



# STATEMENT

Synopsis of Research Report 99

HEALTH  
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## A Case-Crossover Analysis of Fine Particulate Matter Air Pollution and Out-of-Hospital Sudden Cardiac Arrest

### BACKGROUND

Epidemiologic studies have reported associations between short-term increases in particulate matter (PM) air pollution and increased daily mortality and morbidity from respiratory and cardiovascular diseases. Although these studies suggest that persons with preexisting disease are most susceptible to the effects of small increases in PM, the specific clinical conditions that confer increased risk have been unclear. Because most studies use mortality data from death certificates, clinical conditions at the time of death have not been known. Dr Checkoway and his colleagues proposed to investigate a previously uninvestigated association between sudden cardiac arrest and fine particulate air pollution. Such an association would have important public health implications because sudden cardiac arrest is most often observed as sudden cardiac death, responsible for almost 10% of total US mortality.

### APPROACH

The primary hypothesis that Dr Checkoway and colleagues tested was that increases in daily fine particle levels were related to increased risk of out-of-hospital sudden cardiac arrest. Sudden cardiac arrest and questionnaire data collected for a different purpose were used for this study in conjunction with exposure data available from the Puget Sound Clean Air Agency (Seattle WA).

The investigators used a case-crossover study design in which only case subjects were studied (rather than cases and control subjects); their exposure at the time when the health outcome of interest (sudden cardiac arrest) occurred was compared with some estimate of their typical level of exposure measured at another time. The case-crossover

method can be used to investigate whether a recent exposure has triggered or is related to the occurrence of an event—here, whether levels of PM are related to sudden cardiac arrest.

In this study, for each case of sudden cardiac arrest, a time period when the person was disease free was selected as a matched “referent” period. The exposure status at the time of disease onset, the “hazard” period, was compared with exposure during the referent period for that subject. (The authors also examined potential sources of bias in case-crossover studies of air pollution [Appendix A].)

### RESULTS AND IMPLICATIONS

Analyses were conducted for models that included a single pollutant (one of two sizes of PM) and multiple pollutants (in which SO<sub>2</sub>, CO, or both were added). The relative risk estimates for sudden cardiac arrest, which considered exposure to pollutants on the day of the outcome event and up to 5 days before the event, showed no evidence of an increase in risk. Furthermore, these results did not change when either SO<sub>2</sub> or CO exposure were included in the analyses. The investigators also examined several factors that might modify the results, including season, time of entry into the study, age, and risk factors for sudden cardiac arrest, such as diet, education, and smoking. These analyses showed no modification of the results; in addition, stratifying the subjects by age and other cardiovascular disease risk factors did not identify possible susceptible subgroups of the population studied.

Dr Checkoway and his colleagues made good use of a unique but small dataset, collected for a different purpose, to examine the association between PM and sudden cardiac arrest, a well-defined and specific health outcome. This outcome is of interest

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because of the associations between cardiovascular deaths and PM levels reported in other studies. The study results are sufficiently precise to rule out a 50% increase in risk of sudden cardiac arrest from exposure to PM in Seattle residents with no prior history of heart disease. It should be understood, however, that a lack of association between

sudden cardiac arrest and PM in this study does not rule out an association between other cardiac or cardiovascular disease outcomes and PM. Epidemiologic and laboratory studies currently under way will add to our current knowledge about the possible PM effects on potentially susceptible individuals.

# A Case-Crossover Analysis of Fine Particulate Matter Air Pollution and Out-of-Hospital Sudden Cardiac Arrest

## Investigators' Report

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Abstract

Introduction

Specific Aims

Methods

Study Subjects

Air Quality Data

Exposure Substudy

Statistical Methods

Results

Discussion

Appendix A. Referent Selection in Case-Crossover Analyses of Acute Health Effects of Air Pollution

Introduction

Methods

Results

Discussion

Time-Selection Bias Patterns

Bidirectional Versus Retrospective Sampling

Autocorrelation Exclusion Period

Residual Bias in the Estimating Procedure

Analogies Between Case-Crossover and Case-Control Designs

## Health Review Committee's Critique

Introduction

Scientific Background

Findings

Technical Review

Study Design

Analysis

Particulate Matter Exposure Measurements

Conclusion