Monitoring Infants and Children with Special Health Needs

Orofacial Clefts in Michigan, 2001-2010

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Special Report

Orofacial Clefts in Michigan (2001-2010)

Background Information

An orofacial cleft is a separation or split in part of the face that should normally be closed or joined together. The most commonly occurring clefts affect the developing lip, as well as the hard and soft palate of the mouth. The two major categories of orofacial clefts are cleft palate alone (Figure 1) and cleft lip with or without cleft palate (Figure 2). Together they are among the more common birth defects, affecting 1-2/1,000 newborns. Clefts occur early in embryonic development— 5 to 6 weeks after conception for cleft lip and 10 weeks for cleft palate. A cleft may affect one side of the lip and/or palate (unilateral) or both sides (bilateral) and may disrupt the formation of the nose and/or extend into the gum or upper jawbone. Children with orofacial clefts usually require one or more surgeries early in life as well as special feeding techniques, orthodontic care and/or speech therapy. Severity varies with the degree of clefting and with the presence of other birth defects; in extreme cases, death may result[1].

Previous research has identified both environmental and genetic factors that are associated with the development of orofacial clefts. The precise cause of an orofacial cleft in an individual is often not known. Folic acid intake prior to and during the early weeks of pregnancy may decrease the risk of orofacial clefts[2]. The Michigan Birth Defects Registry (MBDR) provides data that make it possible to monitor trends and analyze potential risk factors.

Figure 1: Cleft Palate[1]

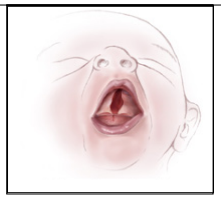
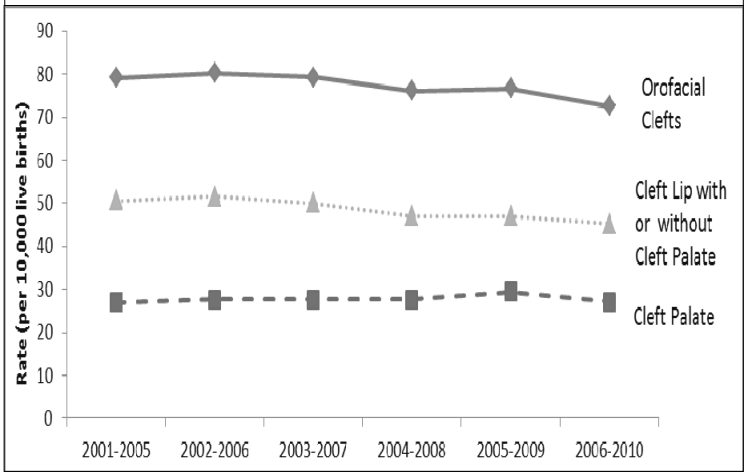


Figure 2: Cleft Lip[1]

Figure 3: Five year moving rates of orofacial clefts diagnosed by 1 year of age: MBDR, 2001-2010.



Rates of orofacial clefts among Michigan infants have remained relatively stable (Figure 3). From 2001 to 2010 a total of 1,981 infants were reported as diagnosed with an orofacial cleft; on average, 1 in every 633 infants in Michigan is born with a cleft. Cleft lip with or without cleft palate is the more common type and affects 1 in every 1,002 Michigan infants, while cleft palate alone affects 1 in every 1,763 Michigan infants.

Table 1: Rates of orofacial defects stratified by selected demographic variables: MBDR, 2001-2010.

