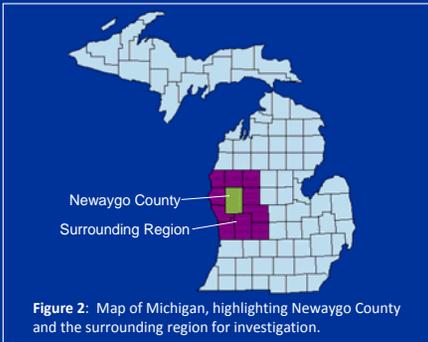


# Investigation of a Reported Cluster of Congenital Heart Defects in Midwest Michigan

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## Introduction

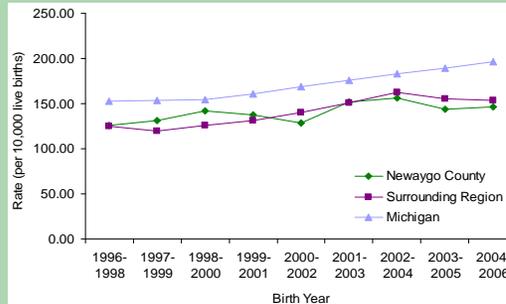
In February 2010, a representative from the District 10 Health Department contacted the Michigan Birth Defects Program regarding community concerns of a possible increase in congenital heart defects (CHDs) in Newaygo County, Michigan. Following the MDCH Cluster Investigation Protocol, which adheres to CDC guidelines, the increased CHD rate was explored.<sup>1</sup> Michigan Birth Defects Registry (MBDR) data was used to compare CHD rates in Newaygo County, the surrounding region, and in Michigan overall. Specific information regarding the cases was reviewed to determine if cases were developmentally similar and to examine potential risk factors.



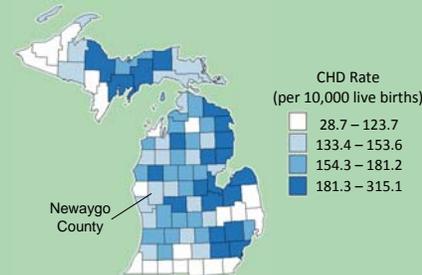
## Results – Overall Congenital Heart Defect Rates

**Table 1:** Frequency of observed and expected cases and average prevalence rate of CHDs by location: MBDR, 1996-2006.<sup>2</sup>

Location	Number of Live Births	Observed Number of Cases	Rate (per 10,000 live births) & 95% Confidence Interval	Expected Number of Cases
Newaygo County	6,939	97	139.8 (112.0, 167.6)	119
Surrounding Region	209,174	2,957	141.4 (136.3, 146.5)	3,578
Michigan	1,448,286	24,785	171.1 (170.9, 171.4)	



**Figure 2:** Three year moving prevalence rate of CHD by location: MBDR, 1996-2006.<sup>2</sup>



**Figure 3:** Seven year average of CHD rates by County: MBDR, 2000-2006.<sup>2</sup>

### Summary of Overall Congenital Heart Defect Rates

- The observed number of CHD cases in Newaygo county and the surrounding region was lower than the expected number of cases (Table 1).
- The CHD rate in Newaygo was not higher than the CHD rate in the surrounding region or in Michigan overall from 1996 to 2006 (Figure 2).
  - The CHD rate increased by about 28% in Michigan overall while in Newaygo County, the rate increased by 17% from 1996-2006.
- Comparison of CHD rates in counties throughout Michigan revealed that the rate in Newaygo County was lower than the rate in counties surrounding Newaygo and in other counties in the state (Figure 3).
- Because CHD rates do not appear to be higher in Newaygo county, compared to other counties, the cluster may be due to chance and normal fluctuation of defect rates over time.

## Methods

- Data from the Michigan Birth Defects Registry (MBDR) was used to compare CHD rates in Newaygo County, the surrounding region, and in Michigan overall for births occurring from 1996 to 2006 (the most current data available).
- Expected numbers of CHDs in Newaygo County and the surrounding region were estimated based on the overall CHD rate in Michigan, using MBDR data.
- Rates of specific CHDs in the surrounding region were compared to overall rates in Michigan. Specific CHDs included: Ebstein's anomaly, transposition of great arteries, double outlet right ventricle (DORV), and interrupted aortic arch.
- Additional information on 11 cases was supplied by the District 10 Health Department and was reviewed in order to determine whether cases were etiologically similar or had common underlying causes.
  - Additional information included child WIC charts, Maternal and Infant Health charts, and Children's Special Health Care Services (CSHCS) information.
  - For some cases, medical records were reviewed, including reports of clinical cardiology examinations, hospitalizations, and medical procedures.

