11.5	11.5	19.4	13.1
1980	12.5	12.4	17.6	11.7
1990	13.0	13.0	17.8	12.1

For the private business economy, the average annual rate of growth of the labor force as measured by hours of work for the period 1948-90 was 1.0 percent while the measure of labor input adjusted for changes in composition in terms of education and experience was 1.3 percent. Thus, changes in the skill level of the labor force accounted for about 9 percent of the growth in labor input for the 1948-90 period.

Part VI of this paper recommends that a similar measure of labor input for the medical industry be developed by HCFA and included in the National Health Accounts.

Note that the OECD manual for a health satellite account contains an annex on "The Measurement of Human Resources in Health Care" (see endnote 2).

Appendix B. 1987 Standard Industrial Classification (SIC) Matched to 1997 North American Industrial Classification System (NAICS) for the Health Services Industry

1987 SIC	1987 U.S. SIC Description	1997 NAICS	1997 NAICS U.S. Description
80	Health services		
8011	Offices and Clinics of Doctors of Medicine		
	. Surgical and Emergency Centers	621493	Freestanding Ambulatory Surgical and Emergency Centers
	. HMO Medical Centers	621491	HMO Medical Centers
	. Offices of Physicians, Mental Health Specialists	621112	Offices of Physicians, Mental Health Specialists (pt)
	. Offices of Physicians Except Mental Health	621111	Offices of Physicians (except Mental Health Specialists) (pt)
8021	Offices and Clinics of Dentists	62121	Offices of Dentists
8031	Offices and Clinics of Doctors of Osteopathy	http://www.census.gov/epcd/naics/NAICS.HTM - N	
	. Offices of Doctors of Osteopathy, Except Mental Health	621111	Offices of Physicians (except Mental Health Specialists) (pt)
	. Offices of Doctors of Osteopathy, Mental Health Specialists	621112	Offices of Physicians, Mental Health Specialists (pt)
8041	Offices and Clinics of Chiropractors	62131	Offices of Chiropractors
8042	Offices and Clinics of Optometrists	62132	Offices of Optometrists
8043	Offices and Clinics of Podiatrists	621391	Offices of Podiatrists
8049	Offices and Clinics of Health Practitioners, NEC		
	. Mental Health Practitioners, Except Physicians	62133	Offices of Mental Health Practitioners (except Physicians)
	. Offices of Physical, Occupational, Recreational, and Speech Therapists and Audiologists	62134	Offices of Physical, Occupational and Speech Therapists, and Audiologists
	. Other Offices of Health Practitioners	621399	Offices of All Other Miscellaneous Health Practitioners
8051	Skilled Nursing Care Facilities		
	. Continuing Care Retirement Communities	623311	Continuing Care Retirement Communities (pt)
	. All Other Skilled Nursing Care Facilities	62311	Nursing Care Facilities (pt)
8052	Intermediate Care Facilities		

1987 SIC	1987 U.S. SIC Description	1997 NAICS	1997 NAICS U.S. Description
	. Continuing Care Retirement Communities	623311	Continuing Care Retirement Communities (pt)
	. Mental Retardation Facilities	62321	Residential Mental Retardation Facilities
	. Other Intermediate Care Facilities	62311	Nursing Care Facilities (pt)
8059	Nursing and Personal Care Facilities, NEC		
	. Continuing Care Retirement Communities	623311	Continuing Care Retirement Communities (pt)
	. Other Nursing and Personal Care Facilities	62311	Nursing Care Facilities (pt)
8062	General Medical and Surgical Hospitals	62211	General Medical and Surgical Hospitals (pt)
8063	Psychiatric Hospitals	62221	Psychiatric and Substance Abuse Hospitals (pt)
8069	Specialty Hospitals, Except Psychiatric		
	. Children's Hospitals	62211	General Medical and Surgical Hospitals (pt)
	. Substance Abuse Hospitals	62221	Psychiatric and Substance Abuse Hospitals (pt)
	. Other Specialty Hospitals	62231	Specialty (except Psychiatric and Substance Abuse) Hospitals
8071	Medical Laboratories		
	. Diagnostic Imaging Centers	621512	Diagnostic Imaging Centers
	. Medical Laboratories, Except Diagnostic Imaging Centers	621511	Medical Laboratories
8072	Dental Laboratories	339116	Dental Laboratories
8082	Home Health Care Services	62161	Home Health Care Services
8092	Kidney Dialysis Centers	621492	Kidney Dialysis Centers
8093	Specialty Outpatient Facilities, NEC		
	. Family Planning Centers	62141	Family Planning Centers (pt)
	. Outpatient Mental Health Facilities	62142	Outpatient Mental Health and Substance Abuse Centers
	. Other Specialty Outpatient Facilities	621498	All Other Outpatient Care Centers
8099	Health and Allied Services, NEC		
	. Blood and Organ Banks	621991	Blood and Organ Banks
	. Medical artists	54143	Graphic Design Services (pt)
	. Medical Photography	541922	Commercial Photography (pt)
	. Childbirth Preparation Classes	62141	Family Planning Centers (pt)
	. Other Health and Allied Services	621999	All Other Miscellaneous Ambulatory Health Care Services

This appendix was extracted from a file on the Census Bureau's website

Appendix C. Data Sources and Methodology for HCFA Estimates of Health Capital

This appendix is in two parts, private and government health capital

A. Private health industries

The procedures used to develop estimates of structures and equipment investment, and the associated measures of depreciation and net stock, for the private health services industry generally follow those used by the Bureau of Economic Analysis (BEA) for its estimates of capital stock and depreciation by industry.

In addition to developing estimates of total private investment spending for the health industry, estimates of investment spending by asset type are also included. The asset-type estimates for detailed structures and equipment types are needed for estimating the real measures and depreciation and net stocks.

Historical-cost estimates

The historical cost estimates are developed in four steps. First, estimates of investment by asset type are developed for benchmark years from BEA's Capital Flow Tables; second, these estimates are interpolated and extrapolated to other years using BEA estimates of historical-cost investment by asset type for all private industries; third, an annual investment control series for the health industry is established using several sources; finally, the annual investments by asset type are adjusted to the control series. These four steps are described in more detail below.