Demographic Variable	Rates[1,2]		
	Total Orofacial Clefts	Cleft Palate	Cleft Lip with or without Cleft Palate
Total	15.8	5.6	10.0
Maternal Age			
<20	17.1	5.9	11.2
20-24	17.7	5.6	12.0
25-29	14.4	5.4	9.1
30-34	15.4	5.7	9.8
35+	13.9	5.9	8.0
Maternal Race/Ethnicity			
Whites	16.8	6.0	10.8
Blacks	10.9	4.5	6.4
Other[3]	15.1	4.8	10.0
Hispanic	12.2	3.5	8.7
Arab	9.8	4.4	4.9
Gestational Age			
<37 weeks	24.1	11.1	13.0
37+weeks	15.3	5.2	10.1
Sex of Infant			
Male	17.2	5.0	12.2
Female	13.9	6.2	7.7

[1] Rates are based on resident births. Data are current through April 2013.

[2] Rate expressed as cases per 10,000 live births.

[3] Encompasses women who do not define themselves as Black or White and includes Native American, Asian/ Pacific Islander, etc. Small sample sizes limit the ability to separate races into further categories for analysis.

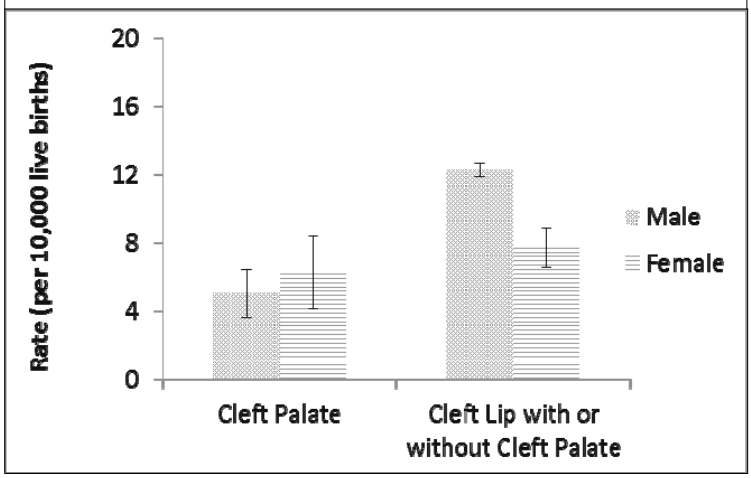
Orofacial clefts were most prevalent in infants born to younger mothers (less than 24 years old) (Table 1). For mothers under the age of 24, the prevalence was 17.4 cases per 10,000 live births and for mothers over the age of 24, the prevalence was 14.6 cases per 10,000 live births. Differences in rates based on maternal age were more pronounced among those with cleft lip (Table 1).

The rate of orofacial clefts among infants born to white mothers was 16.8 cases per 10,000 live births, while infants born to black mothers had a prevalence of 10.9 cases per 10,000 live births. These lower rates for black infants were observed for both categories of orofacial cleft compared to white infants. Infants born to mothers of Hispanic ethnicity had a higher overall rate (12.2 cases per 10,000 live births) of orofacial clefts compared to infants born to Arab mothers (9.8 cases per 10,000 live births). Differences in rates were observed by cleft type. For cleft palate, Hispanic infants had lower rates compared to Arab infants, however, for cleft lip with or without cleft palate, Arab infants had lower rates (Table 1).

Infants born preterm had a higher prevalence of orofacial clefts—24.1 cases per 10,000 live births– compared to infants born full term—15.3 cases per 10,000 live births (Table 1).

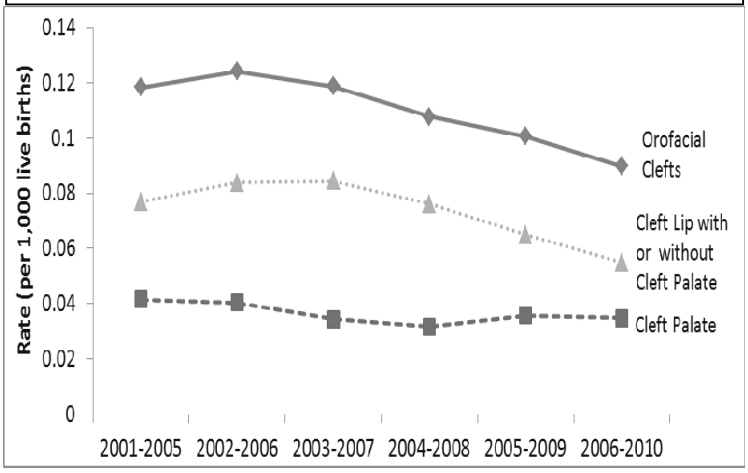
Overall, orofacial clefts were more common in males than in females with 17.2 cases per 10,000 live births and 13.9 cases per 10,000 live births, respectively (Table 1). However, an infant born with a cleft palate is more likely to be female, while an infant born with a cleft lip is more likely to be male (Figure 4). This is consistent with patterns of occurrence for orofacial clefts seen elsewhere.[3-4]

