

# EPIDEMIOLOGICAL ANALYSIS OF THE INFLUENZA A(H1N1)v OUTBREAK IN BOLIVIA, MAY-AUGUST 2009

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The outbreak of pandemic influenza (H1N1) began in Bolivia on 25 May 2009. Between May and August, the National Center of Tropical Disease (CENETROP) analysed by RT-PCR 7,060 samples of which 12.7% were positive. A preliminary analysis of the 895 confirmed cases identified between May and August 2009 describes epidemiological and clinical characteristics. After the first imported cases from the United States and Peru, the locally acquired infections predominated (90%). The number of cases was highest in the age group of 10 to 29 year-olds, and 89.6% of cases were observed in people under the age of 40 years. Fever, cough, nasal discharge and headache remained the main symptoms.

### Introduction

In response to the health emergency declared by the World Health Organization (WHO) on 29 April 2009, the Bolivian Ministry of Health activated a warning system to monitor the presence of influenza within its territory. An active surveillance system was established at all international airports and bus terminals (trains being of low importance in public transport in Bolivia). The current net of sentinel sites established throughout the country for virological surveillance of influenza and respiratory virus was alerted, as well as all other health centres on national territory, with the obligation to report all patients with fever and respiratory symptoms. A number of health facilities were prepared to receive suspected cases. In addition, the Bolivian authorities initiated an educative campaign in the media and distributed informative leaflets on measures to control the epidemic. A free telephone line was set up for health professionals and the public to report suspected cases or obtain information. The Immunology and Molecular Biology laboratory at the National Center for Tropical Diseases (CENETROP) was prepared for testing influenza A(H1N1)v as described by the United States Centers for Disease Control and Prevention (US CDC). All reagents and material for the real-time RT-PCR test were provided from CDC and WHO. This laboratory was the only laboratory in Bolivia accredited to perform this test.

This short report presents the epidemiological characteristics of the early stage of the influenza A(H1N1)v outbreak in Bolivia, from 5 May to 2 August 2009, on the basis of data collected by CENETROP.

### Methods

A suspected case was defined as a person with sudden onset of fever ( $\geq 38$  °C) and respiratory symptoms detected in any part of the Bolivian health system. Suspected cases were examined

at the nearest healthcare facility for clinical evaluation. Nasal samples were taken from symptomatic people and submitted to the CENETROP laboratory for testing, together with a case report form containing clinical and epidemiological data that were collected for all suspected cases. Nasal swabs were received from all suspected cases from 5 May until 31 July 2009. From 1 August, the protocol was changed and nasal samples were only taken from severe cases, following a WHO recommendation to that effect.

If the sample was PCR-positive for influenza A(H1N1)v and the clinical manifestations were severe, the patients were hospitalised and specific treatment was administered. In the beginning of the outbreak, antiviral drugs were given to all suspected cases and their contacts. From 1 August, antiviral drugs were given only to symptomatic high-risk groups.

Data collected by the Immunology and Molecular Biology laboratory at CENETROP were immediately entered in a database. Data from the samples registered until 31 July are analysed here with SPSS (Chi-square tests, Mann and Whitney tests and T-test).

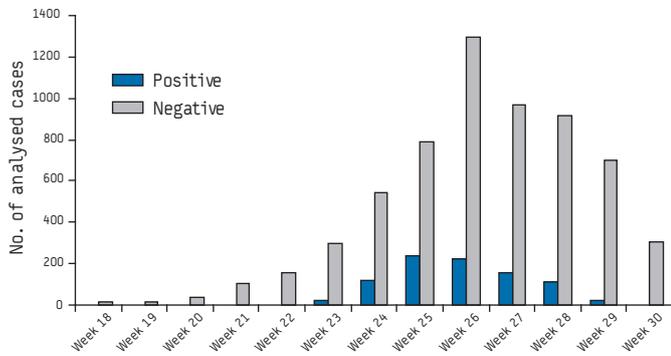
### Results

On 25 May 2009, the surveillance group of the Departmental Health Services (SEDES) in Bolivia identified the first two cases of influenza A (H1N1)v at Santa Cruz international airport by checking all arriving passengers, airplane personnel informing the healthcare staff at the airport about passengers with symptoms of fever, cough or others symptoms of respiratory disease. A woman in her late 30s returning from New York had symptoms of fever, cough and a sore throat. She was accompanied by her seven year-old child who was still asymptomatic. Nasal swabs of mother and child were taken at the airport and sent to the CENETROP laboratory. Both were placed under medical observation in a clinic especially organised to receive suspected cases from the airport, and the child subsequently developed symptoms. The RT-PCR was positive for both of them and treatment was administered in a second level reference hospital.

