



## Outbreak, Surveillance and Investigation Reports

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Ministry of Public Health, Thailand, <<http://www.osirjournal.net>>

### Control of a Pandemic Influenza A (H1N1) 2009 Outbreak in a Prison, Saraburi Province, Thailand, August 2009

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#### Abstract

The influenza A (H1N1) 2009 viruses reached Thailand in May 2009. On 11 Aug 2009, an outbreak of influenza-like illness among 200 prisoners in Prison S was notified. We conducted active case finding, environmental survey and laboratory investigation. Patients' medical records in the provincial hospital and in the treatment units of the prison were reviewed. Prisoners and officers were interviewed. A total of 421 case-patients (attack rate 19%) were identified. Of 34 throat swab specimens collected, 10 (29%) were positive for influenza A (H1N1) 2009 virus by RT-PCR, including nine male prisoners and a female prisoner. The median age was 29 years (range 18-69 years). The prisoners lived in overcrowded condition. The importation of the pandemic virus was from the surrounding community with ongoing influenza transmission. A mobile clinic from the provincial hospital was deployed into the prison to provide early diagnosis and oseltamivir was given to 17% of cases. Multiple intensive control measures probably resulted in declining number of new cases within a short period of time. Allocation of seven rooms, one per day from Monday through Sunday, was feasible for isolation of cases in the prison setting.

*Keywords: influenza A (H1N1) 2009, outbreak, prison, control, Thailand*

#### Background

In the spring of 2009, an outbreak of severe pneumonia in Mexico was caused by a novel swine-origin influenza A (H1N1) virus. The number of cases increased such that the influenza A (H1N1) 2009 subtype viruses became the primary circulating virus. This had not happened since the 1957 pandemic.<sup>1</sup> As of 11 May 2009, the influenza A (H1N1) 2009 virus spread quickly to 30 countries by human-to-human transmission, thus the World Health Organization (WHO) raised its pandemic alert to phase five (sustained community level transmission in two or more countries in one WHO region) out of total six phases.<sup>2</sup> As human-to-human transmission became widespread in at least one region of the world, the WHO rapidly announced the outbreak as an imminent pandemic.<sup>3</sup> Later, WHO declared a phase six pandemic on 11 Jun 2009, when community level transmission occurred in another country in another WHO region.<sup>4</sup>

The pandemic virus arrived in Thailand in early May 2009 with Thai students who returned from epidemic countries.<sup>5</sup> The local outbreaks of influenza A (H1N1) 2009 were reported in many schools in early June 2009.<sup>6</sup>

On 11 Aug 2009, the Saraburi Provincial Health Office notified the Bureau of Epidemiology (BOE), Thailand Ministry of Public Health that over 200 prisoners in Prison S had developed fever and upper respiratory tract infection; six people were admitted to Saraburi Provincial Hospital. The outbreak was detected by prison officers on 8 Aug 2009. Initially, five out of 10 throat swabs were tested positive by Reverse Transcription Polymerase Chain Reaction (RT-PCR) for influenza A (H1N1) 2009. This result prompted a BOE team to investigate the outbreak. On 13 Aug 2009, the team traveled to the prison to confirm the diagnosis, to determine the extent of the outbreak, to identify the source of infection and risk

factors, and to recommend appropriate prevention and control measures.

## Methods

To determine the extent of the outbreak, our team went to the prison and collected demographic information and signs and symptoms of ill people from the log books in the out-patient department (OPD) and medical charts in in-patient department (IPD) in the Provincial Hospital where patients were admitted. In addition, we conducted active case finding in Prison S by inquiring prisoners and officers about their illnesses from 1 Jul through 31 Aug 2009. The BOE and local Surveillance Rapid Response Team (SRRT) conducted face-to-face interviews with prisoners and collected information by employing a structured questionnaire. A suspected case was defined as a prisoner or a prison officer who developed at least two of the following symptoms: fever, cough, sore throat or running nose from 1 Jul to 31 Aug 2009. A confirmed case was a suspected case that had a throat or nasopharyngeal swab that was positive for influenza A (H1N1) 2009 by RT-PCR.

An environmental study was conducted by inspecting facilities and activities in the prison. For statistical analysis, the basic reproductive number ( $R_0$ ) was estimated by R software to evaluate the effectiveness of all the measures taken.

## Results

In Prison S, 2,097 inmates were imprisoned in three zones (male zone 1 and 2, and female zone). There were a total of 1,778 male and 319 female prisoners with 65 officers. All prisoners were over 18 years old. Some prisoners were waiting for trial and some were serving less than 15-year jail term.

