EDITORIAL

The changing impact of infectious diseases on global disease burden

Infectious Disease News, November 2013
J. Glenn Morris Jr., MD, MPH&TM

The world is changing. Cellphones are found everywhere. In one of our studies in rural Haiti, 98% of households had cellphones, despite that only 73% had latrines.

“First world” lifestyles are becoming the norm — or at least the goal — for much of the world’s population. This finds reflection in estimates of the global burden of disease. Such disease burden estimates were first made in 1990, with updates in 2005 and 2010; results of the 2010 analysis are just now finding their way into press. The 2010 data were collected under auspices of The World Bank and WHO, and involved hundreds of investigators/contributors from across the globe. With data from 187 countries, these studies represent a massive effort to understand the etiology — and risk factors — for disease in our world.


J. Glenn Morris Jr.

Quantification of disease burden

So how do we quantify “burden” of a disease? Aside from measures such as mortality rates, how can we compare the public health impact of ischemic heart disease vs. diabetes vs. acute diarrhea vs. tuberculosis? One approach used with increasing frequency in public health is the calculation of disability-adjusted life years (DALYs). In this system, disability weights associated with various diseases are assigned on a scale of 0 to 1.0, with 0 representing perfect health, and 1.0 being death. Years with a disability are entered into the system by multiplying the disability weight times the number of years the disability existed; for premature death, this would mean multiplication of “1” times the number of years of potential life lost, as compared with life expectancy of a reference population. As part of the global

burden of disease studies, estimated DALYs for 291 diseases and non-communicable diseases have now been calculated with 1990 and 2010 data, with results recently reported.

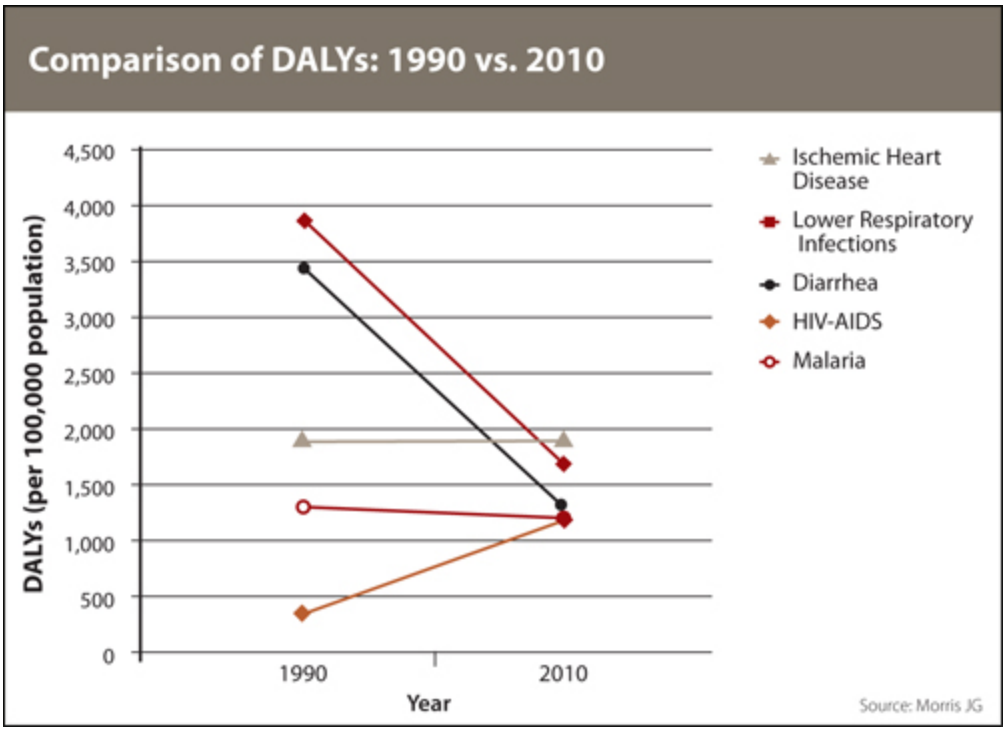
What do these data tell us about the health impact of infectious diseases in today's world? In the 1990 data, infectious diseases accounted for an estimated 14,609 DALYs per 100,000 population, or 31% of the total of the estimated 47,205 DALYs/100,000 population; in 2010, they accounted for 8,197 DALYs/100,000 population, representing 22% of an estimated 36,145 DALYs/100,000 population.