Figure 4: Rates of cleft palate and cleft lip diagnosed by 1 year of age, by infant gender: MBDR, 2001-2010.



Mortality rates among Michigan infants with orofacial clefts have decreased in the last decade (Figure 5). The five year mortality rate from 2001-2005 was 0.12 infants per 1,000 live births, while the five year mortality rate from 2006-2010 was 0.09 infants per 1,000 live births. Infants with cleft lip with or without cleft palate had a steeper decline in mortality rates compared to infants with cleft palate alone (Figure 5).

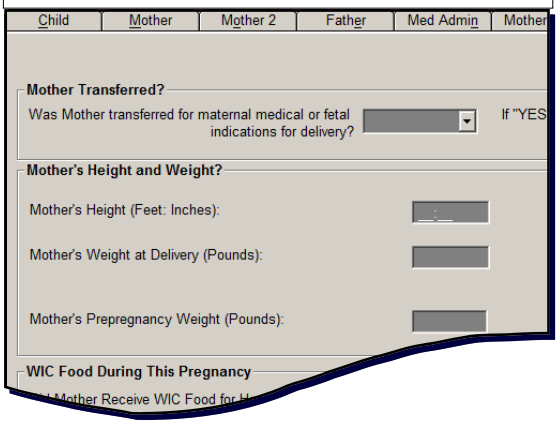
Figure 5: Five year moving infant mortality rates for orofacial clefts diagnosed by 1 year of age: MBDR, 2001-2010.



Pre-Pregnancy BMI

Researchers have observed an association between maternal obesity and increased rates of orofacial clefts among infants.[5-6] In 2008, the Division for Vital Records and Health Statistics at the Michigan Department of Community Health began collecting pre-pregnancy height and weight on the birth certificate (Figure 7). These variables were used to calculate mother's pre-pregnancy BMI and were categorized based on World Health Organization (WHO) guidelines for BMI.[7]

Figure 7: Electronic birth certificate fields for capturing maternal height and weight.



BMI Weight Classifications[7]

BMI <18.5: Underweight

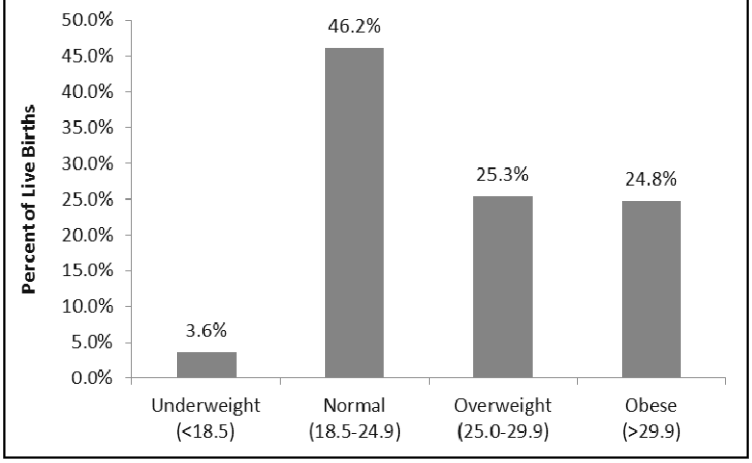
BMI = 18.5 to 24.9: Normal

BMI = 25.0 to 29.9: Overweight

BMI >29.9: Obese

Approximately half of the women who delivered a live born infant in Michigan during 2008-2010 had an overweight or obese pre-pregnancy BMI. In contrast, a small percentage of live births were to women in the underweight pre-pregnancy category (Figure 8).