1. Asset-type investment benchmarks from the Capital Flow Tables

Capital Flow Tables (CFT) are produced by BEA as part of their benchmark Input-Output Tables and show the investment in new assets classified by using (i.e., purchasing) industry. Five CFTs have been published and an additional table for 1982 was not published but was made available on BEA's website.

The tables for the years below were published in the issues of the *Survey of Current Business* indicated.

Year	Issue of *Survey*
1963	August 1971
1967	September 1975
1972	July 1980
1977	November 1985
1992	December 1998

The 1963 table was recast by BEA to be consistent with the 1967 table in the 1975 publication; thus the August 1971 publication was not used for the HCFA estimates.

Benchmark estimates of investment in the private health industry by type of asset are consistent with BEA's estimates of fixed reproducible tangible wealth except that the estimates are on a "using industry" basis and the entire private health industry is included; the BEA estimates are on an "owning industry" basis, and BEA shifts the nonprofit part of the private health industry to the Real estate industry in their estimates. (However, note that BEA has made available unpublished estimates of investment by the health industry including the private nonprofit part, but on an owning-industry basis.)

The CFT for 1992 was the first to separate the health industry from Education, Social services, and Membership organizations. The industry grouping published in earlier CFTs, which had various titles over the years, included Heath, Education, Social services, Museums, art galleries, botanical and zoological gardens, and Membership organizations. The earlier years have been adjusted to the level of Health on the basis of the 1992 share of health in this group.

2. Interpolation of benchmarks

For most asset types, the technique used is to extrapolate from a benchmark level to the following year using the change in the corresponding all-industry series as a first approximation. This change, which is calculated as the ratio of the year following the benchmark to the benchmark year is adjusted for the average difference between the trend from that benchmark to the next and the trend in the all-industry extrapolator between the two benchmark years. This adjustment is derived as the nth root of the ratio of the trend in the benchmark series [BM(t)/BM(t-n)] to the trend in the extrapolator series [E(t)/E(t-n)] for the same period, where t equals the year of the second benchmark and n equals the number of years back to the preceding benchmark. The second year from the benchmark is then calculated in a similar manner beginning with the interpolated value for the first year, and so on as needed.

This procedure has the effect of distributing the difference in trend between the CFT controls and the all-industry interpolators between the benchmarks nearly in proportion to the annual changes in the interpolator. Extrapolation forward from 1992 and backward from 1963 was based on the corresponding all-asset industry investment series from BEA.

A different procedure was used in some special situations. First, where a benchmark level was zero, this procedure could not be used. Therefore, a linear interpolation between the zero level and the earlier and/or later benchmark level was substituted. Second, the transportation equipment categories—Trucks, buses, and truck trailers, Autos, and Aircraft—because they are dramatically impacted by cyclical fluctuations in the overall economy, were also interpolated linearly between CFT benchmarks.

3. Health industry controls

An important step in developing a control series is the establishment of a single benchmark level from which to extrapolate forward and backward. For this purpose, we selected the published CFT level for 1992 (this level does not include BEA's new Software category, which has been added as a later step). The Census Bureau's Annual Capital Expenditures Survey (ACES) is the most comprehensive up-to-date source for recent years (1992-1998 are currently available). Recall that the ACES levels for 1992-95 have been adjusted upward from the published ACES level to reflect the change in 1996 in ACES of excluding firms with fewer than 5 employees to excluding only firms with no employees.

The annual health industry control series was then extrapolated from 1992 to 1998 using ACES. The control series was extrapolated from 1992 back to 1987 using the Census Bureau data from the Assets and Expenditures Surveys (AES) for those two years. For the intervening years (1988-91), the interpolation procedure described in part 2 above was used where the first approximation was provided by the sum of the CFT interpolated series described in part 1 (this CFT interpolation can be considered to be a rough estimate of Health industry investment in the absence of alternative data).

Unfortunately, the AES could not be used to extrapolate the Health industry controls back to 1982. The 1982 AES did not cover the entire health industry (SIC 80), but instead only the health industry other than hospitals. Because hospitals were not separately identified, the AES could not be used even to extrapolate part of the industry back to 1982.

The health industry control series was extrapolated from 1987 back to 1960 using BEA's Plant and Equipment Survey (which was shifted to Census' responsibility in 1988). This measure is defective for this purpose in that it covers Personal and business services (which includes the health industry) as well as the Construction industry). For 1987 the Plant and Equipment Survey investment for this industry group was $30.04 billion, compared with a level of $25.38 billion for the extrapolated control series for Health.

4. Adjustment of investment by asset to the Health industry controls

This step was accomplished in a very simple way, raking the asset components using the ratio of the control to the sum of investment by asset type. Through 1986, the total investment series control was used; for 1987 forward, separate structures and equipment controls were used.

B. Government health investment

The government health investment estimates presented in Table 9 of this paper are BEA's estimates of Government gross investment in the Health functional category. This Federal government series is based largely on data compiled by BEA from Budget of the United States and other sources. The state and local government data are based largely on the Census Bureau's Government Finance survey described in the paper. The estimates have been adjusted to a calendar year basis by BEA. Also, the estimates include software (estimated by BEA) and net purchases of used structures (for state and local government, based on data provided by Census).

HCFA is presently exploring with BEA the possibility of obtaining separate estimates for Structures and Equipment. Also, HCFA will attempt to develop data on investment by type of asset in order to estimate depreciation and net stock of capital and estimates in real terms.

The BEA estimates are from NIPA Table 3.17—Selected Government Expenditures by Function, which appears regularly in the *Survey of Current Business*. BEA's methodology for estimating software is in "Recognition of Business and Government Software as Investment, Methodology and Quantitative Impacts, 1959-98" by Robert Parker and Bruce Grimm, available on BEA's website under papers prepared for the May 5, 2000, meeting of the BEA Advisory Committee.

Estimates of depreciation and the net stock of government health capital as well as estimates of real investment, depreciation, and net stocks are dependent upon the availability of investment flows by type of asset. As part of this study, HCFA is developing estimates of government investment by asset type. The methodology employed is the commodity-flow procedure described for estimating private investment in Part IV-2 of this paper. For the government estimates the procedure involves the following calculation for somewhat more commodity detail than that shown in Table 5B of this paper.

(Manufacturers' shipments + Imports - Exports – private investment) + Margins = Government gross investment in equipment.

