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## Short report

### Doctors' strikes and mortality: A review

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#### ABSTRACT

A paradoxical pattern has been suggested in the literature on doctors' strikes: when health workers go on strike, mortality stays level or decreases. We performed a review of the literature during the past forty years to assess this paradox. We used PubMed, EconLit and Jstor to locate all peer-reviewed English-language articles presenting data analysis on mortality associated with doctors' strikes. We identified 156 articles, seven of which met our search criteria. The articles analyzed five strikes around the world, all between 1976 and 2003. The strikes lasted between nine days and seventeen weeks. All reported that mortality either stayed the same or decreased during, and in some cases, after the strike. None found that mortality increased during the weeks of the strikes compared to other time periods. The paradoxical finding that physician strikes are associated with reduced mortality may be explained by several factors. Most importantly, elective surgeries are curtailed during strikes. Further, hospitals often re-assign scarce staff and emergency care was available during all of the strikes. Finally, none of the strikes may have lasted long enough to assess the effects of long-term reduced access to a physician. Nonetheless, the literature suggests that reductions in mortality may result from these strikes.

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#### Introduction

Few things inspire as much unease as the prospect of not having access to medical treatment during illness. The thought of striking health care providers, especially the spectre of emergency cases left to suffer without immediate care and sick patients deprived of necessary medical attention, cause alarm even among the healthy. The general expectation is that physician strikes would lead to declines in care and mortality increases. However, several studies have suggested that when doctors go on strike, mortality rates paradoxically fall. In a systematic review of the literature addressing physician strikes and their influence on

mortality, we identified seven articles that assess mortality changes during five strikes around the world.

#### Data and methods

We conducted searches of the literature between May 2007 and April 2008 using the PubMed, Jstor and EconLit databases. We used combinations of the keywords *physician(s)/doctor(s)* and *strike/slowdown/labor action/collective action* and *mortality/death* searching English-language peer-reviewed journals. The searches identified 156 articles (this includes overlap as some articles appeared in multiple searches). All articles were identified in PubMed, with Jstor and EconLit providing no additional articles meeting our inclusion criteria. We excluded articles that employed different meanings of the word "strike" and that discussed strikes not involving physicians. The latter criteria eliminated three articles reviewing strikes by other health workers (Allebeck, 1985; Belmin, Chatellier, Bellot, &

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Moulias, 1992; Stabler, Schnurr, Powell, Stewart, & Guenter, 1984). We only included articles presenting empirical data on the relationship between physician strikes and mortality. Four articles that discussed mortality but did not present data were excluded (Adams, 1986; Chapman, 2006; Thompson & Salmon, 2006; Warner, 1984), as were three letters that recounted results from full articles that were included (Joffe, 1979; Roemer, 1979; Slater, 1984). Of the 156 articles, seven met our inclusion criteria.

## Results

We identified seven articles assessing mortality data from five doctors' strikes, all of which occurred between 1976 and 2003. Each one is discussed below and details are provided in Table 1.

A strike in Los Angeles County, CA in January 1976 was the first physician strike to be analyzed in terms of mortality. Doctors initiated the strike to express their discontent about increasingly high medical malpractice insurance premiums for which they were responsible (Roemer & Schwartz, 1979). The slowdown lasted five weeks and approximately 50% of doctors in the county reduced the scope of their practice and withheld care for all but emergency cases (James, 1979).

Three articles examine this strike. James (1979) uses a combination of surveys, *t* tests, moving average comparisons and a physician discussion panel to assess whether the strike actually affected mortality in Los Angeles County. He concludes that the strike may have actually prevented more deaths than it caused: between 31 and 132 deaths were attributable directly to the strike, and 55–153 deaths were avoided because of the strike. James argues that these differences, though not significant, are noteworthy and could be the result of reductions in deaths related to elective surgeries.