Between 29 May and 11 June 2009, six further cases were confirmed in Santa Cruz, La Paz and Montero, all with a history of international travel (to the United States (US), Peru and Argentina) or of contact with travellers returning from affected countries. On 12 June, the first case without travel history or known close contact with a suspected case was confirmed in Santa Cruz. From

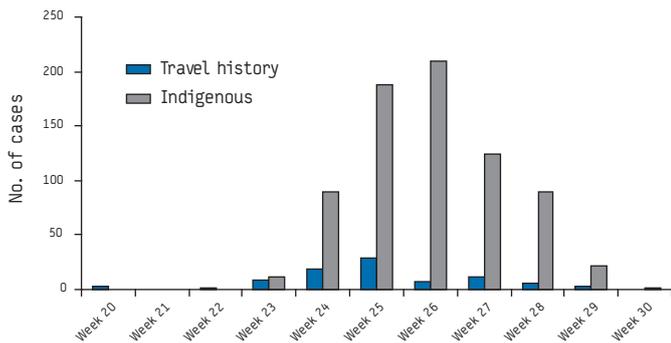
**FIGURE 1**

**Number of cases of influenza A(H1N1)v by week of disease onset analysed at CENETROP, Bolivia, 5 May-2 August 2009 (n=7,060 analysed samples)**



**FIGURE 2**

**Number of laboratory-confirmed influenza A(H1N1)v infections by week of disease onset and travel history, Bolivia, 11 May-26 July 2009 (n=824\*)**



\*for whom travel history was known

**TABLE 1**

**Geographic distribution of influenza A(H1N1)v samples with known place of origin (n=7,018)**

Department	Locality	Total	% Laboratory-confirmed for influenza A(H1N1)v
Santa Cruz	Santa Cruz	4,933	12.8
	Other	343	9.0
La Paz	La Paz/Alto	843	12.6
Beni	Trinidad	62	6.5
Chuquisaca	Sucre	60	10.0
Cochabamba	Cochabamba	351	20.2
	Other	153	3.9
Oruro	Oruro	67	17.9
Potosi	Potosi	41	24.4
	Other	19	10.5
Tarija	Tarija	92	6.5
	Other	48	14.6
<b>Total</b>		<b>7,018</b>	<b>12.7%</b>

15 June onwards, the number of cases increased greatly, mainly in Santa Cruz.

Between 5 May and 2 August 2009, CENETROP received 7,060 samples of suspected cases, of which 895 (12.7%) were confirmed by PCR as influenza A(H1N1)v virus. Thirteen patients (1.5%) died, two of them children under the age of five years, and six of them adults who suffered from chronic medical conditions (diabetes, Chagas disease, chronic respiratory disease) [1]. The temporal distribution of cases by week of onset of disease is presented in Figure 1. The average time between onset of symptoms and arrival of the samples at the CENETROP laboratory was 2.9 days. The weekly number of confirmed cases reached a peak between 22 June and 5 July (21.8% of cases), and decreased until the last week of July. From 1 August 2009, swabs were no longer systematically taken and sent to CENETROP.

Patients with recent history of travel to the US, Argentina, Brazil, Chile, Colombia, Cuba, Paraguay, Peru, Spain, Uruguay or Venezuela accounted for 9.9% of confirmed (n=89). The proportion of travel-related cases among all cases decreased after the end of June (week 26) (Figure 2).

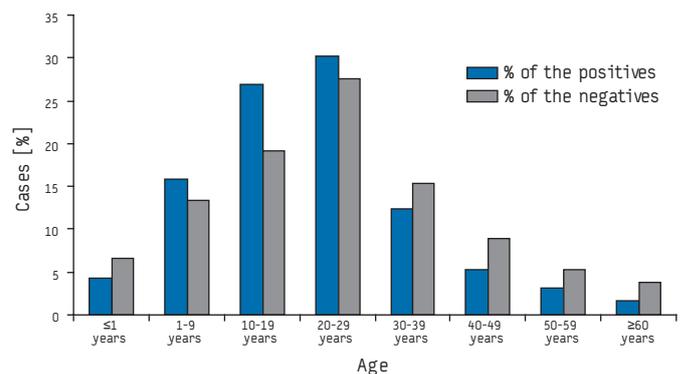
The majority of cases were recorded in the main cities of Bolivia like Santa Cruz (73.7%) and La Paz, Tarija and Cochabamba (Table 1). Other localities were either less affected or sent less samples to CENETROP. The proportion of laboratory-confirmed samples among suspected ones varied from one Department (Bolivia is divided into nine administrative Departments) to the other. By 2 August, cases had been reported in eight of the nine departments.

Of 7,060 specimens analysed, 3,462 were from men and 3,598 from women. The proportion of laboratory-confirmed cases was higher for men (13.6% male versus 11.7% female, P=0.017). The age ranged from one month to 80 years. The average age was 21.5±13.7 years, the median age was 20 years, and the age group most affected was the group of 10-29 year-olds (Figure 3). There was no difference in the mean age according to the sex (women: 21.9±13.6 years, men: 21.0±13.9 years, P<0,05).

