



## Direct costs of a single case of refugee-imported measles in Kentucky

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### ARTICLE INFO

#### Article history:

Received 30 March 2011  
Received in revised form 19 August 2011  
Accepted 30 October 2011  
Available online 12 November 2011

#### Keywords:

Cost  
Contact tracing  
Measles  
Refugees

### ABSTRACT

**Background:** Refugees are highly vulnerable populations with limited access to health care services. The United States accepts 50,000–75,000 refugees for resettlement annually. Despite residing in camps and other locations where vaccine-preventable disease outbreaks, such as measles, occur frequently, refugees are not required to have any vaccinations before they arrive in the United States.

**Purpose:** We estimated the medical and public-health response costs of a case of measles imported into Kentucky by a refugee.

**Methods:** The Kentucky Refugee Health Coordinator recorded the time and labor of local, state, and some federal personnel involved in caring for the refugee and implementing the public health response activities. Secondary sources were used to estimate the labor and medical care costs of the event.

**Results:** The total costs to conduct the response to the disease event were approximately \$25,000. All costs were incurred by government, either public health department or federal, because refugee health costs are paid by the federal government and the event response costs are covered by the public health department.

**Conclusion:** A potentially preventable case of measles that was imported into the United States cost approximately \$25,000 for the public health response.

**Recommendation:** To maintain the elimination of measles transmission in the United States, U.S.-bound refugees should be vaccinated overseas. A refugee vaccination program administered during the overseas health assessment has the potential to reduce the risk of importation of measles and other vaccine-preventable disease and would eliminate costs associated with public health response to imported cases and outbreaks.

Published by Elsevier Ltd.

### 1. Introduction

A refugee was defined by the United Nations Refugee Convention in 1951 as someone who “owing to a well-founded fear of being persecuted for reasons of race, religion, nationality, membership in a particular social group, or political opinion, is outside the country of his nationality. . . [1]”. The United States has the largest refugee resettlement program worldwide and provides safe haven to persons seeking asylum from around the world by admitting 50,000–70,000 refugees annually [2]. Before entering the United States, all refugees complete mandatory health assessments. These

exams are limited in scope and focus on screening for medical conditions that the Centers for Disease Control and Prevention (CDC) defines as making an applicant for entrance (immigrant, refugee, asylee) inadmissible to the United States until the applicant receives treatment. In the case of refugees, this most often means tuberculosis treatment. In 1996 the Immigrant and Nationality Act was amended to require the overseas initiation of Advisory Committee on Immunization Practices (ACIP)-recommended vaccinations for persons seeking legal permanent residence (immigrants) [1] (Appendix A, ACIP immunization recommendations). However, this amendment does not apply to refugees prior to entry to the United States.

After arrival in the United States, most refugee children are fully vaccinated according to state requirements for school entry. The cost of vaccinating refugee children is covered by the Vaccines for Children Program and Medicaid. Refugees are eligible for Refugee Medical Assistance for 8 months after arrival. These funds may cover the cost of some adult vaccinations but there is state-to-state

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variability in coverage. Refugees usually have a post-arrival health assessment within 90 days of arrival and at that time may receive some vaccinations.

After one year in the United States, refugees are eligible to adjust their status to legal permanent residence, and at this time, they are required by the United States Citizenship and Immigration Services to have at least one dose of ACIP-recommended vaccinations [3]. If an adult refugee was not vaccinated free-of-charge during their first 8 months, they may be required to pay for their own vaccination to meet the requirement for adjustment of status from refugee to legal permanent resident.

During the last ten years, CDC has only documented two cases of refugees importing measles [4]. While rare, the introduction of even one case of measles, or any vaccine preventable disease, poses a risk of exposure to unvaccinated people. When discovered, each case of measles requires a public health response in order to prevent or reduce the risk of domestic transmission [5–11]. These disease response events involve the time and resources of a large number of local, state, and federal public health personnel who engage in a variety of tasks, including contact tracing and prophylactic vaccination of contacts, where medically indicated. The tasks associated with disease response events are costly to public health because they are very labor intensive [12–17]. This report of the public health response to one case of imported measles provides summary of the resources used by the public health department to respond to a disease event.

