Assessing Polio Vaccination for Consideration of Wastewater Surveillance

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AIRA 2023 National Meeting

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BACKGROUND

Epidemiology of Poliovirus

- Highly infectious disease transmitted from person to person:
  - Fecal-oral route
  - Common vehicle i.e., contaminated food or water (less common)

- Symptoms: Fever, fatigue, headache, vomiting, stiffness of neck, pain in the limbs, permanent paralysis (1 in 200 infections)

- Incubation period – 7 to 10 days; 90% of those infected are asymptomatic or have mild symptoms

- No cure but can be prevented by immunization

CDC Vaccine Schedule (Birth - 15 mos)

KEY

Vaccine*	months							
	Birth	1	2	4	6	9	12	15
HepB	1d	2d			3d			
Rota			1d	2d	See notes			
DTaP			1d	2d	3d			4d
Hib			1d	2d	See notes		3d or 4d See notes	
PCV13 PCV15			1d	2d	3d		4d	
IPV			1d	2d	3d			
COVID-19					2- or 3- dose series + booster (See notes)			
Flu(IIV4)					1- or 2- doses (Annual)			
MMR					See notes		1d	
VAR							1d	
HepA					(See notes)		2-dose series See notes	
MenACWY			See notes					

CDC Vaccine Schedule (18 mos - 6 yrs)

KEY

Vaccine*	months		years	
	18	19-23	2-3	4-6
HepB	3d			
Rota				
DTaP	4d			5d
Hib				
PCV13 PCV15				
IPV	3d			4d
COVID-19	2- or 3- dose series + booster (See notes)			
Flu(IIV4)	1- or 2- doses (Annual)			
or Flu(LAIV4)			1- or 2- doses (Annual)	
MMR				2d
VAR				2d
HepA	2-dose series See notes			
MenACWY	See notes			
PPSV23			See notes	

Vaccine-derived poliovirus (VDPV)

- VDPV - Poliovirus mutant from the strain contained in Oral Polio vaccine (OPV)

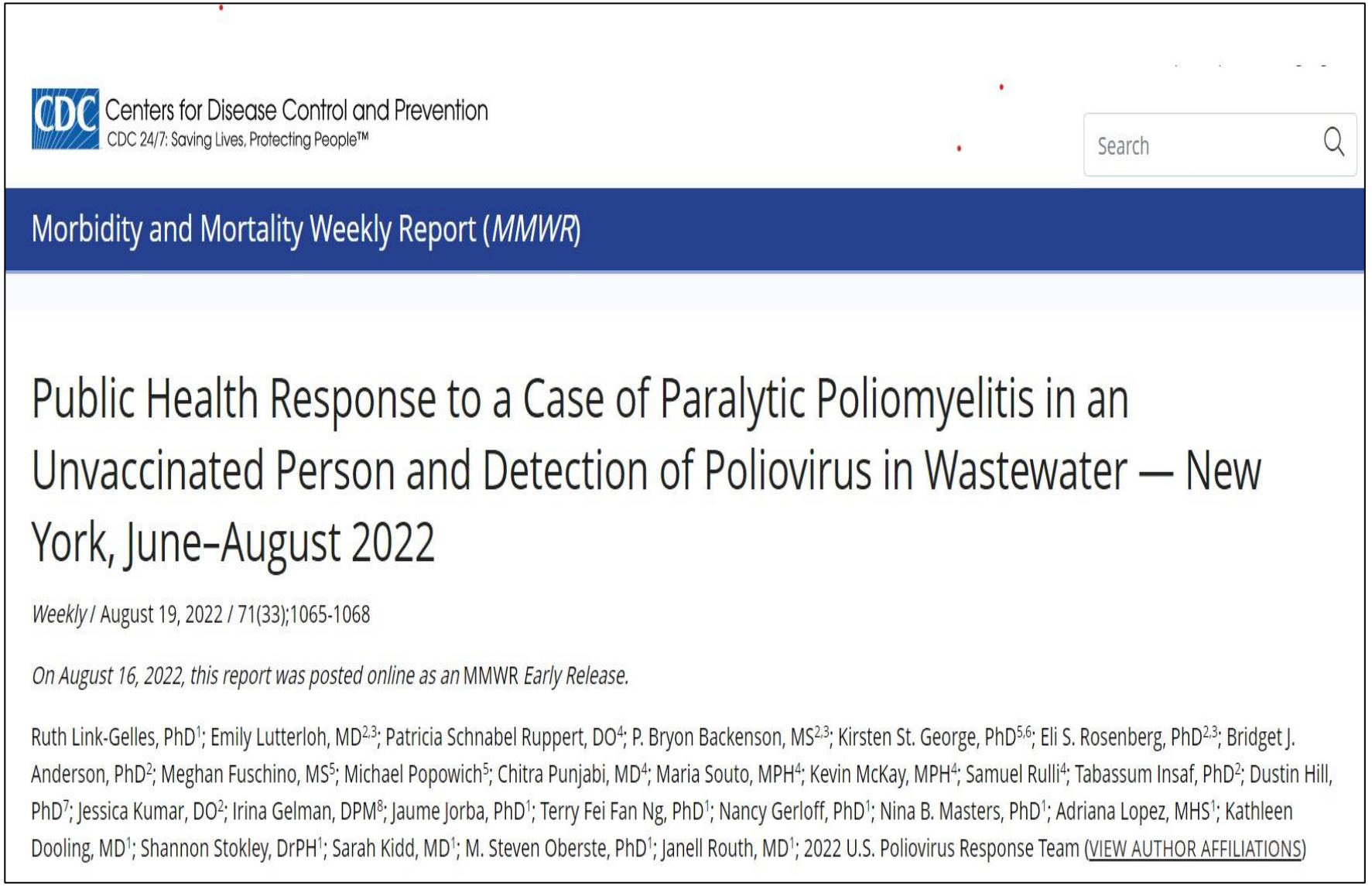
- VDPV strains
  - Circulate in the environment as circulating VDPV
  - Person to person transmission
  - Inverted neurovirulence
  - Can cause paralysis like the wild type poliovirus

