Costs for Households and Community Perception of Meningitis Epidemics in Burkina Faso

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Bacterial meningitis in the African meningitis belt remains 1 of the most serious threats to health. The perceptions regarding meningitis in local populations and the cost of illness for households are not well described. We conducted an anthropologic and economic study in Burkina Faso, in the heart of the meningitis belt. Respondents reported combining traditional and modern beliefs regarding disease etiology, which in turn influenced therapeutic care–seeking behavior. Households spent US $90 per meningitis case, or 34% of the annual gross domestic product per capita, and up to US $154 more when meningitis sequelae occurred. Much of this cost was attributable to direct medical expenses, which in theory are paid by the government. Preventive immunization against meningitis will overcome limitations imposed by traditional beliefs and contribute to poverty reduction goals.

Bacterial meningitis results in an estimated 170,000 deaths per year worldwide [1], and epidemic meningitis due to Neisseria meningitidis is 1 of the most common contributors to this global health threat. Despite antimicrobial therapy and intensive care, case-fatality ratios remain high, and 10%–20% of survivors develop permanent severe sequelae. Most of the epidemic meningitis risk occurs among countries situated in the African meningitis belt, extending from Ethiopia to Senegal [2, 3], which experiences epidemics during the hot, dry, and windy months from December through April. Because of a lack of affordable conjugate vaccines, African countries in the meningitis belt have adopted a strategy of reactive immunization. Although this strategy may prevent some cases, implementation of vaccination only once an epidemic has been declared will not prevent most cases, and use of polysaccharide vaccines does not interrupt carriage and transmission and does not leave vaccinated populations with long-term immunity.

Two studies have made an initial attempt to evaluate the costs of meningitis care in the meningitis belt [4, 5]. However, no previous studies have evaluated the overall economic burden to the population or taken the perspective of the individual household. Meningitis episodes may deplete household resources and thus perpetuate poverty in already impoverished countries. In addition, few studies have assessed population-based perceptions of meningitis [6, 7]. Yet these perceptions will affect individuals’ decisions regarding therapeutic and preventive interventions and thus influence disease occurrence and morbidity and mortality. This is particularly true in countries where traditional beliefs and systems of health care are still widespread [8–10]. To address this lack of information, we conducted a microeconomic and anthropologic evaluation in Burkina Faso, which is located in the center of the meningitis belt and has experienced some of the largest epidemics yet documented [11].

METHODS

The study was conducted during the 2006–2007 meningitis epidemic season in 2 health districts, Réo and
are taken from a societal perspective and on a long-term basis. On the gross domestic product (GDP), associated costs usually include transportation and food; and indirect costs (ICs), such as loss of income and assets linked to the illness episode. Direct medical costs (DMCs) spent for drugs, consultations, biological analysis, and other interventions; direct nonmedical costs (DNMCs), including transportation and food; and indirect costs (ICs), such as loss of income and assets linked to the illness episode. Drug prescriptions were checked to verify that they were related to the meningitis episode.

For ICs, we included costs related to lost productivity. However, we did not include costs associated with loss of life for 2 reasons. Valuing life is controversial and raises ethical concerns, especially in developing countries, where smaller values might be assigned because of lower income levels. In addition, because loss of life is usually valued to determine the economic impact on the gross domestic product (GDP), associated costs usually are taken from a societal perspective and on a long-term basis. In our study, though, ICs were assessed from the household perspective and on a short-term basis.

Anthropologic data analysis was qualitative. The methodological approach chosen combined both individual interviews and focus group discussions. By qualitatively combining data from individuals and groups, we attempted to compensate to some degree for the underreporting of traditional beliefs and practices common when only individuals are interviewed. This method also allowed us to collect information from individuals with various social profiles.

RESULTS

Social constructions of meningitis. The designation of meningitis has evolved based on modern medical terminology, with most people using the terms Mininzit or Meninziti, derived from the French word méningite. Other terms refer to specific meningitis symptoms, such as biankáré, a Lyélé word that means break neck, or yubla banga, which means neck illness in Mossi.

Some terms for meningitis referred to imputed causes, which could be grouped into environmental, dietary, and supernatural categories. Reported environmental causes included the sun and wind, particularly the harmattan that comes during the epidemic meningitis season months, reflected in the Moaga meningitis terms winootog banga (sun disease) and segba banga (wind disease). Direct contact with an ill person was also identified as a potential cause. Dietary factors included food fouled by unspecified contamination carried by the wind, eating the leftover food of someone affected by meningitis, poorly cooked food, oily food, and eating green mangoes, which are avoided during the epidemic meningitis season. These natural causes were used to explain the increased risk among children, who eat forbidden green mangoes and play outside in the sun and wind. The most commonly reported supernatural cause was the activity of sorcerers or soul-eaters, leading to the Moaga term weog banga or sorcerer disease.

