HUMAN CAPITAL INVESTMENT IN HEALTH: A MEASUREMENT FRAMEWORK AND ESTIMATES FOR THE UNITED STATES, 1952–78

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Lack of a conceptual basis for measuring human capital investment in health has hampered efforts to expand national accounting systems to include human capital investment. This paper presents a conceptual basis for developing estimates of this health investment, an estimation methodology consistent with the conceptual basis, and preliminary estimates for the United States for 1952–78.

While much work remains to be done before comprehensive estimates of investment in health are achieved, it is clear that previous estimates based on answers to the question, "What improves health?" have included some inappropriate expenditures while excluding others that should be included.

The conceptual basis presented here leads to a methodology for separating health care costs (not the costs of illness) into maintenance and gross investment. Gross investment can be further separated into net investment and the sum of damages and depreciation but empirical implementation of this step is not attempted here.

This paper presents a conceptual basis for the measurement of human capital investment in health and estimates of gross health investment (GHI) in the U.S. for 1952–78. There are important differences between human capital investment in health and the more often discussed human capital investment in education and training. This implies differences in the way the health and education investment measures relate to health and education stock measures. Since these differences in investment and stock relationships imply differences in the way health costs and education costs are used to develop investment measures, the relationship of health investment measures to health stock measures is also discussed.

There is no consensus in the economic literature on what portion of health costs should be included in health investment. Mushkin [12] mentions a variety of costs including the costs of curative and preventative health services, health education, and the provision of clean water. Grossman [6] includes all health expenditures in his empirical estimates. Newhouse, Phelps and Schwartz [16] refer to investment in health services but give no indication of whether they include some or all health services.

National income accountants have attempted to construct estimates of investment in health; but without a consensus as to what this investment should include, they have been forced to present various illustrative examples. Kendrick [8], and Eisner, Simon, Peiper, and Bender [4] include 50 percent of all health costs.

A conceptual basis for the measurement of health investment would facilitate the more accurate portrayal of investment activity in national income and product

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accounts. Such a basis should also provide guidance for (1) relating health investment measures to tangible investment measures, (2) relating health investment to the health stock, and (3) relating current health care costs to present and future productivity. In the next section, an analogy between investment in and maintenance of machines, and investment in and maintenance of health will be used to illustrate the basis for identifying health investment. This analogy also introduces the concept of health maintenance. In the third section, the measurement of the health stock is considered and the estimation of GHI is outlined. Gross investment, depreciation, and net investment are discussed there. The fourth section presents the details of the methodology used to construct the preliminary estimates presented here. The fifth section presents the estimates of GHI in the U.S. for 1952–78 and points out that these estimates need to be improved in future work.

Identifying Health Investment: A Conceptual Base

In this section, an analogy between investment in and maintenance of machines and investment in and maintenance of health is used to illustrate the conceptual basis for identifying health investment. Before presenting the analogy, it is important to distinguish health care from the health care system.

The costs of providing the health care system are not included in health investment for two reasons. First, health investment refers here to a form of investment in human capital and human capital is embodied in people. Since the hospitals and other facilities that make up the health care system are not embodied in people they are not part of the human capital stock.[1] Hence, investment in these facilities is not investment in human capital. Second, the services of the health care system are an input to the provision of health care. The value of these services is included in the costs of health care as the earnings of health practitioners and the services of capital. This does not in any way imply that improvements in the health care system are not investment. They are simply not human capital investment in health.

The basic premise used to identify health investment can now be stated. The sum of the costs incurred during a year for health care that yield benefits for a period longer than a year is GHI during that year. Implementing this basic premise requires simplification and clarification.

An Analogy

The costs of obtaining and maintaining machinery can be divided into investment and maintenance costs on the basis of the length of time over which benefits or returns are provided. Purchasing a machine can be considered investment on the basis of the long period over which the machine will provide services. Greasing the machine can be considered maintenance on the basis of the short period over which the lubrication services of the grease are provided.

[1]Knowledge and skills of health practitioners are forms of human capital, but they are the result of investment in education and training, not of investment in health.