Appendix D. Research and Development Expenditures in Gross Domestic Product

A major use of the NHA is as an indicator of national expenditures on health as a share of national production. In order to make this comparison as accurate as possible, the NHA should match as closely as possible the coverage of national production to which it is compared. In the most widely used measure of production, gross domestic product (GDP), Research and development expenditures (R&D) are recorded differently depending upon whether the expenditures are incurred by business, government, or nonprofit institutions. This appendix briefly discusses these expenditures.

The recording of R&D in GDP, as is the case for other expenditures in GDP, reflects the different goals and behavior of the spending sectors. In general, government consumption and investment spending is counted directly as part of GDP while only part of business spending—fixed investment—is counted directly as part of GDP. Other spending by business is considered to be "intermediate" purchases or current expenditures—costs that are reflected as part of what the business sells to consumers, to government, to other businesses, or to foreigners as exports. For example, spending by a government agency for transportation services would be counted directly as part of GDP while spending by a private business for transportation services would be counted as a part of sales and national production when it is embodied in "final sales" to consumers, government, or foreigners. R&D spending is treated in the same way as other types of spending—directly in GDP if spending by government and as intermediate if by business.

The description in the above paragraph of government spending refers to spending by "General government" only. "Government enterprises" are agencies that cover a substantial proportion of their operating costs by selling goods and services to the public and that maintain their own separate accounts. These agencies are treated as businesses in GDP, and so their intermediate purchases are also embodied in their sales. Examples of government enterprises are the U.S. Postal Service and state owned and operated liquor stores. Nonprofit organizations serving business (e.g., chambers of commerce) are also treated as part of the business sector. However, R&D spending by nonprofit organizations serving the household sector is counted directly as part of GDP. This is consistent with the treatment of all current expenditures of nonprofit institutions serving households, which are recorded directly as part of part of Personal consumption expenditures and of GDP.

Health agencies are, for the most part, general government agencies in Federal, state, and local governments. Thus, the current coverage of R&D in the NHA, government spending and nonprofit institutions is largely consistent with the recording of R&D in GDP.

Endnotes

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[1] "Productivity Growth in Health Care, Conceptual Problems in Measurement with Emphasis on Capital Input," by Frank C. Wykoff , Eldon Smith Professor of Economics at Pomona College, June 2000; and "Review of 'Capital in the National Health Accounts" by Jack E. Triplett, July 2000. Both of these papers are available on request from HCFA.

[2] A manual for a health satellite account, *A System of Health* Accounts, is available from the Organisation for Economic Co-operation and Development (or from their website, www.oecd.org). The recommendations in this paper are consistent with the OECD satellite account.

[3] Actually, the inputs in multifactor productivity as published by BLS also include three other commodities: Energy purchases, other purchased materials, and purchased services. The rates of increase of the five inputs are combined using weights that reflect their current compensation.

[4] *Economic Report of the President*, Transmitted to Congress February 1999, United States Government Printing Office (Washington, 1999), page 74.

[5] See *Statistical Abstracts of the United States*, 1996 Edition, Bureau of the Census, page 553, Table 964, U.S. Largest Public Companies—Profitability and Growth, 1994. Original Source is *Forbes Annual Report on American Industry* (copyright). In this table, health showed the highest rate of return on capital, 13.4 percent, and the highest rate on equity, 17.4 percent. Health had an above average return on revenues (8.1 percent compared with a 6.3-percent all industry average). Utilities showed one of the lowest rates of return.

[6] Counts of various types of medical capital by country are published by the Organisation for Economic Co-operation and Development on CD-ROM in *OECD Health Data Base 2000*, July 2000, available for purchase from the OECD website.

[7] See the two papers cited in footnote 1.

[8] Another concept that is often discussed is the price of capital services or the cost of using the asset. This is clearer in the case of a business using an asset that they do not own—in this case it is the rent. Most assets are, however, used by the owner, and the cost must be estimated. Such estimates involve information or assumptions about the depreciation, interest rates, and other elements of the cost.

[9] *System of National Accounts, 1993*, prepared under the auspices of the Inter-Secretariat Working Group on National Accounts (see the international agencies listed in the text). Brussels/Luxembourg, New York, Paris, Washington, D.C., 1993. Most of the wording in this section is from this publication, Chapter X The Capital Account, pp. 217ff.

[10] Several other types of investment are included in the NIPA's or in statistical programs related to the national economic accounts. In the NIPA's, net foreign investment is a broader concept than gross private domestic investment (GPDI). Net foreign investment is exports of goods and services, receipts of factor income (i.e., dividends, interests and retained earnings from foreign entities), and net capital grants received by the United States, less imports of goods and services, payments of factor income, and net transfer payments to the rest of the world. Thus, it may be viewed in a broad sense as the net acquisition of foreign assets by U.S. residents less the net acquisition of U.S. assets by foreign residents. But the assets involved can include financial assets as well as fixed assets and inventories. The financing of net foreign investment (i.e., the capital account of the Balance of Payments Accounts) can therefore take many forms; for example, the purchase of a foreign subsidiary by a U.S. parent corporation, an increase in foreign currency held by the U.S. Government, etc.

[11] The adjustments to tax return depreciation that are necessary to achieve the desired concepts of the NIPAs also reflect the differences that apply to capital spending; they are summarized in a table that appears regularly in the NIPA tables. See "NIPA Tables," Table 8.20, Relation of Consumption of Fixed Capital in the NIPA's to Depreciation and Amortization as Published by the Internal Revenue Service, *Survey of Current Business*, volume 80, August 2000.

[12] This section draws on Accounting*: The Basis for Business Decisions*, by Walter B. And Robert F. Meigs, Seventh Edition, McGraw-Hill, 1987.

[13] Land is not usually considered fixed capital. New raw land cannot be created by the economy. Land is not a depreciable asset in national accounting, tax accounting, or business accounting. The cost of developing land is usually considered a part of fixed investment and is often embedded in the value of structures. Residential capital is not considered in this paper. While many users of nursing homes and long-term care facilities are considered residents, investment in these facilities is usually classified under non-residential capital.

[14] *Annual Capital Expenditures, 1998*, U.S. Department of Commerce, Census Bureau, April 2000, page C-4.

[15] See *Benchmark Input-Output Accounts of the United States*, U.S. Department of Commerce, Bureau of Economic Analysis, Washington, DC: U.S. Government Printing Office, 1998, page M-5.

