A Method for Surveillance of Influenza Epidemics

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Introduction

The current interest in influenza has prompted the authors to submit this brief description of work which is an outgrowth of an ongoing study of the effects of air pollution on health in New York City. An analysis of trends in the number of emergency room visits for specific upper respiratory diseases over time suggested to us that such visits might provide a simple and easily accessible measure that would signal the onset of an influenza epidemic and assess its duration.

The New York City Health Department has successfully used the actual number of pneumonia deaths reported each week as a reliable indicator of influenza outbreaks since the fall of 1957. A rise in reported pneumonia deaths above a computed upper "tolerance" level for two successive weeks is considered to be a good indicator of an upper respiratory disease outbreak in the city.[1] Since hospital emergency rooms have become a major source of medical care for large segments of the city's population, it seemed logical to expect that the level of emergency room visits for respiratory complaints would provide a more immediate indicator of a serious influenza outbreak, with a marked rise in emergency room visits preceding an increase in reported pneumonia deaths.

With this in mind, we analyzed available emergency room records at two major municipal hospitals during the Fall and Winter periods preceding influenza outbreaks which occurred in 1970 and 1971.

Materials and Methods

Microfilmed emergency room log records (excluding patients' names) for 1969–1971 at Kings County Hospital Adult Emergency Room and Cumberland Hospital Adult and Pediatric Emergency Rooms were coded by age, sex, and diagnosis.

Despite the known cyclical pattern of respiratory disease visits over the year, it was assumed that a straight line trend would adequately describe the pattern of visits over a relatively short period of a few months. Under this crude assumption, the actual number of emergency room visits occurring during the period immediately following might be expected to fall "close" to the extrapolated line unless there were some important changes in the pattern of emergency room usage which, in turn, might be due to some underlying change in community health conditions. Specifically, it was postulated that a large discrepancy between observed emergency room visits and an "expected" volume of visits might signal a major respiratory disease outbreak. (We are currently performing time series analyses on our data which will describe more adequately patterns of visits to emergency rooms.)

Total weekly visits for bronchitis, pneumonia, and influenza (B + P + I) were tabulated separately for each emergency room. Standard least squares techniques[2] were used to fit a straight line to base period data and extrapolated through the period during which the outbreak occurred in the city. A "tolerance zone" was computed, equal to twice the standard error of estimate.* These are shown on the accompanying graphs, covering the Fall and Winter of 1970–71. Also shown are the pneumonia deaths by week of reporting.

Results

At the Kings County Adult Emergency Room (Figure 1), visits for the specified diagnoses started to rise beyond the upper tolerance limit two weeks after the end of the base period, and did not approach the extrapolated line again until the week ending March 26, eight weeks later. The abrupt peak in emergency room usage roughly paralleled the peaking in reported pneumonia deaths which followed one to two weeks later. The pattern at Cumberland Hospital Adult Emergency Room also followed the trend for pneumonia deaths in the city, with a lead of one to two weeks (Figure 2).

In contrast, corresponding figures on Pediatric Emergency Room visits at Cumberland (Figure 3) show markedly different (double-peaked) patterns of pneumonia mortality and (B + P + I) visits.

The same techniques were applied to Cumberland Hospital data for the 1969–1970 Fall and Winter season with correspondingly similar** results for adult and pediatric visits.

Discussion

For the limited time period we were able to cover, our findings suggest that surveillance of adult emergency room visits may well be effective in detecting major respiratory disease outbreaks at an early stage. The method described above is simple and economical and the required information should be easily accessible.

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*The equations and standard errors are available on request to the authors.

**These graphs are available on request to the authors.

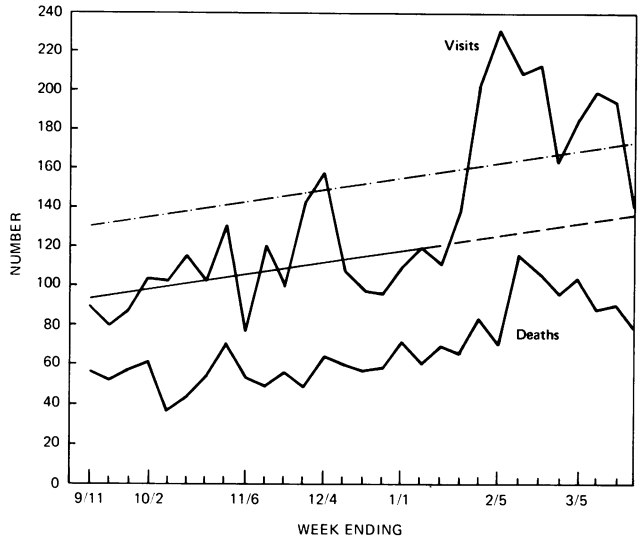

FIGURE 1—Weekly Pneumonia Deaths Reported in New York City, Adult Visits to Kings County Emergency Room for B + P + I Diagnoses 9/11/70–3/26/71 and Least Squares Line Fitted to Emergency Room Visits for Base Period 9/11/70–1/15/71.