## 2. Background

In April 2010, a 21 (1/2) month old refugee child with no vaccination record was diagnosed with measles shortly after entering the United States from India. The initial refugee home visit occurred 24 h after the family entered the United States. During this initial home visit, the refugee caseworker found that the child (who had no siblings) had a rash and febrile illness. The mother stated that the child had been ill during flight the day before. However, there was no observed rash during the flight or on arrival, because had there been a visible rash at airport arrival, the family would have been immediately quarantined according to protocols established for examination of refugee arrivals. The day after the intake interview (3rd day in the U.S.), the child was seen by a physician, who referred the child to a specialist at a children's hospital in Louisville, KY. The physician made the decision to refer the child and family for hospitalization because, while the child did not have specific medical complications, the child and family were exhausted from a long trip to a new community where they had no family or neighborhood network or connections and did not speak the language. It was felt that the entire family needed the additional assistance of a safe, medical environment for a few days to promote their collective well being. Therefore, the child and family were admitted to the hospital's negative pressure room as a family unit for care and management. Within the next 24 h, measles was confirmed by the laboratory testing.

The Kentucky Department of Public Health (KDPH) immediately implemented contact tracing investigation and vaccination of contacts. KDPH coordinated the activities of their personnel and the following stakeholders: CDC; two CDC Quarantine Stations; Green River District Health Department; Kentucky Office for Refugees; local medical practices; and the Louisville Metro Health Department. The response activities conducted by various stakeholders included informational releases (e.g., faxes, contact interview guides), illness reports, coordination of travel logistics, care and transportation for the child and family, medical care, interpreter services, interviews of contacts to determine immunization status, vaccine acquisition, vaccination, treatment with IG, meetings and phone calls, and contact tracing reports.

### 2.1. Objective

The purpose of this analysis is to estimate the medical and public health response costs incurred in responding to a case of measles imported to the state of Kentucky by a refugee. While there are some studies published regarding the costs of contact investigations, the investigation process varies significantly from state to state so the costs are also very different from state to state. Further, this study is unique in that it estimates the costs of the directly documented labor involved in both caring for the index case and conducting the event response.

### 2.2. Overview of analysis

During the response, the Kentucky State Refugee Health Coordinator documented the numbers of personnel involved in the public health response, along with the organizations, job titles, event-related activities, and estimated hours spent on a variety of tasks, as provided by the different stakeholders involved. A total labor and per-contact-and-index-case cost of labor (case cost) was estimated. A total cost was also estimated that added medical care, transportation, and vaccine to the labor costs. The study was evaluated for meeting the definition of research under 45 CFR 46.102(d), and was deemed not to be research.

### 2.3. Methods and data sources

1. Labor hours were categorized by title using the 2009 Occupational Employment Statistics (OES) issued by the Bureau of Labor Statistics [19] (e.g., state public health department, nursing supervisor, pediatrician, refugee caseworker).
2. The OES were also used to determine the hourly wage of each labor title for the state of Kentucky and the nation, with two exceptions:
  - a. Labor costs of CDC employees were calculated by using the 2009 General Service Schedule for GS 14, Step 4, in Atlanta [20].
  - b. The per-minute charge for the translation phone was reported by the Kentucky Office of Refugees.
3. The hourly wages were increased by 30% to incorporate benefits (e.g., health care, retirement) and calculate an hourly compensation.
4. The hourly compensation was multiplied by the labor hours and summed for an estimate of total labor costs from the Kentucky and national perspective.
5. Two total costs were estimated by using Kentucky and national compensation, with the following added components:
  - a. Medical costs: MMR vaccine; immunoglobulin; and testing for measles immunity.
  - b. The hospitalization costs for a child with a viral illness were taken from the Kentucky Hospital Association Hospital Discharge Database for 2009 for the hospital where the child was admitted [21].
  - c. Transportation costs.
  - d. The 2006 costs of a mid-complexity diagnostic visit as reported by the Physician's Fee and Coding Guide, adjusted to 2009 dollars by using the BLS inflation calculator [22,23].
6. Sensitivity analyses were computed by changing the total cost estimates by both 15% and 20% (increase and decrease). The 15% and 20% variations were chosen because, in most cases, state and metropolitan statistical area wages tend to range from 15% to 20% above or below national average wages, and wages are the majority of costs reported in our study [19].

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