SHORT REPORT
Pandemic 2009 H1N1 influenza in two settings in a small community: the workplace and the university campus

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SUMMARY

Data are rare on influenza outbreaks spreading through a workplace, but such transmission dynamics would be useful for comparison with the spread of the infection in other settings. We collected and compared infection data from two settings, a workplace and a university campus, during the 2009 pandemic influenza A(H1N1)pdm09 outbreak in a geographically contained community. Trajectories of infection were markedly alike in both settings. This suggests that transmission behaviour was similar in individuals in the two environments, despite the condition that individuals can leave the workplace setting in order to avoid transmission.

Key words: Influenza, infectious disease epidemiology, virology (human) and epidemiology, workplace epidemic.

An outbreak of pandemic influenza A(H1N1)pdm09 occurred in autumn 2009 in a rural university community in the United States. The infection data were tracked by two independent sources: (1) the university, where the outbreak affected more than 10% of the student population, and (2) a mid-sized company located 2 miles away from the residential university campus. Typical of dozens of areas like this, it is a small college town surrounded by a large agricultural region with a low population. The university and the company are the major employers of the town.

The epidemiological data collected by the workplace were reported weekly to Environmental Health & Safety by each division of the company. Individuals were counted as cases if they called in absent to their division due to an influenza-like illness (ILI). Cases were not laboratory-confirmed. One third of the employees commute less than 3 miles and the remaining employees commute between 3 and 25 miles. The workplace was closed on Thanksgiving Day, 26 November 2009. Information on the age structure of the workplace population was unavailable.

The university data was collected daily by the student health centre, which is the single healthcare provider for the student population. Each individual who visited or called the centre reporting a symptom of ILI was counted as a case of A(H1N1)pdm09. In the first 10 days of the epidemic, all ILI cases were tested and laboratory-confirmed by the centre as influenza A (H1N1)pdm09. After this day, however, testing stopped and any student with ILI was considered a case of A(H1N1)pdm09, according to the recommendations of the Centers for Disease Control and Prevention [1]. The dataset assumes that no callers called more than once. Ninety per cent of visitors to the university health centre were aged between 18 and 26 years. The student population was 18 234, which represents about 61% of the town's total population ($n = 29\,799$). The majority of students live on

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campus or in very close proximity to campus. On campus, students live in residence halls where 2–3 students generally share a room, but there are some single rooms located in the residence halls. Many students also live in the large shared houses of the fraternity/sorority system. Near campus, many students live in shared apartments. The semester began on 24 August 2009 and ended on 18 December 2009, and data were collected from 22 August 2009 to 3 December 2009. The university was not in session for the Thanksgiving holiday from 23 to 27 November 2009, and the health centre was closed from 26 to 29 November 2009.

The company began tracking workplace infection data in early September 2009, when an unusually high number of its 1286 employees called in absent due to symptoms of influenza, coincident with the epidemic reported by the university. The number of employees absent due to ILI was reported every Wednesday, covering the period of the preceding 7 days, from 9 September 2009 to 23 December 2009. Figure 1 shows the data on the number of employees absent from the workplace due to ILI and the number of reported cases by the university (Fig. 1a and Table 1), and the respective proportions of each total population (Fig. 1b), weekly over time. The time-course and dynamics of the epidemic at the workplace and on the campus were markedly similar. Although workplace cases were not tracked prior to 9 September 2009, the number of employees absent due to symptoms of flu reportedly increased at the start of the university's autumn semester in late August 2009, so the figures for 26 August 2009 and 2 September 2009 would likely be comparable to early university data points. Peak infection in the workplace (3·27% of employees) coincided with the peak on campus (3·12% of students) in the week containing 9 September 2009. The infections in both environments declined in tandem and resolved at approximately the same time in December 2009. Neither site had official containments such as vaccination, isolation, or quarantine.

While there have been datasets reported for influenza outbreaks in schools, households, and the general population [2, 3], to our knowledge this report of workplace pandemic H1N1 infection data is unique. Due to the area's geographical containment, this H1N1 epidemic could be considered an outbreak in a closed population with limited entry and exit of individuals. In such a population, transmission between susceptible and infected individuals is not confounded by the import and export of individuals from the outside population. Data collected by two nearby but distinct sites during the same epidemic allow a rare opportunity to compare a workplace outbreak to a university outbreak. Moreover, since university students comprise most of the town's population and live on or adjacent to campus, this comparison places the workplace data in the context of the larger community epidemic.

A few caveats should be mentioned regarding comparison of the workplace dataset with the university dataset. The community is not strictly a closed population since individuals may travel, although students typically do not leave the area until the end of the semester. We also note that the two sites are not strictly independent, although the contact between students and employees from the workplace is minimal. Individuals from both sites may interact in the same community, and some students work as temporary interns at the workplace, although this is not very common. No information was available on the number of students working at the company during the time period studied. In addition, since the workplace data refer to the total number of employees absent per week rather than only the newly beginning absences, it gives weekly prevalence of infection, while the university data refer to the weekly incidence of infection.

