



Incidence of Neural Tube Defects among Hispanic Individuals of Childbearing Age in a Rural Southwestern Wisconsin County

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Abstract

Neural tube defects are a heavily researched and mostly preventable birth defect. However, the odds of neural tube defects are higher for Hispanic fetuses. In a rural southwestern Wisconsin county they were ten times higher than the national average of 6 per 10,000 births. Many factors contribute to increased neural tube defect odds, though fortifying foods with folic acid which was mandated for flour-based products in 1998, reduced incidence of neural tube defects across the nation by 35%. However, the rate of neural defects for Hispanic fetuses after the 1998 mandate did not decrease in the same rate as White fetuses. Because corn-based products may constitute a large proportion of Hispanic diets, and not flour-based products, many Hispanic individuals do not receive the same public health primary prevention effort in the folic acid fortification mandate. With data highlighting the stark inequities in birthing outcomes, legislators have a unique opportunity to join the public health movement toward equity and justice for all birthing persons by adding corn-based products in the fortification mandate.

Problem

Neural tube defects are abnormal brain, spine, and spinal cord formations during fetal development. Incidence of neural tube defects among Hispanic individuals of childbearing age in a rural southwestern Wisconsin county is 10 times higher than the national average of 6 per 10,000 births [1, 2].

Magnitude

Each year in the United States, neural tube defects affect roughly 3,000 pregnancies [1]. Hispanic individuals of childbearing age are approximately 20% more likely to have a baby with a neural tube defect compared to non-Hispanic white individuals [3]. From 2016-2019, 75% of the observed neural tube defects occurred among Hispanic pregnancies in one Wisconsin county. Of the total unique pregnancies during those four years, 69% were Hispanic (Figure 1 and 2).

Costs for raising a child with a neural tube are \$553,151 more than one without, according to a 2016 estimate [4], [5]. Patients with neural tube defects incur high medical costs from inpatient hospital stays at birth, which are followed by specialty care throughout life [6]. Comorbidities and associated costs like infection treatment, respiratory failure, and abnormal kidney function also pose financial pressures on individuals, health systems, and families [7].

Costs are not exclusively medical in nature [6]. Non-medical costs include services such as care management, special education, developmental services, and mobility equipment [6]. Caregivers for those with neural tube defects, often family members, are 25% less likely to be employed. Those that are employed work 25% fewer hours [8]. The reduced economic productivity of the patients themselves also presents significant indirect costs. Financial impacts of neural tube defects affect individuals and reach across systems including health care, education, and government.

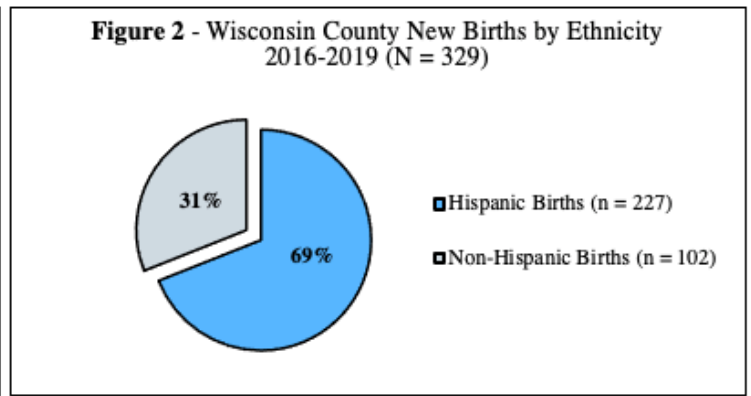
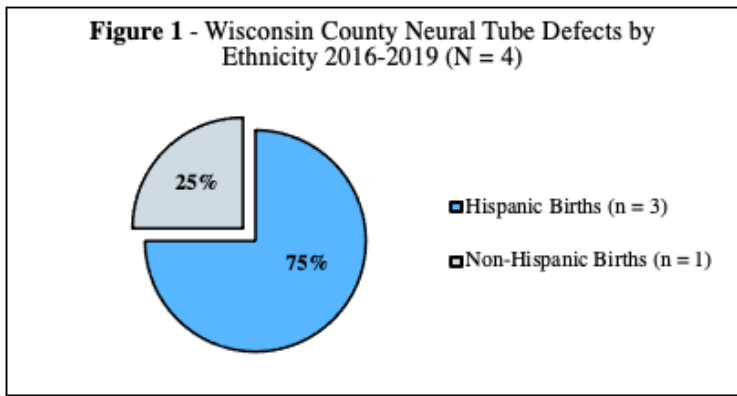


Figure 1 and Figure 2 data derived from "High Prevalence of Neural Tube Defects in a Rural Hispanic Population: Call to Action." [2]

Causes and Influential Factors

Environmental, social, and economic variables increase the risk of neural tube defects in developing fetuses.

