The United States is failing its mothers

There is only one industrialized country where the rate of maternal deaths has risen over the past 30 years. US researchers are trying to find out what went wrong.

BY LAUREN GRAVITZ

It was quiet on the labour and delivery ward when Lisa Hollier arrived for her shift one morning in 1994. In fact it was too quiet, she says. Hollier was a resident in obstetrics and gynaecology at Baylor University Medical Center in Dallas, Texas, and she knew something had happened.

She quickly learned that a young woman had arrived in the night complaining of a severe headache. It was her first pregnancy, she was full-term, and shortly after arriving she lost consciousness. Hollier's colleagues had whisked the woman into the operating room, performed an emergency Caesarean section, and saved the baby's life. The mother was still unconscious.

"I worked with the team to see if we could save her," Hollier says, her voice breaking as she recounts the events of more than 20 years ago. "She passed away. I remember her husband taking home their baby, and it was so incredibly heartbreaking. That should have been the most amazing moment of their lives," she says. "Coming home with my son was phenomenal. That family never had that opportunity."

The experience shaped Hollier's outlook and her career. "I don't know that there's anything we could have done to prevent her death, but it made me want to do everything I could to prevent deaths for other women," she says. "It's why I volunteer so much of my time for this particular issue."

Hollier is now a medical director of obstetrics and gynaecology at Texas Children's Hospital in Houston, and president-elect of the

American Congress of Obstetricians and Gynecologists (ACOG). She and her colleagues have their work cut out for them. Despite a successful effort to address maternal mortality in countries around the world, the United States is the only developed nation where more women each year are dying in or around childbirth, and they have been since 2000. Researchers and physicians are trying to figure out why, but the United States lacks the information it needs to fully understand, let alone address, the problem.

RATE RISE

Maternal mortality, as defined by the World Health Organization (WHO), is the death of someone who is either pregnant or within 42 days of a pregnancy's end. It is generally a good indicator of the quality of a rich country's health system. "It takes a lot to kill a young person," says Steven Clark, who specializes in maternal and fetal medicine at Baylor College of Medicine and Texas Children's Hospital. "For every young pregnant woman who is dying, I guarantee you there are 15 or 20 more women who came really close but didn't quite die. Young people are incredibly resilient."

In 2000, the WHO announced eight Millennium Development Goals to aim for by 2015. Goal 5 — improve maternal health — contained an ambitious 75% decrease (from 1990 levels) in the rate at which mothers were dying around the world. Mothers were dying while pregnant. They were dying during childbirth. They were dying from complications lasting six weeks, a year, or even decades beyond the pregnancy itself. As many as half of these deaths were preventable.

Efforts to decrease maternal mortality rates intensified around the world. Developing nations had a long way to go, but most made huge strides. Rwanda, for instance, brought its maternal mortality ratio down by 77%, from about 1,300 deaths per 100,000 births to just 290. Brazil more than halved its rate, from 104 per 100,000 to 44. Overall, maternal mortality decreased by 45% worldwide.

Even developed countries pushed their rates down. "Some people said developed countries' rates were already so low you couldn't make it better. But that was blown out of the water: the rates decreased by 48%," says Marian MacDorman, a maternal and child-health researcher and statistician at the University of Maryland in College Park. "This is something that is not easily fixable but we know how to fix it. It just takes political will."

Yet between 1990 and 2015, the maternal mortality rate in the United States climbed by 56%, rising from 16.9 deaths per 100,000 births to 26.4, according to a recent study[1] that was published in *The Lancet* (see 'Maternal mortality snapshot'). What caused this rise? Many people have theories but no one knows for sure. Over the past two decades, there have been no consistent documentation and analysis. Without quality data, there is no way to understand the causes of this trend.

In 2003, some US states began adding a checkbox to their death certificates to indicate whether a death was pregnancy related. With a checkbox close at hand, it became easier and more common to report maternal deaths — so easy, in fact, that some women over 55 appeared to start dying of pregnancy-related causes, as did a handful of men. It became incredibly difficult to fact-check the numbers, let alone standardize them so they were comparable from state to state. The government body responsible for tracking maternal deaths in the United States, a branch of the Centers for Disease Control and Prevention (CDC) called the National Center for Health Statistics in Atlanta, Georgia, effectively threw up its hands. It suspended publication of maternal mortality data in 2007, acknowledging that the numbers were just too unreliable and inconsistent.

