

Influenza in Los Angeles County, 1968-69

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THE LAST SIGNIFICANT epidemic of A₂ influenza in Los Angeles County had occurred in early 1966, with its estimated peak around February 20. Although the remainder of the nation experienced epidemic influenza in the 1967-68 winter season, California, including Los Angeles, did not (1).

In July 1968 the World Health Organization received reports of an influenza epidemic in Hong Kong. The agent isolated from patients in this outbreak was found to differ antigenically from recent

A₂ strains, and it was labeled influenza A₂/Hong Kong/68 (2).

Because of the magnitude of the antigenic drift, the Surgeon General's Advisory Committee revised its statement of June 1968 (3). Their original forecast had mentioned little or no influenza activity for most of the nation in the 1968-69 season.

The revised statement and recommendations proved to be correct, as the entire country experienced epidemic activity by January 1969. This report describes the epidemic in Los Angeles County and the surveillance methods used to monitor it.

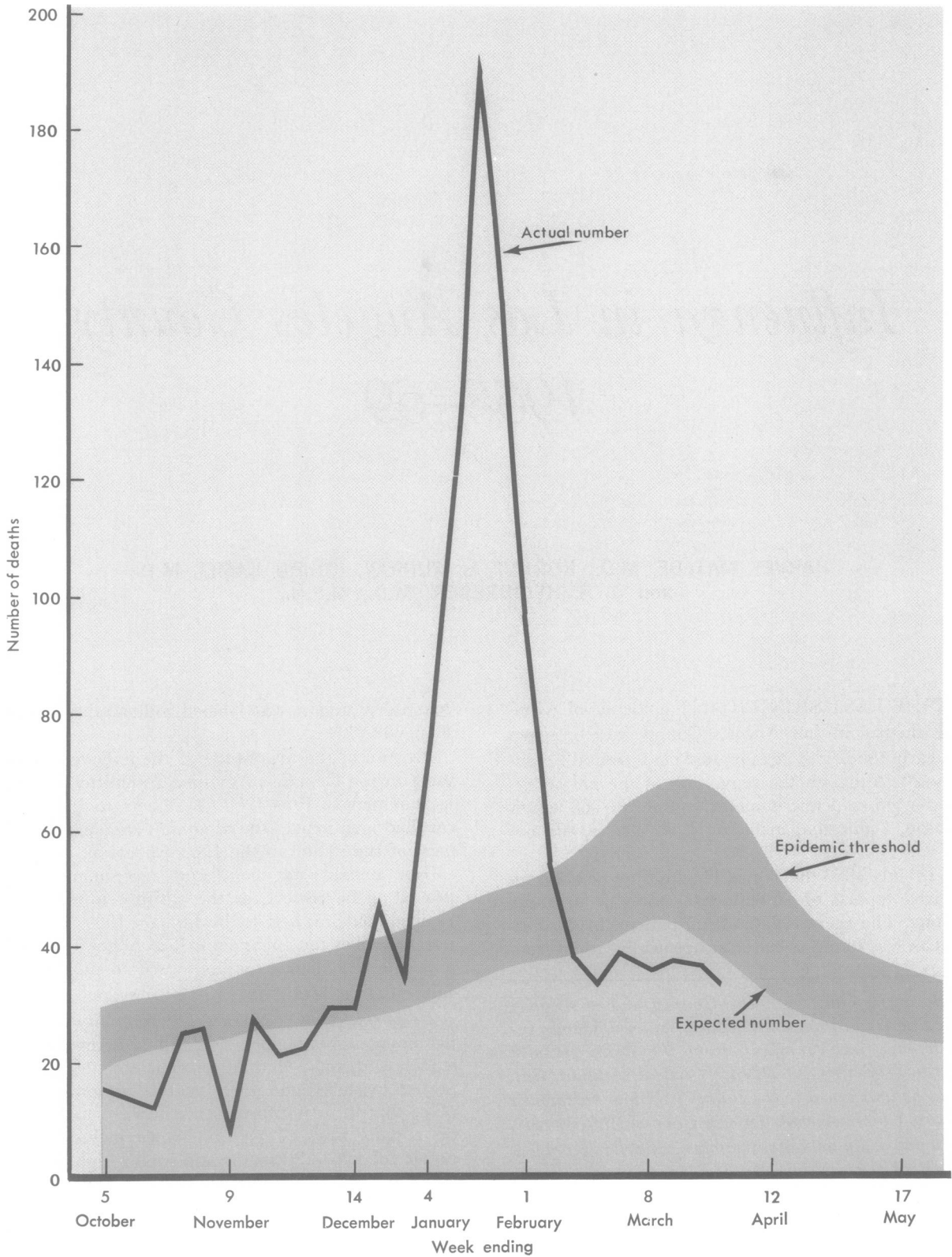
Surveillance Methods

Daily reporting of absenteeism from city schools. Beginning in September 1968, all Los Angeles city schools with more than 10 percent absenteeism reported by telephone to a central administrative office that in turn informed the health department on a daily basis. This surveillance included 576 public schools—130 senior and junior high schools and 446 elementary schools.

