Environmental and health impacts of US health-care system

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If the U.S. healthcare system were a country, it would rank 13th in the world for greenhouse gas emissions, according to new research. The study, published June 9 in *PLOS ONE*, quantified previously unreported environmental and public health impacts of the nation's healthcare sector.

The U.S. healthcare system, the most expensive in the world, uses vast amounts of energy in the form of heating, electricity, and energy-intensive goods and services. It has been estimated that the healthcare sector contributes 8% of the nation's greenhouse gas emissions. Yet emissions of other pollutants from the healthcare sector, and their impact on the public health, have not been reported.

To investigate the impacts, Yale's Jodi Sherman, M.D. and first author Matthew Eckelman of Northeastern University first used an economic model based on federal data to calculate total emissions of different pollutants produced by the healthcare sector over a 10-year period, drawing on national health expenditure data. They analyzed direct emissions from hospitals and clinician's offices, as well as indirect emissions generated by the sector's suppliers of energy, goods, and services.

The researchers then linked the healthcare-related emissions to specific environmental and health outcomes, including global warming; ozone depletion; respiratory disease from air pollutants; cancer from chemical exposure; and the environmental effects of acid rain, among others.

Among their findings, the researchers estimated that greenhouse gas emissions from the healthcare sector grew 30% over the past decade, accounting for 9.8% of the national total in 2013. Were it a country, the sector would rank "ahead of the entire United Kingdom" in emissions, said Sherman.

The research team also reported significant national percentages of non-greenhouse gas effects attributable to the healthcare sector, including acidification (12%), smog formation (10%), and respiratory disease from particulate matter (9%).

"It's a big contributor to our nation's environmental impacts," said Eckelman, "commensurate with its economic impacts."

In addition, the researchers calculated the public health impact of healthcare emissions. For the year 2013, they estimated health damages from the pollutants at 470,000 "disability adjusted life years" (DALYs)—a measure of years lost due to ill health, disability, or early death.

That health burden, the researchers said, is comparable to lives lost each year to preventable medical errors first reported by the Institute of Medicine in 1999, sparking national attention on patient safety. "It's on the same order of magnitude, and we ought to pay attention to it," Sherman noted.

Also detailed in the study are recent efforts to "green" the healthcare system, such as the Healthier Hospitals Initiative. These initiatives, designed to make the healthcare sector more sustainable and reduce pollution, can also improve public health and patient safety, the researchers said.

"While some pollution is currently inevitable in our efforts to safely care

for patients, there is a tremendous amount of waste in our healthcare system," said Sherman. "People are trying to reduce waste from a cost perspective. But there is a public health perspective as well that is important. Protecting public health is also an issue of patient safety."

Provided by Yale University