



public image of someone, [disagreement is] much more difficult to deal with,” she says. “You stop sleeping at night sometimes.”

Vinuesa and her allies continued the fight. They amassed further scientific evidence, including studies from three different labs suggesting the *CALM2* mutation was pathogenic and data showing that both sons had mutations in another gene that can cause lethal epilepsy in mice. They compiled it all in a 2020 peer-reviewed publication. Its authors and many other scientists joined a petition for yet another Folbigg inquiry, and the Australian Academy of Science backed the plea. “The academy was very courageous. Anna-Maria Arabia [its CEO] persuaded the academy this was a cause worth endorsing and that was key,” Vinuesa says.

After a second inquiry was launched in 2022, the tide turned. Vinuesa and Schwartz testified at the new hearing, as well as protein scientist Michael Toft Overgaard and geneticist Mette Nyegaard, both of Denmark’s Aalborg University, whose initial cell studies of the *CALM2* mutation suggested it could cause heart arrhythmias. The state attorneys involved in the new hearing last month told the New South Wales attorney general there was now reasonable doubt that Folbigg had killed her children. He agreed and last week’s pardon was the result. A former judge in charge of the inquiry is still scheduled to release a final report, which could bring an official exoneration of Folbigg and perhaps even compensation.

Vinuesa believes science can now play a greater role in explaining sudden deaths that seem suspicious. The databases recording normal human genetic variation have grown tremendously. And high-throughput methods to test the effects of individual mutations in cells have been developed, she notes. Gene variants can now be officially scored, using criteria endorsed by the American College of Medical Genetics and Genomics, as “likely pathogenic” in a death (a 90% chance it was the cause) or “pathogenic” (a 99% chance).

“People have to be retrained to know how to interpret whole genome data,” she says. “For judges and barristers, particularly if they haven’t had any scientific training, it’s very difficult. There have to be mechanisms put in place to help.”

Other women accused of killing or inflicting harm on a child have sought Vinuesa’s help as a result of the Folbigg case. She says she’s not eager to get back into court, but in some cases may look for genetic diagnoses that may have been missed. “There needs to be more collaboration between the scientific world and the legal profession,” she says. Folbigg would no doubt agree. ■

HEALTH INEQUITIES

Segregation was already hurting Black health 100 years ago

Research links structural racism of 1900s U.S. society to striking disparities in childhood mortality

By **Rodrigo Pérez Ortega**

From the choice of schools to safety to access to green spaces and healthy food, the neighborhood where a child is raised can play a determining role in their future health. And because structural racism can systematically silo nonwhite people in certain neighborhoods, those local factors shape the health of millions of people of color in the United States. Now, census data link Black children’s neighborhoods and mortality rates in the early 20th century, exposing segregation’s devastating impact on health more than 100 years ago.

The study shows segregation drove racial health disparities “not just today, but [also] in the past,” says New York University community psychologist Adolfo Cuevas, who was not involved in the work. John Parman, an economist at the College of William & Mary, says the new results are striking because they document the impacts even before the makings of the Jim Crow era in the late 19th century, which legalized and enforced racial segregation and is known to have exacerbated health inequities.

A growing body of evidence has shown that, today, neighborhoods with majority nonwhite residents tend to have poorer health—the result of many accumulated social and environmental inequalities such as systematic overcrowding, higher noise levels due to industrial projects, and exposure to toxic hazards. But how early such residential segregation began to affect health was not clear, says J’Mag Karbeah, a health services researcher at the University of Minnesota (UM) who led the new study.

So Karbeah and J. David Hacker, a demographic historian at UM, set out to correlate early segregation with child mortality, a proxy for the health of the entire population. “If you don’t have a healthy young population, you won’t have healthy working-age adults, [and] you will not have healthy seniors,” Karbeah says. “It’s really predictive of the quality of your society in the next 40 or 50 years.” The researchers used census data from 1900 and 1910 that were recently processed

by the Minnesota Population Center at UM. The lists, which together cover about 168 million people, include information on literacy, race, and whether the individual lived in a rural or urban area. Census takers also asked each surveyed woman who had ever been married how many children she had given birth to and how many were still alive.

From the data, Karbeah and Hacker reconstructed the number of children born in the 5 years before each census to arrive at a sample of nearly 4.7 million Black and white children. Focusing on the South because 90% of the Black population resided there at the time, they compared the mortality rates for Black and white children. They also calculated the spatial distribution of houses headed by Black or white people as a measure of segregation.

The largest mortality gap was in Savannah, Georgia, in 1910, where Black children were 3.2 times more likely to die than their white counterparts, with almost half dying before age 5. To tease out the influence of segregation, the team controlled for socioeconomic and other variables such as literacy, occupation, and unemployment. They found that in 1910, neighborhood segregation as much as doubled the mortality gap between Black and white children in cities, the team reported last week in *Population, Space and Place*.

Although the researchers couldn’t explain exactly how segregation affects child mortality, children are extremely vulnerable to environmental pollutants as well as to poor sanitation, Karbeah says, all of which tend to go hand in hand with housing segregation. “These are the populations that have been most impacted by these inequities within the neighborhood environment,” she says.

Parman notes that a century ago, access to modern medical interventions, clean water and sanitation was not as different for Black and white residents as it was in later years. That makes the mortality gap between Black and white children all the more striking. “That speaks to a broader set of mechanisms through which segregation might impact health,” he says. ■

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