Figure 8: Percent of all live births by pre-pregnancy BMI category: Michigan Vital Statistics, 2008-2010.



Women classified as underweight or obese pre-pregnancy had a higher prevalence of infants born with orofacial clefts. The rates were 15.5 for underweight women, 16.5 for obese women, 13.2 for normal weight women, and 12.4 for overweight women, per 10,000 live births based on pre-pregnancy BMI. Differences were more pronounced for the occurrence of cleft lip with or without cleft palate compared to cleft palate alone (Figure 9). Furthermore, infants born to mothers with obese BMIs were 1.25 times as likely to have an orofacial cleft compared to infants born to mothers with normal BMIs (Table 2). Since calculation of pre-pregnancy BMI is a newer indicator collected on the birth certificate, we will revisit this analysis in future and control for various demographics and risk factors to further examine this association.

Figure 9: Rates of orofacial clefts diagnosed by 1 year of age, by pre-pregnancy BMI category: MBDR, 2008-2010.

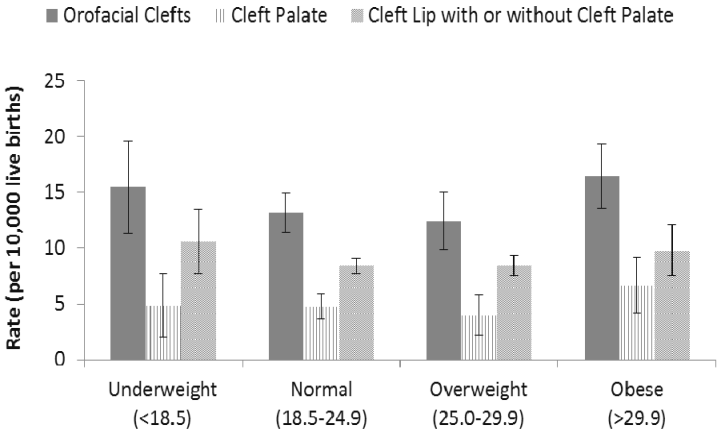


Table 2: Orofacial clefts diagnosed by 1 year of age, by mother's pre-pregnancy BMI category. MBDR, 2008-2010.

Pre-pregnancy BMI	Percent of Live Births	Rate of Orofacial Clefts*	Rate Ratio	95% Confidence Interval
Underweight	3.6	15.5	1.18	0.74 - 1.89
Normal	46.2	13.2	1.00	Reference Group
Overweight	25.3	12.4	0.94	0.74 - 1.19
Obese	24.8	16.5	1.25	1.01 - 1.55

* Rate expressed per 10,000 live births.

Pre-Pregnancy BMI: Prevention Messages

Women who are planning on becoming pregnant are encouraged to maintain or work towards a healthy weight to help prevent adverse birth outcomes. Health care providers can help encourage all women of childbearing age to have a healthy diet and incorporate screening for diabetes and hypertension into well-visits. Every woman should be encouraged to achieve the recommended weight during pregnancy as well as return to a healthy weight after becoming pregnant because obesity is a risk factor for many chronic diseases such as cardiovascular disease, diabetes, and stroke.

For Providers—

Before Pregnancy

- Inform women about the health risks.
- Encourage a healthy diet, including 400 micrograms of folic acid daily.
- Screen for hypertension and diabetes mellitus.
- Encourage regular exercise.

During Pregnancy

- Discuss recommended weight gain.

After Pregnancy

- Counsel to return to a healthy weight.

Figure 9: Recommendations for all women, March of Dimes Foundation[8].

