

Trends of mortality in Greece 1980-2007: a focus on avoidable mortality

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Abstract

Background: Avoidable mortality (AM) refers to deaths from certain conditions considered avoidable given timely and effective health care. AM rates in Greece between 1980 and 2007 were examined in order to investigate the extent to which health care has contributed to the decline in mortality rates in Greece over recent decades and detect possible shortcomings in the Greek healthcare system.

Methods: Mortality data from the General Secretariat of the National Statistic Service were used. The list of avoidable conditions was the basis of the analysis in which avoidable deaths were classified into conditions amenable to medical care (treatable avoidable mortality) and conditions responsive to health policy (preventable avoidable mortality). Ischaemic heart disease (IHD) was examined separately following relevant studies. Age standardized mortality rates were calculated according to the European Community standard population.

Results: A steady decline of the percentage of AM over all-cause mortality was documented (1980-1984:27%; 2000-2007:22.9%). AM rate fell by 30.5% (1980-1984:217.4/100,000 population; 2000-2007: 151.1/100,000). Treatable mortality rate fell by 48.1%, marking the largest contribution to the decline in AM (1980-1984:110.9/100,000; 2000-2007:57.5/100,000). Ischaemic heart disease death rate fell by 13.1% (1980-1984:52.7/100,000; 2000-2007:45.8/100,000). Preventable mortality rates fell by 11%, marking a modest contribution to the decline in AM (1980-1984: 53.7/100,000; 2000-2007: 47.8/100,000).

Conclusions: Trends in AM in Greece between 1980-2007 were similar to those of other European countries, with Greece performing particularly well with respect to treatable mortality. Although the decline in AM may also reflect changes in factors that influence mortality, such as disease occurrence, environment and socioeconomic conditions, they are suggestive of the health care system being an important determinant of health improvements in Greece during the recent decades. Further studies are needed in order to access the quality of care and to examine the structure and adequacy of health care in Greece. Hippokratia 2011; 15 (4): 330-334

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The idea of avoidable mortality (AM), originally introduced by D. Rutstein, refers to deaths from certain conditions within certain age groups that are considered as avoidable, given timely and appropriate provision of health care^{1,2}. AM rates have been used as a proxy of the effectiveness of health care systems, indicating possible weaknesses that require further investigation².

The concept of AM gained full acceptance with the production of a series of Atlases of AM for the countries of the European Community between 1974 and 1989 by the Concerted Action Project on Health Services and Avoidable Deaths (ECCAP). ECCAP introduced several revisions to the list of avoidable deaths, reflecting healthcare advances over the study period and definitions differences across countries^{3,4,5,6}. Following that work, many country-specific studies of AM were presented, especially in the 1990's decade^{2, 7, 8, 9, 10, 11}.

Greece has so far been included in several inter-

national studies of AM^{2, 4, 6, 12, 13, 14}. Nolte and McKee² found important reductions in AM in southern European countries like Greece, where the initial death rates had been higher. In the frame of ECCAP atlases, AM between 1974-78 and 1980-1984 in Greece decreased in a slower pace (-3.5%) compared to the European Community mean (-7.8%)⁴. Greece marked the poorest decline in AM among fifteen European countries in a study by Treurniet et al¹³. In another study examining possible associations between healthcare expenditure and AM in eleven European countries, Greece marked the lowest GDP-adjusted AM along with Netherlands and Denmark. However no association was found between per capita health care expenditure and GDP-adjusted AM¹⁴.

In light of the above, this paper examines AM in Greece between 1980 and 2007 and highlights underlying trends and points of further research regarding the effectiveness of Greece's healthcare system.

Methods

Mortality data from the General Secretariat of the National Statistic Service of Greece based on death certificate information formed the basis of the analysis. The classification of conditions followed the 9th Revision of the International Classification of Disease (ICD-9). The list of conditions as suggested by Newey et al was used, in which an age limit of 74 years for most conditions was considered¹⁵. Avoidable deaths were further classified into three categories: (a) Treatable, referring to conditions amenable to medical care, thus considered to have identifiable effective interventions from which it is expected death to be averted even after the condition has developed². (b) Preventable, referring to conditions responsive to health policy interventions^{5,8,10,13} and (c) Ischaemic heart disease, which was classified separately, regarding its both treatable and preventable character².

The difference between avoidable and all-cause deaths was classified as other-cause deaths. The list of conditions and their corresponding ICD-9 codes are shown in Table 1.

Age-standardized mortality rates were calculated using the European Community population as standardization basis⁶. The study period was divided into five sub-periods i.e. 1980-1984, 1985-1989, 1990-1994, 1995-1999 and 2000-2007. Assuming that deaths in each age group follow a Poisson distribution, mean values with 95% confidence intervals were calculated for each sub-period with the use of Excel 2007 software¹⁶.