The costs of health care can be viewed in the same way as the costs of purchasing and maintaining the machine. A small-pox vaccination provides benefits over an extended period of time and can be considered an investment on that basis. An insulin injection provides benefits over a short period of time—until the next injection is needed—and can be considered maintenance on that basis. The choice of a year as the dividing line between long-term and short-term benefits is an arbitrary one. When the construction of estimates begins, it will become clear that only very rough distinctions between health care with long-term and short-term benefits are possible.

Some attempts have been made to identify investment in health on the basis of the negative effects avoided as a result of receiving health care. For example, Grossman [6] listed diet and exercise as health investment activities because, he argued, they slowed the depreciation of health capital. Kendrick [8] included the provision of clean water among his investment activities. This approach to investment in health is inconsistent with the treatment of machines outlined above. If the machine was not greased, it would stop and be ruined. Greasing the machine thus results in avoiding the loss of the machine. The avoidance of this loss is not the basis for classifying the greasing of the machine as either investment or maintenance. Rather, the services provided as a result of greasing the machine are the basis for the classification of the costs. Similarly, the benefits received as a result of receiving health care are the proper basis for classifying its costs. Grossman's diet and exercise and Kendrick's provision of clean water produce benefits as long as they are continually engaged in. If the people do not follow good diets, stop exercising, or stop drinking clean water the results of having done so can dissipate fairly quickly. These activities, like other maintenance activities, produce benefits in multiple years only if their costs are incurred again in each year.

Total costs of health care can thus be divided into two categories: those included in gross investment and those included in maintenance.[2] At this point, only gross investment is identified. In the next section, net investment will appear.

Measuring Health Stocks and Health Investment

As Mushkin [12] has pointed out, health care is different from education and training. As she put it,

> Educational investment is a development process, which ferrets out and encourages native talent. It proceeds step by step from one level to another... Health programs seek basically to prevent a hostile environment from killing and crippling. (p. 135).

In addition to preventing killing and crippling, much of health care is an attempt to return individuals to a previously realized state of good health. The costs of activities that return an individual's health to a previous level should not cause an increase in the net stock of health capital. If they yield long-term benefits,

[2]No attempt will be made to separate necessary and unnecessary health care. This important question is beyond the scope of this paper.

they are included in GHI but they should not contribute to net health investment (NHI).

The analogy that was used to separate GHI and maintenance can also be used to identify those portions of GHI that should not be included in NHI. Costs associated with prenatal care of mothers and repair of birth defects can be thought of as similar to the costs of purchasing a machine. Costs associated with small-pox vaccinations can be thought of as similar to costs of one-time improvements in the machine that raise its future productivity above what it was expected to be at the time of purchase. Costs associated with the repair of a broken bone are analogous to the costs of repairing damage to the machine. The first two examples are of costs that should contribute to NHI. Childbirth and vaccinations are among the activities that lead to an increase in the future productivity or well-being of the population above what it was in the past. The third example should not contribute to NHI. Repairs of broken bones are among the activities that return the productivity or well-being of the population to what it once was. The costs included in GHI that should not contribute to NHI will be called damages (DM). Put another way, NHI is GHI less DM. We can now explicitly relate health investment to the health stock.

Measuring the Health Stock

The gross stock of health at the beginning of each year is the sum of GHI in past years, less the sum of retirements in past years. Retirements in each year are the sum of GHI per person in past years across all individuals that die during the year. The net stock of health at the beginning of each year is the sum of GHI in past years less the sum of depreciation in past years. Depreciation in each year is the sum of projected depreciation (PD) and DM during that year. PD is explained below. As in the calculation of stocks of tangible capital, the service life used to estimate depreciation can also be used to estimate retirements. The difference between the gross and net stock will then be the depreciation not yet included in retirements.

DM are that part of GHI that restores the level of the population's productivity and well-being to a previously attained level. The remaining portion of GHI contributes to NHI and must be depreciated in the future. The amount of this latter depreciation in each year is PD.

