DEPARTMENT OF HEALTH

# Birth Outcomes in Washington County

## MDH RESPONSE TO WATERFIELD, SUNDING ET AL ARTICLE IN *ENVIRONMENTAL HEALTH*

In January 2018, MDH published a report in response to community concerns in the East Metro. The analyses look at specific health outcomes in Washington and Dakota County communities affected by 3M's disposal of perfluorochemicals (PFASs), and the subsequent contamination of local groundwater and drinking water. MDH examined vital records data for elevated premature birth and low birth weight in Washington county areas impacted by PFAS contamination, as well as the rest of Washington County and the Metro region. This analytical work reaffirms the value of the protective steps Minnesota has taken to limit health impacts from PFAS chemicals.

MDH scientists examined individual vital records data for low birth weight and prematurity in babies born to mothers in PFC-affected east metro communities in three time periods: 2001-2005, 2006- 2010 and 2011-2015. They compared data from those areas to data from unaffected communities in the rest of Washington County and the metro region. While they found a lot of variation in those outcomes – with some higher rates and some lower rates of negative health outcomes – the variation was well within the range that would be expected.

Waterfield, Sunding et al considered similar data in their analysis and reached different conclusions published in the *Reducing exposure to high levels of perfluorinated compounds in drinking water improves reproductive outcomes: evidence from an intervention in Minnesota*.[1] MDH reviewed their article and methods used in their analysis. We find that the following issues would contribute to reaching a different conclusion. These issues are echoed in open access Peer Review reports (https://ehjournal.biomedcentral.com/articles/10.1186/s12940-020-00591-0/peer-review) for this article, and they do not appear to have been sufficiently addressed in the publication. The primary differences lie in the assumptions, data and type of analysis used to produce their results.

## Discussion

1. The two analyses done using this data are based on different assumptions.
    - MDH uses public health surveillance analysis to look at more detail in the data rather than the less stratified data used in the analysis for the article. We do this because we know that public health actions taken in these communities go back to 2004.
        - Private well samples were collected in Lake Elmo beginning in 2004.

[1] Waterfield, G., Rogers, M., Grandjean, P. *et al.* Reducing exposure to high levels of perfluorinated compounds in drinking water improves reproductive outcomes: evidence from an intervention in Minnesota. *Environ Health* **19,** 42 (2020). https://doi.org/10.1186/s12940-020-00591-0

        - The first samples from the Oakdale municipal wells were collected by MDH on January 25, 2005.
        - Results were provided to the City of Oakdale in February 2005, and were made public later that year.
    - We did not assume a single clear stop date to exposure in this community. Residents of Oakdale, and those on private wells in Lake Elmo, could have been taking action to reduce their exposures well before the Oakdale treatment plant went into operation on October 30, 2006. We know that even the suspicion of contamination can cause people to change their habits around water use, especially those who might consider themselves more vulnerable, such as pregnant women. This means residents of Oakdale could have been taking action to reduce their exposures well before treatment was provided in Oakdale in 2006.
    - The zip codes used to define the study area for the analysis are not clearly defined in their analyses so it is difficult to compare the two reports directly.
2. MDH examined all affected zip codes, not only Oakdale, in separate and aggregate analyses. This helps us to see variability over time in multiple areas. There are differences between the impacted East Metro communities in income, ethnicity, age, and other population characteristics, especially from the 1990s to 2010.
3. The data used was different.
    - Data in MDH analysis is individual level and uses standard case definition for low birth weight. Individual maternal race and Medicaid status provide more accurate information than ecologic (zip code level) racial composition proxy from census data. MDH can then “adjust” for area-level racial composition and household income instead of looking directly at disparities by maternal race and Medicaid status. See the discussion below for more on how this individual, more detailed data shows disparities, and how obscuring those inequities can lead to spurious conclusions.
    - Full-term low birthweight births are the standard for environmental health surveillance and epidemiology. MDH chooses to exclude babies that are born too soon, rather than born too small. This is more useful for understanding if there is a connection to an exposure. Maternal and neonatal risk factors for having a preterm baby rather than a low birth weight baby can be different. For example, gestational diabetes is an important risk factor for preterm birth, but not necessarily for full term low birth weight. In Waterfield et al., it appears that the majority of births in the low birth weight group are premature. We cannot compare numbers directly, however, because of different year aggregations, but

