STOP CHOLERA

Work Together. Stop Transmission. End Deaths.

An Updated Estimate on the Burden of Cholera in Endemic Countries

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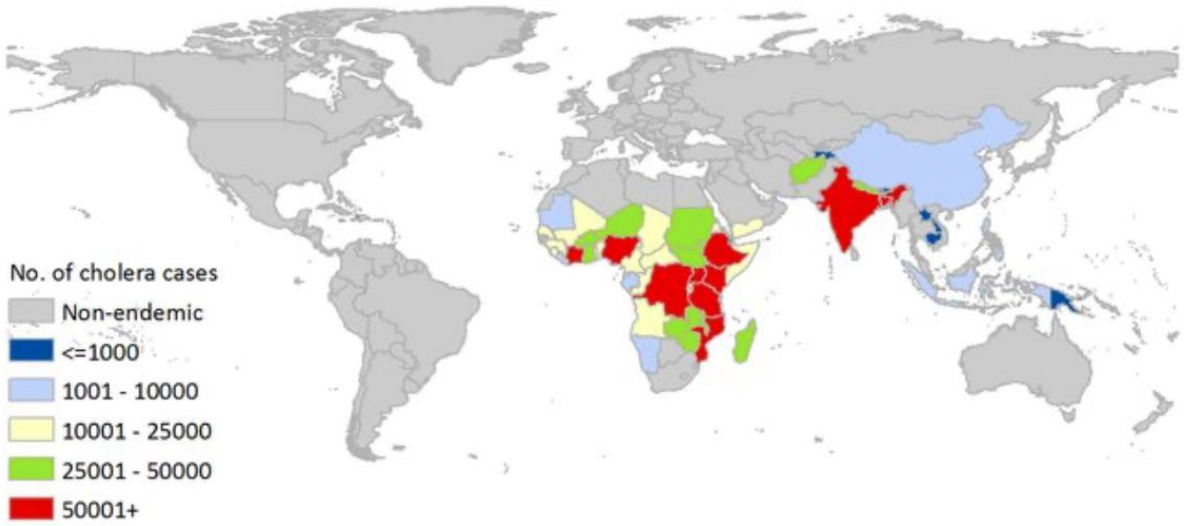

Estimated Annual Number of Cholera Cases

Figure 1 sourced from: https://doi.org/10.1371/journal.pntd.0003832

Safe drinking water and advanced sanitation systems have made Europe and North America cholera free for decades, however the disease continues to affect **at least 47 countries** across the globe, resulting in an estimated 2.9 million cases and 95,000 deaths per year worldwide. [1]

The persistence of cholera today and the geographic and temporal pattern of cholera outbreaks show that, despite ongoing efforts, current strategies have failed to control cholera in endemic areas, let alone to prevent outbreaks. The vast majority of cholera control activities have been focused on emergency response to outbreaks, which reduces the number of cases and deaths but does not have significant effect on the prevention of cholera. Long-term WASH programs are too few and do not regularly prioritize areas most affected by cholera. Worldwide, 844 million people still lack access to even a basic drinking water source, more than 2 billion drink water from sources that are faecally contaminated, and 2.4 billion are without basic sanitation facilities, exposing them to a range of water-related diseases including cholera[4]. As illustrated in Figure 1, households in cholera-affected countries are largely below the global mean with regard to access to basic water and sanitation services. Cholera is preventable with the tools we have today, putting the goal of ending it within reach. More proactive and targeted measures to prevent cholera through

investments in WASH, improved health systems, and large-scale use of OCV for those most in need are urgently required.

The global burden of cholera is not precisely known. Estimates of the number of cholera cases and deaths rely on available reports, such as those sent by countries to the World Health Organization, which must then be adjusted for data gaps and inconsistencies. The lack of accurate reports is due to limited capacity for disease surveillance, including laboratory support, in cholera-affected countries, as well as social, political, and economic disincentives for reporting cholera. For example, countries that export food or have a tourism industry may be reluctant to report cholera.

Data Sources: A systematic search of all publicly available data was conducted using the search terms "cholera" and "acute watery diarrhea." Major data sources included the annual cholera reports published in the WHO *Weekly Epidemiological Record*, the Gideon database and ProMED. All figures were aggregated at the country-level, with the exception of India, China, and Indonesia, for which figures are available at sub-national levels.

Identifying Cholera-Endemic Countries: The first step was to draw up a list of all counties where cholera is endemic. Because many countries do not report cholera to WHO, we used a **"**spatial lag regression model" that takes into account the cholera risk in neighboring countries, as well as available data from the country itself. The model predicts the probability of a country having cholera in a specific year. If the model's predicted incidence rate in a particular country exceeded the threshold of 0.01 cases/100,000 population for a given year, that country was deemed to have cholera cases in that year. If cholera cases were predicted in at least three of the five years included in the study (2008-2012), the country was considered to be endemic; following the WHO definition of a cholera-endemic country.[2] The model considers cholera cases as the dependent variable and access to improved water and to sanitation as the independent variables. Using this method, 69 countries were found to be cholera-endemic.

Estimating the Population at Risk: The next step was to estimate the number of people at risk for cholera in each endemic country. Population figures were collected from the United Nations Development Program (UNDP) *World Population Prospects: The 2012 Revision*.[3] The proportion of the population at risk was based on the percent of the population without access to improved sanitation facilities according to UNICEF's State of the World's Children Report 2013.[4]

Classifying Countries by Cholera Risk: Countries were then grouped by the "WHO mortality strata," which are defined by WHO region and level of mortality. Countries in group A have very low child and low adult mortality; those in group B have low child and low adult mortality; C countries have low child and high adult mortality; D countries have high child and high adult mortality; and E countries have high child and very high adult mortality.[5]

Estimating Country-Specific Incidence Rates: Since cholera incidence rates are not known for most endemic countries, we used data from population-based passive cholera surveillance studies conducted in the early to mid-2000s in three sites in Asia and Africa – Beira, Mozambique; Kolkata, India; and Jakarta, Indonesia – and applied these rates to other countries in the same mortality stratum in their respective regions.[6] Thus, the incidence rate from Beira, Mozambique was applied to the at-risk populations of all African-E countries, the rate from Kolkata, India was applied to the at-risk populations of Asian-D countries, and the rate from Jakarta, Indonesia was used for at-risk populations of Asian B countries. For Haiti and the Dominican Republic, we used the average incidence rates reported to WHO from each country from 2010-2012.

Estimating Cholera Deaths. Case fatality rates (CFRs) were calculated using variance-weighted

average CFRs by WHO mortality stratum.[1] CFRs for Haiti and the Dominican Republic were averages of the rates reported to WHO.

Results: Using these methods, we estimated that there are about 2.86 million cholera cases per year, resulting in approximately 95,000 deaths in the 69 endemic countries. Countries with estimates of more than 100,000 cases per year are:

- India
- Ethiopia
- Nigeria
- Haiti
- Democratic Republic of the Congo (DRC)
- Tanzania
- Kenya, and
- Bangladesh.

Conclusion. Cholera remains an important public health problem in more than one-third of the world's countries, and disproportionately affects disadvantaged groups. Continued global efforts are needed to improve cholera surveillance and reduce the burden of this disease through a combination of improvements in water and sanitation systems, cholera vaccination and improved access to good quality health care.

References

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