For the sake of simplicity, a simple straight line formula can be used to specify the annual amount of PD resulting from an investment in health. Even with this simple approach however, a problem arises. Since life expectancies change over time, the length of time over which the benefits of a health investment will be received cannot be specified at the time of the investment. Levels of future GHI and maintenance, as well as advances in medical knowledge, will have a significant effect on the service life of the investment.[3]

There are two approaches to the problem of specifying service lives. Each results in a systematic bias in the resulting stock estimates. The two approaches are described below but at this point neither is specified as preferable.

[3]Some investments (e.g. vaccinations) must be augmented at prescribed intervals for the benefits to continue. In these cases, a separate calculation could be performed. The service life problem would still remain for other investments (e.g. correction of birth defects).

One approach to service life specification is to divide the population into cohorts and estimate the portion of GHI associated with each cohort. The remaining life expectancy of the average member of each cohort is then used to calculate the future contributions to PD resulting from GHI associated with that cohort in each year. For example, if the remaining life expectancy of 30 year old, white males is 50 years and if the average age of 26 to 34 year old white males is 30, $100 of GHI associated with white males aged 26 to 34 will contribute $2 per year to PD for 50 years. The problem with this approach is that life spans have historically been longer than life expectancies. This results in GHI being fully depreciated when the average individual with whom it was associated is still alive. This introduces a downward bias into estimates of the health stock.

The second approach to service life specification is to specify an optimal life expectancy at birth that would occur in a world free from illness and injury. This optimal life expectancy at birth is used to calculate optimal remaining life expectancies for various population cohorts. These optimal remaining life expectancies are used to calculate contributions to PD in the same way as life expectancies are in the first approach. The problem with this approach is that the world is not free from injury and illness. This results in GHI not being fully depreciated when the average individual with whom it is associated dies. This introduces an upward bias into estimates of the health stock.

A variant of the second approach to service life specification was implemented by Kendrick [8]. He begins by dividing the population into cohorts with one cohort for each year of age and estimating the GHI associated with the average person of each age in each year. He then assumes no depreciation occurs until age 18 and uses a life expectancy at birth of 75 years to calculate the net stock remaining from GHI in each past year for the average individual of each age. Kendrick can then calculate the gross stock embodied in the average person of any age as the sum of GHI associated with the average person of each age this person would have been in past years. By calculating the net stock embodied in the average person of each age in a similar manner, multiplying the average gross and net stock per age group by the population per age group, and summing these products across age groups, he obtains estimates of the gross and net stock of health at the end of each year. He then estimates depreciation as the net stock at the end of one year plus total GHI during the next year less the net stock at the end of the next year. The use of average GHI per person and population per age group prevents problems encountered in the estimation of retirements. The use of a fixed life expectancy of 75 years results in underestimates of depreciation since as late as 1977 average life expectancy at birth in the U.S. was 73.2 and in earlier years it was less (see reference 15, p. 138).

A possible resolution of the service life dilemma would be to calculate gross and net stocks using each of the first two approaches and compare the results. Perhaps the biases noted above are not large and a simple average of the stock measures could be used. Alternatively, the biases may be large and their cumulative nature may preclude a simple compromise as the two approaches yield increasingly different results over time. All of this assumes reliable measures of GHI are present and can be allocated among age groups.

Measuring GHI

Since the sum of GHI and maintenance is the total of health care costs in each year, estimating GHI requires (1) the estimation of total annual health care costs and (2) the separation of these costs into those associated with health care that produces long-term benefits and those associated with health care that produces short-term benefits. The estimation of total health care costs is discussed first and then the separation of these total costs into GHI and maintenance.

The estimates of investment presented here are initial estimates based on an attempt by the author to separate medical treatments and government programs into the categories of GHI and maintenance. It is hoped that other researchers with more knowledge of the medical arts and of government programs will refine this effort. These estimates are based on the National Income and Product Accounts (NIPA's) prepared by the Bureau of Economic Analysis (BEA).