Table 1. Number of total influenza cases with attack rate and confirmed influenza A (H1N1) 2009 cases by zones in Prison S, Saraburi Province, Thailand, 1 Jul - 31 Aug 2009

Zone	Number of prisoners	Total cases (AR %)*	Confirmed cases
Male zone 1	1,295	269 (21)	7
Male zone 2	483	70 (14)	2
Female zone	319	79 (25)	1
Officer	65	3 (5)	0
Total	2,162	421 (19)	10

\* No death or severe complications

The total number of case-patients reached 421, with attack rate (AR) of 19%. Ten (29%) out of 34 samples collected from case-patients of every zone were positive for the influenza A (H1N1) 2009 virus,

including nine male prisoners and a female prisoner. There was no confirmed case among the officers. No death or severe complications occurred during this outbreak (Table 1).

There were 398 patients who could recall the first date of their illnesses between 1 Jul and 30 Aug 2009. The first suspected case started symptoms on 3 Jul 2009 and additional suspected cases were identified in the same week. The number of cases started to climb up at the beginning of August 2009. The outbreak reached an alarming scale on 8 Aug 2009, followed by a peak on 10 Aug 2009. In the next few days, it decreased gradually (Figure 1). The illness onset of the first confirmed case was on 22 Jul 2009. He was treated by a physician in Saraburi Provincial Hospital. The first cluster appeared in the male zone 1 and followed by the male zone 2. Then, the last zone was the female zone. The time lag between each zone was about a week (Figure 2).

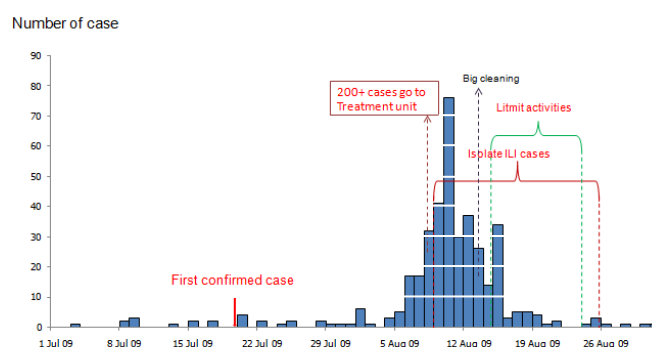


Figure 1. Number of influenza cases by date of onset in Prison S, Saraburi Province, Thailand, Jul-Aug 2009 (n=398)

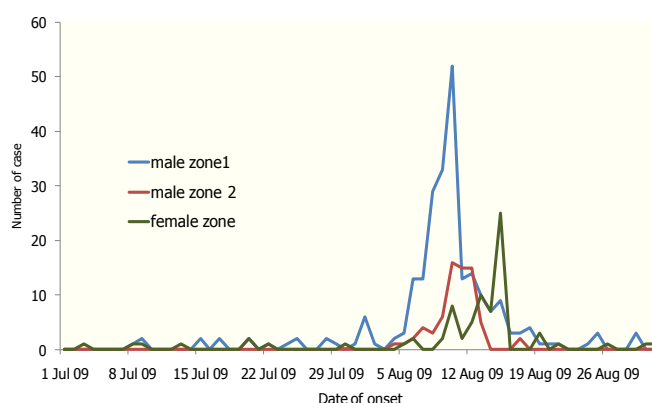


Figure 2. Number of total influenza cases by zones in Prison S, Saraburi Province, Thailand, Jul-Aug 2009 (n=389)

The median age of influenza cases was 29 years (range 18-69 years) and the highest number of cases (45%) was in the age group of 20-29 years. However, the number of prisoners in each age group was not available to estimate age-specific attack rates. Most cases presented with cough (87%), sore throat (67%), fever (50%) and rhinorrhea (45%).

In the Prison S, prisoners could have very close contact with each other through activities in some areas even though concrete walls with iron bars separated each zone. The work places and the kitchen were located near the male zone 2. There were separate treatment units for males and females. The prison office was outside the restriction area. The work places and prisoners' buildings were overcrowded (1 square meter per prisoner) when compared with the standard capacity (2.25 square meters per prisoner).<sup>7</sup> The visitors' room was located close to the prisoners' building, and had a glass partition that provided 2-meter separation between the prisoners and their visitors. They used telephones to communicate. About 300 relatives came to the prison's visiting room every day. In the attorney's visiting room, there were iron bars without any physical barriers in between, and thus, they could come to contact with each other easily (Figure 3). About 15 new prisoners arrived at the prison, and nine were released every day during the past year. Before this outbreak occurred, one or two prisoners visited Saraburi Provincial Hospital and 20-50 prisoners worked daily in the community.

