

Effects of Race on Hearing Screening Failure Rates in a Newborn, Well-Baby Unit

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Abstract. At most birthing facilities – including Wesley (Medical Center) in Wichita – trained examiners screen well babies' hearing using a three-stage screening process: an initial otoacoustic emissions (OAE) screening, a second OAE screening for well babies who fail the initial screening, and an automated auditory brainstem response (AABR) screening for well babies who fail the second OAE screening. If a baby fails the three-stage screening, the baby is scheduled for follow-up hearing testing with an audiologist to diagnose if the baby does, indeed, have a hearing loss. This three-stage screening has been performed on all well babies born at Wesley since 2009. Researchers have reported a higher prevalence of hearing loss among Hispanic *school-aged* children than among children of other races. The purpose of this study was to measure if a higher risk of hearing loss is already present *at birth* among Hispanic well babies. Specifically, in this retrospective study, investigators reviewed hearing screening and demographic records of 14,648 well babies born at Wesley from 2009-2012, and statistically compared the screening failure rates of Hispanic well babies versus well babies of other races.

1. Introduction

Early identification and intervention of babies with hearing loss is critical for their development of speech, language, communication, and learning. Accordingly, hearing of nearly all newborns is screened soon after birth in all states, including Kansas. In fact, in 2011, Centers for Disease Control and Prevention (CDC) reported 97.9% of babies born in the United States had their hearing screened in the first few weeks of life [1]. Locally, Wesley (Medical Center), one of the largest birthing facilities in the Midwest, has screened hearing of over 22,000 well babies since 2009. Numerous studies have shown that certain socioeconomic, ethnic, and racial groups have poorer health outcomes than others. The most recent US National Health and Nutrition Examination Survey reported a higher prevalence of hearing loss among 6-19 year old Hispanic children than among non-Hispanic children of the same age; however, no information was reported for children younger than 6 years old in the survey [2]. The one previous study measuring effects of race on newborn hearing screening outcomes found failure rates were not

significantly higher among Hispanic newborns than non-Hispanic newborns. However, they used a relatively low sample size, they only employed a one-stage screening process, and their study was prospective which could have increased examiner bias [3]. There are several risk factors associated with temporary or permanent hearing loss for well babies including male gender, low birth weight, low APGAR scores, Caesarean delivery, ear tags/pits, family history of hearing loss, and syndromes associated with hearing loss. The purpose of this study was to measure effects of race on hearing screening failure rates in a newborn, well-baby unit.

2. Experiment, Results, Discussion, and Significance

A retrospective, between-subjects analysis was conducted using existing hearing screening results of 14,648 well-babies born at Wesley and demographic information from Wesley's Department of Information Technology. As shown in Figure 1, 17% of the well babies were Hispanic and 83% of the well babies were non-Hispanic.

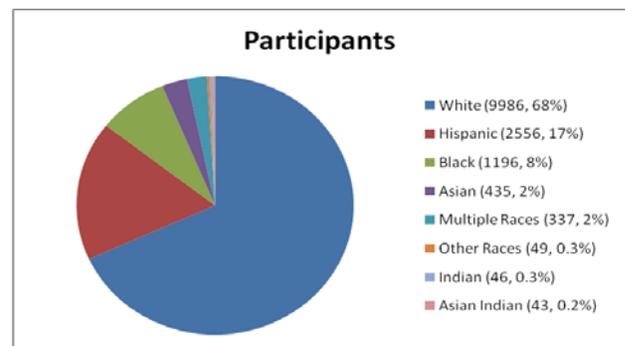


Fig. 1. Number and percentage of participants by race.

Investigators stratified by race the number of well babies who passed and failed hearing screenings (see Figure 2).

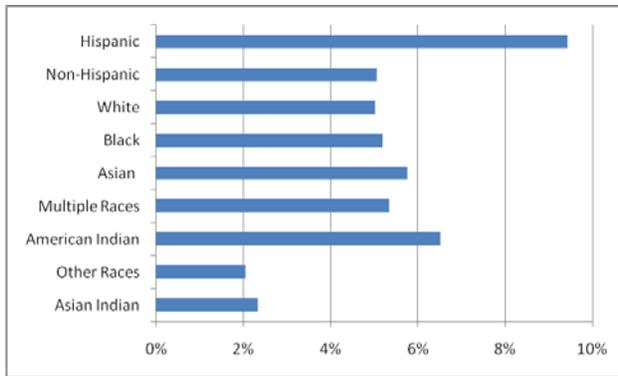


Fig. 2. Failure rates (in %) of well babies of different races.

Approximately 9% of Hispanic well babies failed their initial hearing screening, whereas only about 5% of non-Hispanic well babies—including about 5% of White and Black well babies—failed their initial hearing screening.

Investigators then used odds ratios to test the null hypothesis that Hispanic well babies would not fail hearing screenings at a significantly higher rate than well babies of other races. The null hypothesis was not supported at a $p < 0.0001$ significance level. Specifically, Hispanic well babies were almost twice as likely to fail the initial newborn hearing screenings as non-Hispanic well babies.

It is unclear what might be causing higher failure rates among Hispanic well babies. For example, several researchers have recently reported C-section deliveries versus vaginal deliveries increases morbidity among newborns. C-section deliveries of Hispanic well babies in this study, however, were significantly lower than C-sections among non-Hispanic well babies (see Figure 3). Failure rates, moreover, apparently were not associated with racial minority status as failure rates were twice as high for Hispanic well babies as failure rates for both Black and White well babies.

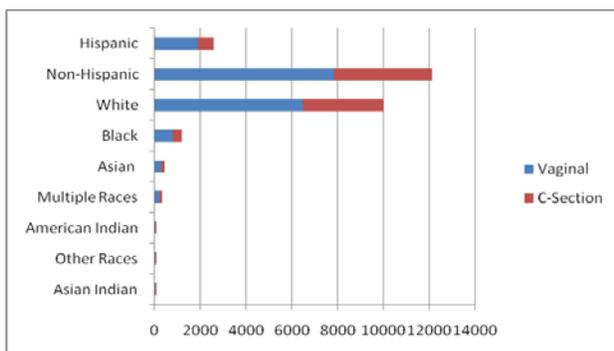


Fig. 3. Number of vaginal (blue) vs. C-section (red) deliveries.

3. Conclusions

The National Center for Hearing Assessment and Management (NCHAM) reports that detecting and treating hearing loss at birth for one child saves \$400,000 in special education costs by the time that child graduates from high school [4]. Accordingly, if there are unknown risk factors that put well babies at greater risk for hearing loss at birth, they need to be identified. Although researchers have reported numerous risk factors for failing initial newborn hearing screenings, this is the first study to our knowledge that has shown race as a significant risk factor, at least for Hispanic well babies. We are currently completing a more in-depth analysis of what demographic factors (e.g., gender) and medical factors (e.g., birth weight, APGAR scores) may, alone or in combination, account for higher failure rates among Hispanic well babies.

4. Acknowledgements

Jill Brumbaugh, Wesley IT, designed the report containing all demographic data for well babies born from January 2009 to December 2012.

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Stephanie Fowler, Wichita State Undergraduate Student, helped with the write-up of both Wichita State and Wesley's IRB.

Nicholas Coates, Wesley Audiology Technician, designed the program used to merge demographic data with Hi-Track data.

5. References

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