Total health care costs must be distinguished from the total costs of illness. Health care costs are incurred as a result of receiving health care. The costs of illness result from being ill. Since most health care is received as a result of being ill, most health care costs are included in the costs of illness. There are, however, costs of illness that are not costs of health care. These costs occur regardless of whether or not health care is received. An important part of these costs is the opportunity cost of time associated with illness.[4]

The opportunity cost of time associated with illness is the lost production or lost welfare resulting from people's inability to work or play as productively as they can when they are healthy. The production or welfare that would be lost whether people received health care or not is not a health care cost. The production or welfare lost as a result of receiving health care—for example, time off from work to receive a vaccination—is a health care cost. Unfortunately, the data that would allow separation of the opportunity costs of time due to illness and of time due to health care are not available. Since most health care is received as a result of some health impairment, it seems more reasonable to attribute inseparable time costs to the health impairments than to health care. No opportunity costs of time incurred by people receiving health care are included in what follows.

There are therefore, two types of health care costs to be estimated. Expenditures are the purchases of health care by persons and businesses, and government purchases that result in the provision of health care. Capital services are the depreciation plus the net returns to capital stocks whose services are utilized to provide health care. Estimates of some purchases and capital services costs can be taken directly from the NIPA's. Estimates of other costs can be constructed using Social Security Administration data on business purchases, BEA estimates of capital stocks and depreciation, and appropriate rates of return . The discussion that follows is based on pre-1980-benchmark tables from the NIPA's. All table and line number references are to those tables.

[4]For an extensive discussion of the costs of illness, see Cooper and Rice [3].

Details of the Estimation Procedure

Much of the terminology in this section is taken from these data sources. This should aid readers interested in tracing data sources but the author apologizes for the stilted prose that sometimes results.

Current-dollar Estimates

Expenditures. Purchases of health care by persons consist of personal consumption expenditures (PCE) for medical care expenses (Table 2.6, line 44) less PCE for opthalmic products and orthopedic appliances (Table 2.6, line 46), and less PCE for income loss insurance (Table 2.6, line 53).[5] Purchases of health care by business consist of in-plant health expenditures as reported by the Social Security Administration for some years and extrapolated to other years by the total of philanthrophy and in-plant health expenditures. Purchases of health care by governments consist of purchases (by Federal, state, and local governments) for: most of health and hospitals, and parts of purchases for social security and special welfare services, and veterans' benefits and services (all government purchases numbers taken from Table 3.4).

Capital services. Capital services costs of for-profit owned capital and depreciation of non-profit capital are included in the purchases of health care by persons. The net return to non-profit-owned capital and the capital services costs of government-owned capital are not represented in NIPA's. BEA has conducted research on the size of government-owned capital stocks and the services of those stocks.[6] While the services of government-owned capital whose services are utilized to provide health care have not been calculated, they can be. The methods used to calculate the net return to government-owned capital can be applied to unpublished BEA estimates of the stock of non-profit-owned capital to produce estimates of the services of that capital.

The separation of total health care costs into GHI and maintenance (M) will now be discussed. The separation of purchases is discussed in detail. The separation of capital services costs is then presented. Information on the net return to non-profit-owned capital and the services costs of government-owned capital is not available in great detail so these costs are separated on the basis of the proportions developed for purchases.

GHI in purchases by persons. Purchases of health care by persons are grouped in the NIPA's into (1) drug preparations and sundries, (2) physicians' services, (3) dentists' services, (4) other professional services, (5) privately controlled hospitals and sanitariums, (6) medical care and hospitalization insurance, and (7) workmen's compensation insurance.

GHI includes 16.5 percent of drug preparations and sundries. The remainder is included in M. This proportion is the same as that used to divide physicians' services. Its derivation is discussed below.

[5]Personal nontax payments to governments for hospital and health charges (Table 3.4) are included in government purchases. They are not included here to avoid double-counting.

[6]For stock measures see Musgrave [11]. For services measures see Martin, Landefeld, and Peskin [9].

Physicians' services are divided into GHI and M on the basis of the proportion of physicians' visits that result in long-term benefits.[7] The visits identified as resulting in long-term benefits were for (1) pre- and post-natal care, (2) immunization and vaccination, and (3) a group of health impairments that are not self-limiting and are curable.[8] This choice of health impairments is preliminary and should be based on the judgments of health professionals. 16.5 percent of physicians' services are included in GHI.

GHI includes 56.9 percent of dentists' services. This percentage is based on average total incomes of dentists in different types of practices.[9] One-half of the income of general practitioners and all of the income of specialists is assumed to result from health care that yields long-term benefits.