Despite the obvious problems related to obtaining accurate and complete diagnoses under the adverse conditions of many hospital emergency rooms, the diagnoses listed in the logs of these busy emergency rooms have been shown to be useful for the purposes described above.

In the past, others have suggested monitoring the number of visits for all causes as an indicator of an influenza outbreak.[3, 4] We have compared the trends for total visits** as opposed to visits for the specified respiratory conditions, and found that they differ considerably.

The use of pediatric emergency room records for surveillance of epidemics of influenza a2/Hong Kong/68 has been

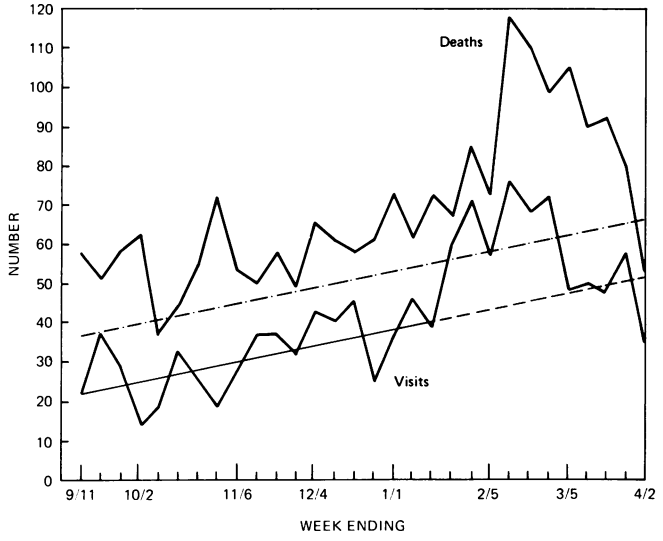

FIGURE 2—Weekly Pneumonia Deaths Reported in New York City, Adult Visits to Cumberland Emergency Room for B + P + I Diagnoses, 9/11/70–4/2/71 and Least Squares Line Fitted to Emergency Room Visits for Base Period 9/11/70–1/15/71.

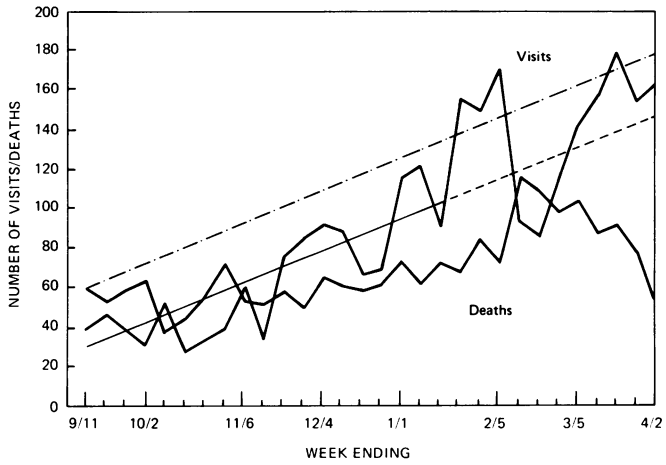

FIGURE 3—Weekly Pneumonia Deaths Reported in New York City, Pediatric Visits to Cumberland Emergency Room for B + P + I Diagnoses, 9/11/70–4/2/71 and Least Squares Line Fitted to Emergency Room Visits for Base Period 9/11/70–1/15/71.

reported by Matlof, et al.[5] They reported a peak number of patients with upper respiratory infections or unclassified viral illness approximately two weeks before the peak in pneumonia and influenza deaths. Our data suggest that surveillance of pediatric emergency room patients may not be as useful a monitoring device as surveillance of adults.

Conclusions

To further test the effectiveness of this method, we suggest that the same analysis be carried out in both epidemic and non-epidemic years for hospitals in other parts of New York City. Should this method prove effective in future tests as well, it should be used routinely to provide a simple, sensitive, and early indicator of a serious community health problem.

ACKNOWLEDGMENTS

We would like to thank Ms. F. Nelson from the Bureau of Health Statistics and Analysis, New York City Department of Health, who supplied the death statistics. Support for this work was provided by a General Research Grant from the Public Health Service (No. 5-SO1-RR-05449) and grants from the Environmental Protection Agency (No. 1-RO1-AP-01100) and the Health Research Council of New York City (No. HRC-U-1939) and the National Institute of Environmental Health Sciences (No. 1-RO1-00899).

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