Environmental, dietary, and supernatural causes may act independently and lead to different outcomes. For example, respondents reported that persons with meningitis due to environmental or dietary causes will respond to modern medical care and survive. Those afflicted by the action of a sorcerer, however, will not. The importance of different causes also varied by district, with supernatural causes being mentioned more often in the Lyélé area than in the Moaga area. Universally, meningitis was described on the basis of symptoms regardless of the specific etiologic agent.

Preventive and therapeutic practices. The imputed causes affected the reported therapeutic approaches families took, which included a mix of interventions offered by soothsayers, traditional healers, and modern health care workers. Not all families used modern medical care as a first recourse when they...
suspected meningitis had occurred, reflected in an average delay between symptom onset and presentation to a health care center of 3 days. Therapeutic approaches during the initial meningitis period included a combination of self-medication and treatment offered by traditional healers and soothsayers. The latter was sought in particular to identify whether the meningitis resulted from supernatural causes. If so, the soothsayer would protect the family against evil spirits through sacrifice and protection rituals. Families that saw traditional healers reported doing so regardless of recourse to other sources of medical care and would consult these persons at all stages of illness, including after having seen a modern health care worker. Traditional healers varied in their willingness to treat or refer patients with meningitis. Government approaches to traditional healers also varied, with some district health care professionals engaging and training traditional healers (for instance in the Kombissiri District).

Respondents reported approaching each of these groups for prevention. Soothsayers offered ritual protection, traditional healers provided preventive medicines, religious leaders prayed for protection, and modern medical workers provided hygiene, dietary advice, and vaccination. Respondents agreed that vaccination provided the most effective protection. However, some reported that they questioned vaccine quality or feared adverse events.

Respondents reported fear of death and sequelae, frequently mentioning deafness, mutism, and mental impairment. Respondents recognized that these sequelae affected child development, leading to permanent incapacity to work, and that affected children will not contribute to family earnings but rather will be an additional financial burden on the household.

**Total costs.** For households, meningitis episodes resulted in DMCs, such as medicines and consultations; DNMCs, such as food and transportation; and ICs, such as loss of income or assets resulting from lost productivity. In Burkina Faso, the annual GDP per capita was US $268 during 2007 [12]. In our study, we estimated that the total average cost incurred by each household per meningitis case was US $90 (95% confidence interval [CI], US $84.4–$95.4; Figure 1), representing 34% of the GDP per capita. Households in which a person experienced sequelae bore an additional cost of US $25.4–$154.4 for rehabilitation, which in some cases raised the total expenditure to close to the GDP per capita level. The absolute costs, although high in themselves, masked their true impact. At the time of the study, most households in Burkina Faso had little or no disposable income, using all resources for food, shelter, and clothing; thus, any decrease in income resulted in a decrease in 1 of these basic necessities.

**DMCs.** DMCs were expected to be low because official government policy was to provide free meningitis case management during the epidemic period. Despite this, 96% of in-
Figure 3. Average direct nonmedical costs per meningitis case per cost category (US dollars; percentage of total) spent by households in Burkina Faso, 2006–2007 (total direct nonmedical costs = US $15.5).

Individual households paid for all or a part of meningitis care. Respondents reported most commonly that they paid for medicines prescribed by government health centers (93%) and consultations (67%). In addition, 34% of households paid for self-medication (mostly antipyretics and pain relief medications) and 23% for traditional care.

Overall, households paid an average of US $25.3 (95% CI, US $17.4–$33.2; Figure 1) for DMCs per meningitis case. Of this, US $20.8 resulted from modern health care services, which in turn included primarily prescription medicines (US $19.5), consultations (US $0.6), and biological analyses (US $0.1). Apart from prescription medicines, households spent an additional US $0.4 per case on self-medication. Household expenditures for traditional care represented an additional 18% of DMCs at US $4.5 per case (Figure 2). This latter value likely was an underestimate because cases were recruited through health care registries, which excluded persons who sought only traditional care.

Two reasons were identified for the high cost of medicines for households despite official government policy. First, many health care workers were unfamiliar with official guidelines regarding payment schedules for different interventions and at different seasons. When unsure, these workers erred on the side of charging. Second, health care centers experienced frequent shortages of free medicines delivered by the Ministry of Health. If this happened, patients paid for their own medicine, including at more expensive private pharmacies if they presented outside the health center pharmacy hours.

