INTRODUCTION

The series of Maternal and Infant Health Monthly Surveillance Reports are part of a county-wide initiative to improve maternal and infant health and reduce infant mortality. In order to take effective actions to improve the health and safety of infants in the community, it is essential to identify, describe and monitor the problems and populations at risk. This report characterizes the current status of infant mortality in Hamilton County.

The data sources for this report series have been enhanced to improve the monthly surveillance process. The Ohio Department of Health (ODH) provides monthly mortality data to Hamilton County Public Health that will be used to improve the timeliness and accuracy of monthly surveillance data. These data were provided by the Ohio Department of Health. The Department specifically disclaims responsibility for any analyses, interpretations or conclusions. These provisional data are numbers only and do not include any additional information from birth or death certificates (Appendix A). The mortality data included in this report were obtained from ODH on August 5th, 2015 and August 17th, 2015; the birth data were updated on the Ohio Public Health Information Warehouse on August 18th, 2015.

The Maternal and Infant Health Monthly Surveillance Report will include the following indicators:

- Number of infant deaths by month
- Current monthly infant mortality rate
- Current monthly neonatal mortality rate
- Current monthly preterm, very preterm, and <23 weeks gestation birth rate
- Current monthly small for gestational age birth rate
- Percentage of pregnancies spaced <18 months
- Maternal smoking rates
- Number of sleep-related deaths
- Current two-year infant mortality rate moving average
- Comparison of “Filed” and “Unfiled” data

INFANT MORTALITY SURVEILLANCE

Public health surveillance is the ongoing systematic collection, analysis, interpretation and dissemination of data regarding a health-related event for use in public health action to reduce morbidity and mortality and improve health1. The Maternal and Infant Health Surveillance System is designed to better understand infant morbidity and mortality in our community, monitor infant deaths and evaluate whether collective actions to prevent infant deaths are effective. The surveillance charts contained within this report are tools that are used to monitor infant mortality in our community. Please read the General Guidelines for Using Surveillance Charts in Appendix B.

One measure of infant mortality is to track the number of infant deaths per month. In April 2015, there was 1 infant death within Hamilton County. The infant death that occurred in April 2015 in Hamilton County, occurred amongst Cincinnati residents. Table 1 displays the provisional number of infant deaths and births for each month in 2014 and 2015. Please see Appendix A on Page 12 to learn more about provisional death data limitations.

Another method used to monitor infant mortality is the examination of an Infant Mortality Rate (IMR). The monthly IMR is the number of infants (children less than one year of age) who died, divided by the number of live births during the month per 1,000 live births. The Neonatal Infant Mortality Rate (NIMR) is a specific IMR for neonates (infants younger than 28 days) who died per 1,000 live births. An increase in the number of infant deaths may not be surprising if there is also an increase in the overall number of babies born.

The IMR for April 2015 was 1.1 infant deaths per 1,000 live births (Figure 1). April was lower than the average IMR (8.75) as shown in Figure 1. Subsequent reports will provide improved statistical validity of these estimates (Appendix A). The April 2015 NIMR was below the upper statistical thresholds and is displayed in Figure 2. The April NIMR (1.1) is below the Healthy People 2020 goal of 4.1 neonatal deaths per 1,000 live births and lower than the Hamilton County 24-month average of 6.32 neonatal deaths per 1,000 live births. Neonatal deaths accounted for 65.3% of the January 2014 - April 2015 infant deaths as of data collected August 5th, 2015 and August 17th, 2015. As can be seen from the comparison of Hamilton County rates and national infant health goals, Hamilton County is experiencing problems within the community regarding maternal and infant health.

### Table 1. Number of Infant Deaths and Births, Hamilton County, 2014-2015

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<thead>
<tr>
<th></th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
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<td>Live Births</td>
<td>Infant Deaths</td>
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<td>February</td>
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<td>June</td>
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<td>964</td>
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<td>August</td>
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<td>3</td>
<td>875</td>
</tr>
<tr>
<td>December</td>
<td>10</td>
<td>903</td>
</tr>
<tr>
<td>Total</td>
<td>97</td>
<td>10,957</td>
</tr>
</tbody>
</table>

1.1 per 1,000

April 2015 IMR

This provisional rate was lower than the Healthy People 2020 goal (6.0)
Figure 1. Infant Mortality Rate Surveillance Chart, Hamilton County, Mar 2013 - Apr 2015*