Weekly reporting of school absenteeism. A sample of approximately 30 city, county, and parochial schools reported absenteeism by mail on a weekly

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Figure 1. Deaths from pneumonia and influenza, Los Angeles County, weeks ending October 5, 1968–May 17, 1969



basis. The weekly total figure was derived in the following manner:

$$\text{Total percent absenteeism} = \frac{\text{Total number of person-days of absence for 30 schools}}{\text{Total enrollment} \times \text{number of school days in the week}} \times 100$$

Separate calculations were derived for elementary and high schools.

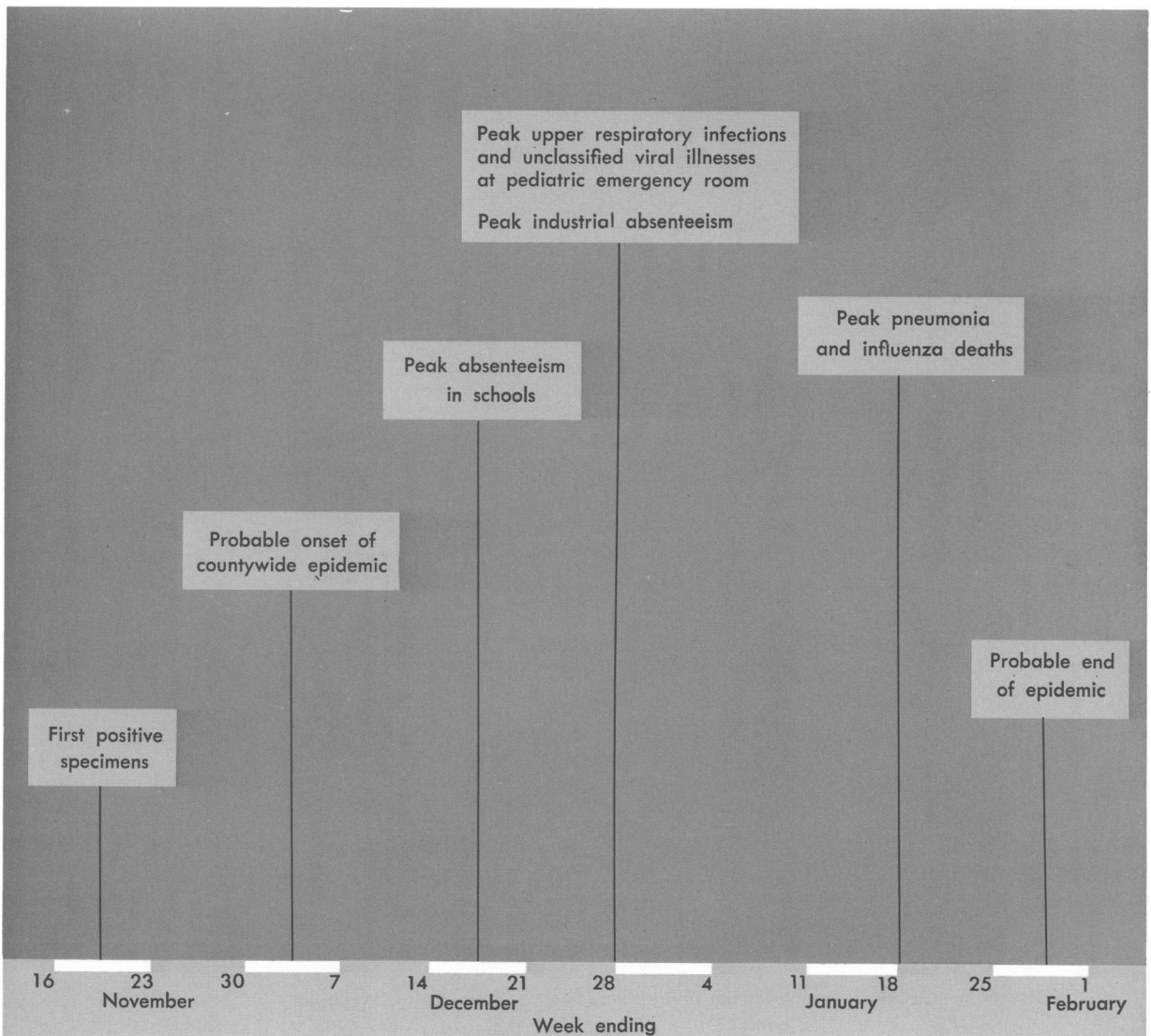
Industrial absenteeism. Scattered reports indicating excess absenteeism during the epidemic were received from many large industrial employers. However, only one formal surveillance was established for industry, and it was maintained with the personnel health office of a local telephone company which employed approximately 10,000 per-

sons. On a weekly basis, the company reported the total number of employees who attributed their absence from work to influenza. The more desirable data, total daily absentee figures, were not available.

Pediatric emergency room data. Daily reports were received from the pediatric emergency room (PER) at the Los Angeles County-University of Southern California Medical Center. These data included daily totals for the number of patients seen and the diagnoses of their conditions. Patients with unclassified viral disease included those with non-specific febrile illness and influenza if the illness was diagnosed by PER physicians. Upper respiratory illnesses, diagnosed by PER physicians were also reported.