State public health programs such as the Supplemental Nutrition Program for Women, Infants and Children (WIC), the Maternal and Infant Health Program (MIHP), the Nutrition, Physical Activity and Obesity Prevention (MiNPAO) Program and MI Healthier Tomorrow (a public-private initiative) offer information, education and support to assist individuals in their efforts to achieve and maintain a healthy weight. Find more information at: *www.michigan.gov/MIHealthierTomorrow.*

Reducing obesity in Michigan is one of Governor Snyder's top priorities, as seen in the *Michigan Dashboard*, which measures Michigan's success with selected performance indicators. More information on the *Michigan Dashboard* can be found at: *www.michigan.gov/midashboard/*.

Smoking

Previous research has found that tobacco exposure during pregnancy, both from direct maternal smoking and passive smoke, is associated with an increased prevalence of birth defects[9-14]. Beginning in 2008, the Division for Vital Records and Health Statistics at the Michigan Department of Community Health collected both maternal smoking status and household smoking status on the birth certificate (Figure 10). Since this information is self-reported by the mother, smoking exposure may be underreported. Nonetheless, this information helps capture the effect that second-hand smoke can have on the developing infant. Infants were divided into four categories based on smoking exposure.

Smoking Exposure Categories:

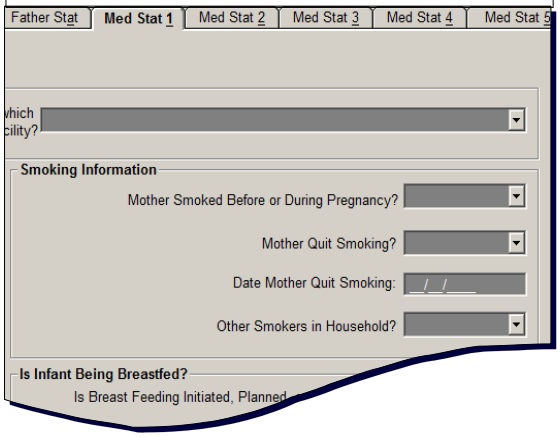
Mother Nonsmoker/Household Nonsmoking

Mother Nonsmoker/Household Smoking

Mother Smoker/Household Nonsmoking

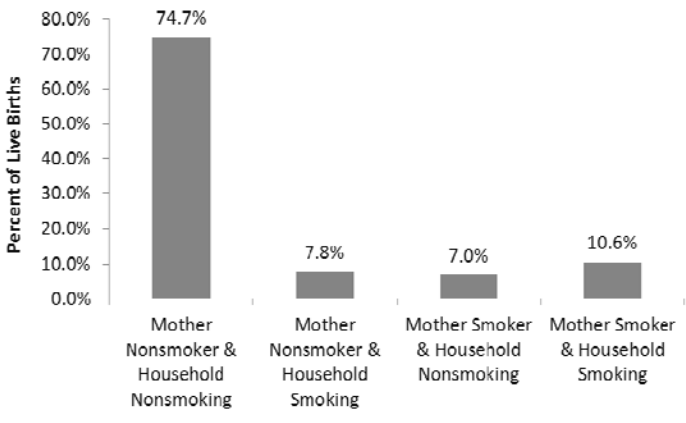
Mother Smoker/Household Smoking

Figure 10: Electronic birth certificate fields for capturing smoking exposure.