- Monthly IMR
- Healthy People 2020 Goal (6.0)
- Average (8.75)
- Control Limits

NOTE: The mean is calculated using two years of data from Mar 2013 - Feb 2015. Orange points are more likely to change in future reports.
*Data for 2014 - 2015 are provisional; ODH reconciles (i.e. finalizes) data by fall of the subsequent year.
Data Source: ODH Vital Statistics

Figure 2. Neonatal Mortality Rate Surveillance Chart, Hamilton County, Mar 2013 - Apr 2015*

- Monthly NIMR
- Healthy People 2020 Goal (4.1)
- Average (6.32)
- Control Limits

NOTE: The mean is calculated using two years of data from Mar 2013 - Feb 2015. Orange points are more likely to change in future reports.
*Data for 2014 - 2015 are provisional; ODH reconciles (i.e. finalizes) data by fall of the subsequent year.
Data Source: ODH Vital Statistics
The preterm birth rate is the percentage of infants born before 37 weeks gestation. The very preterm birth rate is the percentage of infants born before 32 weeks gestation. Preterm birth is a significant risk factor of infant mortality and many other adverse health outcomes. The average preterm birth rate in Hamilton County (13.3%) is above the Healthy People 2020 goal of 11.4%. The provisional preterm birth rate for April 2015 is 12.9%; this rate is above the Healthy People 2020 goal of 11.4% for all live births. The average very preterm birth rate in Hamilton County (2.89%) is above the Healthy People 2020 goal of 1.8%. The provisional very preterm birth rate for April 2015 is 2.3%; this rate is above the Healthy People 2020 goal of 1.8% for all live births. The provisional <23 weeks gestation birth percentage for April 2015 is 0.1% in Hamilton County, which is below the average <23 weeks gestation birth rate (0.38%).

The <23 weeks gestation birth rate is also important to track as approximately 1/3 of all infant deaths within Hamilton County each year are from babies who are born earlier than 23 weeks gestation. These babies are born so early that their chance of survival after being born is very small. By preventing preterm births in Hamilton County, infant morbidity & mortality can be reduced, ultimately preserving the community’s financial resources and providing children with a healthy start to life.

**Figure 3. Preterm Birth Rate Surveillance Chart, Hamilton County, Mar 2013 - Apr 2015**

*Data for 2014 - 2015 are provisional; ODH reconciles (i.e. finalizes) data by fall of the subsequent year.*

Data Source: ODH Vital Statistics
Figure 4. Very Preterm Birth Rate Surveillance Chart, Hamilton County, Mar 2013 - Apr 2015*

NOTE: The mean is calculated using two years of data from Mar 2013 - Feb 2015. Orange points are more likely to change in future reports.
*Data for 2014 - 2015 are provisional; ODH reconciles (i.e. finalizes) data by fall of the subsequent year.
Data Source: ODH Vital Statistics

Figure 5. <23 Weeks Gestation Birth Rate Surveillance Chart, Hamilton County, Mar 2013 - Apr 2015*

NOTE: The mean is calculated using two years of data from Mar 2013 - Feb 2015. Orange points are more likely to change in future reports.
*Data for 2014 - 2015 are provisional; ODH reconciles (i.e. finalizes) data by fall of the subsequent year.
Data Source: ODH Vital Statistics
The small for gestational age (SGA) birth rate is the proportion of singleton live-born infants whose birth weight is at or below the 10th percentile for a given gestational age\(^2\). SGA compares the infant birth weight with a national distribution of live births so that weights are relative to infants of the same gestational age\(^2\). The 10th percentile cut-off of birth weight was derived from 1990 live births in the United States as a baseline\(^3\). Maternal health and social factors prior to pregnancy influence SGA, and can have an impact on the health of the infant throughout childhood and into adulthood\(^2\). Infants who are born with birth weights below the 10th percentile are at an increased risk for infant mortality and morbidity, permanent deficits in growth, neurocognitive developments in childhood, and development of adult chronic disease\(^2\). The provisional SGA birth rate in April 2015 is 12.0%, which is below the average SGA birth rate in Hamilton County (13.47%).


NOTE: SGA Percent illustrated in Figure 6 is calculated using gender-specific small for gestational age 10th percentile cut-off for more accurate measures.

Figure 6. Small for Gestational Age Rate Surveillance Chart, Hamilton County, Mar 2013 - Apr 2015*

*Data for 2014 - 2015 are provisional; ODH reconciles (i.e. finalizes) data by fall of the subsequent year.