Roemer and Schwartz (1979) use not only the five weeks of the strike, but also the mortality figures from the seven subsequent weeks in 1976 and in the previous five years as comparison. They argue that it is important to also review death records for the weeks following the strike because mortality due to surgery sometimes does not occur until two to three weeks later (Roemer, 1979; Roemer & Schwartz, 1979). Furthermore, the strike may have caused delays in recording deaths (Joffe, 1979). Thus, James' analysis may have overlooked some deaths. Still, Roemer and Schwartz found that Los Angeles County residents experienced only minimal reductions in access to medical care during the strike. They also observed that mortality declined steadily from week one (21 deaths/100,000 population) to weeks six (13) and seven (14), when mortality rates were lower than the averages of the previous five years. However, as soon as elective surgery resumed, there was a sharp rise in deaths. These authors also highlight the risks associated with elective surgeries in interpreting the patterns of mortality following the strike.

Roemer (1981) presents similar conclusions based on examinations of death certificates from the two weeks following the strike. This revealed that there were ninety more deaths associated with surgery for the two weeks following the strike in 1976 than there had been during the same period in 1975. On the other hand, infant mortality rates, generally regarded as a reliable indicator of the

population's general health, showed no significant deviations from the control period (Roemer, 1981). This provides more evidence that the halt in elective surgeries was the primary cause of the decline in deaths.

Several issues remained unaddressed in these papers. Since the strike involved only 50% of physicians, it may not have drastically reduced access to health care. The sick could still receive care from the remaining doctors, and emergency services were still provided. Second, a five-week strike is long enough to assess the impact of doctor shortages on catastrophic and emergency health care, but may not be long enough to assess the health impact of removing access to many procedures, such as removal of malignancies. It would have been beneficial to separate out changes in deaths from emergent, life-threatening conditions such as acute myocardial infarctions and acute gastrointestinal bleeds. With respect to elective surgery, risks are immediate while any benefits are not observable until later. On the other hand, if these surgeries are delayed, there may be an increase in deaths in the months following the strike, as more follow-up surgery may be needed. Roemer and Schwartz offer the most promising analytic approach by comparing mortality during and following the strike with the same period in previous years.

Jerusalem experienced a doctors' strike from 2 March to 26 June 1983 as a result of a salary dispute between the government and the Israel Medical Association. 8000 of Jerusalem's 11,000 physicians participated in the strike by refusing to treat patients inside hospitals, though many of them set up separate aid stations where they treated emergency cases for a fee. Warner (1984) notes that mortality rates in Israel decreased during the strike, but she does not provide data to support her assessment (Warner, 1984). Slater and Ever-Hadani's (1983) analysis examines death certificates from several months surrounding the strike period, 16 February–3 September 1983, and from a control period the previous year, 17 February–3 September 1982. They find that mortality did not increase during or after the strike, even when elective surgery resumed. The pre-strike deaths for the control period and the strike period were identical at 89; there were six fewer deaths during the strike than during the control period, while in the ten weeks following the strike, there were seven more deaths than there had been in 1982. The authors argue that this apparent lack of impact of the strike on mortality suggests that there was an over-supply of doctors in Jerusalem (Slater & Ever-Hadani, 1983).

This action offers a more comprehensive view of the effects of health care strikes than the one in Los Angeles County because a majority of doctors participated and the strike lasted several months. The results underscore that a doctors' strike involving the withdrawal of some non-emergency services does not necessarily lead to increased mortality. We cannot, however, overlook the fact that striking physicians opened aid stations, which supplemented medical care and also likely prevented people from crowding the hospitals. In addition, Steinherz (1984) points out in response to Slater and Ever-Hadani's analysis that, while physicians were technically on strike during the four months of the dispute, most physicians did not actually adhere to the strike regulations. In fact, most doctors in