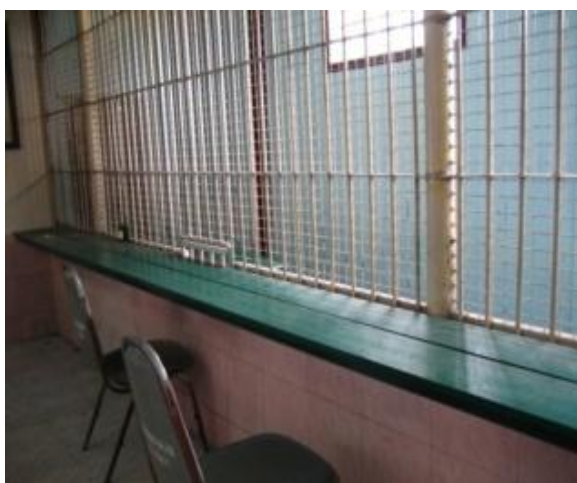


Figure 3. Attorney visiting room in Prison S, Saraburi Province, Thailand

In order to prevent further transmission at the beginning of the outbreak, the local health officers isolated suspected cases in a single room, provided health education to the prisoners and officers, assigned prisoners to disinfect their wards, conducted hand washing campaign with installation of additional water tanks at new locations with soaps and provided masks. A mobile clinic from the Provincial Hospital was deployed into the prison to provide early diagnosis and treatment. Seventeen percent of patients who had influenza-like illness were treated with oseltamivir. Prison officers directly observed that the ill prisoners swallowed the antibiotics to assure the treatment compliance.

Intensive measures for outbreak containment were implemented after the joint investigation on 15 Aug 2009. Each of seven rooms in the male zone 1 was sequentially allocated for the new cases, starting from Monday through Sunday, with a purpose of strict isolation for a week. The mass gathering and working activities were prohibited. Frequency of relative visits was decreased from twice to once a day, and the processes of food and supplies distribution were also changed to reduce cross contamination.

A respiratory illness surveillance system was established in the prison for daily screening of new cases in the morning meetings and at the treatment unit. Additionally, every new inmate was screened for respiratory symptoms before entering the prison. Prevention and clinical detection were promoted particularly among high risk groups of developing severe illness.

## Discussion

The moderate attack rate (19%) of influenza cases in this prison outbreak was likely attributable to overcrowded condition in cafeteria, work places and wards as doubled the standard capacity (1 square meter per prisoner),<sup>7</sup> and sharing of telephones, utensils and glasses. Previous studies identified high attack rates of influenza infections in prisons, ranging from 19-40%.<sup>8,9,10</sup>

Compared with the male zones, the higher attack rate in the female zone (25%) could be explained by more sensitive surveillance in the female zone at the late phase of the outbreak than that of the male zone. Female prisoners were working, having meals and sleeping in the same quarter (Figure 4), and there was only one isolation room that might increase risk of influenza transmission.

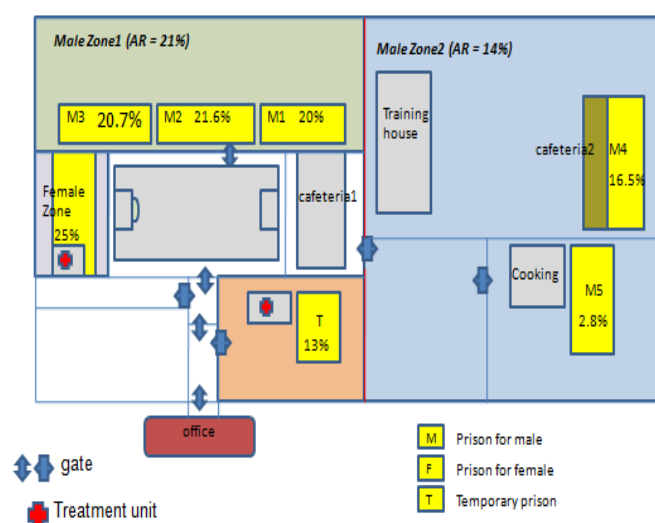


Figure 4. Map of Prison S and influenza attack rate by zones in Saraburi Province, Thailand, Jul-Aug 2009