GHI includes 16.5 percent of other professional services. This percentage is the same as that used to divide physicians' services.

GHI includes 72.3 percent of privately-controlled hospitals and sanitariums. This percentage is found in two steps. First the hospital portion of hospitals and sanitariums is identified.[10] Second, a deduction is made from this hospital portion to account for care of the terminally ill.[11] The remainder of the hospital portion is the contribution of privately controlled hospitals and sanitariums to GHI.

GHI includes 72.3 percent of medical care and hospitalization insurance. This percentage is the same as that used to divide privately-owned hospitals and sanitariums.

GHI includes 44.8 percent of workmen's compensation insurance. This percentage is based on the distribution of workmen's compensation insurance benefits in 1975 and the distribution of purchases of health care by persons. First, the percent of workmen's compensation insurance benefits related to health care was identified.[12] Second, the percent of workmen's compensation insurance related to health care that went for hospital payments (WCH) was estimated. Finally, 72.3 percent of WCH and 23.0 percent of the remainder of workmen's compensation insurance related to health care were included in GHI.[13]

GHI in purchases by business. GHI includes 16.5 percent of in-plant expenditures for health services. This percentage is the same as that used to divide physician's services. In-plant expenditures were estimated in three steps. First, business expenditures for in-plant health services for various years were interpolated to fill in the missing data. Second, philanthrophy and in-plant health expenditures for 1967–75 were interpolated on the basis of observed values in 1959–60 to 1965–66 and 1976–78. Fiscal year figures were averaged to obtain

[7]Data on physician visits are from National Center for Health Statistics [14].

[8]The treatments included are for diseases of the thyroid gland, diseases of the blood and blood-forming organs, hernia of abdominal cavity, orthopedic impairments, fractures and dislocations, sprains and strains, open wounds and lacerations, and diseases of the musculoskeletal system. See National Center for Health Statistics [14], p. 36.

[9]Data on dentists' incomes are taken from American Dental Association [1].

[10]Based on Bureau of Economic Analysis [2].

[11]Based on proportion of total hospital days of care accounted for by those in the last year of life in 1961. National Center for Health Statistics [13] and Office of Program Analysis [17].

[12]Based on the percent of workmen's compensation insurance premiums that are payments for hospitals and medical care in 1975. Daniel N. Price [18].

[13]23.0 percent of purchases of health care by persons, excluding health insurance and privately controlled hospitals and sanitariums, is included in GHI.

calendar year estimates. Finally, business expenditures for in-plant health services were extrapolated to the years 1966–78 on the basis of philanthrophy and in-plant health expenditures for those years.[14]

GHI in purchases by government. GHI includes 5.2. percent of federal government purchases for health and hospitals. This percentage is based on an analysis of outlays for fiscal year 1977 for the programs included by BEA in federal purchases for health and hospitals. The small size of this percentage occurs for two reasons. First, many federal purchases that are related to health—for example, health research—but not related to health care are included in health and hospitals. Second, most federal purchases related to health care are included in M.

GHI includes 14.3 percent of State and local government purchases for health and hospitals. This percentage is based on an analysis of federal grants to State and local governments for health and hospitals in fiscal year 1977. These grants are more oriented to the provision of health care than federal purchases for health and hospitals.

GHI includes 67.1 percent of Federal government purchases for the hospital and supplementary medical insurance of social security and special welfare services. This percentage is based on a breakdown of these purchases into hospital, physicians' services, nursing home, and other purchases.[15] The percentages developed to separate each of these types of services in purchases by persons are then applied.

None of the Federal government purchases for the public assistance and relief part of social security and special welfare services is included in GHI.

GHI includes 20.7 percent of State and local government purchases for the public assistance and relief part of social security and special welfare services. This percentage is determined in three steps. First, the medical vendor payments (Table 3.6) portion of these purchases is identified. Second, these payments are broken down by type of service and the percentages developed to separate these types of services in purchases by persons are applied.[16] Third, the payments included in GHI are summed and expressed as a percentage of the government purchases.

