

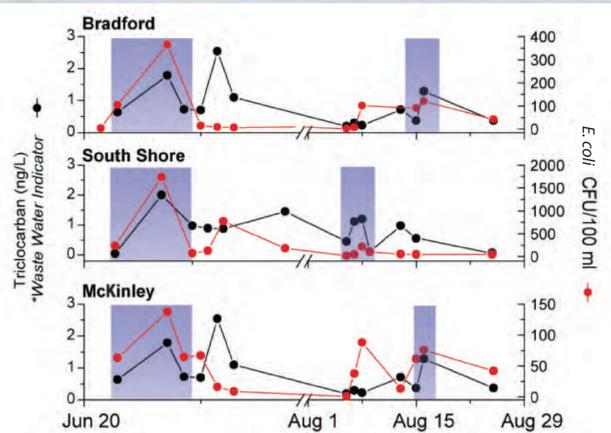
Improving Public Health Recreational Beach Water Quality Monitoring Programs Through Academic Partnership

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Abstract

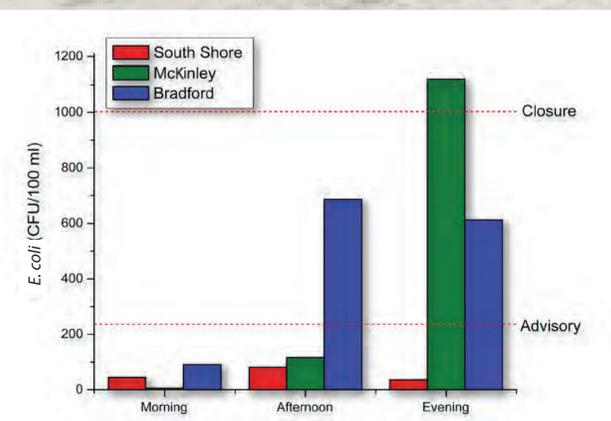
The City of Milwaukee Health Department (MHD) conducts water quality monitoring at several local public beaches on a seasonal basis (June-August) for purposes of assessing health risk to patron contact with potentially contaminated surface water. This information is important and used by the MHD in decision-making specifically related to the necessity of posting daily public water quality advisories at each site. These advisories alert patrons to the elevated bacteria levels in the water posing a potential health risk. During 2012, the MHD developed a partnership with the University of Wisconsin – Milwaukee Zilber School of Public Health (ZSPH) to more comprehensively assess water quality at each City public beach including monitoring of *Escherichia Coli* levels, impact of seagull and algal presence, significance of rainfall on water quality and determination of triclocarban concentrations. Sub-daily *E. coli* samples were obtained to better understand variance in public exposure as a function of time of day. The data collected as a result of this partnership suggest that non-point pollution sources from storm water run-off and sewer cross connections may contribute to adverse environmental beach water quality conditions. Documented fluctuation of *E. coli* during a single day indicates a potentially wide variance in water quality conditions at a beach, having implications for both sample collection and current public health risk assessment processes. The data collected validates the need for public health agencies to conduct routine sanitary surveys of designated public beaches for purposes of identifying unique characteristics and influences impacting water quality. In addition, the partnership informs both future research as well as refinement of practitioner strategic outcomes and operational field protocols. Leveraging academic partnerships to enhance public health agency capacity and capability is an important tool that can advance understanding of public health risk within these settings.

Zilber School of Public Health (ZSPH) Beach Research Triclocarban and *E. coli* Levels in Beach Water (2012)