Results

From 1980-1984 to 2000-2007, all-cause mortality declined by 17.8%, other-causes mortality declined by 13.1% and AM declined by 30.5%. As the decrease in

Table 1: Avoidable mortality - List of conditions

	Age Limits	ICD-9 code
Treatable		
Intestinal infections	0-14	001-009
Whooping cough	0-14	33
Measles	1-14	55
Abdominal hernia	0-74	550-553
Benign prostatic hyperplasia	0-74	600
Influenza	0-74	480-486
Diseases of the thyroid	0-74	240-246
Maternal deaths	All ages	630-676
Other infectious	0-74	032, 037, 045
Chronic rheumatic heart disease	0-74	393-398
Appendicitis	0-74	540-543
All respiratory diseases (excl. pneumonia/influenza)	1-14	460-479, 488-519
Malignant neoplasm of body of the uterus	0-44	179, 182
Cholelithiasis & cholecystitis	0-74	574-575.1
Malignant neoplasm of testis	0-74	186
Tuberculosis	0-74	010-018, 137
Malignant neoplasm of skin	0-74	173
Diabetes mellitus	0-49	250
Misadventures to patients during surgical and medical care	All ages	E870-E876, E878-E879
Epilepsy	0-74	345
Peptic ulcer	0-74	531-533
Malignant neoplasm of cervix uteri	0-74	180
Leukaemia	0-44	204-208
Hodgkin's disease	0-74	201
Congenital cardiovascular anomalies	0-74	745-747
Hypertensive disease	0-74	401- 405
Septicaemia	0-74	38
Pneumonia	0-74	487
Perinatal deaths, all causes excluding stillbirths	All ages	760-779
Nephritis and nephrosis	0-74	580-589
Malignant neoplasm of colon and rectum	0-74	153-154
Malignant neoplasm of breast	0-74	174
Cerebrovascular disease	0-74	430-438
Preventable		
Malignant neoplasm trachea, bronchus and lung	0-74	162
Liver cirrhosis	0-74	571
Motor vehicle accidents	All ages	E810-E825
Ischaemic heart disease	0-74	410-414

Avoidable mortality conditions (ICD-9) and their relevant age limits.

all-cause mortality was less pronounced compared to AM rate decrease, the proportion of AM over all-cause mortality declined from 27.0 % during 1980-1984 to 22.9% during 2000-2007.

From 1980-1984 to 2000-2007, treatable mortality rate declined by 48.1% (1980-1984:110.9/100,000; 2000-2007:57.5/100,000. Preventable mortality marked a modest decline of 11.0% (1980-1984:53.7/100,000; 2000-2007:47.8/100,000). Avoidable mortality from IHD declined by 13.1% (1980-1984: 52.7/100,000; 2000-2007:45.8/100,000). IHD accounted for 6.9% of all-cause mortality for the period 2000-2007 (1980-1984:6.6%) affirming its important position in the mortality spectrum.

Further analysis reveals different trends for the three preventable causes between 1980-1984 and 2000-2007. Avoidable deaths from malignant neoplasms of the trachea, bronchus and lung accounting for more than half of the preventable mortality rate, showed an overall increase of 2.5%. Death rate from motor car accidents declined by 15.9%. Death rates from liver cirrhosis followed a decreasing trend resulting to an overall decline of 48.7%.

Regarding the treatable mortality context, avoidable deaths from cerebrovascular disease declined by 47.1%, (1980-1984:47.8/100,000;2000-2007:25.3/100,000 contributing notably to the treatable mortality death rate trend. Perinatal deaths marked a well pronounced overtime decline of 74.4% (1980-1984:13.2/100,000; 2000-2007:3.4/100,000). Malignant neoplasm of the breast death rate marked a weak decline of 12.1% (1980-1984:9.3/100,000; 2000-2007:5.4/100,000). Significant declines were found in all except five (5) of the thirty-three (33) conditions that compose treatable mortality i.e. malignant neoplasm of colon and rectum (+27.8%), malignant neoplasm of skin (+15.2%), malignant neoplasm

of the testis (+5.1%), septicaemia (+4.7%) and Hodgkin's disease (+3.5%). However, we express doubts about the data quality in the case of septicaemia as annual death rate showed a rather erratic trend.