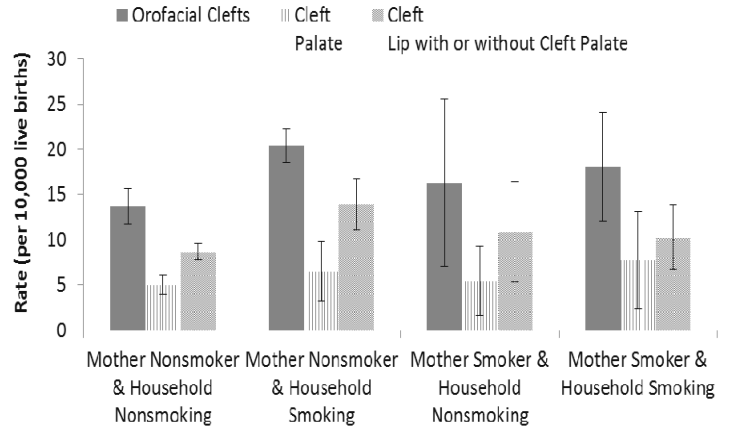
The vast majority of Michigan live births between 2008-2010 were to mothers who do not smoke and who live in households without smokers. Approximately one quarter of infants were exposed to some form of tobacco before birth (maternal and/or household) (Figure 11).

Figure 11: Percent of all live births by maternal and household smoking status. Michigan Vital Statistics, 2008-2010.



In order to explore the potential impact of prenatal exposure to tobacco, we analyzed the occurrence of orofacial clefts 2008-2010 according to the category of smoking exposure and type of cleft. We found that the rates of orofacial clefts varied depending on the infant's exposure before birth. Infants born to nonsmoking mothers and nonsmoking households had the lowest rate of clefts at 13.7 per 10,000 live births. Infants exposed to only household smoking had the highest rate at 20.4 per 10,000 live births. However, this difference did not reach significance.

Figure 12: Rates of orofacial clefts diagnosed by 1 year of age, by smoking exposure categories. MBDR, 2008-2010.



Infants exposed to maternal smoking only, as well as those exposed to *both* maternal and household smoking, experienced significantly higher rates of orofacial clefting, at 16.3 and 18.1 per 10,000 live births respectively (Figure 12). Differences based on smoking exposure were more pronounced for the occurrence of cleft lip with or without cleft palate as compared to cleft palate alone.

Table 3: Orofacial clefts diagnosed by 1 year of age, by smoking exposure categories. MBDR, 2008-2010.

Prenatal Smoking Exposure	Percent of Live Births	Rate of Orofacial Clefts*	Rate Ratio	95% Confidence Interval
Mother Nonsmokers/ Household Nonsmoking	74.7	13.7	1.00	Reference Group
Mother Nonsmoker/ Household Smoking	7.8	20.4	1.49	1.10 - 2.02
Mother Smoker/ Household Nonsmoking	7.0	16.3	1.19	0.86 - 1.64
Mother Smoker/ Household Smoking	10.6	18.1	1.32	1.01 - 1.73

* Rate expressed per 10,000 live births.

Infants born into smoking households (with and without maternal smoking) were significantly more likely to have an orofacial cleft compared to infants born to nonsmoking mothers in nonsmoking households (Table 3). Analysis of these indicators will be revisited in the future, controlling for various demographics and risk factors, to explore this association further.

Smoking: Prevention Messages

Smoking during pregnancy is the leading preventable cause of illness and death among mothers and infants. The simple act of a health care provider asking about a person's smoking status has been demonstrated to be a significant trigger in helping that person to think about quitting[15]. One or two minutes spent by the provider in addressing tobacco use can make a real difference for women of reproductive age and their children.

For Providers—

1. **Ask** - Identify and document tobacco use for every patient at every visit.
2. **Advise** - Urge every tobacco user to quit.
3. **Assess** - Is the tobacco user willing to make a quit attempt at this time?
4. **Assist** - For those willing, use counseling and pharmacotherapy to help them quit.
5. **Arrange** - Schedule follow-up contact, preferably within the first week after the quit date.

Figure 9: Five major steps to intervention, Agency for Healthcare Research and Quality.[16]

While most smoking interventions during pregnancy focus on the mother, limiting second-hand tobacco exposure in the household should also be a priority. The Tobacco Reduction and Prevention program at the Michigan Department of Community Health has a number of resources available to help Michiganders quit smoking. The **Michigan Tobacco Quitline** is one such resource. For more information, visit the website at *www.michigan.gov/tobacco.*

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