Consultation costs were relatively low because the price for this service was low, ranging from US $0.2 in health care centers to US $1 in hospitals. Costs for biological examinations were also low, primarily because during an epidemic lumbar punctures were no longer considered compulsory (during our study, 26% of patients received a lumbar puncture). In addition to lumbar puncture, biological examination costs included cerebrospinal fluid cytologic analysis and Gram stain.

**DNMCs.** The average DNMC per household with a meningitis case was US $15.5 (Figure 1), and food represented 63% of these costs (US $9.6; Figure 3). Because health care structures did not provide food, families purchased items from street vendors. Transportation represented 17% of DNMCs (US $2.6), despite 58% of respondents reporting that they traveled by bicycle. Transportation costs were related mainly to fuel and repair, the latter especially for bicycles and motorbikes. Telephone calls represented 8% of DNMCs (US $1.3). Additional costs included personal hygiene items and other goods essential for the stay in a health care center (e.g., flashlight, mat, change).

**ICs.** ICs represented the most important cost component associated with meningitis, with an average of US $49.2 (95% CI, US $42.7–$55.6; Figure 1) per case. The primary component of ICs was loss of caregiver income, which on average was US $28.5, representing 9 days of lost work. Among caregivers who reported lost income (84% of the total sample), the average loss per case was US $34.1 (Figure 4).

Among people who had meningitis, the average loss of income per case was US $11.5, including US $51.3 among the 31% who held jobs at the time of their illness. In contrast to caregivers, persons with meningitis who worked lost an average of 21 days. Persons with meningitis attending school missed an average of 12 days. Beyond income, households lost an average of US $9.1 in assets, such as crops or cattle. Only 6% of persons reported loss of assets, and among this group the average loss was US $151.1.

No deaths occurred among the target population; thus, we...
could not capture short-term household costs associated with a fatal outcome, for example, costs associated with a funeral. In theory, death could lead to an increased or decreased household economic impact, the latter particularly if the death occurred early in the illness.

**Urban versus rural costs.** Costs for urban households were 229% higher than for rural ones (US $132 and US $57.7, respectively; Figure 1). The difference was related mostly to increased ICs, in turn related to higher salaries. DMCs also were higher because costs in urban public health structures (including hospitals) were greater than those in rural ones.

**CONCLUSION**

We can draw 2 main conclusions from this study. First, although modern concepts of disease and hence care seeking have penetrated to some extent, beliefs and care-seeking behavior with regard to meningitis in Burkina Faso remain influenced by traditional thinking. These findings have implications for prevention strategies. For example, delays in presenting for antibiotic therapy and resulting morbidity and mortality might be reduced by having public health services work closely with traditional healers. This could be achieved through inclusion of traditional healers on coordination committees for control of meningitis epidemics and their involvement with social mobilization activities.

Second, meningitis epidemics have a high economic cost for Burkinabe society. The cost for households could be reduced in several ways. The main solution would be preventive immunization against meningitis with conjugate vaccines, which, when compared with polysaccharide vaccines currently used in Burkina Faso for reactive mass vaccination campaigns, provide longer-term immunity and indirect protection. Meningococcal (and pneumococcal and *Haemophilus influenzae* type b) conjugate vaccines would reduce the frequency and number of households affected by meningitis, thereby reducing household costs. A secondary intervention to reduce costs would be to improve the education of health care workers regarding free access to meningitis care during meningitis epidemics, with ongoing supervision of the implementation of free access to care. Finally, improved stock management of medicines for meningitis (including reallocation of stocks between affected and nonaffected areas) would facilitate free access to care and thus would contribute to reduced DMCs for households.

Although we included only a small sample of persons because of funding and time limitations, this sample was randomly selected and hence likely representative of at least the districts in which the study was conducted. If our findings reflect the situation throughout Burkina Faso, they indicate that meningitis epidemics have a devastating effect at all levels of society, including the individual household. Meningitis belt countries, and Burkina Faso at the center of the region, have experienced 1000 to >100,000 meningitis cases per year for the past 60 years [13]; however, these statistics mask the effects of the localized nature of meningitis epidemics in Sub-Saharan Africa, where up to 3% of individuals in a particular village may develop disease [14]. Moreover, although the highest attack rates occur among young children, most cases and deaths occur among older children and working age adults, which as we have shown may adversely affect entire households [15].

Meningitis is a severe disease with substantial economic impacts and in the African meningitis belt occurs at a high incidence. Epidemic waves that can strike up to 3% of a village may make the disease well recognized and highly feared, as demonstrated in our study by the language used to describe and explain meningitis, the multiple approaches used for prevention and treatment, and the economic investment households are willing to make. These factors make preventive vaccination of the highest health care priority for affected African countries.

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