Discussion

The decline in AM rates has been more intense than that for all-cause and other-cause mortality over the study period. This pattern of AM is consistent with those reported in other studies that have used similar measures of

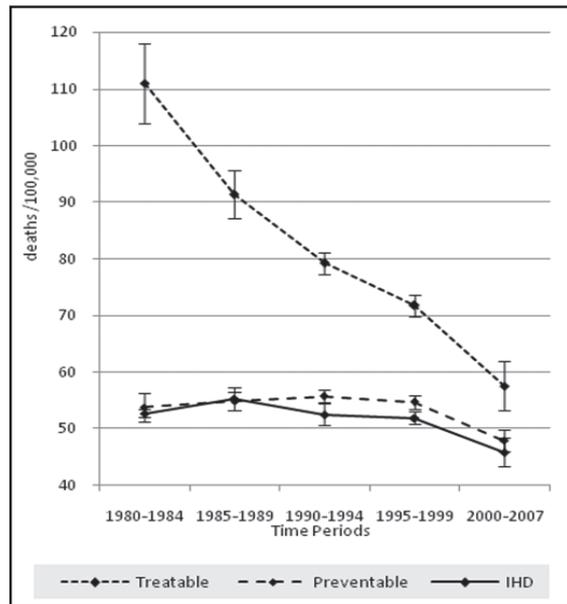


Figure 2: Treatable, preventable and avoidable mortality from IHD in Greece, 1980-2007
Error bars represent 95% confidence intervals

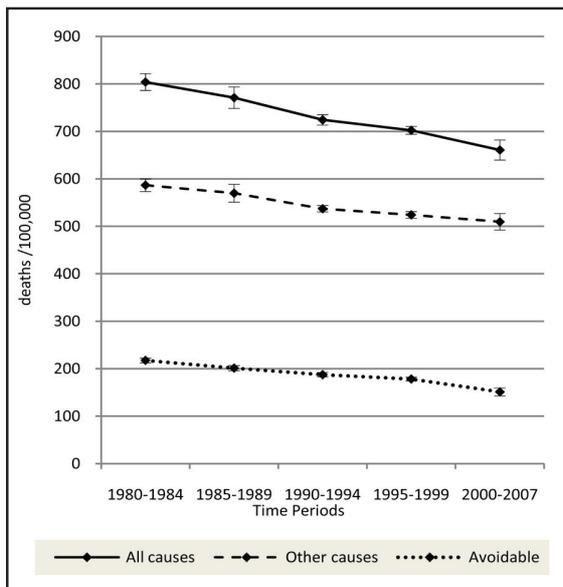


Figure1: All-causes, other causes and avoidable mortality in Greece, 1980-2007
Error bars represent 95% confidence intervals

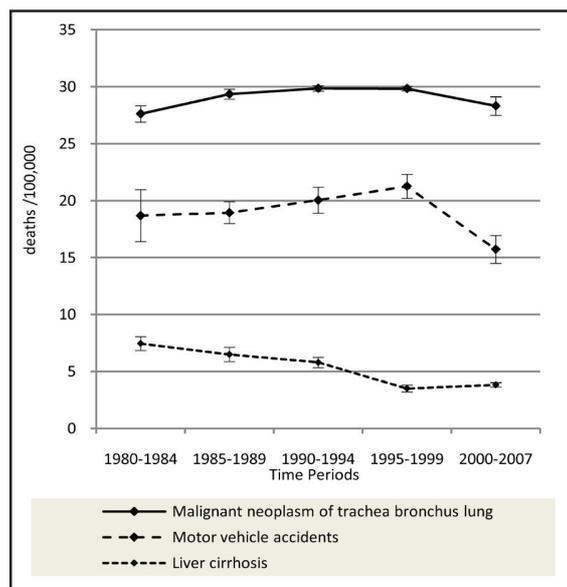


Figure 3: Age standardized preventable mortality in Greece, 1980-2007
Error bars represent 95% confidence intervals

avoidable and all-causes or other causes mortality^{1, 3, 4, 9-12}. Treatable mortality showed the largest percentage decline, a finding that has been also reported in similar studies^{12, 13, 17, 18}. This finding enhances the hypothesis that the Greek health care system has made substantial contributions to the reduction in mortality over the past three decades.

Methodological considerations-limitations

It has been shown that observed AM trends are influenced by the list of avoidable deaths applied¹⁹, a problem that impairs the comparability between AM studies.

Moreover, the margin between treatable and preventable causes in some cases is blurry, due to the multi-factorial nature of most health outcomes. In that sense, the inclusion and classification of breast cancer as treatable has been often disputed, given that treatment is effective only at early stages and more than 30% of deaths are considered preventable through regular mammographic screening^{12, 20}. Also, deaths from traffic accidents, classified in most studies as preventable, may also be influenced by changes in emergency services, and thus considered partially treatable¹³. In conclusion, to some degree, treatable mortality also reflects the impact of health policy and, similarly, preventable mortality relates to some extent with advances to medical care. In the same sense, the arbitrary use of age limits within which death is considered avoidable has been criticized as a rather crude approach²¹.