Data Source: ODH Vital Statistics
PREGNANCY SPACING

Research has shown that short spacing between pregnancies, less than 18 months from a previous live birth to conception of the next pregnancy, can lead to harmful outcomes for both mothers and newborns. Women with short pregnancy spacing have an increased risk for developing pre-eclampsia, while the infant is more likely to be born prematurely, or with low birth weight. Short spacing between pregnancies was a factor in 45% of Hamilton County’s infant deaths† between 2007 and 2012. Pregnancy intervals between 18 and 59 months are considered optimal birth spacing, as recommended by the World Health Organization4. Optimal spacing can lead to better outcomes for both the mother and the infant. However, for women of advanced maternal age, short pregnancy spacing may be part of the intended family building; in these cases women should consult with their doctor to weigh the health benefits of longer spacing between pregnancies and health risks of short spacing between pregnancies. The average percentage‡ of Hamilton County pregnancies that were spaced less than 18 months (32.8%) is slightly above the Healthy people 2020 goal of 29.8%. The provisional percentage of pregnancies that were spaced less than 18 months for April 2015 is 31.9%; this percent is above the Healthy People 2020 goal of 29.8% of all pregnancies spaced less than 18 months. Of the Hamilton County pregnancies spaced less than 18 months between January 2013 and April 2015, 43.3% of pregnancies were spaced between 12 and 18 months. By informing mothers about properly spacing pregnancies, the risk for adverse health complications for both mother and infant could be reduced.


Figure 7. Percent of Pregnancies Spaced <18 Months, Hamilton County, Mar 2013 - Apr 2015*

NOTE: The mean is calculated using two years of data from Mar 2013 - Feb 2015.
*Data for 2014 - 2015 are provisional; ODH reconciles (i.e. finalizes) data by fall of the subsequent year.
† Infant deaths to mothers with a previous live birth
‡ Percentage of short spaced pregnancies does not include first time mothers or pregnancies where information pertaining to previous live birth was missing/unknown
Data Source: ODH Vital Statistics
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MATERNAL SMOKING RATE

Tobacco use, and other forms of substance abuse during pregnancy, can be extremely harmful to a developing baby. Recent data show us that local women who smoked during pregnancy were 44% more likely to have an infant death. The provisional rate for mothers who smoked during the 2nd and 3rd trimester of pregnancy for April 2015 was 8.4% (Figure 8). This rate was lower than the average number of women who reported smoking during the 2nd and 3rd trimester of pregnancy for Hamilton County (10.1%) as shown in Figure 8.

NOTE: The mean is calculated using two years of data from Mar 2013 - Feb 2015. Orange points are more likely to change in future reports.

*Data for 2014 - 2015 are provisional; ODH reconciles (i.e. finalizes) data by fall of the subsequent year.

Data Source: ODH Vital Statistics

Figure 8. Maternal Smoking Rate Surveillance Chart, Hamilton County, Mar 2013 - Apr 2015*

NOTE: The mean is calculated using two years of data from Mar 2013 - Feb 2015. Orange points are more likely to change in future reports.

*Data for 2014 - 2015 are provisional; ODH reconciles (i.e. finalizes) data by fall of the subsequent year.

Data Source: ODH Vital Statistics
SLEEP-RELATED DEATHS

A sleep-related death is the death of an infant due to unsafe sleeping environments. A safe sleeping environment is one in which the infant is sleeping alone, on their back, and in a crib. Unsafe sleeping environments can consist of co-sleeping (a parent, adult or older child sharing a bed with an infant), an infant sleeping on a couch, an infant sleeping in a crib filled with blankets or pillows, or an infant being put to sleep on his/her stomach. There has been three sleep-related deaths in Hamilton County in 2015 so far. However, as further iterations of the report are published, the number of sleep-related deaths may change as records become finalized and complete.

ALWAYS FOLLOW THE ABC’S OF SAFE SLEEP, EVEN DURING NAP TIME.

**A** lone  **B** ack  **C** rib

Baby sleeps safest alone, on their back, in a crib.
TWO-YEAR MOVING AVERAGE

Reviewing monthly rates is one approach used to determine whether there has been a change over time in infant mortality. However, monthly rates have a tendency to fluctuate and may disguise emerging trends. An alternative measure is the un-weighted, monthly moving average, which can provide a more stable picture of evolving patterns. In Figure 10, the infant mortality rate for each month is the 24-month average of months immediately prior to and including the current month. The two-year moving average has decreased from April 2012 (10.1) to April 2015 (8.7) as shown in Figure 10. Please note that the two-year moving average is subject to change based on new data, which may ultimately affect current trends. Multiple approaches are required to measure the impact of efforts to reduce infant mortality.

