

# The Impact of Economic and Demographic Factors on Government Health Expenditures in Poland

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# 1. Introduction

Secured by the Constitution in 1952, free and general access to health care services has long been considered the foundation of the Polish health care system. As a result, citizens of Poland enjoy free access to state-owned and managed hospitals, sanatoriums and other levels of medical care. Although a partial payment of at least 33% for medications is required for most citizens, some groups such as the retired and the military are exempt. Thus, in the absence of formal private sector activity, bulk of the burden of health care financing was borne by the government and came directly from the national budget, at least in the 1980s.

Meanwhile, general macroeconomic problems, in part due to a large debt owed to the western banks, began to put severe strains on the national budget. At the same time, compared to the early 1950s, the proportion of population over 65 began increasing rapidly due to declining birth rates and increasing life expectancy. The health budget also suffered, and the rate of growth of per capita government expenditure slowed considerably. Private out-of-pocket expenditure started increasing in this period, mostly in the form of informal payments for physicians and medical staff. In fact, the system of direct payment to physicians became more or less institutionalized during 1985-90, and making direct payments to doctors for better quality of service became commonplace. By 1989 the government began to sharply reduce its role in the everyday life of the population, including in those areas affecting health status, and the transition from a centrally planned to a market economy began in earnest.

The purpose of this study is to determine (1) the impact of economic transition and declines in GDP; and (2) the impact of other important socio-economic variables such as demographic transition and urbanization, on government health expenditures in Poland for the period 1960-1995. Data collected from various government sources are used in this analysis. Results indicate that changes in income during the previous year have a positive and significant impact on government health expenditures. Demographic transition has a significant positive impact on government health expenditures, while other factors such as urbanization and number of beds have little or no impact.

The paper is structured as follows: Section 2 provides a brief literature review on health expenditures; Section 3 discusses the data; Section 4 analyzes the factors affecting government health expenditures in Poland using a multivariate

regression analysis; and Section 5 discusses the key results of the study and provides the concluding remarks and policy implications for both Poland and other countries undergoing economic and demographic transition.

## 2. Review of Literature

The information on health expenditures in the OECD countries evolved considerably during the past three decades since the initial efforts of Abel Smith (1,2). In most instances however, private and public expenditures were analyzed separately. Most studies found per capita income to be the most significant determinant of per capita health expenditures, and income elasticity to be greater than one (3,4,5,6,7). Furthermore, while some studies have argued that other variables such as physician and age-structure of the population have only a limited impact on the level of health expenditures (8,9), others dispute these findings (10,11,12,13).

In developing countries where international development assistance has been a significant part of overall government expenditures during the past three decades, attempts were only recently made to analyze factors affecting government health expenditures. Gbesemete and Gerdtham (14) analyzed the factors affecting health expenditures in Africa, and similar studies were undertaken by Govindaraj et al. (15,16) for Latin America and the Caribbean, Griffin (17) for Asia and Murray et al. (18) for the world as a whole. Specific studies on individual countries of the developing world have also been undertaken in the recent past. Chellaraj (19,20) assessed the factors affecting private expenditures in Mexico and the impact of government expenditures on health status in Barbados, and Montoya-Aguilar and Marchant Cavieres (21) undertook a similar study for Chile. None of these studies take into consideration the age structure of the population.

In Eastern Europe, access to information was only granted with the collapse of communism. Recently, the data on health expenditures, services and status in Central Eastern Europe were compiled by Chellaraj et al. (22) as a part of the World Bank's Social Challenges of Transition Project and further work on the Former Soviet Union (23) is being currently undertaken. However, the data on reliable private expenditures continue to remain scanty due to the use of out-dated methodology in the former socialist economies. At present attempts are being made to introduce new household techniques to better account for out-of-pocket health expenditures in these countries. Using the information on government expenditures, Goldstein et al. (24,25) found that for all of Eastern Europe there has been a sharp decline in real health expenditures. This can generally be attributed to the economic difficulties accompanying transition, although in countries in with National Health Insurance (NHI), health

expenditures as a percentage of GDP has increased much more rapidly than in countries without NHI. In addition, Adeyi et al (26) also found that the economic difficulties in Eastern Europe have resulted in declines in health status and life expectancy. Evidence from World Bank studies (27,28) also indicates that declines in GDP in the transition economies has resulted in increasing poverty. Preker and Feachem (29) also find that it has resulted in declining access to health care in most countries of Eastern Europe, which was also confirmed in a recent study by Demery et al. (30) for Bulgaria.