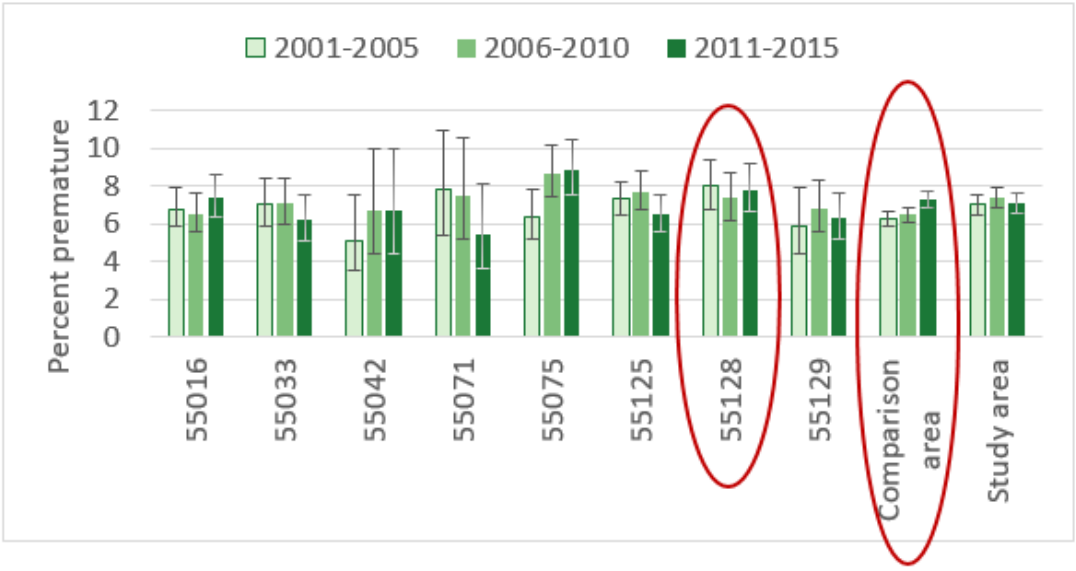
it appears that there is a 3 to 4 fold difference between MDH and Waterfield et al. numbers. Including the babies born too soon increases the total number and makes it appear to be a more important feature of the data, yet blurs the interpretation. This explains why the results look so similar for the two outcomes.

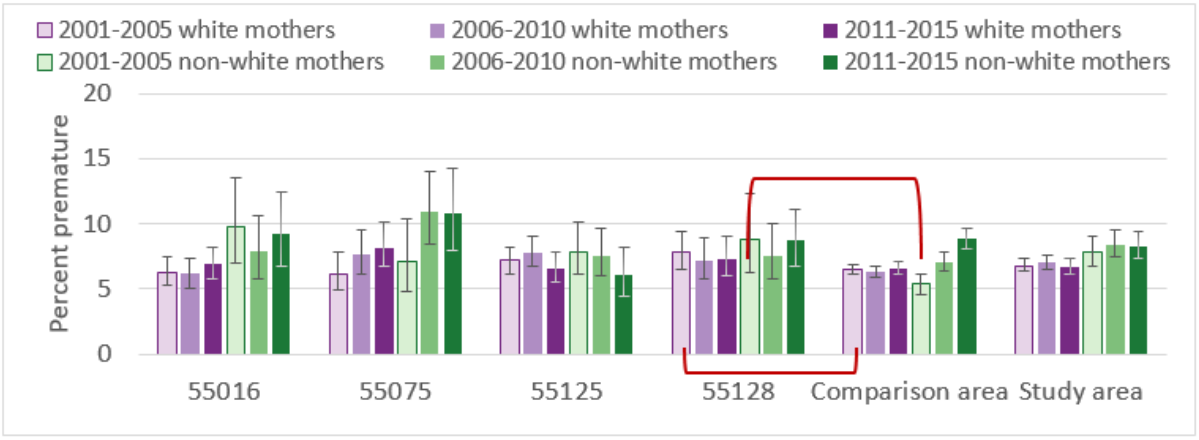
- MDH uses three time periods rather than two. This helps to find "trends" in the data. (2001-5, 2006-10, 2011-15 vs. 2002-6, 2007-11). It allows us to see that racial inequity is actually increasing over the periods.