Pneumonia-influenza deaths. Death certificates were reviewed by report week to ascertain the total

Figure 2. Sequence of events pertaining to influenza, Los Angeles County, weeks ending November 23, 1968–February 1, 1969



number of deaths directly or indirectly attributable to pneumonia, influenza, or both. The Records and Statistics Division of the County of Los Angeles Health Department derived figures from 5 previous years to calculate the average number of deaths caused by pneumonia or influenza. These averages were plotted as a normal incidence curve along with a calculated epidemic threshold curve, which was 1.65 standard deviations higher than the normal incidence curve (fig. 1).

Results

The first known communitywide epidemic of influenza A₂/Hong Kong/68 among civilians in the United States occurred in Needles, Calif., in late October and early November (4). The outbreak

was investigated by the California State Department of Public Health. Confirmation was obtained serologically from convalescent patients and by isolating the viral agent from acutely ill patients.

Between November 15 and November 20, the Acute Communicable Disease Control Division of the county health department received the following information indicating the possibility of influenza activity within the county.

1. One junior high school in South Los Angeles reported 10–20 percent absenteeism for an entire week. The school nurse observed and reported symptoms consistent with influenza.

2. An outbreak of clinical influenza among staff and patients at a large local hospital.

Figure 3. Patients with upper respiratory infections or unclassified viral illness seen at Los Angeles County—University of Southern California pediatric emergency room September 9, 1967–April 6, 1968, and September 7, 1968–April 5, 1969

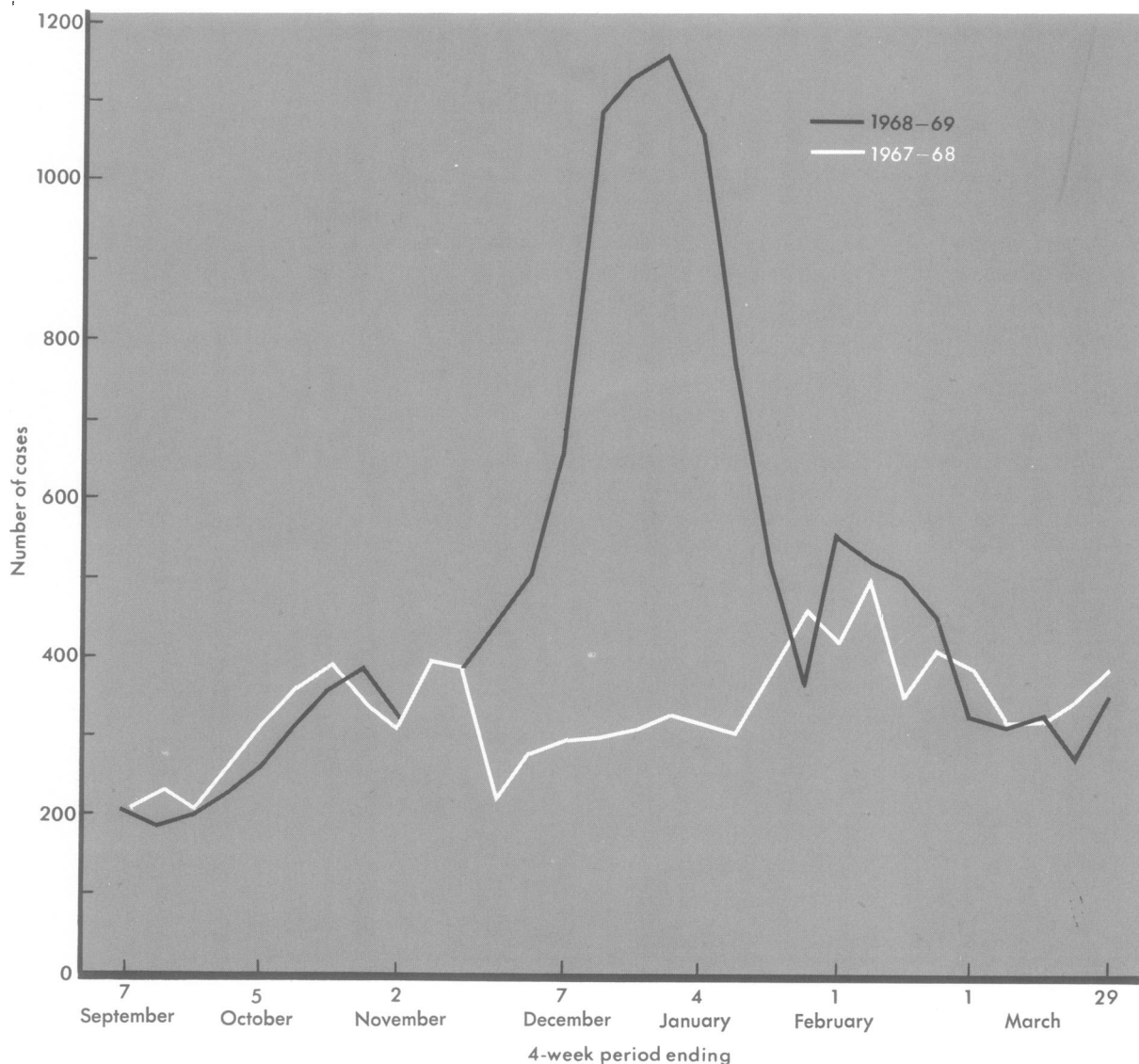
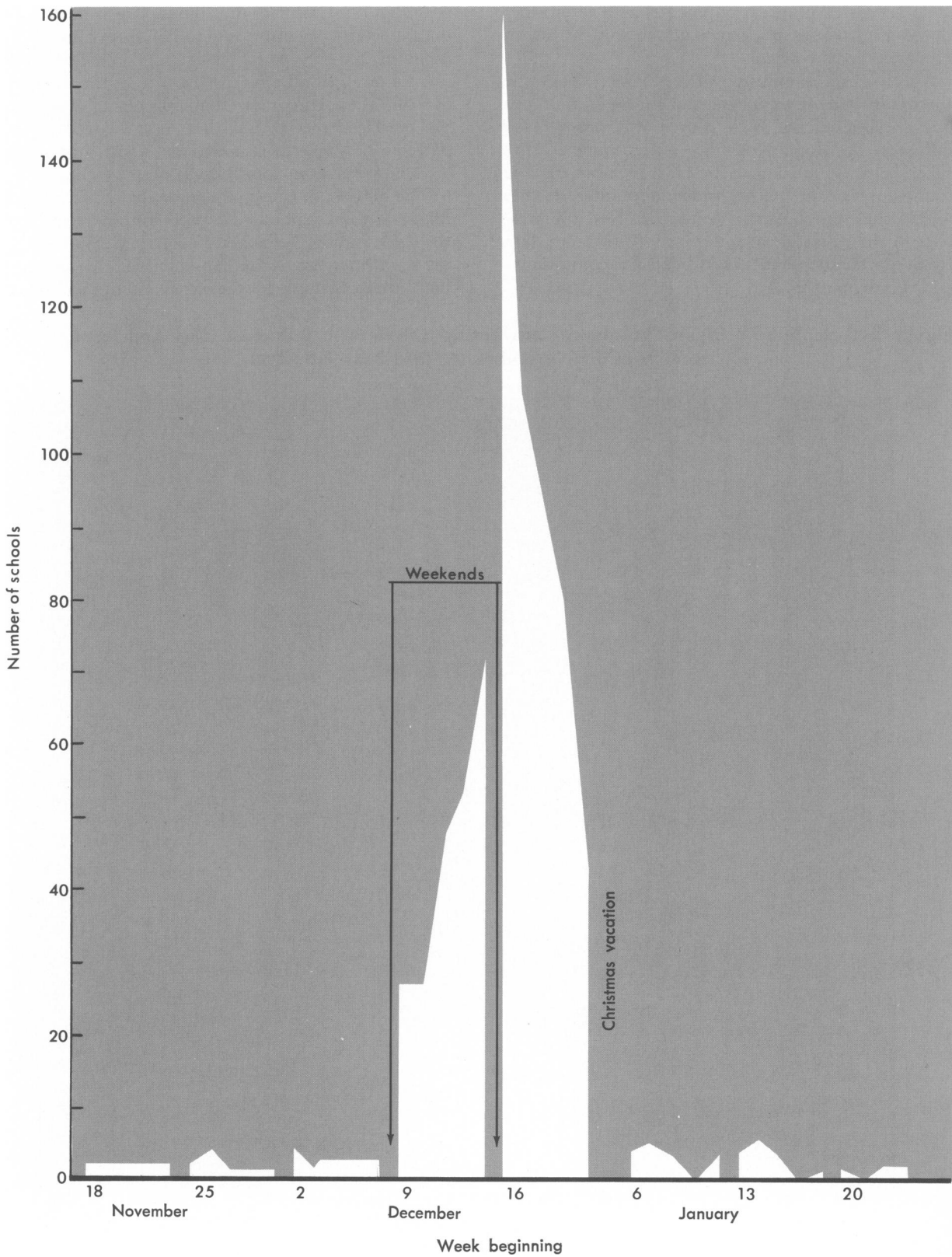