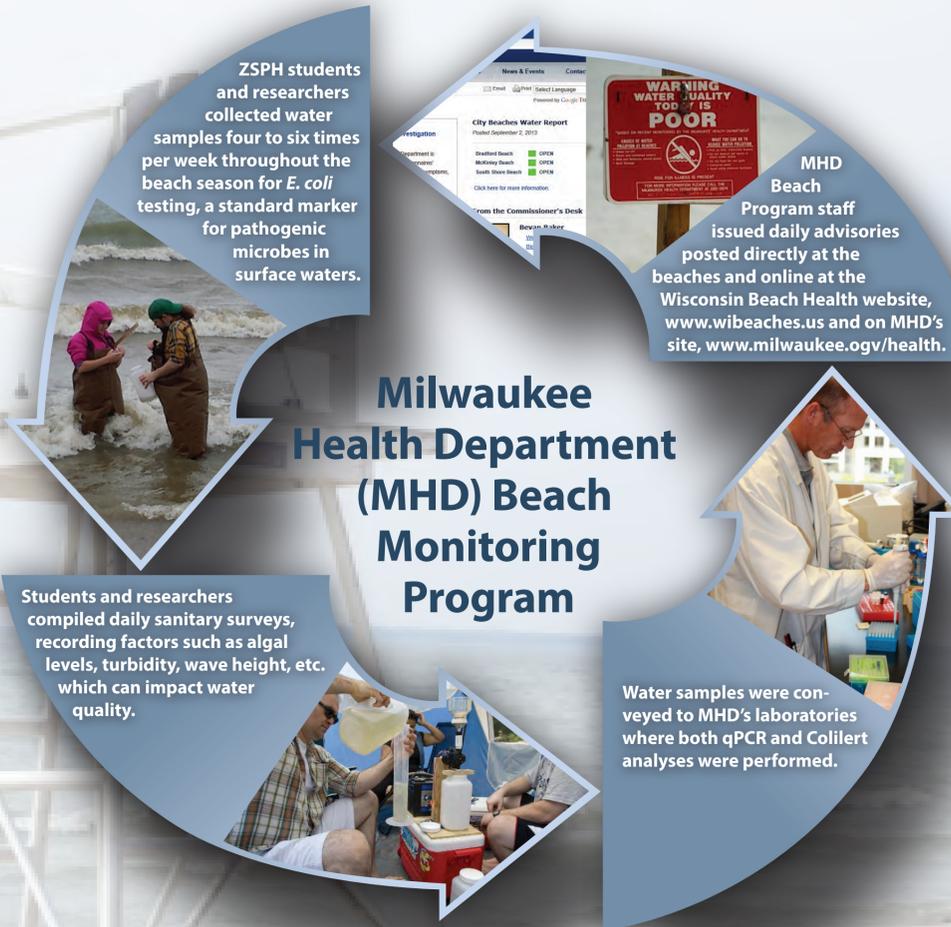


A positive correlation between Triclocarban and *E. coli* levels suggests that wastewater influences beach water quality. (Triclocarban is present in personal care products.)

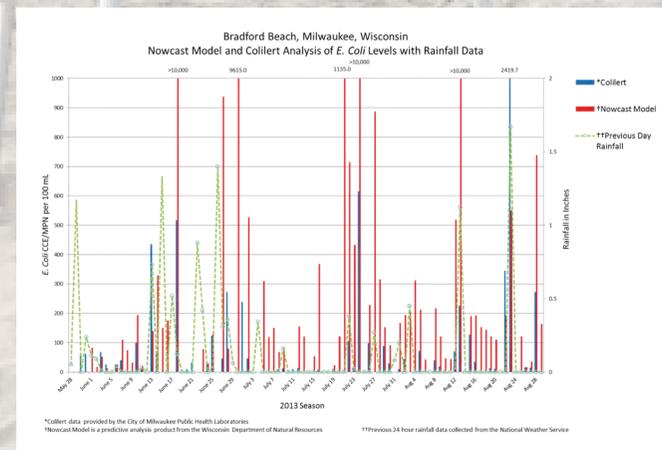
Sub-Daily Variations in *E. coli* Levels (2012)



Sub-daily testing for *E. coli* showed the possibility of dramatic shifts in water quality over a 24-hour period. Beach water sampling by the Milwaukee Health Department has historically been done in the morning.



Enhancement of Predictive Modeling (2013)



E. coli data was used along with meteorological, hydrological, and sanitary survey data in refining Nowcast, a water quality predictive model developed at the Wisconsin Department of Natural Resources.

Advantages of Collaboration

- Public Health Risk Assessment**
MHD was able to better protect the beach-going public as a result of this collaboration. ZSPH gained from the resources of MHD to expand its research efforts. This research will further enhance modeling and analytical approaches to beach risk assessment.
- Capacity Building**
Previously MHD only had the staffing and resources to sample some beaches once a week. Beginning in 2012, ZSPH sampled all beaches four to six times per week, providing more timely *E. coli* data for advisory decisions.
- Enhanced Capabilities**
ZSPH researchers compiled more detailed sanitary survey data, which was used to refine a Nowcast predictive model. Analysis for triclocarban, a wastewater marker, was also conducted by ZSPH and informed MHD's understanding of beach water quality.
- Workforce Development**
MHD staff and ZSPH students gained experience in interpretation and presentation of data, statistical methods, and analytical techniques. MHD lab added qPCR methods to its array of analytical services.
- Special Events Support**
The USA Triathlon Age Group Nationals were held in Milwaukee this past summer. MHD, with the capabilities of ZSPH for off-shore sampling, was able to compile *E. coli* data along the proposed swim route, validating it on a water quality basis.

Acknowledgements

- Milwaukee County Department of Parks, Recreation and Culture
- Wisconsin Department of Natural Resources
- U.S Geological Survey – Wisconsin District
- United States Environmental Protection Agency
- National Weather Service Milwaukee/Sullivan Weather Forecast Office
- Michael J. Murphy, 10th District Alderman, City of Milwaukee
- Background photo credit: https://myqei.org/ideas/lp/imageideas/1/img_44150.jpg

Future Trends for the MHD Program

- Water quality predictive modeling is an important line of research. The Nowcast model could be enhanced by sub-daily or even streaming data from a Sonde device, measuring important parameters such as wind speed and direction, wave height, etc. Retrospective analysis of a growing volume of historical data may also lead to improved forecasting.
- With uncertainty as to future public health agency funding streams, academic partnerships will become increasingly vital in maintaining levels of service and protections to the public. Emphasis on cost-effective methodologies and efficient resource pooling will be key.
- Clearer epidemiologic understanding of the impacts of poor beach water quality is needed to validate, inform, and allocate surveillance efforts. This will ultimately improve characterization of risk at public beaches.
- Sub-daily variations in *E. coli* levels of an order of magnitude or more underscore the challenges of accurate and timely beach advisories. Quantitative determinations of *E. coli* or other reliable marker species, with quicker turnaround times, would be an important breakthrough.
- Triclocarban occurs in a variety of personal care products, and when found in surface water it indicates wastewater infiltration. Peaks of Triclocarban co-occurring with peaks in *E. coli* may suggest that the *E. coli* originates from wastewater. The presence of Triclocarban may be useful in predicting beach water quality and offer the advantage of a quicker analytical turnaround time.



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