"The United States hasn't had a reported maternal mortality rate since 2007," MacDorman says. "Uzbekistan has one, yet one of the most developed, richest countries in the world can't produce a maternal mortality rate. I see this as a big problem."

MacDorman, who was formerly a statistician at the CDC, decided to find a way to measure maternal deaths and crunch the numbers. Her 2016 study[2] on US maternal mortality showed that, for 48 states and Washington DC, the rate went up by 27% between 2000 and 2014.

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Compared with the study in *The Lancet*, which covered more than 140 countries, MacDorman's numbers are more comprehensive and US specific. The differences between the two studies' findings show how hard it is to gather, adjust and analyse maternal mortality data. By 2015, although almost all US states were using a standard death certificate, the data were still not being validated and had no quality control. This situation allows different US states and statisticians such as MacDorman to come to their own conclusions based on a combination of birth certificates correlated with death certificates and, occasionally, information from medical-insurance codes. So although the trends are clear, the causes are not. "If someone were to tell me I could do anything I wanted to change maternal health care, what would I do?" Clark asks. "My answer is: I have no clue. I don't have the data. No one does."

MacDorman excluded California and Texas from her trend calculation because of incompatibility and uncertainty about their data. In fact, these states provide a study in contrasts. The rate in Texas seemed to more than double, from about 17 deaths per 100,000 in 2000 to nearly 36 in 2014, with a sudden and surprising spike in 2011. California, on the other hand, bucked the trend. According to MacDorman's research, maternal mortality decreased from a high of 21 per 100,000 in 2003 to about 15 in 2014, the last year for which the state has data.

THE CALIFORNIA EXCEPTION

No one is yet sure why the rate in Texas spiked. But we do know why California's rate went down: it was through the concerted, collaborative effort of hospitals, health providers, public-health initiatives and an organization known as the California Maternal Quality Care Collaborative (CMQCC). California's experience may provide clues for addressing maternal mortality elsewhere in the country, and could serve as a model for other states.

In 2006, the California Department of Public Health noticed that the state's previously decreasing rate of maternal deaths was rising, along with US rates as a whole. Alarmed by the trend, California established the CMQCC and put together its first maternal mortality review committee to assess every known pregnancy-related death. "California is one-eighth of all the births in the United States, so it's a big deal," says Elliott Main, medical director of the CMQCC at Stanford University in California.

California based its approach on the UK Confidential Enquiry into Maternal Deaths programme, in which the circumstances of every pregnancy-related death are reviewed to determine whether it might have been prevented and to see what lessons can be learned to improve care. The UK system, instituted in England and Wales in 1952, requires all physicians and midwives who cared for a mother who died to give a true account of their involvement, to provide all relevant case notes, and to reflect on