Figure 10. Two-Year Moving Average Infant Mortality Rate by Month, Hamilton County, Apr 2012 - Apr 2015*

NOTE: The infant mortality rate for each month in the average of the 24 months immediately prior to and including the last month.
*Data for 2014 - 2015 are provisional; ODH reconciles (i.e. finalizes) data by fall of the subsequent year.
Data Source: ODH Vital Statistics
In 2014, Cradle Cincinnati was awarded Cincinnati’s only Healthy Start grant by the Health Resources and Services Administration (HRSA). With a focus on improving birth outcomes and reducing health inequalities, our Healthy Start program – Cradle Cincinnati Connections – is designed to enhance and assist existing maternal/child health support programs in the area as well as provide direct services to local families and children.

A multidisciplinary team, Cradle Cincinnati Connections is made up of a social worker, a registered nurse, a dietitian, and a mental health specialist. Connections’ services are open to moms-to-be and families with children under the age of one in the following zip codes: 45204 (Lower Price Hill), 45205 (East Price Hill), 45214 (South Fairmont and West End), and 45225 (North Fairmont and Camp Washington).

Cradle Cincinnati Connections is a resource not only for families, but for service providers, too. This program is designed to provide both families and agencies with health education and screenings, care conferencing, and access to supplies as well as establish relationship between clients and agencies with more specialized services. With this wrap-around service model, we hope to promote better health outcomes and help Cincinnati neighborhoods thrive.

If you have questions or would like to make a referral, contact Cradle Connections Program Director Lindsey Cencula at (513) 818-7300 or by email at lindsey.cencula@cchmc.org

For more information, check us out on-line at www.cradlecincinnati.org, and follow us on social media: @cradlecincy
APPENDIX A
DATA LIMITATIONS

There are multiple datasets that can be used to support surveillance activities associated with infant mortality. Two primary data sources are used to supply the data for the monthly Maternal and Infant Health Surveillance Reports (http://www.hamiltoncountyhealth.org/en/resource_library/reports.html). Both of these data sources are considered provisional until ODH completes data reconciliation processes each year. Provisional Data Source A (PDS-A) contains records that correspond to filed certificates and are linkable (i.e., birth to death records), whereas Provisional Data Source B (PDS-B) contains records that correspond to both filed and unfiled/pending certificates and are not linkable. PDS-A is used for more in-depth analysis of risk factors, but suffers from incompleteness due to missing unfiled/pending certificates. PDS-B is used to collect death data more expeditiously, but provides only count data, precluding more in-depth analysis of prenatal and perinatal risk factors. Data from both PDS-A and PDS-B become more accurate as the length of time increases from event to report. Annually, ODH releases a reconciled dataset that contains final cause of death information and geographic information.

PDS-B is used in this report to provide the count statistics in each section except preterm births (Figure 3-5), small for gestational age (Figure 6), pregnancy spacing (Figure 7), maternal smoking (Figure 8), and sleep-related deaths. Table 2 displays the discrepancy between the two infant mortality data sources from ODH. Please note that delayed certificates impact data quality, and therefore the integrity of findings shared in this report.

<table>
<thead>
<tr>
<th>Data Source</th>
<th>2014 Number of Infant Deaths</th>
<th>2015 Number of Infant Deaths</th>
</tr>
</thead>
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<tr>
<td>PDS-A</td>
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</tr>
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<td>PDS-B</td>
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</table>

Table 2. Infant Mortality Data Source Assessment, Hamilton County, 2014-2015.
APPENDIX B
GENERAL GUIDELINES FOR USING SURVEILLANCE CHARTS

The Hamilton County Infant Mortality Surveillance System (HCIMSS) uses surveillance charts to monitor infant mortality rates, preterm birth rates, and other birth outcomes. These charts provide a method for monitoring the status of infant health over time and provide timely feedback on the effectiveness of local efforts to reduce infant deaths.

Several tools are included in the surveillance charts that help facilitate interpretation:

1. A baseline - the center line which is the average number of deaths per month over the preceding two years,
2. A goal line which shows the goal that has been established by the community,
3. Upper and lower control limits (dashed) that allow user to detect unusual events.

Annotations indicate when certain interventions began or special changes occurred.

Here are some types of unexpected events that could be detected within surveillance charts:

- A single point outside of the control limit
- A run of eight or more consecutive points below or above the center line
- Six consecutive decreasing or increasing points
- Two out of three consecutive points near a control limit.

This report was prepared by Hamilton County Public Health, Department of Community Health Services, Division of Epidemiology and Assessment in collaboration with Cradle Cincinnati.

Thank you to John Paulson, Ohio Department of Health, Center for Public Health Statistics and Information, and Merrily Wholf, Ohio Bureau of Child and family Health Services, for providing data for this report.

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