GHI includes 44.8 percent of Federal government purchases for the hospital and medical care part of veterans' benefits and services. This is the percentage of purchases of health care by persons, excluding insurance, that is included in GHI in 1975.

GHI in capital services costs. BEA estimates of capital stock whose services are utilized to provide health care represent structures. Hence, the capital services costs of government-owned capital and the net returns to non-profit-owned capital are separated into GHI and M with the same percentage as is used for private purchases for privately-controlled hospitals and sanitariums (72.3 percent). The capital services costs of government-owned capital are the sum of (1) 7 percent

[14]Data from Ida C. Merriam [10] and Gibson [5].

[15]Based on breakdown of medicare expenditures for 1977 in National Center for Health Statistics [15].

[16]Based on breakdown of medicaid expenditures for 1977 in National Center for Health Statistics [15].

of the year end net stock of government hospital structures, in current dollars, and (2) the annual current-dollar depreciation of that stock. The net returns to non-profit-owned hospital structures are 7 percent of the year end net stock of that capital, in current dollars.[17]

Constant-Dollar Estimates

Expenditures. Estimates of constant-dollar purchases are obtained by deflating current-dollar estimates with the BEA implicit price deflator for the medical care services portion of PCE and implicit price deflators for the components of those services (Table 7.2, lines 64–67). The drugs and sundries, physicians' services, dentists' services, and other professional services portions of PCE were deflated with their respective implicit price deflators. The hospitals, medical care and hospitalization insurance, and workmen's compensation insurance portions

TABLE 1

GROSS HEALTH INVESTMENT IN THE U.S., 1952–78

(millions of dollars)

Year	Total	PCE	Government purchases		Business purchases	Services of government owned capital and net returns to nonprofit owned capital
			Federal	State and local		
1952	5,039	3,751	350	366	30	542
1953	5,499	4,153	341	402	32	571
1954	5,896	4,541	301	434	34	586
1955	6,308	4,862	329	462	36	619
1956	6,843	5,263	350	515	38	677
1957	7,445	5,752	355	577	39	722
1958	8,023	6,240	386	608	41	748
1959	8,766	6,813	415	707	43	788
1960	9,500	7,432	438	757	45	828
1961	10,207	7,977	472	845	47	866
1962	11,082	8,685	496	939	50	912
1963	12,065	9,483	535	1,024	52	971
1964	13,441	10,622	579	1,141	54	1,045
1965	14,419	11,383	570	1,274	56	1,136
1966	15,886	12,419	668	1,496	58	1,245
1967	17,727	13,812	777	1,717	61	1,360
1968	20,326	15,553	972	2,234	64	1,503
1969	23,778	18,475	928	2,598	66	1,711
1970	27,231	21,008	1,082	3,110	69	1,962
1971	30,714	23,426	1,233	3,736	72	2,247
1972	35,010	26,657	1,441	4,282	75	2,555
1973	39,115	29,499	1,659	4,955	78	2,924
1974	44,315	33,208	1,887	5,787	81	3,352
1975	52,871	40,241	2,071	6,724	84	3,751
1976	60,324	46,233	2,377	7,535	87	4,092
1977	69,472	53,911	2,487	8,403	108	4,563
1978	78,371	60,865	2,891	9,360	122	5,133

Various sources: see text.

[17]All stock and depreciation measures (both current and constant dollars) are taken from unpublished tabulations provided by the Bureau of Economic Analysis.

of PCE were deflated with the implicit price deflator for other professional services. Business expenditures were deflated with the implicit price deflator for physicians' services. Federal, State and local government purchases were deflated with the implicit price deflator for medical care services.

Capital services. Capital services costs of government-owned capital and net returns to nonprofit-owned capital in each year are each the product of (1) the current-dollar estimate in 1972 and (2) the ratio of the current year end of year gross stock in 1972 dollars to the end of year gross stock in 1972.

GHI IN THE U.S., 1952–78

Total GHI has increased from $5.0 billion in 1952 to $78.4 billion in 1978 (Table 1). When measured in constant 1972 dollars, the increase is from $10.9 billion in 1952 to $46.2 billion in 1978 (Table 2). The growth rates of both current- and constant-dollar GHI have risen over time. Simultaneously, current-dollar GHI has increased from 36.1–39.8 percent of total health care costs (Table 3).