**Table 1**  
Summary of articles assessing mortality during doctors' strikes

Article	Strike location	Strike dates	Strike duration	Participation	Study period	Control period	Findings
James (1979)					Weekly number of deaths during strike (5 weeks) and 2 weeks following strike	Predicted deaths based on means for the preceding 5 years	Mortality declined during strike; deaths avoided: between 55 and 153
Roemer and Schwartz (1979)	Los Angeles County, CA	January 1976–February 1976	5 weeks	≈ 50% of physicians	Death rates during strike (5 weeks) and 7 weeks following strike	Same periods of the previous 5 years	Mortality declined during strike and increased when elective surgery resumed
Roemer (1981)					Deaths in 2 weeks following strike	Same 2 weeks of the previous year	Death rate after strike was lower than in previous year but there were more surgery deaths among these than in the previous year
Slater and Ever-Hadani (1983)	Jerusalem, Israel	March–June 1983	17 weeks	8000 of 11,000 physicians	Number of deaths pre-strike (2 weeks), during strike (17 weeks) and post-strike (10 weeks)	Same period of the previous year	No difference in mortality
Erceg et al. (2007)	Croatia	January–February 2003	1 month	Majority of physicians in hospitals and polyclinics	Number of deaths pre-strike (1 month), during strike (1 month) and post-strike (1 month)	Same period in 2001, 2002 and 2004	No difference in mortality during the strike period, and no difference in distribution of causes of death
Siegel-Itzkovich (2000)	Jerusalem, Israel	March–June 2000	3 months	Physicians in public hospitals	Number of monthly funerals performed during strike	Monthly averages of previous 3 years	Number of funerals decreased
Salazar et al. (2001)	Spain	May–June 1999	9 days, non-consecutive	All resident physicians except family care physicians in teaching hospitals	Mortality rate in the emergency department on strike days during study period (1 Barcelona hospital studied)	Mortality rates in the emergency department on non-strike days during study period (1 Barcelona hospital studied)	No significant difference in mortality rates in the emergency department

Jerusalem provided services in a private or partially private context, so, while they participated in the strike in spirit, they did not actually halt their services.

Resident physicians in teaching hospitals in Spain went on strike for nine non-consecutive 24-h days between 5 May and 22 June 1999. Resident physicians in all specializations except family medicine participated. Salazar et al. (2001) evaluate the impact on patient health based on emergency department data from the Bellvitge hospital in Barcelona using data on patients admitted between 5 May and 22 June. They compare the nine days of the strike with the twelve days with no strike in this time interval and find that the strike did not have a statistically significant influence on mortality rates in the emergency department or on other indicators of care. During the strike, the emergency department experienced a mean of zero deaths per day, and during the non-strike period a mean of one death per day (Salazar et al., 2001). The focus on mortality on specific days limits the possibility of finding differences. The focus on emergency care is limiting, because these deaths represent only a small portion of deaths, so the scope for assessing the impact of access to a doctor is limited. Still, they may represent the deaths where medical care can have the most impact. It is important to note that during this strike, the residents were replaced with staff physicians, so the care provided may have actually been more experienced.

Between March and June of 2000, Jerusalem's health care system experienced another strike, resulting from the Israel Medical Association's discontent with the government's proposed wage contract. The hospitals in the area cancelled all elective admissions and surgeries, but kept emergency rooms and other vital departments, such as dialysis units and oncology departments, open. Siegel-Itzkovich (2000) assesses changes in mortality by studying the *Jerusalem Post's* reports of funerals during the strike period. She finds a decline in the number of funerals during the three months of the strike, compared with the same months of the previous three years. One burial society reported 93 funerals during one month of the strike (May 2000) compared with 153 in May 1999, 133 in May of 1998, and 139 in May 1997. The author concludes that the strike was the only variable that could have caused a significant enough change in population health to bring about a decrease in funerals, and therefore presumably in mortality. The proposed explanation for the decrease in mortality was, once again, the halt in elective surgeries (Siegel-Itzkovich, 2000). The amount of data presented in this article is very limited, as is the discussion of methods, making the results difficult to assess. The method of examining funeral records is likely to systematically exclude certain deaths. On the other hand, there is no reason to expect that the under-count would be higher during the strike relative to other times, so the patterns are likely consistent with actual trends.

The Croatian Physicians' Trade Union organized a country-wide strike between 15 January and 14 February 2003, with the majority of physicians working in hospitals and polyclinics participating. Emergency medical and dental care was provided during the four-week strike at levels similar to what was normally provided during

weekends and holidays. Erceg, Kujundzic-Tiljak, Babic-Erceg, Coric, and Lang (2007) examined national death statistics from the month of the strike, the month preceding the strike, and the month following the strike (thus, 15 December–17 March), as well as from the corresponding periods in the two years preceding the strike (2000–2002) and the year following the strike (2003–2004). They find that death rates during the month of the strike were similar to those during the surrounding years (1.0–1.1/1000), with no significant differences. The authors conclude that there is no significant evidence that mortality rates were affected by the strike. This article provides a particularly thorough examination of mortality rates associated with a strike. An advantage of this article is that it also explores cause-specific mortality, which makes it possible to assess whether increase in certain causes of death actually existed but were masked by overall trends. However, Erceg et al. find no evidence of differences in cause-specific mortality between strike and non-strike periods.