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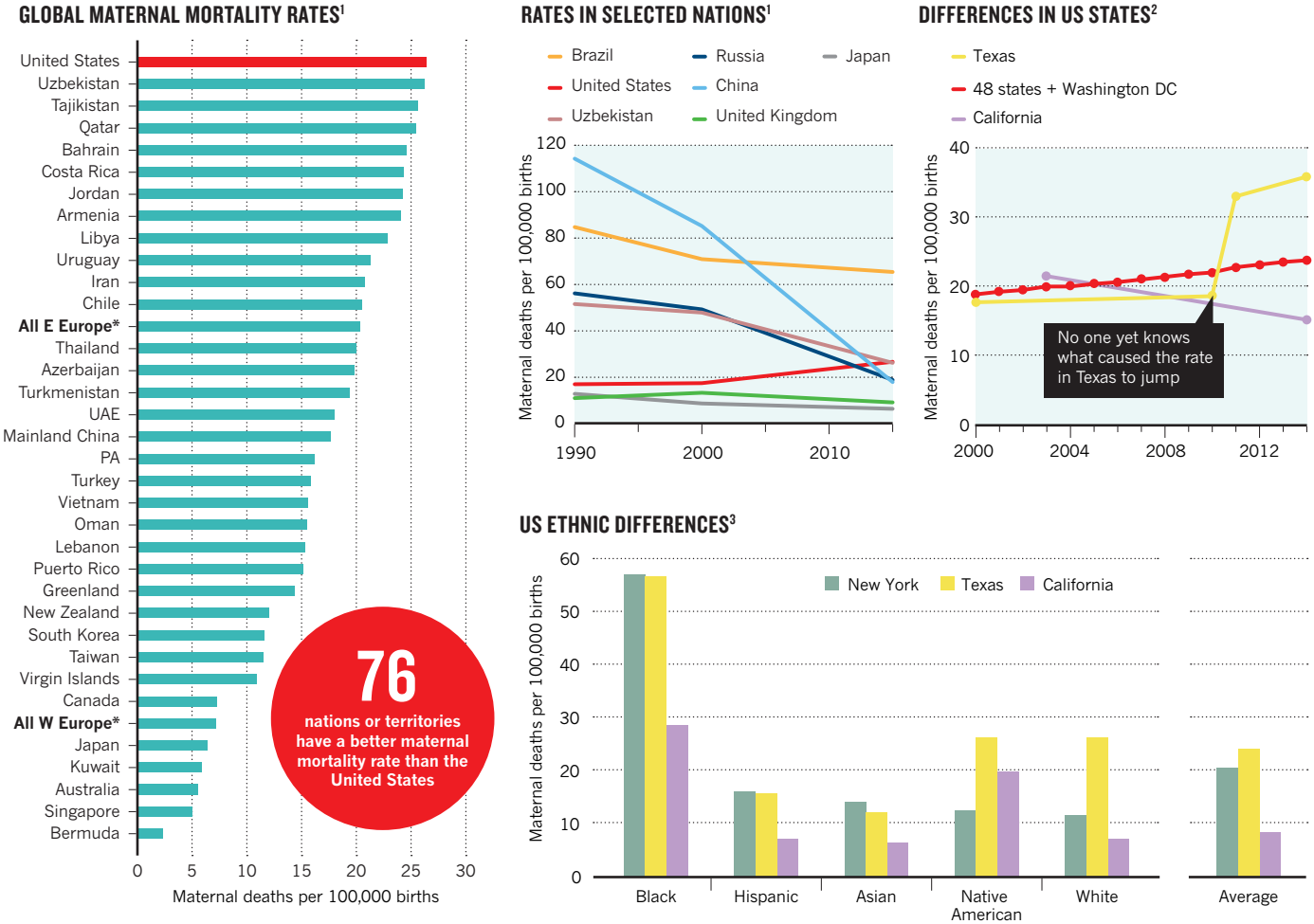
MATERNAL MORTALITY SNAPSHOT

The rate of women dying in or around childbirth rose in the United States between 1990 and 2015. Its maternal mortality rate is now only the 77th best in the world[1], putting it behind many less-developed nations, and the rise comes at a time when all the other developed nations, and many developing ones, were reducing their rates[1]. There are stark differences between US states, however — the rate in Texas rose, but California bucked the trend and reduced its maternal mortality[2]. There are also clear ethnic differences in most states[3], including the three most populous.



*Eastern Europe comprises data from 21 countries, Western Europe from 22. UAE, United Arab Emirates. PA, Palestinian Authority.

what they learned and what they might do differently in future. All reports are anonymized, and physicians are guaranteed that the information they provide can never be revealed in court.

Such privacy has been invaluable. It has enabled a true retelling of events without fear of naming or shaming, or of legal action, says Gwyneth Lewis, who led the Confidential Enquiry from 1992 until 2013. "We realized that being open and discussing the mistakes we made was a really good learning tool."

Lewis recently retired and spends much of her time now helping other countries and US states create their own maternal-mortality review processes. With advice and input from Lewis, Main and his colleagues in California created the state's maternal-mortality review board. It began by examining data from 2002 to 2007, the years when deaths seemed to spike. "We found some causes that were clearly much more preventable than others," Main says.

Haemorrhage was at the top of the list. "It's a very traumatic situation to be thrust into as a physician, when a woman starts to haemorrhage," says Main. "You're doing a vaginal birth and after the baby comes out, the woman starts to bleed and the puddle grows bigger at your feet. I've seen a number of physicians get a deer-in-the-headlights look." Without a standard protocol that nurses and physicians can immediately implement, the situation can quickly spin out of control, he adds.

Main and his colleagues at the CMQCC created two toolkits to help hospitals build streamlined, standard approaches to the top causes of maternal death: haemorrhage and pre-eclampsia (a fast-progressing complication of pregnancy characterized by high blood pressure and potential organ damage). The toolkits are information resources that help hospitals to develop standard procedures and address policy and preparedness at every level, from the delivering obstetrician to the pharmacy and the blood bank. Additional toolkits for thromboembolism and cardiovascular disease are under final review.

