



## Costs and impact of meningitis epidemics for the public health system in Burkina Faso

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### ARTICLE INFO

#### Article history:

Received 3 February 2011

Received in revised form 6 May 2011

Accepted 18 May 2011

Available online 12 June 2011

#### Keywords:

Meningitis

Costs

Case management

Immunization campaign

Impact

Organization

### ABSTRACT

**Background:** Epidemic meningococcal meningitis remains a serious health threat in the African meningitis belt. New meningococcal conjugate vaccines are relatively costly and their efficiency will depend on cost savings realized from no longer having to respond to epidemics.

**Methods:** We evaluated the cost and impacts to the public health system of the 2007 epidemic bacterial meningitis season in Burkina Faso through a survey at the different level of the health system. A micro-economic approach was used to evaluate direct medical and non medical costs for both the public health system and households, as well as indirect costs for households.

**Results:** The total national cost was 9.4 million US\$ (0.69 US\$ per capita). Health system costs were 7.1 million US\$ (1.97% of annual national health spending), with 85.6% for reactive vaccination campaigns. The remaining 2.3 million US\$ was borne by households of meningitis cases. The mean cost per person vaccinated was 1.45 US\$; the mean cost of case management per meningitis case was 116.3 US\$ when including household costs and 26.4 US\$ when including only health sector costs. Meningitis epidemics disrupted all health services from national to operational levels with the main contributor being a large increase in medical consultations.

**Conclusions:** Preventive meningococcal conjugate vaccines should contribute to more efficient use of funds dedicated to meningitis epidemics and limit the disruption of routine health services.

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## 1. Introduction

Most of the global risk of epidemic *Neisseria meningitidis* (Nm) meningitis occurs among countries situated in the African meningitis belt, extending from Ethiopia to Senegal [1,2], which experiences epidemics during the hot, dry, and windy months from December through April. The current strategy to address epidemic meningitis is reactive immunization. While this strategy may prevent some

cases, implementation of vaccination only once an epidemic has been declared will not prevent the majority of cases.

New meningococcal conjugate vaccines exist for preventive vaccination. But they are relatively costly and their efficiency will depend on cost savings realized from no longer having to respond to epidemics. However, there are few reports on the cost of current strategies, including case management and reactive immunization campaigns [3,4]. This lessens the ability of the international community and national decision-makers to prioritize between different immunization strategies. To address this lack of information, we evaluated the costs and organizational impact of meningitis during the 2006–2007 epidemic season in Burkina Faso.

## 2. Methods

### 2.1. Study sites and data collection

The study was conducted during the 2006–2007 meningitis epidemic season in two health districts, Réo and Kombissiri. It involved the two associated District Sanitary Regions (DRS), district

**Abbreviations:** CSPS, health and social welfare centers; CM/S, medical centers with or without surgery facilities; MOH, Ministry of Health; FTP, financial and technical partners; COGES, community management committee.

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Fig. 1. Map of Burkina Faso with health districts included in the study.

laboratories ( $n=2$ ) and hospitals (MC/S;  $n=2$ ), plus a set of health centers ( $n=10$ ). At the national level, the study included Ministry of Health (MOH) departments involved in meningitis surveillance and response ( $n=8$ ), technical and financial partners ( $n=12$ ), and national reference laboratories ( $n=2$ ) within the selected districts. Districts were selected based on experiencing an ongoing epidemic (that is, reaching the meningitis epidemic threshold) and subsequent implementation of a reactive immunization campaign. Among the districts that fulfilled these criteria, Réo and Kombissiri districts were chosen by the Ministry of Health based on their assessment that these areas had no specific health, economic, cultural, geographical or other context that would interfere with the results of the study (Fig. 1). Health and social welfare centers (CSPS) included in the study were selected randomly by creating a line list of all centers that met inclusion criteria (these were the same as for District selection), splitting these into rural and urban location, and then using a random number generator to select the appropriate number of centers within urban and rural categories. All other groups sampled were comprehensive within the study districts. Each district had only one public hospital and one laboratory and thus each was selected for inclusion.

Data collection was done through structured interviews and a desk review. These methods captured resources used, expenses, and funding allocated to case management, immunization campaigns and other surveillance and response activities against meningitis epidemics. Desk review data sources included patient medical records, medical registers of hospitals and health centers, laboratory registers, forms for stocks of generic drugs and drugs allocated especially for the meningitis epidemic, purchase orders, receipts, monthly epidemiological reports, and the budget and financial plans of the different stakeholders and structures surveyed. For the impact of meningitis epidemics on the health structure, interviews of experts ( $n=78$ ) were made based on semi-structured questionnaires. Respondents were questioned on factors, causes, and consequences of meningitis epidemics at the different levels of the health system.

## 2.2. Type and perspective of the study

The study type was prospective, using a quantitative and micro-economic approach for economic components and a qualitative approach for the assessment of the impact of meningitis on health system organization. The study perspective was societal; however, in this article we present only the costs and financing sustained by the government, MOH partners and communities since the costs for households have been presented previously [5].

## 2.3. Costs and financing categories

The costs for the public health system were broken down into specific recurrent and capital costs. Recurrent costs represent the value of resources consumed in one year or less (in accordance with the budgetary cycles for public spending). Capital costs represent the value of resources with a functional life-span greater than one year. Specific costs express the value of resources used exclusively for the subject of this study, i.e., meningitis surveillance and response.

We differentiated direct medical costs (DMC), direct non medical costs (DNMC) and indirect costs (IC). DMCs concern healthcare goods and services (curative or preventive) whose use is directly attributable to the considered pathology. DNMC are those costs that are directly related to the pathology but are not healthcare resources. For this study, DNMC included costs for transportation to medical facilities and other non-medical costs concerning the hospitalization of the patient (e.g., personal hygiene items or food products). Though not presented in this article, our study also included IC for households. IC were those costs associated with loss of income and assets due to the family care provided to the patient.

Consultation costs were those costs associated with case management in basic health care centers (called CSPS). Hospitalization costs were those costs associated with meningitis case management in medical centers with surgical facilities. We did not include private medical facilities in our study, so could not assess the contribution of these to overall health system costs; while it is likely that a higher proportion of populations in major urban centers seek care at private facilities, even in urban areas, the majority of the population is poor and thus likely to seek care at government funded facilities. Financing assessment included domestic public and private financing along with external financing. Domestic financing included the national budget and cross subsidies. Activities covered within the general categories of case management, immunization campaigns, and other surveillance and response activities are presented in Table 1. The officially recommended first line treatment was oily chloramphenicol or ceftriaxone if there was a shortage of

Table 1  
Surveillance and response activities for meningitis epidemics.

	Activities
Case management	Pre positioning and distribution of medicines during the epidemics Laboratory analyses for case diagnosis and choice of treatment (district laboratory) Care to patients
Immunization campaign	Planning of immunization campaigns  Training for immunization campaigns (e.g., vaccinators, supervisors) Social mobilization for immunization campaigns Monitoring of the immunization campaigns Adverse Events Following Immunization (AEFI) case management Waste management Supervision of immunization campaigns Assessment of the immunization campaigns
Other surveillance and response activities	Planning of overall surveillance and riposte activities (pre epidemics)  Training Social communication on meningitis Investigation of suspected cases Laboratory case confirmation and etiologic identification (at national reference laboratories) Supervision Coordination of actors for surveillance and response activities

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