[16] *Standard Industrial Classification Manual: 1987*, Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402, Stock No. 041-001-00314-2.

[17] See *Annual Capital Expenditures, 1998*, U.S. Department of Commerce, Census Bureau, April 2000, for a description of the survey.

[18] Two other Census Bureau programs that contain data on capital expenditures are not covered in this paper. The 5-year economic Censuses include data on capital expenditures and depreciable assets for mining, construction, and manufacturing establishments, and the Business Expenditures Survey (formerly the Assets and Expenditures Survey), also conducted as part of the 5-year censuses for wholesale trade, retail trade, and selected service industries, includes data on capital expenditures.

[19] This section based largely on "Investment in New Structures and Equipment in 1992 in Using Industries," by Belinda Bonds and Tim Aylor, *Survey of Current Business*, Volume 78, December 1998, pp. 26-37.

[20] Generally Input-Output Tables and Capital Flow Tables are prepared at 5-year intervals corresponding to the economic censuses. Appendix C contains more information on these tables.

[21] The 1987 table was a proxy developed by BEA.

[22] See "Improved Estimates of Fixed Reproducible Tangible Wealth" by Arnold J. Katz and Shelby W. Herman, *Survey of Current Business*, Volume 77, May 1997, pp. 69-92. See also *Fixed Reproducible Tangible Wealth of the United States, 1925-94*, published by BEA in August 1999.

[23] See "Updated Summary Methodologies," *Survey of Current Business*, Volume 78, September 1998, pp. 31-32.

[24] See "The Measurement of Depreciation in the National Income and Product Accounts" by Barbara M.Fraumini, *Survey of Current Business*, Volume 77, July 1997, pp. 7-23.

[25] The source for all American Hospital Association data presented in this paper is the AHA Annual Survey, Health Forum, LLC, a subsidiary of the American Hospital Association. All data are copyrighted (1998) by Health Forum, LLC.

[26] Alabama, the District of Columbia, and Michigan fiscal years end September 30; New York, March 31; and Texas, August 31.

[27] "Government Spending by Function: A New Presentation" by Karl Galbraith, *Survey of Current Business*, Volume 80, June 2000. See Table 3.17 Selected Government Spending by Function. Also as noted in the article, a final version of COFOG was approved by the United Nations Statistical Commission in March 1999 and published in *Classification of Expenditures According to Purpose*, Statistical Papers, Series M, No. 84 (New York: United Nations).

[28] A complete enumeration is often considered to be the optimal estimation tool. However, complete enumerations (or censuses) are rare and more expensive than a sample. Even the economic censuses conducted by the Census Bureau often do not enumerate very small businesses, and the Census Bureau has proposed estimating some demographic counts in the decennial census of population for 2000 by means of sampling rather than by complete enumeration.

[29] Unpublished table "Number of Hospitals Reporting by Source," prepared by Charlie Fisher, Jing Xing Technologies Inc., August 1999.

[30] In BEA's Capital Stock Program, only the total private health industry as defined by BEA (i.e., excluding capital purchased by nonprofit institutions) is available in price-adjusted form.

[31] In some of the earlier CFTs, the allocation of capital by industry was based on data such as sales that had an even weaker relationship to the use of capital.

[32] See "Fixed Assets and Consumer Durable Goods: Estimates for 1925-98 and New NIPA Table—Changes in Stock of Produced Assets" by Shelby W. Herman, *Survey of Current Business*, volume 80, April 2000, pp. 17-30.

[33] Edward F. Denison, *Trends in American Economic Growth, 1929-82*, Brookings Institution, (Washington, DC, 1985); D. Jorgenson, F. Gallop, B. Fraumini, *Productivity and Economic Growth*, Harvard University Press, (Cambridge, MA, 1987); and Peter Chinloy, "Sources of Quality Change in Labor Input," *Amercan Economic Review*, March 1980, pp. 108-119.

[34] A matched sample of *Current Population Survey* Social Security work histories and Internal Revenue Service records for the year 1973 provided the basis for these annual matrices.

Table 1. Capital Requirements Per Worker

Adapted from *National Income Analysis* by Charles L. Schultze

	Business less housing	Health services
	(1)	(2)
1998		
a. Gross Product (bil. $)	6725.4	598.3
b. Net capital stock (end of year; bil. $)	9449.9	472.6
c. Work force (millions)	111.6	11.5
d. Capital stock per worker (thous. $)	84.7	41.1
e. Work force growth (percent per year)	2.5	2.3
f. Capital used up (percent per year)	8.8	6.7
g. Increase in capital per worker (percent per year)	3.4	4.6
1999-2001		
h. Projected capital requirements (bil.$ per year)		
1. Replacement	831.6	31.7
2. Needed for new workers	236.2	10.9
3. Increase in capital/worker	329.3	22.2
4. Total investment	1397.2	64.8
I. Investment as percent of product	20.8	10.8

Concept adapted from Charles L. Schultze, *National Income Analysis*, Foundations of Modern Economics Series, Otto Eckstein, Ed. Pages 138-39, third edition, 1971. Health services column added and other figures updated as indicated on the next page.

Source Notes for Table 1

In the source notes below, the first source (1) refers to the first column of numbers in the table, "Business less housing," and the second source (2) refers to the second column of numbers, "Health services."

Line a -- (1) National Income and Product Accounts (NIPAs) Table 1.7, line 2 less line 5, August 2000 *Survey of Current Business*; (2) The health services industry measure of gross domestic product by industry (see "Improved Estimates of Gross Domestic Product by Industry for 1947-98," by Sherlene K.S. Lum, Brian C. Moyer, and Robert E. Yuskavage, *Survey of Current Business*, June 2000. The private health industry was adjusted upward to include an allowance for employees working in health services but employed by government.

Line b -- (1) private, non-residential net stock of capital in current dollars from table 1 of "Fixed Assets and Consumer Durable Goods Estimates for 1925-98 and New NIPA Table--Changes in Net Stock of Produced Assets," by Shelby W. Herman, Survey of Current Business, April 2000. (2) Table 5 the same source but adjusted upward to include the government health activity (see line a) and the non-profit portion of the private health industry, based on unpublished investment data from the Bureau of Economic Analysis.