Figure 4. Absenteeism exceeding 10 percent in Los Angeles city schools, weeks beginning November 18, 1968-January 20, 1969



3. Reports of an influenza-like illness in patients seen by the personnel physician at a large aircraft plant.

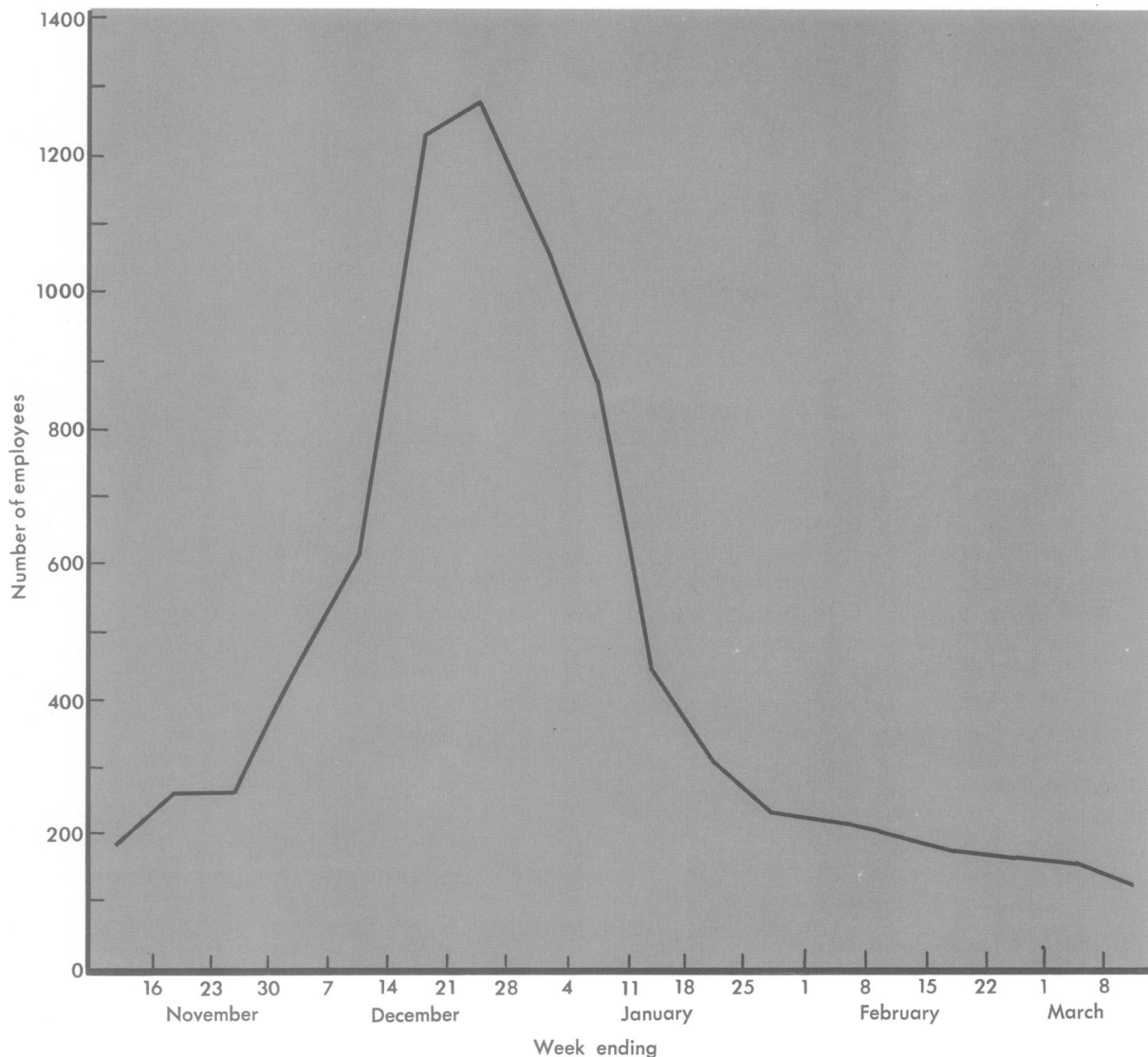
4. Increased numbers of patients with respiratory illness seen by the physicians at the student health clinic of a local college.

Specimens for culture were obtained from the throats of patients at all four locations, and at least one specimen from each source was positive for influenza A₂/Hong Kong/68. All specimens were taken between November 15 and November 20. The four sources were from widely separated locales within the county. At this point, therefore, the presence of the causative agent was confirmed, but data from surveillance had not indicated a community-wide epidemic (fig. 2).

The first indications of countywide influenza activity appeared during the week ending December 7, 1968. The total number of upper respiratory illnesses and unclassified viral illnesses seen in the pediatric emergency room rose to 650 from a previous range of 200–400 per week (fig. 3). This increase was followed rapidly by a sharp rise in the number of schools reporting more than 10 percent absenteeism on December 9. On that date 27 schools reported excess absenteeism compared with a previous level of fewer than four schools per day (fig. 4).

The number of employees reporting influenza-like illness at the telephone company also increased for the week ending December 7 (fig. 5). Concurrently, the slight increase in total absenteeism observed for the 30-school sample for the weeks ending November

Figure 5. Telephone company employees attributing absences to influenza, Los Angeles County, weeks ending November 16, 1968–March 8, 1969



29 and December 6 assumed greater significance (fig. 6). Thus, all four surveillance systems indicated the development of a communitywide epidemic between November 29 and December 7.

In the pediatric emergency room a peak number of 1,160 patients with upper respiratory infection or unclassified viral illness were treated during the week ending December 28. Following this peak a sharp decline was observed, and by January 25, 1969, the totals were again baseline. These data indicated 7 weeks of influenza activity with a peak during the fourth week (fig. 3).

