GIS and COVID-19: Tribal-Focused Environmental Risk and Sustainability (Tribal-FERST) Tool to Enhance COVID-19 Surveillance and Monitoring

TRIBAL CLIMATE & ENVIRONMENTAL HEALTH PROJECT

Wind Environmental Services, LLC

Audrianna Marzette[1], Brett Weber[1], Garet Couch[2], Letisha Couch[2] Ed Smith[2] and Lacee Cofer[2]

[1]National Indian Health Board, Washington D.C., [2]Wind Environmental Services, LLC, Bonne Terre, MO

Introduction

The National Indian Health Board (NIHB), the United South and Eastern Tribes (USET), and the Alaska Native Tribal Health Consortium (ANTHC) partnered with Wind Environmental Services, LLC to develop the Tribal-Focused Environmental Risk and Sustainability (Tribal-FERST) tool. NIHB awarded 3 Tribal entities to pilot the Tribal-FERST tool to support their Tribal environmental health programs carrying out surveillance, epidemiology, laboratory capacity, and other COVID-19 preparedness and response activities.

Project Aims

- To determine the steps needed to collect, analyze, and contribute environmental health data to surveillance and monitoring efforts.
- To foster greater collaborative efforts and bidirectional data sharing between Tribal Epidemiology Centers and Tribal environmental health programs.
- To identify what would be needed to better coordinate with laboratories processing tests and samples.
- To better understand how data can be translated into actionable public health activities.

Background

- American Indians and Alaska Natives (AI/ANs) life expectancy fell from 71.8 years in 2019 to 65.2 by the end of 2021.
- AI/ANs were 3.5 times that of non-Hispanic White persons (594 per 100,000 vs 169 per 100,000, respectively) to test positive for COVID-19 during the pandemic.
- The risk of hospitalization from COVID-19 is three times higher among American Indian and Alaska Native people compared with non-Hispanic Whites.
- AI/ANs were three times more likely than White persons to die from COVID-19.
- Geographic information systems (GIS) support Tribal health professionals in addressing the COVID-19 pandemic, opioid epidemic, vaping-related respiratory illness, and other diseases and injuries.