As Mierzewski (31) notes, the communist economy and the system of health care under it has left behind a "legacy of immense social expectations....from the numerous promises made earlier, of which many were purely words". Reformers thus face not only the challenge of "taking into account various periods and phases....from the past", but also the challenges relating to the "transitional stage of the system" (31). Furthermore, lack of studies on the impact of demographic transition on any aspect of health expenditures in Eastern Europe has been a major gap in our understanding. This paper therefore analyzes the impact of income levels, demographic transition, and other socio-economic variables such as physician supply and urbanization, on government health expenditures in Poland for the period 1960-1995. In the absence of reliable estimates on private expenditures, as discussed above, this aspect is not included in this study. As this study focusses on health expenditures in one particular country undergoing both economic and demographic transition, it makes a significant contribution to the understanding of country specific problems associated with the government financing of health sector.

### 3. Data

The data analyzed in this study was collected from the annual Statistical Year Books: 1960-1990, Statistical Demographics Year Books: 1960-1990, Statistical Health Care Year Books: 1960-1990, and Economic Analysis of Health Care Sector, Yearly Reports: 1960-1990, and Chellaraj et al (22).

It is important to note that until 1991, the system of computing national income in Poland was fundamentally different from the one used, for example, in OECD countries. It reflected, in part, the communist outlook of the economy. Calculations of national income were based on the "material product system" that accounted only for the production of material goods and services for the productive sphere in economic activities, to the exclusion of non-material outcomes. Services such as health care, culture, and education are not, therefore, accounted for in computation of national income. Thus, the figure of national income as reported for Poland before 1991 is not readily comparable to the standard definition of gross domestic product. For the purposes of our analysis we use the figures generated by the material product system until 1991, and for the period 1992 to 1995 we use the World Bank reported GDP figures for Poland and apply a standard adjustment to eliminate the contribution of the services sector.

It is also useful to note that a proper system of monitoring health care services and their cost did not exist in Poland during this period. Thus, while it is reasonable to assume that the aggregate budgetary receipts and expenditure figures would be generally accurate, there could be considerable margins of error in the reporting of other figures.

Descriptive statistics of the variables used in the analysis are given in table 1.



**Table 1**

**Descriptive Statistics: All money values adjusted to 1995 prices and quoted in billion PLZ (PLZ 1=10,000 zloty, US\$1 = PLZ 2.37)**

	<i>Mean</i>	<i>Standard Deviation</i>	<i>Minimum</i>	<i>Maximum</i>
national income	176.42	64.69	68.60	315.48
current government health expenditure	7.29	3.34	2.25	12.84
government health expenditure (salaries)	3.29	3.58	0.45	8.76
government health expenditure (drugs)	1.73	1.06	0.64	3.04
government health investment	0.77	0.09	0.17	2.00
population ('000)	34,799	2,872	29,795	38,610
population>65 ('000)	3,177	728	1,750	4334
inpatient days	55167	6280	39,605	62,100
average length of stay	14	1	12	17
number of physicians	55,807	17,737	28,700	88,000
annual outpatient visits per capita	6.7	1.2	4.5	8.0

## 4. Analysis

Real national income in Poland has increased at an average annual rate of 3.53% in the period 1960-95, with the maximum average growth of 7.7% per annum recorded in the 1970s. At the same time real government income has grown at an average annual rate of 3.29%, peaking at a high of 9.64% per annum in the 1970s, and falling at an annual rate of 1.1% in the 1980s. As a result, the share of government income as a percentage of national income has actually fallen at an average annual rate of 1.05% over the thirty-six year period, with the maximum fall of 5.8% occurring in the 1980s. Despite the changing trends, government's share of national income has always been high, and has averaged between 47% and 56% throughout the period 1960-95.

Real government expenditure on health has also increased at an average annual rate of 4.96% over the three decades, outstripping the annual average increase in total government expenditure of 4.2% over this period. The highest growth was recorded in the 1970s, which saw an average annual rate of growth in health expenditure of 7.46%, which fell to 3.9% in the next decade. As a percentage of total government expenditure, health expenditure has remained rather high, averaging between 8.32% in the 1960s and 10.4% in the 1980s. Per capita government expenditure on health has grown at an annual rate of 4.74% over the period 1960-95, with maximum growth of 6.55% recorded in the 1970s. As a share of national income, however, government health expenditure has averaged between 3% and 3.5% for most of the 1960s and 1970s, and between 4% and 5% through most of the 1980s, crossing the 5% mark in 1991 only.

Physician (and other staff) salaries have accounted for much of the government budget, and have tended to increase over time, from 33.9% of the government's health budget in 1963 to a high of 58.6% in 1989, registering an average annual growth rate of 6.97%. Expenditure on drugs, the other major item in the health budget, accounted for around 30% of the budget through most of the 1960s and 1970s, but started declining rapidly after that, contributing to 15.3% of health expenditure in 1993. The state-run pharmaceutical industry was privatized during the 1980s, and the subsequent overhaul of the payment system may have led to a decrease in government expenditure on drugs, which fell to an all-time low of 6.9% of the total health budget in 1989. However, we note that the share of drugs in the total budget bounced back to 23% in 1990, and thus the low figure of 1989 may well be due to unpaid bills.