Line c -- (1) persons engage in production (sum of full-time equivalent employment and the self employed) for private industries, August 2000 *Survey of Current Business*, NIPA table 6.8C. (2) Same table for the private health services industry adjusted to include government employees working in "Health and hospitals" field (adjustment similar to line a). Data for this adjustment from *Statistical Abstracts of the United States, 1998*, Table 531--All Governments, Employment and Payroll, by Function, 1995. The 1995 figures were extrapolated to 1998 by private persons engaged from the NIPA table mentioned above.

Line d -- (1) and (2) -- line b/line c.
Line e -- (1) and (2) -- percentage increase in line c from 1995 to 1998 at an annual rate.

Line f -- (1) BEA measure of depreciation in current cost for 1998 (not shown here) as a percent of line a for the end of 1997. (2) Similar measure for the private health industry, except 1997 depreciation taken as a percent of end of 1996 net stock.

Line g -- (1) and (2) -- percentage increase in line d from 1995 to 1998 at an annual rate.
Line h1 -- (1) and (2) -- product of line b and line f.

Line h2 -- (1) and (2) -- growth in new workers (line c X line e) multiplied by capital stock per worker (line d).

line h3 -- (1) and (2) -- capital needed for workers, including new workers (line b + line h2) multiplied by the growth in capital per worker (line g).

Line h4 -- (1) and (2) -- sum of lines h1, h2, and h3.
Line i --(1) and (2) -- line h4 as a percent of line a.

NOTE: The latest year for which gross domestic product in the private health industry is available is 1998.

Table 2.--Relationship of the Definitions of Capital to the Major Uses of Capital

Uses of Capital	Definitions of Capital: Financial	Non-financial: Produced: Fixed assets	Non-financial: Produced: Inventories	Non-financial: Produced: Valuables	Non-financial: Non-Produced: Land	Non-financial: Non-Produced: Uncultivated assets	Non-financial: Non-Produced: Mineral deposits	Non-financial: Non-Produced: Intangible assets
Policy issues	X	X	X	....	....	....	....	....
Productivity	....	X	X	....	X	....	....	....
Capital intensity	....	X	....	....	....	....	....	....
Rates of return	X	X	X	....	X	....	....	....
Capacity	....	X	X	....	X	....	....	....
Market analyses	....	X	X	....	....	....	....	....

X indicates a strong relationship between the uses and the definitions; leaders indicate no relationship or a weak relationship

Definitions of capital are based on the System of National Accounts. See text, Part II.

Table 3.--Statistical Characteristics of Sources of Fixed Investment Data for Health

	Type of sample (1)	Frequency (2)	Timeliness: Latest year available (3)	Timing of reporting (4)	Real, or price-adjusted, measures available (5)	End-of-year stocks available (6)
Construction Put-in-place Survey	Probability	Monthly *	1999	Put in place	Yes	No
Commodity Flow Procedure	Hybrid	Annual **	1999	Delivery	Yes	No
Annual Capital Expenditures Survey	Probability	Annual	1998	Hybrid	No	No
Capital Flow Table	Hybrid	5-year intervals	1992	Hybrid	No	No
BEA Capital Stock Program	Hybrid	Annual	1999	Hybrid	Yes	Yes
HCFA Medicare Cost Report	Self selecting	Annual	1998	Hybrid	No	Yes
AHA Annual Survey	Self selecting	Annual	1993	Hybrid	No	Yes
Government Finances	Probability	Annual	1997***	Hybrid	No	No

Abbreviations: BEA - Bureau of Economic Analysis; HCFA - Health Care Financing Administration; AHA - American Hospital Association.

* Annual estimates derived as sum of the months.

** Most recent 2 years are extrapolated using less detailed quarterly estimates, based on an abbreviated procedure.

*** Fiscal year 1997.

Table 4.--Coverage of Sources of Fixed Investment Data for Health Industry

	Coverage of		
	Sector: Private/ Government	Structures/ equipment	Health Industry, Assets, or Institutions
Construction Put-in-place Survey	Both	Structures	Type of institution: Private: Hospital and institutional includes health care institutional facilities, sanatoria convalescent and rest homes, nursing homes, orphanages, and similar establishments for prolonged care, and surgical and outpatient clinics affiliated with a hospital. Federal: Health care and institutional facilities such as veterans' hospital and clinics. State and local: Health care and institutional facilities such as hospitals, clinics and infirmaries, rest homes, nursing homes, sanatoria, psychiatric institutions, schools for the handicapped, orphanages, half-way homes, outpatient clinics, etc. All of the asset types exclude buildings used primarily as offices
Commodity Flow Procedure	Private	Equipment	Industry: None Asset type: Various types of capital equipment similar to the asset types shown in table 5A
Annual Capital Expenditures Survey	Private	Both	Industry: SIC 80 and SIC 830, "Social services institutions" by company of purchaser Asset type: Total structures and total equipment annually; detail by type of structure at 5-year intervals (see table 6)
Capital Flow Table	Private	Both	Industry: SIC 80 by establishment, based on using industry Asset type: Various types of structures and equipment as shown in tables 5A and 5B
BEA Capital Stock Program	Private	Both	Industry: SIC 80 by establishment, based on owning industry Asset type: Various types of structures and equipment, approximately as shown in table 5A
HCFA Medicare Cost Report	Both	Both	Industry: SIC 80 4 asset types: Buildings and fixtures, building improvements, fixed equipment, and movable equipment
AHA Annual Survey	Both	Both	Industry: SIC 806, Hospitals 4 asset types: Buildings and improvements, fixed equipment, movable equipment, and construction in progress
Government Finances	Government	Both	Function: Social services and income maintenance, which includes Public welfare, Hospitals, Health, and "Other"

Abbreviations: AHA - American Hospital Association, BEA - Bureau of Economic Analysis, HCFA - Health Care Financing Administration, SIC Standard Industrial Classification.