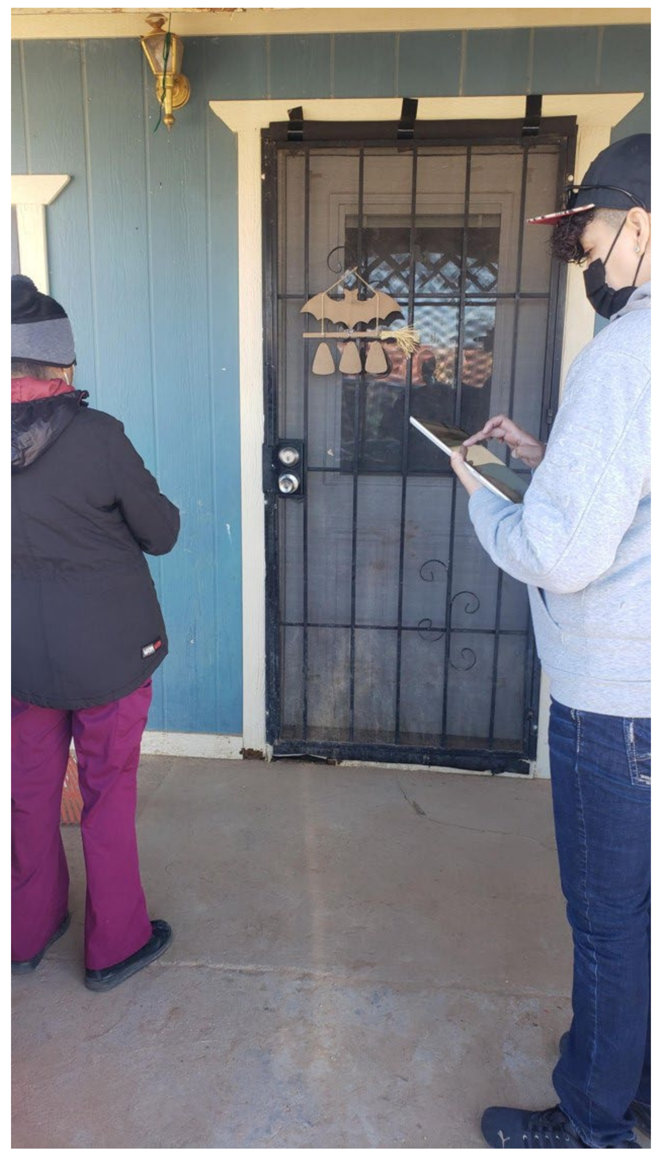
References

- Arrazola J, Masiello MM, Joshi S, et al. COVID-19 Mortality Among American Indian and Alaska Native Persons — 14 States, January–June 2020. MMWR Morb Mortal Wkly Rep 2020;69:1853–1856. DOI: http://dx.doi.org/10.15585/mmwr.mm6949a3.
- CDC Covid Data Tracker: maps and data for cases and deaths per 100,000, testing, mobility, etc.
- Dornell Pete, Scott L. Erickson, Melissa A. Jim, Sarah M. Hatcher, Abigail Echo-Hawk, and Adrian E. Dominguez, 2022: COVID-19 Among Non-Hispanic American Indian and Alaska Native People Residing in Urban Areas Before and After Vaccine Rollout—Selected States and Counties, United States, January 2020–October 2021. American Journal of Public Health 112, 1489_1497, https://doi.org/10.2105/AJPH.2022.306966
- Hatcher SM, Agnew-Brune C, Anderson M, Zambrano LD, Rose CE, Jim MA, Baugher A, Liu GS, Patel SV, Evans ME, Pindyck T, Dubray CL, Rainey JJ, Chen J, Sadowski C, Winglee K, Penman-Aguilar A, Dixit A, Claw E, Parshall C, Provost E, Ayala A, Gonzalez G, Ritchey J, Davis J, Warren-Mears V, Joshi S, Weiser T, Echo-Hawk A, Dominguez A, Poel A, Duke C, Ransby I, Apostolou A, McCollum J. COVID-19 Among American Indian and Alaska Native Persons - 23 States, January 31-July 3, 2020. MMWR Morb Mortal Wkly Rep. 2020 Aug 28;69(34):1166-1169. doi: 10.15585/mmwr.mm6934e1. PMID: 32853193; PMCID: PMC7451969.

Methodology

Geospatial
Community Contact Tracing
Data Collection and Visualization Tools

By adding location information to contact tracing, public health analysts will be able to perform location analytics to illuminate the places where viral spread is happening outside of direct and prolonged contact between two individuals.