The stock of physicians grew at an average annual rate of 3.22% during 1960-95, leading to an improvement in population per physician from 1038 in 1960 to 450 in 1993. The number of beds available in government health facilities increased from 165,000 in 1960 to 252,000 in 1995.

On the demand side, inpatient admissions increased at an average annual rate of 2.15% over the 36-year time period, while the total number of inpatient days recorded an average annual increase of 1.2% in this period. Outpatient visits per person also increased, from an average of 4.5 visits per person per year in 1960 to 7.8 visits in 1987, falling to 6.4 in 1995.

## Multivariate Regression Results

As a first step in identifying the form of the model to be fitted, we sought to difference the series to make it approximately stationary. This was achieved by differencing the logarithm of health expenditure once, which effectively removed the trend. To choose the initial value of the autoregressive term, the partial autocorrelation function and the associated graph, the partial correlogram, were used. As is well known (32), the theoretical partial correlogram has the property that, if the order of the autoregression is  $p$ , then the coefficients on all lagged values lagged more than  $p$  times are not significantly different from zero. We find that the available data suggests the use of an AR(1) model. The dependent variable used in the model is thus the first difference in logs of health expenditures, which approximates the annual percentage rate of change.

Many previous analyses (5, 10) of aggregate health expenditure data suggest a strong association between GNP growth rates and health expenditures. As Getzen (5) notes, inflation will have an effect on real expenditures only if health prices do not change in the same proportion and direction as general prices as measured by the consumer price index. In a centrally planned economy like Poland was till 1989, it is reasonable to expect the health prices to lag general inflation. Income growth and inflation are thus prime candidates for inclusion as independent variables explaining changes in aggregate health expenditures.

Population growth rate, and in particular the growth rate of vulnerable population, defined here as those over 65, are also likely to influence health expenditures. Similarly, changes in supply of physicians and hospital beds are also likely to affect changes in aggregate health expenditure, considering that more than half of government health expenditure is on salaries alone. Finally, the growth in urban population is also likely to increase aggregate government health expenditures.

The impact of changes in income and inflation are not likely to be instantaneous, however. In particular, the effect of income changes are likely to be felt over a number of time periods. To capture this lag in behavior, we include lagged

values of income and inflation in our search for the “best” fit of the time-series model.

Estimation results are presented in tables 2 and 3. The Cochrane-Orcutt method is used to correct for autocorrelation in each of the models estimated, and the Durbin-Watson statistic of transformed residuals is presented. In the first specification (equation 1, table 2) we include only trend and income as the independent variables, and find that though the model offers a poor fit, the income effect is positive and significant. This income effect becomes insignificant with the inclusion of inflation (equation 2, table 2), and the significant negative coefficient on inflation indicates that a change in the price level reduces real expenditures on health because health care prices rise at a lower rate as compared to general prices. (Getzen, 1990, finds a similar result).

In the third specification (equation 3, table 2) we add population growth rate to the list of explanatory variables. The coefficient on population is insignificant, and the effect of other variables is unchanged. An increase in the number of physicians (equation 4, table 2), who alongwith other staff account for the single largest category of government health expenditures, is associated with a reduction in government health expenditures, which is surprising. A possible explanation is that an increase in total salaries has been more than compensated by reduction in government expenditure on drugs, that has fallen rather dramatically right through the 80's. Urbanization has had no significant effect on aggregate health expenditures (equation 5, table 2). In the next specification (equation 6, table 2), we include population over 65 as an explanatory variable. We find that aggregate health expenditures are positively and (weakly) significantly affected by the percentage of population above 65 years of age, which is an expected result. In the final specification (equation 7, table 2), the number of beds available is added as a regressor, but it does not change the results in any significant manner.

In an attempt to capture some of the dynamics of the system, a number of distributed lag models are also estimated, and the results are presented in table 3. In the first specification (equation 1, table 3) health expenditures are regressed on income and income lagged one year. As before, the income effect is positive and significant, though previous year's income has no significant effect. In the second specification (equation 1, table 3), two-year lagged income is added to the list of regressors, and the estimate results show that this lagged effect is also positive and significant. In the remaining three specifications, current and previous year's inflation are also considered. We find that lagged effects of income and current year's inflation have a significant effect on current government health expenditures, while the previous year's inflation has a significant effect only when income is also lagged by just one year.

The sum of the lagged income effects, which provides an estimate of the cumulative income elasticity, is in the range of 0.5 to 0.7, which is much below the values of 1.3-1.6 as reported for market economies (3,5,32).