These data may have been subject to reporting bias. For example, some employees with ILI may have still gone to work, because they perceived the infection as mild and not severe. Conversely, some students may have mistakenly suspected they had ILI when in fact they felt ill due to inadequate sleep and typical patterns of alternating studying with excessive social behaviour at the start of the semester. These biases would have led to over-reporting in the student population and under-reporting in the employee population. Other biases are possible as well, including under-reporting due to individuals with ILI who decided to self-treat.

It is interesting to observe that the epidemic trajectories and proportions of the total populations were similar, despite that the ability to self-isolate was different in each of the two sites. Specifically, an infected employee avoids the workplace by calling in absent and staying home, but an infected student who stays in his/her room does not leave the campus community. Thus we might have expected the proportions affected to be lower in the workplace. The reasons for the similarity observed instead could be a high transmission
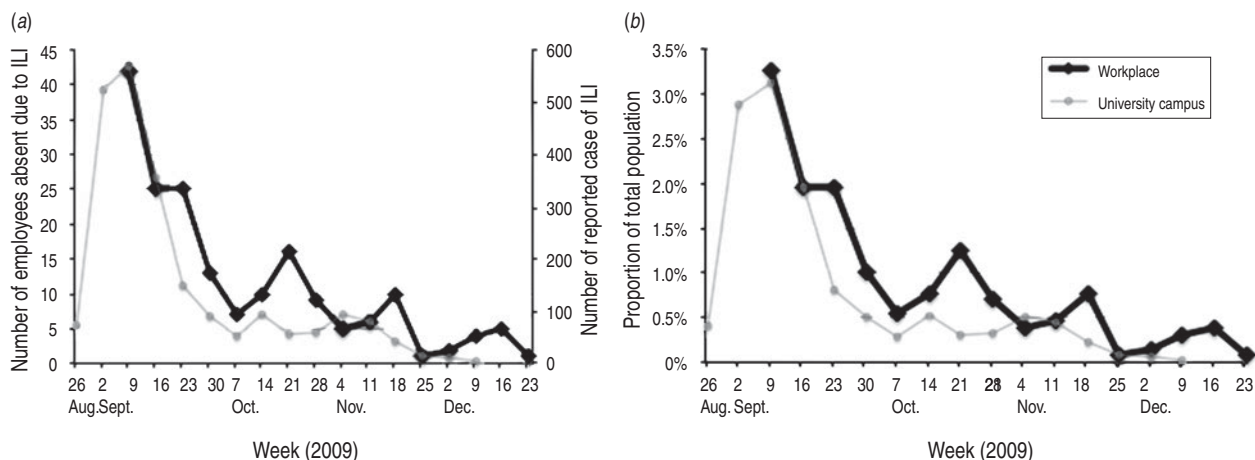
Fig. 1. (*a*) Workplace data (thick black line, left axis) and university data (thin grey line, right axis) over time. ILI, influenza-like illness. (*b*) Proportion of each total population over time, where the number of employees absent is given for the workplace (thick black line) and the number of reported cases is given for the university (thin grey line). The workplace was closed on Thanksgiving Day, 26 November 2009. The university was not in session for the Thanksgiving holiday from 23 to 27 November 2009, and the student health centre was closed from 26 to 29 November 2009.

Table 1. *Workplace ILI absences and and university campus ILI cases*

Week (2009)	Employees absent from workplace with ILI	Reported cases on university campus
26 Aug.	n.a.	73
2 Sept.	n.a.	524
9 Sept.	42	569
16 Sept.	25	357
23 Sept.	25	149
30 Sept.	13	92
7 Oct.	7	53
14 Oct.	10	95
21 Oct.	16	56
28 Oct.	9	61
4 Nov.	5	94
11 Nov.	6	81
18 Nov.	10	41
25 Nov.	1	16
2 Dec.	2	12
9 Dec.	4	3
16 Dec.	5	n.a
23 Dec.	1	n.a
Total population size	1286	18 234

ILI, Influenza-like illness; n.a., not available.

rate for community-acquired infection, a high transmission rate in individuals who are members of both populations, or the nature of the geographically contained community in which most individuals infrequently travel throughout the time period. This suggests that the self-isolation by infected employees who stayed home when ill may have had little effect on the epidemic spread in the workplace, as would be consistent with the results of modelling studies on the university dataset [4, 5] showing that containment interventions such as quarantine of infected individuals may not play a large role in reducing new infections for rapidly spreading outbreaks in closed communities. While similar results might not be seen in larger populations with extensive immigration, emigration, and mixing, they may be relevant for other outbreaks in smaller, geographically contained communities. Future studies are needed to investigate whether epidemic dynamics in the workplace are synchronous with other settings in a wide variety of environments.

DECLARATION OF INTEREST

None.

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