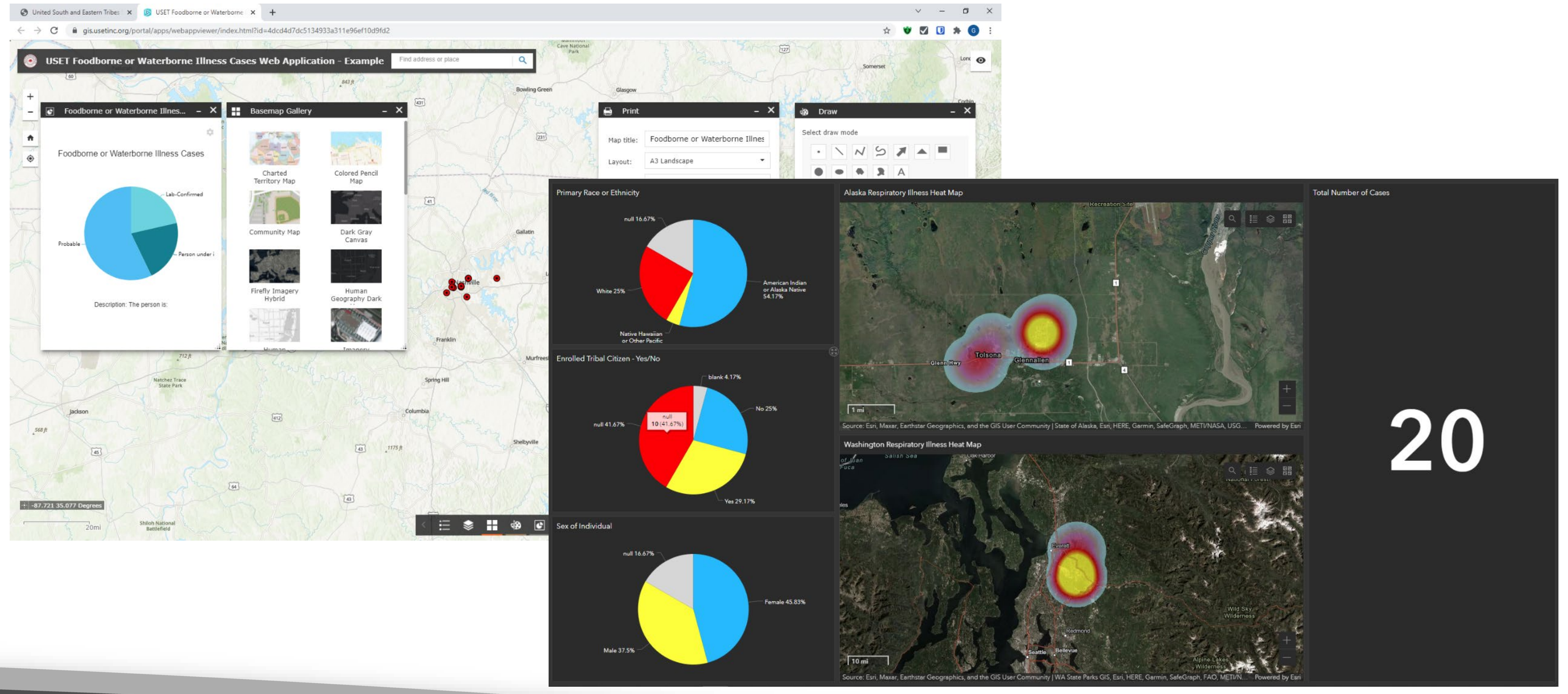


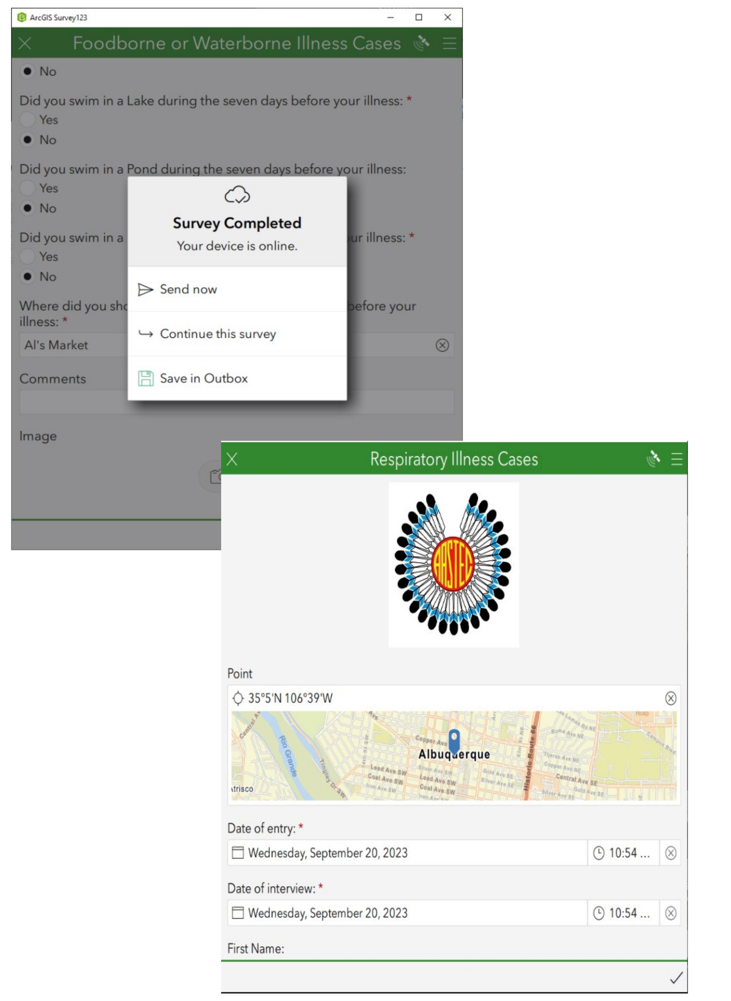
Implementation Steps:

1. Conducted a series of meetings with stakeholders from the public health community to determine what tools would be most useful.
2. Through stakeholder engagement, developed a robust geo-database containing pertinent data structures to accommodate response to foodborne, waterborne, or airborne outbreak events.
3. Developed digital case investigation forms using Esri Survey123 that could be rapidly deployed that would easily allow the collection of patient information along with the geo-location of the patient's home and areas visited.
4. The system infrastructure allows for case information to be aggregated in near real-time into a single system. Further allowing for initial visual analysis to occur in the form of heat maps giving health professionals the ability to visualize the "hot spots" where spread is occurring in near real-time.
5. Information aggregated in the system can be exported or connected via a REST (real-time) connection to other software packages allowing further, more detailed investigations to occur.
6. With accurate information available in near real-time, health professionals can better deploy resources in response to an event.

Results

- Significantly improved the ability to quickly and accurately aggregate case information.
- Gained the ability to visualize the spread of an epidemic or pandemic, in near real-time, allowing leadership to deploy resources more effectively has proven valuable.
- Utilizing digital data collection forms allowed for more consistent data collection and streamlines to data aggregation process.
- Improved the ability to perform advanced epidemiological analysis by having access to digital data more rapidly.
- By establishing the geospatial platform the system provided the community with the tools necessary to conduct other types of surveys and data gathering activities to be better prepared for future public health events.





Conclusion

- Collecting case information in a digital environment allowed for the information to be aggregated and analyzed in a much more efficient and accurate way.
- Heat maps provided a simple way to visualize which local communities were experiencing COVID hot spots. They allowed community health representatives (CHRs) to better respond.
- The initial draft of survey questions was very lengthy, and CHRs knew that community members would be reluctant to participate. The survey was then adjusted to include questions that the CHRs felt the community would be more willing to provide answers for.

Limitations

- Internet bandwidth capacity along with network and IT issues.
- Absence/lack of knowledge regarding geographic information systems (GIS) and its capabilities to support community contact tracing and visualization when responding to a public health crisis such as the COVID-19 pandemic. This led to many staff underutilizing GIS until late in the pandemic.
- Slower response time to implement new technology in the health programs due to Tribal approval processes.
- Limited staffing capacity or ability to hire additional staff to facilitate better data gathering.

Acknowledgments

Special thanks to the staff members and administrative leadership at Wind Environmental Services, LLC, the Albuquerque Area Southwest Tribal Epidemiology Center, Hopi Tribe-Land Information Systems, Hopi's Department of Health and Human Services, Northwest Tribal Emergency Management Council, United South and Eastern Tribes, and the Alaska Native Tribal Health Consortium. This project was made possible by funding from the Centers for Disease Control and Prevention (CDC) grant number 6 NU38OT000302-03-02.

Disclosure and Contact Information

- No conflicts of Interest.
- For further information, contact: Brett Weber, Environmental Health Programs Director, BWeber@nihb.org or Garet Couch, Business Manager, gcouch@windenvironmental.com.

National Indian Health Board