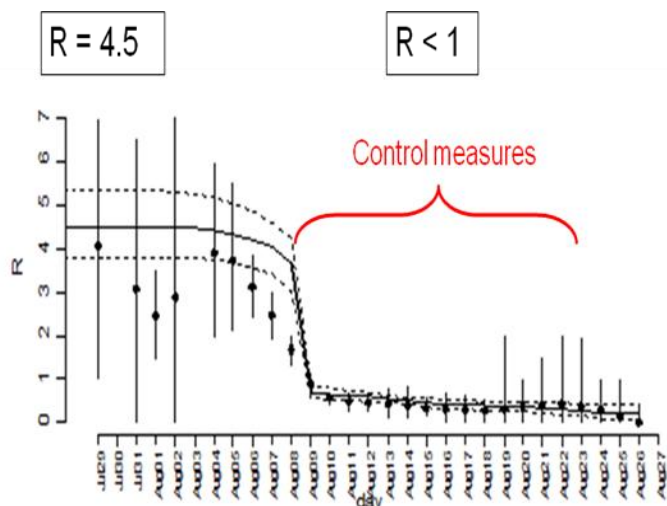


Figure 5. Reproductive number of influenza outbreak in Prison S, Saraburi Province, Thailand, Jul-Aug 2009

The  $R_0$  of influenza in this outbreak was about 4.5 at the beginning and then, decreased rapidly to below one after 8-9 Aug 2009 while the outbreak was detected and the control measures were first implemented (Figure 5). Compared to average basic reproductive numbers of 1.3-1.7 in influenza outbreaks from any other community,<sup>11</sup> the  $R_0$  of 4.5 in this outbreak suggests the higher transmission rate of influenza in overcrowded institutional setting like prison.

Possible sources of influenza A (H1N1) 2009 infection at the beginning were new prisoners, or prisoners who were infected during their visits to local hospitals, or prisoners who were working outside the prison during day-time, or officers who were infected by close contacts in the communities, or attorneys who visited prisoners. The outbreak of influenza A (H1N1) 2009 in Saraburi Province was first reported in June 2009.

The influenza outbreak in the female zone began after the male zones with a delay of one week. It showed that the virus spread easily probably via officers or male prisoners or assistant prisoners of officers from the epidemic zone.

The local SRRT responded to the outbreak rapidly with good multi-disciplinary cooperation from several organizations. Although the outbreak occurred among criminals, good cooperation was witnessed during the investigation. However, the limitations emerged in the restriction areas where the team was barred from direct investigation. In that connection, self-reporting and interviews were performed by prison nurses and assisting prisoners. Other limitation was inadequate information in log books at the treatment units as onset dates of illness were missing. The attack rate of influenza was estimated by using the number of

suspected cases and a few of confirmed cases, it was subject to bias in overestimation of influenza incidence. However, under-reporting of mild cases was possible, especially in the early epidemic.

## Conclusion

Laboratory-confirmed influenza A (H1N1) 2009 outbreak occurred in Prison S from July to August 2009 with a moderate attack rate, yet without any severe complications or deaths. The source of infection was importation of the pandemic virus from the surrounding communities with ongoing transmission.

Rapid virus transmission among prisoners was probably attributable to overcrowded condition in close institution and sharing objects. Multiple intensive control measures that were simultaneously implemented to control the influenza outbreak probably resulted in declining number of new cases within a short period of time. Allocation of seven rooms for strict isolation of cases was feasible in the prison setting. However, the measure requires thorough assessment of its effectiveness in the future outbreaks.

## Recommendations

Control of influenza outbreak requires multiple intensive control measures with interdisciplinary cooperation from several organizations. To prevent importation of influenza virus into prison, the interventions include screening respiratory symptoms of new prisoners, prison officers, and attorneys and relatives visiting prison.

Improvement of medical records such as adding information on onset dates in log books was recommended. Delay detection and report of influenza outbreak should be improved by training of prison nurses and officers to increase their knowledge and awareness.

## Acknowledgements

We thank prisoners and prison officers in Prison S, staff in Saraburi Provincial Health Office, Saraburi Provincial Hospital, Office of Disease Prevention and Control 2, Respiratory Virus Section, National Institute of Health, Department of Medical Sciences and Dr. Justin Lessler of Johns Hopkins University. This study was partly supported by a grant from the NIH-Fogarty Institute (Grant 1D43 TW007387-01).

## Suggested Citation

Karnjanapiboonwong A, Iamsirithaworn S, Sudjai U, Kunlayanathee K, Kunlayanathee P, Chaipanna N, et al. Control of a pandemic influenza A (H1N1) 2009



outbreak in a prison, Saraburi Province, Thailand, August 2009. OSIR. 2011 Dec; 4(2): 12-16.

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