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Babies on a maternity ward in Boston, Massachusetts.

The first two toolkits were introduced throughout California via lectures and multi-hospital learning collaboratives, covering about 350,000 births each year. Even without full adoption, the state's maternal mortality was halved in just three years. Targeting haemorrhage and pre-eclampsia was important, but it was not the entire reason for the improvement, says Main. "A lot of it is changing the culture of a unit to support safe practices, having people work better together as a team, and having more standard protocols in place," he says. Improving teamwork reduced overall maternal mortality rates from a range of complications, he adds.

PUSHING AHEAD

As the efforts in California (and certain hospital systems) have shown, part of the solution to reducing maternal deaths lies in having clear guidelines for emergency situations. Unlike specialities such as cardiology, in which physicians attach a patient to an electrocardiogram at the first sign of a heart attack, most US hospitals do not have clear procedures in place for dealing with emergent obstetric crises. To address this problem, ACOG is working with 12 states to implement toolkits like the ones Main helped to create.

Toolkits can help once patients have already been admitted to the hospital, but life outside the labour and delivery wards is also a huge factor in maternal mortality rates. Researchers suspect that rises in known risk factors, such as diabetes, obesity and increased maternal age, are contributing to mortality rates. But problems such as these are bigger than toolkits, checklists and co-morbidities, and require a different set of solutions that are as diverse as the country itself.

Each of the 50 states plus Washington DC has a different demographic. Some are rural, some more urban, and some have a wide mix of both. Some cities, such as New York and San Francisco, have several medical centres. In other areas, it is a two-hour drive to the nearest labour unit, which can be too far when a pregnant woman begins to haemorrhage.

Ethnic, racial and socioeconomic diversity also affect the numbers[3]. Between 2005 and 2014, California's maternal mortality rate averaged 8.3 deaths per 100,000 births. But there was a huge gap between the rate at which Hispanic women and non-Hispanic white women were dying (both at 7.1 per 100,000 births) and the rate for non-Hispanic black women (28.6). Similar gaps exist, to greater and lesser degrees, in all US states. The same is true for Native Americans: in North Dakota in those years, the maternal mortality rate for whites was 10.4 per 100,000 births, but for Native Americans it was 78.5.

There are many potential reasons for these demographic discrepancies. Native Americans living on reservations can be hundreds of miles away from the nearest crisis centre. African Americans have higher rates of hypertension than other US ethnicities, and some have a mistrust of doctors. And the burden of racism this group encounters cannot be overstated. But with few maternal mortality boards equipped to gather enough data and analyse the contributing factors, the underlying causes remain a mystery.

Two bills were introduced in the US Congress this year (one in the House of Representatives and one in the Senate) to address the dearth of data. The bills, which have bipartisan support, would provide funding to help states create or strengthen their maternal-mortality review process and find solutions to address local problems head-on.

"The ultimate goal of the bill is to prevent moms from dying," said Representative Jaime Herrera Beutler (Republican, Washington) in e-mailed correspondence, "but it's also to improve the quality of care and health outcomes for moms during their pregnancy, birth and in the post-partum period." Even though health-care legislation in the country is currently up in the air, she added, "we're going to push this important solution forward regardless of the path health reform takes in the coming months."

At the moment, 33 states have a maternal-mortality review board of some sort. "We need the legislation to help the 17 states that haven't done it. If we were to wait for the states to do it one at a time, then it would be many, many years," says Barbara Levy, the vice-president of health policy at ACOG. "This is the future of our country. Healthy pregnancies and healthy babies mean a healthy country."

Most of those in the field think that nationwide legislation cannot come soon enough. As bad as the climbing maternal mortality rate is, without data, researchers and clinicians have their hands tied. Hollier sums it up: "You can't change something if you're not measuring it." ■

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1. GBD 2015 Maternal Mortality Collaborators *Lancet* **388,** 1775–1812 (2016).
2. MacDorman, M. F., Declercq, E., Cabral, H. & Morton, C. *Obstet. Gynecol.* **128,** 447–455 (2016).
3. Moaddab, A. *et al. Obstet. Gynecol.* **128,** 869–875 (2016).