TABLE 2

GROSS HEALTH INVESTMENT IN THE U.S., 1952–78

(millions of 1972 dollars)

Year	Total	PCE	Government purchases		Business purchases	Services of government owned capital and net returns to nonprofit owned capital
			Federal	State and local		
1952	10,892	8,144	805	841	70	1,032
1953	11,272	8,511	738	870	71	1,082
1954	11,678	8,956	625	900	73	1,124
1955	12,262	9,424	666	935	74	1,163
1956	13,094	10,098	697	1,026	74	1,199
1957	13,706	10,611	679	1,103	75	1,238
1958	14,313	11,111	714	1,124	76	1,288
1959	15,215	11,785	744	1,267	77	1,342
1960	15,978	12,431	760	1,314	77	1,396
1961	16,727	12,974	796	1,425	80	1,452
1962	17,748	13,794	813	1,539	83	1,519
1963	18,978	14,798	859	1,644	83	1,594
1964	20,574	16,130	903	1,780	84	1,677
1965	21,427	16,785	861	1,925	85	1,771
1966	22,565	17,511	958	2,146	84	1,866
1967	23,676	18,287	1,043	2,305	82	1,959
1968	25,687	19,493	1,230	2,828	81	2,055
1969	28,016	21,613	1,094	3,064	79	2,166
1970	30,529	23,475	1,210	3,479	76	2,289
1971	32,564	24,829	1,301	3,941	74	2,419
1972	35,010	26,657	1,441	4,282	75	2,555
1973	37,389	28,282	1,592	4,755	75	2,685
1974	39,033	29,384	1,666	5,108	72	2,803
1975	39,610	30,017	1,556	5,052	66	2,919
1976	42,451	32,413	1,663	5,273	62	3,040
1977	44,569	34,402	1,585	5,356	71	3,155
1978	46,154	35,648	1,693	5,480	74	3,259

Various sources: see text.

TABLE 3

TOTAL HEALTH CARE COSTS IN THE U.S., 1952–78

(millions of dollars)

Year	Total	PCE	Government purchases		Business purchases	Services of government owned capital and net returns to nonprofit owned capital
			Federal	State and local		
1952	13,941	9,743	921	2,347	180	750
1953	15,069	10,600	893	2,594	192	790
1954	16,035	11,461	777	2,783	204	810
1955	17,057	12,172	846	2,967	216	856
1956	18,688	13,275	962	3,288	227	936
1957	20,481	14,551	985	3,708	238	999
1958	22,246	15,827	1,066	4,070	249	1,034
1959	24,449	17,286	1,318	4,495	260	1,090
1960	26,258	18,713	1,321	4,809	270	1,145
1961	28,265	19,982	1,468	5,331	287	1,197
1962	30,877	21,842	1,606	5,863	304	1,262
1963	33,420	23,608	1,781	6,374	314	1,343
1964	37,309	26,497	1,984	7,058	325	1,445
1965	39,956	28,210	1,985	7,852	338	1,571
1966	43,973	30,470	2,321	9,106	354	1,722
1967	48,168	33,021	2,656	10,240	370	1,881
1968	55,226	36,472	3,035	13,254	386	2,079
1969	63,402	42,110	3,194	15,330	402	2,366
1970	72,617	47,470	3,806	18,208	419	2,714
1971	81,794	52,148	4,292	21,809	437	3,108
1972	92,341	58,320	5,188	24,845	454	3,534
1973	103,536	64,303	6,079	28,638	472	4,044
1974	119,960	75,481	6,064	33,289	490	4,636
1975	136,775	85,223	7,426	38,430	508	5,188
1976	154,242	97,178	8,039	42,839	527	5,659
1977	175,381	112,158	8,476	47,779	657	6,311
1978	196,782	126,031	9,623	53,286	742	7,100

Source: Sums of all components of health care costs from which gross health investment has been separated. Data shown are totals including gross health investment.