Notes:
SIC 80 includes (1) offices and clinics of doctors of medicine and osteopathy, (2) offices and clinics of dentists, (3) offices and clinics of other health care practicioners, (4) nursing and personal care facilities, (5) hospitals, (6) home health care services, and (7) other health and allied services. These seven categories are are published separately in the Annual Capital Expenditure Survey for beginning in 1997; less detail is available for earlier years. Institutions reporting in the the Medicare Cost Report program are also identified by type of control: voluntary nonprofit (church or other), proprietary (individual, corporation, partnership, or other), governmental (Federal, city-county, county, state, hospital district, city, or other). They are also identified by type of hospital: general short term, general long term, cancer, psychiatric, rehabilitation, or other. Institutions reporting to the AHA are identified by type: Federal, nonfederal (psychiatric, tuberculosis and other respiratory, long-term general and other special, short-term general and other special, and hospital units of institutions). The short-term general and other special category is broken down into: not-for-profit, investor owned (for profit), and State and local government. A separate grouping of "Community hospitals" is also broken down into these latter three categories.

Table 5A.--New Structures and Equipment Purchased by the Private Health Services Industry, by Asset Type from BEA's Capital Flow Table 1992

(Millions of dollars in purchasers' prices)

Asset type	Total	Hospitals	Other health services
Computers and peripheral equipment	725	563	162
Office equipment	257	161	96
Communication equipment	119	79	40
Instruments	11,576	7,221	4,355
Photocopy and related equipment	226	135	91
Fabricated metal products	33	28	5
Engines and turbines	0	0	0
Metalworking machinery	12	10	2
Special industry machinery	2	2	0
General industrial, including material handling equip.	31	26	5
Electrical transmission, distribution and industrial apparatus	31	27	4
Trucks, buses and truck trailers	24	12	12
Autos	283	117	166
Aircraft	9	9	0
Ships and boats	0	0	0
Railroad equipment	0	0	0
Furniture and fixtures	909	653	256
Tractors	22	14	8
Agricultural machinery, except tractors	0	0	0
Construction machinery, except tractors	0	0	0
Mining and oilfield machinery	0	0	0
Service industry machinery	320	217	103
Electrical equipment, nec	5,369	3,075	2,294
Other nonresidential equipment	188	170	18
Residential	0	0	0
Total new equipment	20,136	12,519	7,617
Industrial buildings	110	110	0
Commercial buildings	2,264	1,912	352
Religious buildings	0	0	0
Educational buildings	0	0	0
Hospital and institutional buildings	11,077	7,943	3,134
Other nonresidential buildings, including farm	82	68	14
Electric light and power	375	375	0
Other	0	0	0
Total new structures	13,908	10,408	3,500
Total new structures and equipment	34,044	22,927	11,117

nec - not elsewhere classified.

Source: Table 2 of "Investment in New Structures and Equipment in 1992 by Using Industry" by Belinda Bonds and Tim Aylor, *Survey of Current Business*, December 1998.

Table 5B.--New Equipment Purchased by the Private Health Services Industry by Commodity from BEA's Capital Flow Table

(Millions of dollars in purchasers' prices)

CFT Industry code	Commodity	Total	Hospitals	Other health services
1094	Uranium-radium-vanadium ores	6	5	1
2273	Carpets and rugs	54	41	13
2521	Wood office furniture	17	9	8
2522	Office furniture, except wood	209	112	97
2531	Public building and related furniture	44	33	11
2541	Wood, partitions and fixtures	45	26	19
2542	Partitions and fixtures, except wood	53	33	20
2591	Drapery hardware and window blinds and shades	24	17	7
2599	Furniture and fixtures, n.e.c.	475	396	79
3069	Fabricated rubber products, n.e.c.	1	1	0
3086	Plastics foam products	4	3	1
3425	Saw blades and handsaws	1	1	0
3443	Fabricated plate work (boiler shops)	5	5	0
3444	Sheet metal work	8	5	3
3494	Valves and pipe fittings, n.e.c.	2	2	0
3498	Fabricated pipe and fittings	2	2	0
3499	Fabricated metal products, n.e.c.	7	6	1
3523	Farm machinery and equipment	8	5	3
3524	Lawn and garden equipment	22	14	8
3535	Conveyors and conveying equipment	3	0	3
3537	Industrial trucks and tractors	4	4	0
3546	Power-driven handtools	11	9	2
3559	Special industry machinery, n.e.c.	1	1	0
3561	Pumps and pumping equipment	3	3	0
3563	Air and gas compressors	8	7	1
3567	Industrial furnaces and ovens	3	2	1
3569	General industrial machinery, n.e.c.	8	8	0
3571	Electronic computers	275	214	61
3572	Computer storage devices	156	122	34
3575	Computer terminals	88	67	21
3577	Computer peripheral equipment, n.e.c.	176	134	42
3578	Calculating and accounting machines	12	7	5
3579	Office machines, n.e.c.	71	43	28
3582	Commercial laundry equipment	66	31	35
3585	Refrigeration and heating equipment	67	61	6
3586	Measuring and dispensing pumps	2	2	0
3589	Service industry machinery, n.e.c.	172	114	58
3596	Scales and balances, except laboratory	4	4	0
3621	Motors and generators	3	3	0
3625	Relays and industrial controls	1	1	0
3629	Electrical industrial apparatus, n.e.c.	18	14	4
3632	Household refrigerators and freezers	4	2	2
3635	Household vacuum cleaners	8	6	2
3648	Lighting equipment, n.e.c.	22	0	22
3651	Household audio and video equipment	9	8	1
3661	Telephone and telegraph apparatus	92	61	31
3663	Radio and tv communications equipment	8	3	5
3699	Electrical equipment, and supplies, n.e.c.	1	1	0

CFT Industry code	Commodity	Total	Hospitals	Other health services
3711	Motor vehicles and car bodies	295	123	172
3713	Truck and bus bodies	6	3	3
3715	Truck trailers	6	3	3
3721	Aircraft	9	9	0
3821	Laboratory apparatus and furniture	385	295	90
3823	Process control instruments	36	36	0
3824	Fluid meters and counting devices	3	3	0
3825	Instruments to measure electricity	7	7	0
3826	Analytical instruments	65	52	13
3827	Optical instruments and lenses	27	23	4
3829	Measuring and controlling devices, n.e.c.	8	7	1
3841	Surgical and medical instruments	8309	5147	3162
3842	Surgical appliances and supplies	1586	1537	49
3843	Dental equipment and supplies	1014	28	986
3844	X-ray apparatus and tubes	2220	759	1461
3845	Electromedical equipment	2864	2149	715
3861	Photographic equipment and supplies	180	100	80
3999	Manufacturing industries, n.e.c.	113	113	0
7370	Computer and data processing services	32	28	4
8710	Engineering & architectural services	688	449	239
	Total	20136	12519	7617

Source: Unpublished data underlying table 1 of "Investment in New Structures and Equipment in 1992 by Using Industry" by Belinda Bonds and Tim Aylor, *Survey of Current Business*, December 1998.
Note that the published table 1 is in producers' prices. This table is in purchasers' prices and shows only the commodities that provide capital equipment to the Hospital and Other health services industries.