## Results – Specific Heart Defects

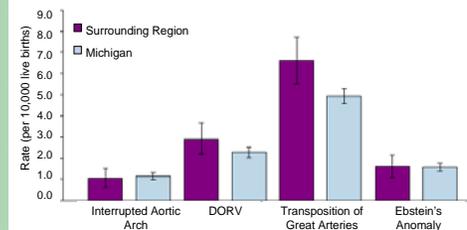
**Table 3:** Frequency of observed and expected cases and average prevalence rate of specific CHDs by location: MBDR, 1996-2006.<sup>2</sup>

Specific Heart Defect	Surrounding Region		Michigan	
	Number of Observed Cases	Rate (per 10,000 live births) & 95% Confidence Interval	Number of Expected Cases	Rate (per 10,000 live births) & 95% Confidence Interval
Interrupted Aortic Arch	22	1.1 (0.6, 1.5)	23	1.1 (1.0, 1.3)
DORV	61	2.9 (2.2, 3.6)	48	2.3 (2.0, 2.5)
Transposition of Great Arteries	138	6.6 (5.5, 7.7)	102	4.9 (4.6, 5.3)
Ebstein's Anomaly	34	1.6 (1.1, 2.2)	33	1.6 (1.4, 1.8)

### Summary of Specific Congenital Heart Defect Rates

- Rates were not determined for Newaygo County alone because there were too few cases (<3 cases), making rate estimates unstable.
- Rates of double outlet right ventricle (DORV) and transposition of the great arteries were slightly higher in the surrounding region with slightly more than the expected number of cases compared to Michigan overall (Table 3 and Figure 4).
- Rate estimates for specific CHDs may fluctuate with just one additional case because there were very few live births in the area, making rates unstable.
- Additionally, CHD rates in Midwest Michigan were compared to rates in Southwest Michigan - no significant differences among regions were found.

**Figure 4:** Average prevalence rate of observed CHDs in selected locations with 95% confidence intervals: MBDR, 1996-2006.<sup>2</sup>

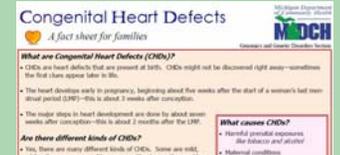


### Factors that Influence Birth Defect Rates

- Chance** – rates may increase or decrease based on chance alone and normal fluctuation over time.
- Under or Over Reporting** – hospitals may not report all cases or report some that are later ruled out, resulting in higher or lower than expected rates.
- Diagnostic Techniques** – improved technology may result in improved diagnoses which could increase rates.

## Discussion

- Assessment of medical information on 11 cases from Newaygo County and the surrounding region found that cases are unlikely to be etiologically similar.
  - Cases had a variety of heart defects, affecting many different areas of the heart.
  - Some cases had isolated heart defects while others had additional birth defects, affecting other body systems.
- Case review revealed that many mothers had one or more potential risk factors, including: prepregnancy diabetes, smoking during pregnancy, prepregnancy obesity, and family history of cardiovascular problems.<sup>3</sup> Moreover, a few cases appeared to have had a genetic evaluation to identify possible genetic causes of CHD.
- MBDR data revealed that CHD rates were not higher in Newaygo County compared to Michigan overall - the cluster may be due to chance and/or normal fluctuation of rates over time.
- The Birth Defects Team will continue to monitor the CHD rate in Newaygo County and throughout Michigan.
- A fact sheet with information about heart defects, support services, and steps to reducing the risk of having an infant with a CHD was developed for families of children with a CHD.



## Acknowledgements

- Lorrie Simmons, RHIT, Quality Improvement Coordinator, Michigan Birth Defects Registry
- Glenn Copeland, MBA, Director, Michigan Birth Defects Registry
- The District 10 Health Department

## Resources

- Guidelines for Investigating Clusters of Health Events. Center for Disease Control and Prevention. *MMWR*. 1990; 39 (RR-11); 1-16.
  - Michigan Birth Defects Registry Data (MBDR).
  - Jenkins KJ, Correa A, et al. Non-inherited risk factors and congenital cardiovascular defects. Current knowledge: a scientific statement from the American Heart Association Council on cardiovascular disease in the young, endorsed by the American Academy of Paediatrics. *Circulation*. 2007; 115: 2995-3014
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