The estimates of GHI developed here are smaller than the estimates produced by Kendrick [8] and by Eisner, Simmons, Peiper, and Bender (ESPB) [4]. This occurs because less than 50 percent of health care costs were found to be associated with health care that yields long-term benefits. Both Kendrick and ESPB include an arbitrary 50 percent of total health costs in their estimates of GHI.

Interestingly, there is some convergence of the estimates in recent years (Table 4). In 1952, Kendrick's estimate is 42.0 percent larger than the estimate developed here and ESPB's estimate is 52.0 percent larger. By 1969, the differences have decreased to 17.2 percent for Kendrick's estimate and 30.7 percent for ESPB's. In 1976, ESPB's estimate is 17.7 percent larger than the one developed here. The convergence is due to Kendrick's and ESPB's omission of the portions of government purchases of hospital and supplemental medical insurance and public assistance and relief that are health care related from their estimates of total health care costs. These costs have risen over time.

TABLE 4

VARIOUS ESTIMATES OF GHI, SELECTED YEARS

Year	This paper	Kendrick estimate	ESPB estimate
	(Billions of dollars)		
1952	5.0	7.1	7.6
1960	9.5	13.3	14.5
1967	17.7	22.2	24.6
1969	23.8	27.9	31.1
1976	60.3	—	71.0

Sources:

John W. Kendrick, *The Formation and Stocks of Total Capital* (New York: Columbia University Press for the National Bureau of Economic Research, 1976), Table B-2, Total Gross Investment in Current Dollars, by Type, U.S. Domestic Economy, pp. 168–69.

Robert Eisner, Emily R. Simmons, Paul J. Pieper, and Steven Bender, *Total Incomes in the United States*, 1946 to 1976 (Northwestern University, February 13, 1981), unpublished paper, Table 1. National Income and Product Account, Billions of Dollars, 1946–1976, pp. 1-1 to 1-91.

Components of GHI. Personal consumption expenditures (PCE) contribute the largest share of GHI.[18] In constant 1972 dollars, the PCE portion of GHI increased from $8.1 billion in 1952 to $35.6 billion in 1978. The fastest growing component of GHI is State and local government purchases. These purchases grew from 7.7–11.9 percent of total constant-dollar GHI during the period 1952–78. This growth in percent of total GHI resulted from a constant-dollar average annual growth rate of 7.5 percent compared to the growth rate of 5.7 percent for total constant-dollar GHI.

While the PCE and State and local government purchases components of GHI have grown as a percent of total GHI, Federal government purchases, business purchases, and the services of government-owned and net returns to nonprofit-owned capital have declined. The growth rate of constant-dollar Federal purchases was negative for 1952–60. Although this growth rate increased to 4.5 percent for 1967–78, this was not enough to prevent the percent of constant-dollar total GHI accounted for by Federal purchases from falling from 7.4 to 3.7 during the 1952–78 period. The growth rate of constant-dollar business purchases declined from 1.2 percent for 1952–60 to −0.9 percent for 1967–78. This caused a decline in the percent of constant-dollar GHI accounted for by business purchases from 0.6 in 1952 to 0.2 in 1978. The growth rate of the services of government-owned and net returns to nonprofit-owned capital has fluctuated. The percentage of constant-dollar total GHI acccounted for by these capital services and net returns has fallen from 9.5 in 1952 to 7.1 in 1978.

[18]This is partly because in the NIPA's household payments for health care that are reimbursed by governments or employers are still considered to be household expenditures. The author thanks Richard Ruggles for pointing this out.

Summary

According to the pre-1980-benchmark NIPA's that were used to construct the estimates of GHI presented here, gross private domestic investment in the U.S. in 1978 was $351.5 billion (or $214.3 billion 1972-dollars). The estimate of GHI presented here would constitute a 22.3 percent increase in gross domestic investment in 1978 (a 26.6 percent increase in the constant-dollar measure). More work needs to be done however, before such a change in the NIPA measure of investment is warranted.

The separation of total health care costs into GHI and maintenance should be performed by people with an extensive knowledge of health care and of government programs. The relationship between health investments and health stocks must be investigated further. It is possible that such an investigation would have unforeseen implications for the measurement of investment.

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