## Discussion of Disparities Found by MDH

The MDH analysis did find health differences across the county population that are consistent with health disparities and trends seen across Minnesota. For example, researchers found premature births and low birth weights were more common among mothers of color and American Indian mothers than white mothers, and premature births among mothers of color and American Indian mothers increased in some east metro areas from 2001 through 2015.

1. *East Metro Birth Outcomes: Low Birth Weight and Prematurity in Washington and Dakota Counties* (2018) (https://www.health.state.mn.us/communities/environment/tracking/reports/eastmetrobirths.html) showed premature birth rate in Oakdale 2001-2005 (8, 6.8-9.4) was significantly higher than the comparison unaffected areas (6.3, 5.9-6.7). However, when births in this period are stratified by maternal race, the difference compared to unaffected areas is only significant for births to non-white mothers (n=31, rate 8.8, 6.3-12.3), vs. white mothers (n=104, rate 7.8, 6.5-9.4). Further complicating the interpretation, the unaffected comparison areas have a near-significant difference in preterm birth rates between white (6.5, 6.1-6.9) and non-white (5.4, 4.6-6.2) mothers, but in the opposite direction, with lower rates among non-white mothers. Together, this racial disparity in Oakdale and flipped pattern in the comparison areas further complicate the interpretation of the overall difference between Oakdale and unaffected areas in 2001-2005. Because Waterfield et al. did not consider maternal race, only zip code-level racial composition, their analysis could not detect this important disparity.




2. We are glad to see Waterfield et al. recognizing the complex interactions between socioeconomic factors, including race/ethnicity, and environmental exposures. However, by using the zip code-level ecologic proxy for maternal race, Waterfield et al. aren't adjusting for racial disparities in birth outcomes, but are actually exploiting them, potentially re-traumatizing minority populations.
3. Additional issues with Watefield et al. treatment of race in the analysis:
    - Did not account for births to mothers identifying as American Indian/Alaskan Native or other/unknown race. In Minnesota, these two groups have the highest rates of premature births and infant deaths (Source: MN Public Health Data Access Portal https://data.web.health.state.mn.us/web/mndata/birthoutcomes).
    - The manuscript states that individual maternal race information and Medicaid payment for birth are not available due to privacy restrictions. However, maternal

race covariates are available via data request and are robust/complete (0.5% missing data) for the years/areas in question.

4. More context on racial inequities in Oakdale and the East Metro.
    - Among premature births in Oakdale, 23% were to non-white mothers during 2001-2005 and 35% during 2006-2010. That seems like a high percentage relative to population percentage of  non-white residents in the zip code.

## Conclusion

The findings of MDH's data review are consistent with the department's May 2017 update to guidance values for PFCs in impacted east metro communities. These results provide additional assurance that lowering the level of PFAS in drinking water reduces long-term health risks and protects the most vulnerable in the community. MDH has not collected public health data on other types of potential health effects of PFAS reported in the scientific literature, such as liver and kidney effects, thyroid disease and immune system changes. While MDH's water guidance values protect against all of these effects, data on their occurrence in people are not available.

The full reports can be found on the MDH website at:
http://www.health.state.mn.us/divs/healthimprovement/data/reports/birtheastmetro.html

Residents of east metro communities with specific questions or concerns about the health effects of any potential exposure to consumption of PFCs in their drinking water should contact the MDH Biomonitoring program by phone at 1-800-205-4987 or 651-201-5900, or by email at health.tracking@state.mn.us.

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To obtain this information in a different format, call 651-201-4897.