Table 6.--Capital Expenditures for in the Private Health Services Industry, Companies With Employees New and Used, by Type of Structure and Type of Equipment from the Census Bureau's Annual Capital Expenditures Survey, 1998

[Millions of dollars]

Asset type	Total	New	Used
Total, structures and equipment	41616	38968	2648
Total structures	20277	18207	2070
Residential	685	377	308
Industrial buildings	70	69	1
Offices	3944	3257	687
Commercial buildings	49	35	14
Health care	15414	14370	1044
Amusement and recreation facilities	56	40	16
Utility structures and facilities	11	11	0
Other buildings	12	12	0
Other non-building structures	36	36	0
Total equipment	21339	20761	578
Information processing	19043	18660	383
Industrial equipment	314	311	3
Transportation equipment	379	349	30
Energy, electrical, and related eq.	76	55	21
Miscellaneous equipment	1336	1264	72
Other equipment	191	122	69

Source: *Annual Capital Expenditures, 1998*, US Census Bureau, April 2000, Tables 5 and 7.

Table 7A.--Comparison of Alternative Estimates of Fixed Investment in Private Health Industry: Levels

[Millions of dollars]

	1982	1983	1984	1985	1987	1992	1993	1994	1995	1996	1997	1998
Structures and equipment												
ACES	....	....	....	....	....	29,489	29,208	30,764	31,259	32,748	34,711	38,968
CFT	17,643	....	....	....	23,747	34,044	....	....	....	....	....	....
BEA-K	16,261	19,012	19,541	18,079	20,970	33,423	33,893	33,229	32,842	34,662	37,379	39,738
Structures												
VPIP	7,204	8,089	7,808	6,969	7,614	11,487	12,492	12,268	11,248	11,780	13,546	13,663
ACES	....	....	....	....	....	14,879	15,026	16,067	15,822	16,362	17,377	18,207
CFT	8,402	....	....	....	10,521	13,908	....	....	....	....	....	....
BEA-K	10,010	11,129	11,075	10,242	11,049	13,732	14,845	14,750	13,821	14,574	16,037	16,039
Equipment												
ACES	....	....	....	....	....	14,610	14,182	14,697	15,437	16,386	17,334	20,761
CFT	9,241	....	....	....	13,226	20,136	....	....	....	....	....	....
BEA-K	6,251	7,883	8,466	7,837	9,921	19,691	19,048	18,479	19,021	20,088	21,342	23,699

Abbreviations and sources: VPIP - value of new construction put in place, "Construction Reports, Series C-30, Value of New Construction Put in Place," Census Bureau. ACES - Annual Capital Expenditures Survey, Census Bureau. Data shown are for new investment; data for 1992-95 have been adjusted from the level of companies with 5 or more employees to the level of companies with 1 or more employees on on the basis of data for 1996. CFT - Commodity Flow Table, part of the Input-Output Tables program, published by the Bureau of Economic Analysis. BEA-K - BEA's capital stock program, unpublished data. Data are consistent with BEA's comprehensive revision released in October 1999 except that estimates exclude software.

Table 7B.--Comparison of Alternative Estimates of Fixed Investment in Private Health Industry: Changes

	[Percent change from preceding year]						[Percent change]
	1993	1994	1995	1996	1997	1998	1992-98
Structures and equipment							
ACES	-1.0	5.3	1.6	4.8	6.0	12.3	32.1
BEA-K	1.4	-2.0	-1.2	5.5	7.8	6.3	18.9
Structures							
VPIP	8.7	-1.8	-8.3	4.7	15.0	0.9	18.9
ACES	1.0	6.9	-1.5	3.4	6.2	4.8	22.4
BEA-K	8.1	-0.6	-6.3	5.4	10.0	0.0	16.8
Equipment							
ACES	-2.9	3.6	5.0	6.1	5.8	19.8	42.1
BEA-K	-3.3	-3.0	2.9	5.6	6.2	11.0	20.4

Abbreviations and sources: See table 7A.

Table 8A.--Comparison of Alternative Estimates of Fixed Investment in Hospitals: Levels

[Millions of dollars]

	1992	1993	1994	1995	1996	1997
Private and State and local government						
			Structures and equipment			
MCR	18,583	21,989	24,375	24,140	26,256	26,782
AHA	19,638	19,657	....	....	....	....
			Structures			
MCR	7,186	9,673	11,740	11,411	12,703	12,897
AHA	9,078	10,730	....	....	....	....
			Equipment			
MCR	11,397	12,316	12,635	12,729	13,553	13,885
AHA	10,560	8,927	....	....	....	....
Private only						
			Structures and equipment			
ACES	....	19,710	20,469	20,793	21,315	22,068
CFT	22,927	....	....	....	....	....
MCR	16,003	18,527	20,222	19,596	21,491	22,021
			Structures			
ACES	....	10,753	11,315	11,141	11,142	11,721
CFT	10,408	....	....	....	....	....
MCR	6,160	8,186	9,676	8,987	10,006	10,206
			Equipment			
ACES	....	8,957	9,154	9,652	10,173	10,347
CFT	12,519	....	....	....	....	....
MCR	9,843	10,341	10,546	10,609	11,485	11,815

Abbreviations and sources: ACES - Annual Capital Expenditures Survey, Census Bureau. Data shown are for new investment; it was not necessary to adjust data for 1992-95 from the level of companies with 5 or more employees to the level of companies with 1 or more employees as in table 7A because there were no hospitals in either the "5 or more employees" or "1 or more employees" categories. CFT - Commodity Flow Table, part of the Input-Output Tables program, published by the Bureau of Economic Analysis. MCR - Medicare Cost Report, an administrative program of the Health Care Financing Administration. AHA - American Hospital Association Annual Survey. Unpublished data tabulated by AHA for this study, copyrighted 1998 Health Forum, LLC. The 1992 and 1993 estimates derived from AHA tabulations by differencing end-of-period balances.