In 1990, lower respiratory tract infections were responsible for more DALYs than any other disease (3,894/100,000); in 2010, ischemic heart disease had moved into the No. 1 position. Diarrheal disease, No. 2 in 1990, was No. 4 in 2010. Malaria showed a slight increase, moving from No. 7 in 1990 to No. 6 in 2010. However, TB dropped from No. 8 in 1990 to No. 13 in 2010, and meningitis went from No. 18 to No. 25.

Obviously, global disease estimates such as these are fraught with error, and there is no question that infectious diseases continue to have a tremendous impact on public health, particularly in sub-Sahara Africa (where non-communicable diseases still constitute less than 30% of the total DALY burden). However, in much of the rest of the world, infectious diseases are being supplanted as the major causes of disability and death by non-communicable diseases and injuries (including what might be called "lifestyle" diseases, such as cardiovascular disease, stroke and diabetes).

So, are infectious diseases to become a thing of the past, pushed aside by successful eradication campaigns, combined with new global lifestyles and changing demographics? No, not yet. Although historically important infectious diseases may be contributing less to the overall global burden of disease, new diseases are appearing: HIV/AIDs, No. 33 on the rank list in 1990, has now moved into the No. 5 position. Pathogenic microorganisms have the ability to constantly evolve, to meet new challenges and move into new populations. As our environment changes, opportunities for exposure to new and emergent pathogens increase, and new niches open up that permit older pathogens to expand their impact.

Increase in antimicrobial resistance



As recently reported by the CDC, antimicrobial resistance is burgeoning, at a time when new antimicrobial agents are becoming increasingly rare. H1N1 influenza, thankfully, was not highly pathogenic, and did not replicate the devastation caused by the 1918 “Spanish” influenza. However, it highlighted the ease with which new pathogens can spread across the globe, taking advantage of our global transportation networks. Today, more than 2 billion passengers take commercial flights each year, providing pathogens with easy, rapid transit from one side of the globe to the other.

Ebola, Lassa fever and Nipah virus provide examples of viruses with animal origins, moving into human populations in the setting of deforestation and population increases that have increased contact between wild animals and humans. Middle East respiratory syndrome coronavirus (MERS-CoV), a first cousin of SARS, is perhaps the newest of these emerging pathogens of potential global concern: It continues to be reported from foci in Saudi Arabia, disturbingly close to areas where 4 million pilgrims are traveling to Mecca for the hajj.

Pathogenic microorganisms have been part of our world since the beginning of time. Continuing efforts to control, or even eradicate, the disease that they cause must continue, and we can look forward to continued decreases in the contribution that they make to the global burden of disease. At the same time, we must be continually alert to emergence of new pathogens and refine our ability to identify and control these new agents as they appear.

References:

CDC. Antibiotic resistance: threat report 2013. Available at: www.cdc.gov/drugresistance/threat-report-2013.
Lozano R. *Lancet.* 2012;380:2095-1228.
Murray CJ. *Lancet.* 2012;380:2197-2223.
Murray CJ. *N Engl J Med*. 2013;369:448-457.
WHO. Middle East respiratory syndrome coronavirus (MERS-CoV) – update. Available at: www.who.int/csr/don/2013_10_18/en/index.html.

For more information:

J. Glenn Morris Jr., MD, MPH&TM, is director of the Emerging Pathogens Institute at the University of Florida, Gainesville, Fla. Morris is also a member of the *Infectious Disease News* Editorial Board.

Disclosure: Morris reports no relevant financial disclosures.