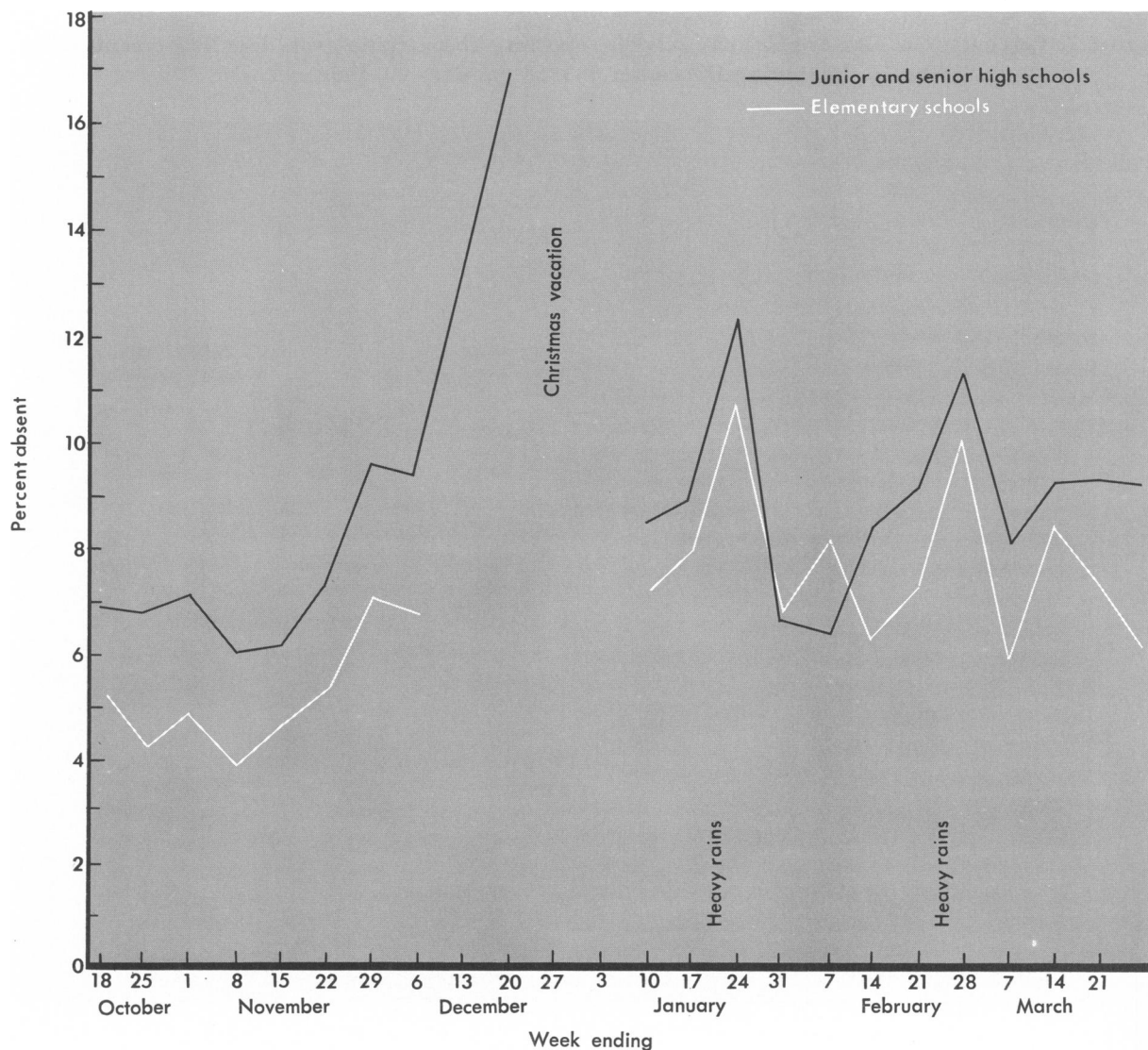
On December 16 the number of schools reporting excess daily absenteeism reached a peak of 158, followed by a rapid decline. Unfortunately, the beginning of Christmas vacation on December 20

obscured the estimated duration of the epidemic in city schools. After the reopening of schools on January 6, no more than six schools reported excess absentees on any given day (figs. 4, 7).

Total absenteeism from the countywide 30-school sample indicated a similar peak for the week ending December 20. Total absenteeism for the first week of school after Christmas approached normal levels (figs. 4, 6, 7). The rise noted for the week ending January 24 can probably be attributed to heavy rainstorms which caused considerable property damage and transportation problems.

The data from the telephone company showed a peak in the week ending December 28 with a return to normal on January 25. The estimated duration of activity by this indicator was 7 weeks, with a peak

Figure 6. Absenteeism in 30 selected Los Angeles County and city schools, weeks ending October 18, 1968–March 21, 1969



during the fourth week (fig. 5). Informally received data from other large industrial employers revealed estimated peak absenteeism between December 27 and January 3. This sample represented about 50,000 employees.

Deaths from pneumonia or influenza rose sharply in the week ending January 3 (fig. 1). A peak of 143 excess deaths from pneumonia or influenza occurred 2 weeks later on January 18. By February 8 the figures were below the calculated epidemic threshold.

