

**Conflicts of interest.** The author reports no conflicts of interest relevant to this article.

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# Re-estimating annual deaths due to multidrug-resistant organism infections

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*To the Editor*—Multidrug-resistant organisms (MDROs) are responsible for an increasing number of infections each year.<sup>1</sup> An oft-cited statistic is that MDRO infections cause > 2 million illnesses and 23,000 deaths each year in the United States.<sup>1</sup> However, the true burden of MDRO infections remains uncertain due to insufficient national reporting rates and an absence of ICD-10 codes specifically for MDRO infections. Therefore, we sought to provide an updated estimate of deaths due to MDRO infections in the United States. Based on availability of data, we provide an estimation of mortality from MDROs for the year 2010.

In 2010 in the United States, 2,468,435 deaths were registered,<sup>2</sup> of which 715,000 (29.0%) were inpatient hospital deaths.<sup>3</sup> Using a conservative estimate for deaths due to sepsis,<sup>4</sup> 34.4% of inpatient deaths occur among patients with sepsis,<sup>5</sup> and the reported rate of MDR pathogens in sepsis is 28.8%.<sup>6</sup> With these parameters, MDRO sepsis could cause 70,837 inpatient deaths each year (Table 1).

We have yet to assign infection as a cause of death to the 1,753,435 outpatient deaths in 2010. Subtracting deaths that are unlikely to be due to infection (eg, suicides, accidents, and homicides), we are left with 1,572,624 deaths. After subtracting deaths due to infections, 1,550,536 deaths remain. If 17%–19% of these 1,550,536 deaths are due to infections (despite not being indexed as such)<sup>7</sup> and 28.8% are due to MDROs, there would be 285,680–316,690 deaths in which infection contributed to death, of which 82,276–91,207 deaths were due to MDROs (Table 1).

Summing the lower bounds of our estimates for inpatient and outpatient deaths due to MDRO infections gives us

**Table 1.** Estimates of Number of Deaths Due to Infection and Multidrug-Resistant Organisms in the United States in 2010

Category	Deaths Due to Infection	Deaths Due to Multidrug-Resistant Organism Infection
Inpatient	245,960	70,837
Outpatient	285,680–316,690	82,276–91,207
Total	531,640–562,650	153,113–162,044

153,113 deaths, a number almost 7-fold higher than that estimated by the CDC (ie, ~ 23,000).<sup>1</sup> Assuming a worst-case scenario and summing the upper limits of our estimate, 162,044 deaths in the United States were due to MDRO infections in 2010 (Table 1). This would move MDRO infections to the third highest cause of death in the United States for 2010. All infections would then supersede the MDRO infections group as the third highest cause of death,<sup>2</sup> with > 500,000 (Table 1).

Our estimates illustrate a need for better surveillance and reporting mechanisms for MDRO infections. With rampant over-use of antibiotics, establishment of MDRO breeding and transmission centers (long-term acute-care hospitals and nursing facilities), and increasing rates of iatrogenic immunosuppression, the population at risk for MDRO infections and the likelihood of drug resistance will continue to increase. To address this critical issue, establishing the burden of MDROs is crucial to guide research funding allocation.

## Acknowledgments

**Financial support.** Dr Kollef's efforts were supported by the Barnes-Jewish Hospital Foundation. Dr Burnham reports that this publication was made possible by the NIH-National Center for Advancing Translational Sciences (NCATS grant no. UL1 TR002345, subaward KL2 TR002346),

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**Cite this article:** Burnham JP, *et al*. (2019). Re-estimating annual deaths due to multidrug-resistant organism infections. *Infection Control & Hospital Epidemiology* 2019, 40, 112–113. doi: 10.1017/ice.2018.304

components of the National Institutes of Health (NIH), and NIH Roadmap for Medical Research. Its contents are solely the responsibility of the authors and do not necessarily represent the official view of NCATS or NIH.

**Conflicts of interest.** All authors report no conflicts of interest relevant to this article.

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# Affected healthcare workers during outbreaks: A report from the German consulting center for infection control (BZH) outbreak registry

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*To the Editor*—In 2013, the outbreak registry of the German consulting center for infection control and prevention (Deutsches Beratungszentrum für Hygiene, BZH GmbH, Freiburg, Germany) was instituted as a quality assurance project to analyze outbreak situations to gain epidemiological data and to generate practical advice for the affected institutions. After 5 years, the registry now contains data for 96 outbreaks plus final analyses. Here, we focused on outbreaks affecting healthcare workers (HCWs) as part of the infected or colonized outbreak cohort.

## Material and Methods

In contrast to the German legal definition (German infection prevention law, Infektionsschutzgesetz), which defines 2 or more cases of infection with a presumed epidemiological link as an outbreak, our registry only includes “major” outbreaks, which are defined as 5 or more cases of infection or colonization with an epidemiological link or, in cases of special organisms like multidrug-resistant organisms (MDROs), highly contagious diseases with 2 or more cases or sentinel cases of special interest.<sup>1</sup> The definition was chosen to limit the analytical effort on common outbreaks (eg, with norovirus) to major events but to include

colonization outbreaks without infections if they required comprehensive infection control interventions.

Data from the outbreak analysis were entered without personal identifiers in an anonymized database according to European Union’s (EU) General Data Protection Regulation (GDPR). This was not human research, and data analysis does not require review by our institutional review board. Overall, 94 outbreaks were analyzed regarding information related to involvement of HCWs.

## Results

The 94 screened outbreaks involved 464 people with infections and 168 with colonization only. The duration of the outbreak management ranged from 1 day to 185 days; the number of affected people ranged from 1 to 66 per outbreak. Figure 1 shows the distribution of organisms involved and their relation to outbreaks of infections (59%), combined outbreaks with infections and colonizations (20%), and colonization only (21%).

Overall, 192 HCWs became sick as part of an outbreak: 162 had norovirus infections, 22 had influenza infections, 8 had scabies infections. Furthermore, 2 HCWs were found to be colonized with MRSA in the screenings performed during an outbreak. No clear epidemiological link was identified between MRSA colonization status and the outbreak in 1 case, whereas an HCW was identified as superspreader during an upper respiratory tract infection in the other. In 5 outbreaks with gram-negative MDROs and 1 VRE outbreak, rectal screening of staff was performed without any meaningful results.

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**Cite this article:** Schulz-Stübner S, *et al.* (2019). Affected healthcare workers during outbreaks: A report from the German consulting center for infection control (BZH) outbreak registry. *Infection Control & Hospital Epidemiology* 2019, 40, 113–115. doi: 10.1017/ice.2018.274

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