Although outside the scope of this review, we found that similar findings are reported about mortality during other health workers' strikes. Two articles on nurses' strikes, one from a month-long strike in Alberta, Canada in 1982 (Stabler et al., 1984) and one from a 25-week strike in Paris (Belmin et al., 1992) found no significant changes in mortality. An article examining a two-week strike involving nurses and other hospital employees in Sweden found that mortality was significantly lower during the strike than in the previous year (Allebeck, 1985).

## Discussion

This study is based on a systematic review of articles assessing the effects of doctors' strikes on mortality. Four of the seven articles presenting data found that mortality dropped as a result of the strike, and three observed no significant change in mortality during the strike or in the period following the strike. One found that while overall mortality fell, surgery deaths in the period following the strike increased, but the relationship of this increase to the strike is unclear.

Methods varied, but all included tests for statistical differences in deaths between the strike period and one or several control periods using chi square or *t*-test statistics. Four articles used control periods that included data from times corresponding with a few weeks following the strikes as well, to capture delayed deaths and delays in recordkeeping, as well as to assess how mortality was affected by the resumption of elective surgery. Because the studies are unavoidably observational, they do not account for variations in the strikes, such as duration, participation rates, and level of curtailment of care. The fact that all but one study compares mortality surrounding strikes with control periods in other years is an important strength of the papers, allowing them to identify trends and to hold constant some of the other sources of variation, such as seasonality of mortality or accidents.

Further variation in the assessments is introduced because different indicators are used to evaluate the effects of the strikes on mortality. For example, articles use

different sources of data on mortality (vital statistics, death certificates, funeral records) and examine different populations (residents of a country, a county, a city, those admitted to a hospital). Because people may often be able to seek care elsewhere, examining mortality in a broader population offers better possibilities for assessing changes in mortality. Still, we may expect that those who are able to seek care elsewhere may be less likely to be emergency cases, which would actually bias results in the opposite direction.

An alternative that we have not encountered is to compare the differences between an area that did experience a strike and one that did not, both prior and subsequent to the strike. This double-differencing would offer another approach to taking advantage of the natural experiment of the strike. Another promising approach is to consider cause-specific mortality, or mortality due to causes amenable to interventions to determine whether deaths that should not occur in the presence of timely and effective health care were differently affected (see [Nolte & Mckee, 2003](#)). This approach was explored by [Erceg et al. \(2007\)](#) and [Roemer \(1981\)](#), but is often difficult because there are usually not sufficient deaths to identify significant differences by cause.

The results that mortality is either not affected or decreases during doctors' strikes are unexpected, and may be interpreted as indicating that doctors have little impact on mortality. However, there are several limitations and alternative explanations that need to be considered. First, none of the strikes were total and emergency care was provided during all of them. Second, three of the five strikes covered small geographic regions. The strikes lasted no more than a few months and the nation-wide strikes lasted no more than one month. Therefore, these actions do not allow us to test the effects of prolonged and complete lack of access to health care. Third, mortality as an outcome is in some ways limiting because death is ultimately a rare event and therefore may not fluctuate greatly in response to even severe changes. Mortality may not be a good indicator of changes in health that do not culminate in death but that increase suffering. Furthermore, death is often the culmination of a long series of events and interactions, many of which are outside the realm of health care ([Nolte & Mckee, 2003](#)). Indeed, some of the major causes of death are not amenable to medical intervention ([Nolte & Mckee, 2008](#)).

In spite of the limitations of the studies, the fact that several studies using different methods in different settings found consistent results suggests that they may indeed be capturing a phenomenon. The findings raise important issues regarding the appropriate levels of health care. They highlight the risks of elective surgeries, which may actually increase mortality. They also highlight the possibility that an over-supply of doctors may not increase patient survival

and may introduce inefficiencies into health care. In summary, the selective withdrawal of services by various health care workers for relatively short period of time does not appear to adversely influence mortality.

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