Genetic Factors

Methylenetetrahydrofolate reductase (MTHFR) genetic variants also impact risk of neural tube defects [9]. These genetic variants, found within 20-40% of the Hispanic population in the U.S., correlate with increased odds of a neural tube event [10, 11]. However, research shows that even for individuals with the MTHFR allele mutation, consumption of appropriate amounts of folic acid can prevent a neural tube defect in a developing fetus [9].

Access to and Consumption of Folic Acid

Studies suggest that 50-70% of neural tube defect cases could be prevented with appropriate folic acid consumption before and during early pregnancy [12]. However, only 13% of the Hispanic birthing population consumed the recommended intake of folic acid from foods, according to a frequently cited 2001-2002 National Health and Nutrition Examination Survey data [13].

A lack of access to folic acid, prior to and during the initial stages of pregnancy, is the primary issue leading to elevated neural tube defect incidence for Hispanic individuals giving birth. Folic acid fortification in flour-based products as a passive primary prevention effort drastically reduced incidence of neural tube defects, but not for the Hispanic population whose staple grain is corn [14]. Folic acid intake could increase by 3.9-42.9% for different Hispanic sub-populations if corn-based products were fortified in the same manner as flour-based products [14].

Economic, Social, and Political Factors

Economic and social factors contribute to and perpetuate higher incidence of neural tube defects within the Hispanic population.

Lack of access to primary care prevents conversations around elevated neural tube defect risks and potential solutions, such as folic acid supplements. Folic acid supplements are a covered preventive health service for birthing people under the Affordable Care Act [15]. In 2016, an estimated 55% of uninsured Hispanic Americans were unaware of existing insurance coverage opportunities through the Affordable Care Act and Marketplaces [16]. Additionally, many Hispanic people who give birth are ineligible for government services due to lacking U.S. citizenship. Even though pregnancy grants health coverage through Medicaid/CHIP in Wisconsin for those otherwise ineligible for government services, the neural tube and potential defects may have already developed [17]. Neural tube defects develop between 17 and 31 days after conception, often before an individual knows they are pregnant and without preventive efforts available through medical care, such as folic acid supplements, to reduce the risk [18].

In addition to health care access barriers, a lack of political representation and structural racism undermine equitable birthing outcomes in Hispanic populations. Though comprising approximately 18% of the U.S. population as the country's largest minority group, only 1.2% of local, state, and federally elected officials identify as Hispanic [19]. Inequitable representation allows bias and structural racism to take root in legislation [20].

Previous Policies

In 1998, the U.S. Food and Drug Administration (FDA) mandated the fortification of grain products with folic acid. The regulation covered breads, rice, pasta, and cereals. The FDA estimated that the cost-savings of this prevention strategy outweighed the cost of fortifying food by a multiple of 24. Mandatory fortification reduced the incidence of babies born with neural tube defects by approximately 35%, or 1,300 babies each year [3, 21].

In 2006, the Corn Masa Flour Fortification Working Group petitioned the FDA to include corn masa flour as a product for fortification because the incidence of neural tube defects remained elevated for Hispanic individuals [22]. The petition succeeded and, as of 2016, folic acid could voluntarily be added to corn masa flour [22].

The rate of voluntary participation in the fortification of corn masa flour, as well as the availability of folic acid-fortified corn masa flour to the public, is almost negligible [23, 24]. One study sampled 41 corn masa flour and tortilla products and found that approximately 5% were labeled as containing folic acid [23]. A second investigation identified 43 unique corn masa flour or corn tortilla products, of which only 3 included folic acid. None were fortified [24].

By not mandating the fortification of corn-based products, as the FDA has done with flour-based products, Hispanic populations have continued to experience an elevated incidence of neural tube defects because of structural inequity and ethnocentrism.

Call for Action

This southwestern Wisconsin county received a spotlight during the American Academy of Pediatrics Virtual National Conference and Exhibition in October 2020, drawing the attention of the Centers for Disease Control and Prevention. The data is clear. With neural tube defect incidence rates that are ten times the national average, Hispanic community members bear the consequences of non-inclusive, inequitable policies. However, with increasing awareness and a public health movement toward inclusion and justice, legislators stand in a unique position to close policy gaps that perpetuate poor health outcomes.

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