Discussion

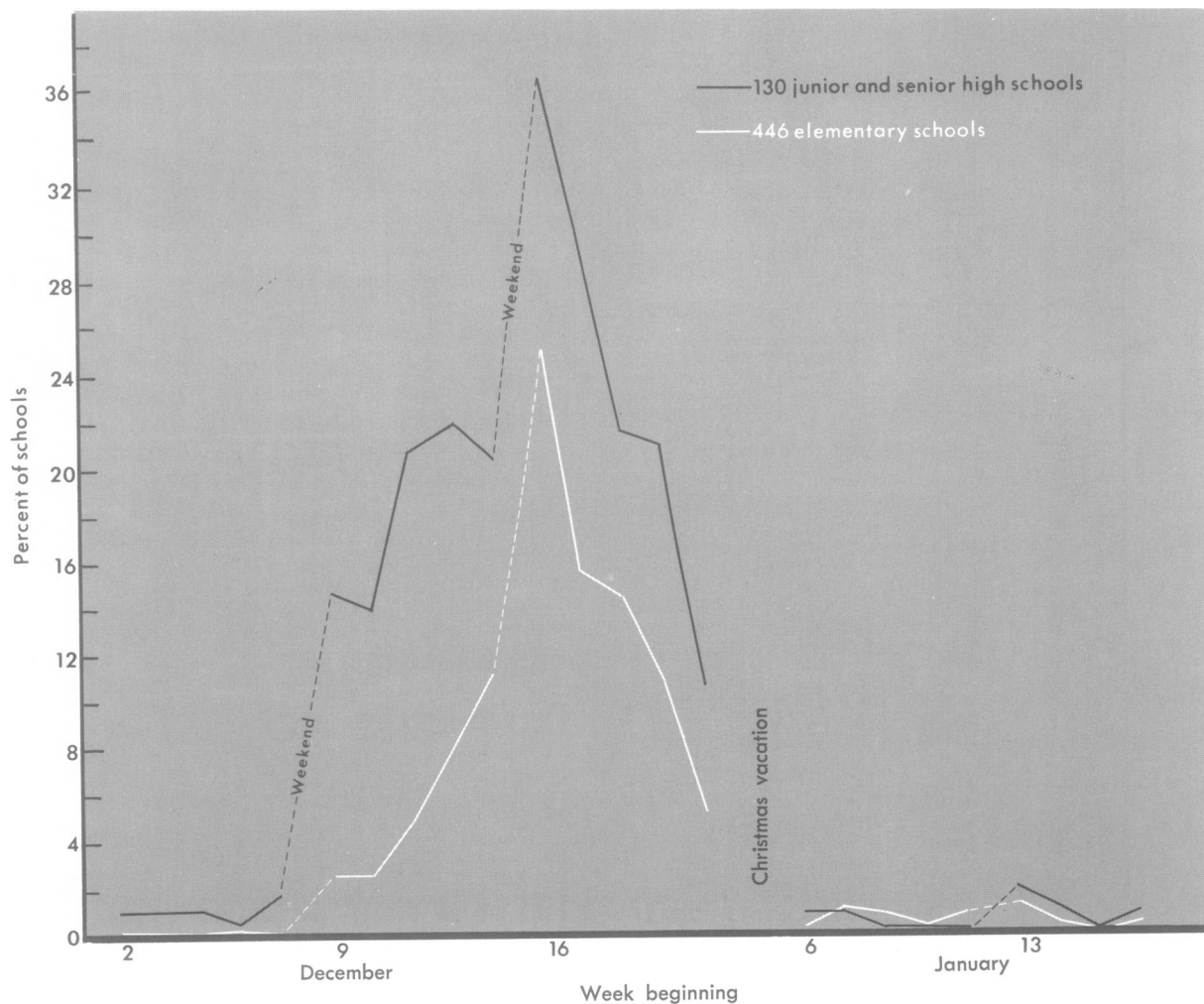
Since influenza is not a reportable disease in most areas of the United States, other means of surveillance have been recommended (1). These means include (a) monitoring absenteeism in schools and industry, (b) correlating reports of upper respiratory illness from physicians, outpatient clinics, and college infirmaries, (c) reviewing death certificate

data when pneumonia, influenza, or both were contributory causes, (d) investigating specific epidemics, (e) studying data from survey questionnaires, and (f) conducting serologic surveys.

Serologic surveys, survey questionnaires, and epidemiologic investigations are of value mainly in retrospective analyses aimed at defining the epidemiology of influenza. Monitoring absenteeism, correlating physicians' reports, and reviewing death certificates are of more practical importance to local health officials because use of these methods results in day-to-day awareness of approximate influenza activity. During any given epidemic, health departments are besieged by questions pertaining to the onset, peak, duration, and intensity of the outbreak. The surveillance techniques provide approximate, but practical answers to these questions.

The methods used by the County of Los Angeles Health Department during the 1968-69 sea-

Figure 7. Percentage of Los Angeles city schools reporting absenteeism exceeding 10 percent, weeks beginning December 2, 1968-January 20, 1969



son seemed to be reliable indicators of countywide influenza activity. In addition, certain characteristics of the epidemic could be analyzed and compared with previous communitywide outbreaks.

The presence of influenza A₂/Hong Kong/68 was documented in the county approximately 2 to 3 weeks before evidence of a significant epidemic was apparent. This latency between seeding of the virus and onset of the epidemic has been noted previously (5, 6). In the Asian influenza epidemic of 1957 in New York City, specimens yielding positive cultures of the virus were obtained from incoming foreign exchange students during August (6). However, the citywide epidemic was not apparent until the end of September.

All the data in this paper indicate a rapid rise in influenza morbidity after the onset of the epidemic was recognized. This rapid rise in morbidity is characteristic of influenza and consistent with previously described experience (6-11). Two of the independent sources of surveillance in Los Angeles revealed remarkably similar estimates of the duration of the epidemic. The data from the pediatric emergency room and industry indicated a duration of 7 weeks. Thus the 1968-69 epidemic in Los Angeles typified influenza's rapid onset and spread through a community. Previous epidemics of A₂ influenza in urban communities have lasted 5-9 weeks (6-11). A notable exception to this pattern was the 1957-58 Asian influenza epidemic which had a definite "second wave" phenomenon (12).