The use of the same list of avoidable causes throughout the period of the study raises one of the most controversial issues addressing the core concept of AM, as it implies that no progress in medicine or public health has been made over this period. This conceptual limitation warrants for regular updates of the AM lists of conditions, as more conditions become progressively more treatable or preventable.

As noted by Nolte and McKee² the concept of AM has been criticized since it does not consider underlying disease incidence. To that point, Charlton et al, argue that regardless of whether or not disease incidence influences variation in death rates, high avoidable mortality rates indicate areas of potential health system weakness, given that the deaths are potentially avoidable²². Furthermore, varying incidence may reflect the influence of genetic, social and environmental factors that lie outside the health care system. AM studies that have considered underlying disease incidence as measured by morbidity data report that this only partly accounts for the observed variation in AM¹¹. AM variations have been shown to persist in studies that were able to control for disease incidence or proxies for disease incidence such as socioeconomic status or health care expenditure per capita^{14, 23, 24}.

Finally, the validity of death certificates in Greece poses as another issue of concern as indicated from different studies^{25, 26}. According to a WHO report²⁷, the death registration system of Greece has been judged to miss 10% of deaths overall. This limitation was considered as an overtime-systematic invariable error, thus the study findings should be interpreted with caution.

Findings – interpretation and discussion

The decrease of all-causes mortality in Greece during

the last three decades can be a result of the combined impact of two controversial trends: on one hand the decrease of infant mortality and mortality from infectious diseases and on the other the relatively slower and more gradual increase in mortality rates by disorders related to the “western” lifestyle culture, such as IHD and different types of cancer²⁸. According to the present study, the decline in AM in Greece is mostly attributed to falling rates of treatable mortality. The causes that contributed most to this decline were cerebrovascular disease together with perinatal deaths, as these causes were reported to have high death rates at the start of the study period and marked significant declines overtime.

The downward trend in death rates from infectious diseases in Greece (tuberculosis, pneumonia, measles, whooping cough, influenza) can be attributed to development of the health care system that included mass application of antibiotics and immunization programs. Further, the decline in mortality from infectious diseases may denote the epidemiological transition that any community is experiencing when shifting to a more advanced living standard-that have been the case of Greece during the last three decades.

A rather ambiguous trend was observed for some treatable conditions such as the neoplasm of the breast. The changing patterns of childbearing and breastfeeding, of exogenous hormonal intake and of dietary factors, including obesity and reduced physical activity, contribute to trends in incidence and mortality. On the other hand, the improvement in disease treatment and management with the establishment of treatment protocols, improved chemotherapeutic options and better therapeutic guidelines might explain many of the observed declines in mortality²⁹.

As opposed to the above, death rates from malignant neoplasm of colon and rectum, of skin, of testis and to a lesser extent, Hodgkin’s disease, showed an overtime increasing trend that should call for further investigation.

Preventable mortality death rates have declined at a slower pace than those of treatable. This reflects mostly, the overall stagnant death rates of malignant neoplasm of the trachea bronchus and lung, diseases highly attributed to smoking. Notably, Greeks have been classified among the heaviest smokers in the E.U^{30, 31}. Insofar, the health policies concerning tobacco control and smoking cessation have been poorly designed and implemented with no significant results. However, the time-lag between tobacco control interventions and the onset of any results in mortality^{32, 33}, should be considered for the interpretation of the mortality trend as the effectiveness of any health policy intervention is not fully realized.

A rather positive development in avoidable deaths from IHD was found during 2000-2007. In the absence of systematic implementation of health policies regarding the major risks for health i.e. tobacco use, dietary habits and lack of physical exercise, the decline observed would be possibly associated with the withdraw of the post -World War II Greek population cohort which experienced a sharp economic development followed by a rapid and radical change towards unhealthy alimentary habits³⁴, along with improvements related mostly to the

treatable aspect of IHD (i.e. introduction of statins therapy, angioplasty, drug-eluting stents).

Conclusions

AM can be regarded as an easy and cost effective signalling system of poor performance that can provide useful insights regarding the health system¹². Our findings suggest the important role of the health care system in Greece in terms of mortality. The fast decline of treatable mortality has influenced decisively the formation of the AM rate trend. This finding provides evidence of the contribution of therapeutic and diagnostic technologies that were introduced in Greece's health care during the past three decades. On the other hand, the slow decline in preventable mortality and IHD should be associated to unhealthy lifestyle and to weaknesses in health promoting policies such as tobacco control, smoking ban and physical exercise. Although the observed declines in AM rates may also reflect changes in other factors that influence mortality such as environment and socioeconomic conditions, they are suggestive of the health care system being an important determinant of health improvements in Greece in recent decades. Further studies on the quality of care should enrich AM concept with other methods examining the structure and adequacy of health care.

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