Note: The available data for the State and local only category are not comparable and therefore no direct comparisons are shown. This category was not available for the AHA data compiled for this study. State and local government tabulations are available for the MCR, but the tabulation prepared for this study does not include stand-alone Skilled nursing facilities and Home health care agencies. The Government Finances - BEA data are not available separately for Hospitals.

Table 8B.--Comparison of Alternative Estimates of Fixed Investment in Hospitals: Changes

	[Percent change from preceding year]					[Percent change]
	1993	1994	1995	1996	1997	1993-97
	Structures and equipment					
Private						
ACES	....	3.9	1.6	2.5	3.5	12.0
MCR	15.8	9.1	-3.1	9.7	2.5	18.9
	Structures					
Private						
ACES	....	5.2	-1.5	0.0	5.2	9.0
MCR	32.9	18.2	-7.1	11.3	2.0	24.7
	Equipment					
Private						
ACES	....	2.2	5.4	5.4	1.7	15.5
MCR	5.1	2.0	0.6	8.3	2.9	14.3

Abbreviations and sources: See table 8A.

Table 9.--Comparison of Published and Proposed National Health Accounts
(Amount in Billions of Current Dollars, Except as Noted)

As Presently Published

	Line	1980	1990	1993	1994	1995	1996	1997	1998
National Health Expenditures	1	247.3	699.3	898.5	947.9	993.8	1042.5	1088.3	1149.0
Health Services and Supplies	2	235.6	674.8	869.5	917.4	963.1	1010.6	1053.5	1113.6
Personal Health Care *	3	217.0	614.7	790.5	834.0	879.1	924.0	968.6	1019.3
Program Administration and Net Cost of Private Health Insurance	4	11.9	40.5	53.7	55.2	53.6	52.1	50.3	57.7
Government and Public Health Activities	5	6.7	19.6	25.3	28.2	29.8	31.3	34.6	36.6
Research and Construction	6	11.7	24.5	29.0	30.5	30.7	32.0	34.8	35.4
Research	7	5.5	12.2	14.5	15.9	16.7	17.2	17.9	19.9
Construction	8	6.2	12.3	14.5	14.6	14.0	14.8	16.9	15.5
National Health Expenditures Percent Change from preceding column at annual rate	9	....	11.0	8.7	5.5	4.8	4.9	4.4	5.6
As a Percent of Gross Domestic Product	10	8.8	12.1	13.5	13.4	13.4	13.3	13.1	13.1

As Proposed

	Line	1980	1990	1993	1994	1995	1996	1997	1998
Gross Health Expenditures	11	264.0	727.5	931.7	982.4	1030.9	1082.2	1129.3	1198.3
Health Services and Supplies	12	235.6	674.8	869.5	917.4	963.1	1010.6	1053.5	1113.6
Personal Health Care *	13	217.0	614.7	790.5	834.0	879.1	924.0	968.6	1019.3
Program Administration and Net Cost of Private Health Insurance	14	11.9	40.5	53.7	55.2	53.6	52.1	50.3	57.7
Government and Public Health Activities	15	6.7	19.6	25.3	28.2	29.8	31.3	34.6	36.6
Public and Nonprofit Research	16	5.5	12.2	14.5	15.9	16.7	17.2	17.9	19.9
Gross Fixed Investment	17	22.9	40.5	47.7	49.1	51.1	54.4	57.9	64.8
Private	18	18.7	31.8	36.6	38.1	39.2	41.3	43.8	49.8
Structures	19	7.4	13.7	14.0	15.0	14.8	15.3	16.2	17.0
Equipment	20	11.3	18.1	22.6	23.1	24.4	26.0	27.6	32.8
Government **	21	4.2	8.7	11.1	11.0	11.9	13.1	14.1	15.0
Federal	22	1.3	2.9	3.9	3.9	4.4	5.1	5.6	6.4
State and Local	23	2.9	5.8	7.2	7.1	7.5	8.0	8.5	8.6
Gross Health Expenditures: Percent Change from Preceding Column at Annual Rate	24	....	10.7	8.6	5.4	4.9	5.0	4.4	6.1
As a Percent of Gross Domestic Product	25	9.4	12.5	14.0	13.9	13.9	13.9	13.6	13.6
Depreciation Charges (current year)	26	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Private	27	15.8	24.9	29.6	31.0	32.5	33.6	34.9	36.7
Structures	28	6.1	9.6	10.3	10.8	11.3	11.6	12.1	12.6
Equipment	29	9.7	15.3	19.3	20.2	21.2	22.0	22.8	24.1
Government **	30	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Federal	31	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
State and Local	32	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

	Line	1980	1990	1993	1994	1995	1996	1997	1998
Net Health Expenditures	33	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Net Fixed Investment	34	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Private	35	14.5	23.1	25.5	27.1	27.3	28.2	29.7	34.8
Structures	36	6.1	10.8	10.1	11.1	10.4	10.2	10.6	10.6
Equipment	37	8.4	12.3	15.4	16.0	16.9	18.0	19.1	24.2
Government **	38	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Federal	39	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
State and Local	40	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Net Health Expenditures:									
Percent Change from Preceding Column at Annual Rate	41	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
As a Percent of Net Domestic Product	42	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Addenda:									
Net Stock of Health Fixed Capital	43	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Private	44	361.9	558.5	617.9	649.7	670.5	693.3	730.2	764.9
Structures	45	299.4	467.2	510.3	537.8	553.6	572.2	604.2	630.5
Equipment	46	62.5	91.3	107.6	111.9	116.9	121.1	126.0	134.4
Government **	47	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Federal	48	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
State and Local	49	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Gross Domestic Product	50	2795.6	5803.2	6642.3	7054.3	7400.5	7813.2	8318.4	8790.2
Net Domestic Product	51	2450.3	5092.0	5829.5	6179.4	6488.8	6857.0	7305.0	7712.9

* Personal Health Care in both the presently published and proposed presentations includes lines not shown in this table.
** Separate estimates for Structures and Equipment are being developed and will be included in the near future.
n.a. Not available at present but would be available for future use in the National Health Accounts
Note: Gross investment, Depreciation charges, Net investment, and Net stock of health fixed capital will be available in real, or price-adjusted, dollars for future use.