It would appear that children in the Los Angeles city and county schools experienced an epidemic of shorter duration than the rest of the population. Although Christmas vacation obscured the true duration of influenza activity among school children (figs. 4, 6, 7), it still seems that the epidemic lasted less than 1 month. This shorter epidemic among school children might be explained on the basis of rapid spread among susceptible persons in a large semiclosed population.

The role of schools in the spread of influenza in communities has been emphasized in previous reports. In general most studies have revealed highest attack rates in the population 5-19 years old, with lower rates among preschoolers and progressively lower rates beyond age 20 (7-9, 11, 13). This distribution is seen in illness surveys as well as in serologic studies. The data in this study do not include age-specific attack rates for comparison.

Not only do school-age children seem to have higher rates of illness, but they also seem to be the first large segment of the population to be stricken. Experience in Liverpool (11), Louisiana (9), New York City (6), and a southern city with a population of 75,000 (7) demonstrated that the incidence of influenza among school children peaked 1 to 2

weeks before the peak in adult populations. The Los Angeles experience for 1968-69 is similar, with peaks in school children 1 to 2 weeks before peaks in industrial workers. The fact that the data from the pediatric emergency room peaked at the same time as illness in the adult population may be explained by the fact that preschoolers as well as school children are seen in the emergency room. As mentioned previously, preschoolers have lower attack rates, and in one study the peak of their illnesses temporally paralleled the peak of illness among the adult population. This observation would suggest that epidemics begin in schools and are brought home to adults and preschool children.

Figure 7 shows that although illness in elementary and high school students peaked on the same day, the earlier portion of the epidemic was much more evident in the high schools. This situation may have been a real difference or an artifact resulting from the higher baseline absenteeism in high schools (fig. 6). Since the pre-epidemic absenteeism in high schools was 7 percent, it is probable that the epidemic would push these schools past the reporting threshold of 10 percent, which is the basis for figure 7, sooner than the elementary schools. On the other hand, earlier activity in high schools had been noted in Louisiana in 1957 (9). Investigation of another southern community in the same year did not confirm this finding (7).

The importance of schools in the epidemiology of A₂ influenza has been observed in other studies. All recorded epidemics of influenza in the United States have occurred when schools were in session. This situation existed in 1957, when, despite documented presence of the organism in two large cities in June, epidemic activity was apparent only when schools reconvened (5). The well-described Tangipohoa Parish epidemic began in late July 1957. This was considerably earlier than in the rest of the country. Interestingly, the parish's schools opened July 12 in keeping with the manpower needs for the harvest in this rural community (9). In addition, Semple and co-workers noted distinct differences between Liverpool's private and public schools in 1957. The public schools started their session 3 weeks earlier and, indeed, illness in the public school population peaked 3 weeks earlier than in the private schools (11).

Statistically significant excess overall mortality has been considered a reliable indicator of influenza epidemics (1, 14). Similar excesses are noted when mortality in the elderly population, 65 years and older, is analyzed. In Los Angeles the peak number of deaths among elderly persons followed the estimated peak of the epidemic by 3 weeks. This interval is typical of nationwide epidemics (1).

The techniques of surveillance described in this

paper were originally intended to monitor the daily status of influenza A₂/Hong Kong/68 in Los Angeles County. In addition, the data gathered permitted comparison with previous influenza A₂ epidemics. The other epidemics had been analyzed by questionnaire surveys and seroepidemiology. Although the community surveillance system described in this paper does not provide any estimate of attack rates, certain typical temporal patterns of the epidemic do emerge.

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MATLOF, HARVEY (County of Los Angeles Health Department), **MURRAY, ROBERT A.**, **KAMEI, ICHIRO**, and **HEIDBREDER, G. A.**: *Influenza in Los Angeles County, 1968–69. HSMHA Health Reports, Vol. 86, February 1971, pp. 183–192.*

The Los Angeles County Health Department monitored a communitywide epidemic of influenza A₂/Hong Kong/68 during the fall and winter of 1968–69. All 576 Los Angeles city schools with more than 10 percent absenteeism reported by telephone daily, and 30 city, county, and parochial schools reported by mail weekly. The pediatric emergency room of the Los Angeles County-University of Southern California Medical Center reported daily. The local telephone company, which had 10,000 employees, reported weekly. Death certificates were reviewed by report week to ascertain the total number of deaths directly

or indirectly attributable to pneumonia, influenza, or both.

The first indications of influenza activity in the county became apparent between November 15 and 20, and the ubiquitousness of the illness became apparent during the week ending December 7. The total number of upper respiratory illnesses and unclassified viral illnesses seen in the pediatric emergency room rose to 650 from a previous range of 200–400 per week. Concurrently, a similar rise was seen in the number of employees reporting influenza-like illness at the telephone company.

These increases were followed rapidly by a rise in the number of schools reporting more than 10

percent absenteeism on December 9. On that date 27 schools reported excess absenteeism compared with a previous level of four.

The pediatric emergency room treated a peak number of 1,160 patients with upper respiratory infections or unclassified viral illness during the week ending December 28; by January 25 the totals were again baseline.

Deaths caused by pneumonia or influenza rose sharply the week ending January 3, and a peak occurred 2 weeks later on January 18. By January 25 the epidemic seemed over, and by February 8 the number of deaths was below the calculated epidemic threshold.