**Table 2: Regression Results**

**Dependent Variable: Annual Percentage Change in Health Expenditures  
(standard errors in parenthesis)**

<i>Variables</i>	<i>Eq 1</i>	<i>Eq 2</i>	<i>Eq 3</i>	<i>Eq 4</i>	<i>Eq 5</i>	<i>Eq 6</i>	<i>Eq 7</i>
Trend	-.00111 (.001)	.00005 (.0013)	.00003 (.0013)	.00059 (.0013)	.0003 (.0015)	.00095 (.0016)	.0016 (.0019)
Income	.17317* (.0876)	.05513 (.0972)	.05512 (.0988)	.06334 (.0966)	.06812 (.0985)	.06445 (.0972)	.0685 (.0969)
Inflation		-.066* (.0314)	-.066* (.0319)	-.0649* (.0309)	-.0632* (.0315)	-.0643* (.0302)	-.0633* (.0305)
Population			-.0692 (1.22)	.3724 (1.229)	.3580 (1.252)	.9746 (1.308)	.9248 (1.343)
Physicians				-.645** (.4034)	-.634** (.4115)	-.723** (.4218)	-.655 (.4474)
Urban Population					.61807 (1.437)	.91477 (1.423)	.8019 (1.462)
Population over 65						.9652** (.5859)	.935** (.5949)
Beds							.9226 (1.569)
R2	0.1616	0.2134	0.1845	0.1916	.15799	.24182	.24193
DW	1.9024	1.7784	1.7773	1.7591	1.7829	1.8444	1.8459

\*: significant at 1% level

\*\* : significant at 5% level

**Table 3: Regression Results**

**Dependent Variable: Annual Percentage Change in Health Expenditures**  
**(standard errors in parenthesis)**

<i>Variables</i>	<i>Eq 1</i>	<i>Eq 2</i>	<i>Eq 3</i>	<i>Eq 4</i>	<i>Eq 5</i>	<i>Eq 6</i>
Trend	-.0009 (.0010)	.00025 (.001)	.00014 (.00121)	.00017 (.00121)	.00105 (.00118)	.00177 (.00138)
Income	.17849* (.0896)	.19555* (.0864)	.19763* (.08849)	.11494 (.0972)	.0953 (.0387)	.08961 (.09431)
Income (t-1)	.10055 (.09067)	-.0975 (.0881)	-.10767 (.0904)	-.31437* (.11428)	.28264* (.11214)	.29411* (.11247)
Income (t-2)		.1859* (.0879)	.1823* (.0906)		.16572* (.08204)	.17412* (.08345)
Income (t-3)			.0866 (.09049)			.10954 (.07891)
Inflation				-.10827* (.03352)	.10183* (.03238)	-.10661* (.03261)
Inflation (t-1)				.07885* (.03754)	.05434 (.03769)	.0503 (.03834)
R2	.25661	.45371	.24435	.42833	.20492	.4334
DW	1.9517	2.0071	1.9790	1.8018	1.90776	1.8619

\*: significant at 1% level

\*\*: significant at 5% level

## 5. Discussion

Our results indicate that national income is the most important determinant of government health expenditures between 1960 and 1995. In particular, income lagged by one year was the most significant variable followed by the current year's income. This effect tends to fade when lagged by two years and the maximum cumulative income elasticity reached is of the order of magnitude of 0.67. Further, the analysis reveals that inflation reduces real government expenditures, indicating that health sector prices lag the general consumer price index. Another major determinant of health spending in Poland is aging population. The population of Poland has grown 8.2 million in the period 1960-95, of which more than 25% is accounted for by the increase in population over the age of 65, and this has a positive and significant impact on government health expenditures.

The results indicate that health sector reforms and transition to market-based economic structure need to consider the increasing pressure of inflation, one and two year lags in income, and demographic transition on the real value of resources required for health care production and delivery. Policies aimed at increasing the allocation of resources to health care switching from a government-controlled system to free-market economy must therefore take into consideration the effects on demand for health that are likely to be generated by higher incomes and increased life spans, even as inflation erodes the real value of the expenditures on health care.

The results also have significant implications for countries undergoing demographic and economic transition. The combination of both economic and demographic transition is likely to put further pressure on already strapped government budgets, and increase the pressure for health system reform and developing alternate health financing schemes, in order to make efficient use of government resources. However, before viable reform of the health system and development of sustainable health financing mechanisms can be considered, further research on factors affecting health expenditures needs to be undertaken in individual economies undergoing economic and demographic transition such as the Baltic Republics and Bulgaria.

Future research needs to take into account the growing private sector activity in finance and provision of health care in Poland. In the absence of any such data, we have had no option but to ignore this sector entirely and focus only on government spending. Undoubtedly, this underestimates the level of health care

spending in Poland, and does not adequately reflect the contribution of public spending.



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