The symptoms most frequently reported by confirmed influenza A(H1N1)v patients were fever (91.6%), cough (86.7%), nasal discharge (82,4) and headache (82,4 followed by sore throat,

**FIGURE 3**

**Age distribution of suspected and laboratory-confirmed influenza A(H1N1)v cases, Bolivia, 5 May-2 August 2009 (n=7,060)**



myalgia, and asthenia. Diarrhoea was rare as well as bronchitis and pneumonia. Symptoms that were found to be correlated with laboratory-confirmed samples are listed in Table 2 (P<0,01). Diarrhoea and pneumonia were negatively correlated. Nasal discharge and otitis were observed more frequently in women than in men (P<0,05). Fever and vomiting were observed more frequently in young people under the age of 15 years, while myalgia, headache, asthenia and short breath were observed more frequently in adults over the age of 15 years (P<0,05).

### Discussion

By 25 May 2009, the new influenza A(H1N1)v virus had entered Bolivia from the US, Peru and Chile, one month after the first notification of the infection in Mexico, and two to three weeks after the neighbouring countries were affected [2-4]. Despite the fact that Bolivia continued to observe sporadic imported cases, mainly from Argentina (47/89), indigenously acquired infections predominated as a consequence of local transmission (90%). Indigenous cases in Bolivia had a rate of local transmission almost like the one observed in Peru (95.6 %) [2] and much higher than in Colombia (35.5 %) [3]. As soon as the new influenza virus arrived in the country, it spread rapidly in the major urban centres, particularly in Santa-Cruz. Geographical spread within rural Bolivia currently seems low, but unfortunately cannot really be estimated in this study, based on analyse of received suspected nasal swabs.

The distribution of cases by age and sex is similar to what is observed elsewhere [4-7], with young adults being mostly affected by the disease. However, in Bolivia men are slightly more affected than women, and the median age is at the higher end of the range observed worldwide. It is possible that the rapid spread of disease in Santa Cruz has enlarged the age range.

As of 2 August, CENETROP has confirmed only a small proportion of 12.7% influenza A(H1N1)v virus infections among the total of 7,060 samples analysed. Of the 81.7% of submitted

samples that matched perfectly the inclusion criteria, 13.8% were laboratory-confirmed). The remaining 18.3% analysed samples came from patients who had fever without respiratory symptoms (7.12% of those were confirmed) or respiratory symptoms without fever (8.2% of those were confirmed). Finally, six asymptomatic patients (tested as contacts) were confirmed to have influenza (H1N1)v virus infection. The low concordance between early clinical suspicion of influenza A(H1N1)v and laboratory confirmation may be partly due to the fact that other influenza viruses are currently circulating in Bolivia (apart from other virus such as dengue virus). Of 179 samples negative for influenza A(H1N1)v that were subsequently analysed for other respiratory viruses in La Paz, seven (3.9%) were positive for syncytial respiratory virus by indirect immunofluorescence test, 24(13.5%) were positive for seasonal influenza A by PCR, and 12(6.7%) were positive for influenza A by indirect immunofluorescence [1].

The low percentage of laboratory-confirmed samples also reflects the impact on healthcare services of the current H1N1 influenza pandemic. Between May and August 2009, an abundance of samples were sent to the national reference laboratory at CENETROP. It was partly a consequence of the high concern in the population, fed by the media in response to the increasing number of positive cases throughout the world. Symptoms are similar to those of seasonal influenza, and many people in Bolivia would not usually consult at healthcare facility for such symptoms. The volume of medical consultations has overwhelmed the CENETROP laboratory which succeeded in managing the extraordinary work load but experienced a shortage in reagents after only a few weeks. The drop in the epidemiological curve at the end of July is a reflection of this deficit in reagents, which are currently reserved for severe cases. At the same time, medical staff began to send fewer samples to CENETROP. Overall, this study also highlights the difficulty, with regard to local resources, of managing an epidemic surveillance system at a high level and for a long time.

TABLE 2

Clinical characteristics of patients with RT-PCR-positive and -negative result for influenza A(H1N1)v, Bolivia, 5 May-2 August 2009 (n=7,055\*)

Symptoms	Total number with symptoms	% with symptoms		P value
		RT-PCR A(H1N1)v positives(n=895)	RT-PCR A(H1N1)v negatives(n=6,160)	
Asthenia	4,370	65.8	61.3	0.01
Bronchitis	1,144	19.4	15.7	0.005
Conjunctivitis	2,240	35.0	31.2	0.02
Cough	5,599	86.7	78.1	<0.001
Diarrhoea	964	10.6	14.1	0.004
Fever	6,078	91.6	85.2	<0.001
Headache	5,450	82.4	76.3	<0.001
Myalgia	4,812	74.2	67.2	<0.001
Nasal discharge	5,504	82.4	77.2	<0.001
Otitis	966	13.7	13.7	NS
Pharyngitis	5,183	77.9	72.7	0.001
Pneumonia	368	3.5	5.5	0.01
Vomiting	1,506	21.5	21.3	NS

NS: non-significant.

\* for which information on symptoms was available.

## Acknowledgements

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## Disclaimer

The views expressed in this article are those of the authors and do not necessarily reflect the official policy or position of the National Minister of Health of Bolivia.

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