- Especially critical in communities with low IPV coverage!

Poliovirus in the US

- In 1950s, Poliovirus disabled about 35,000 people a year in US
- Subsequently, OPV and IPV vaccines were administered at the recommended timepoints in children!
- US was declared polio-free in 1979!
- The last polio outbreak in US was in 2013 – VDPV!

Poliovirus Outbreak in the US – July 2022



CDC Centers for Disease Control and Prevention
CDC 24/7: Saving Lives, Protecting People™

Search

Morbidity and Mortality Weekly Report (*MMWR*)

Public Health Response to a Case of Paralytic Poliomyelitis in an Unvaccinated Person and Detection of Poliovirus in Wastewater — New York, June–August 2022

Weekly / August 19, 2022 / 71(33);1065-1068

On August 16, 2022, this report was posted online as an MMWR *Early Release.*

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- Paralytic Poliovirus case in a New York county (July 2022)
- Detection of cVDPV in Wastewater
- Serious threat to communities with low IPV coverage

Surveillance in Michigan

CNN health Life, But Better Fitness Food Sleep Mindfulness Relationships

Michigan measles outbreak linked to outbreak in New York; Rockland County takes new steps to contain virus

By Debra Goldschmidt and Susan Scutti, CNN

Updated 1:20 PM EDT, Tue April 16, 2019

- Epidemiological connections b/w a Michigan County and Rockland, NY!
- Close community connections warranted Surveillance for polio in Michigan!
- Assessing immunization coverage levels for IPV and wastewater testing in the Michigan county recommended by CDC!

https://edition.cnn.com/2019/04/16/health/measles-outbreak-new-york-michigan-bn/index.html

METHODS

Data source

- Michigan's Immunization Information System (IIS) – Michigan Care Improvement Registry (MCIR)

- MCIR was established in 1998
  - ➢ Mandatory childhood vaccine reporting (birth through 18 years)
  - ➢ Became a lifespan registry in 2006 with addition of adult records

https://mcir.org/public/

Data Analysis

- Coverage levels in 12 – 47-month-old kids:
  - IPV ≥ 3 doses
  - IPV = 0 doses

- MCIR data was used as denominator since providers are mandated to report vaccines administered to children ≤ 18 years

- Zip code level coverage in kids ≤ 2 years was assessed for the Oakland county with close connections with Rockland, NY

RESULTS

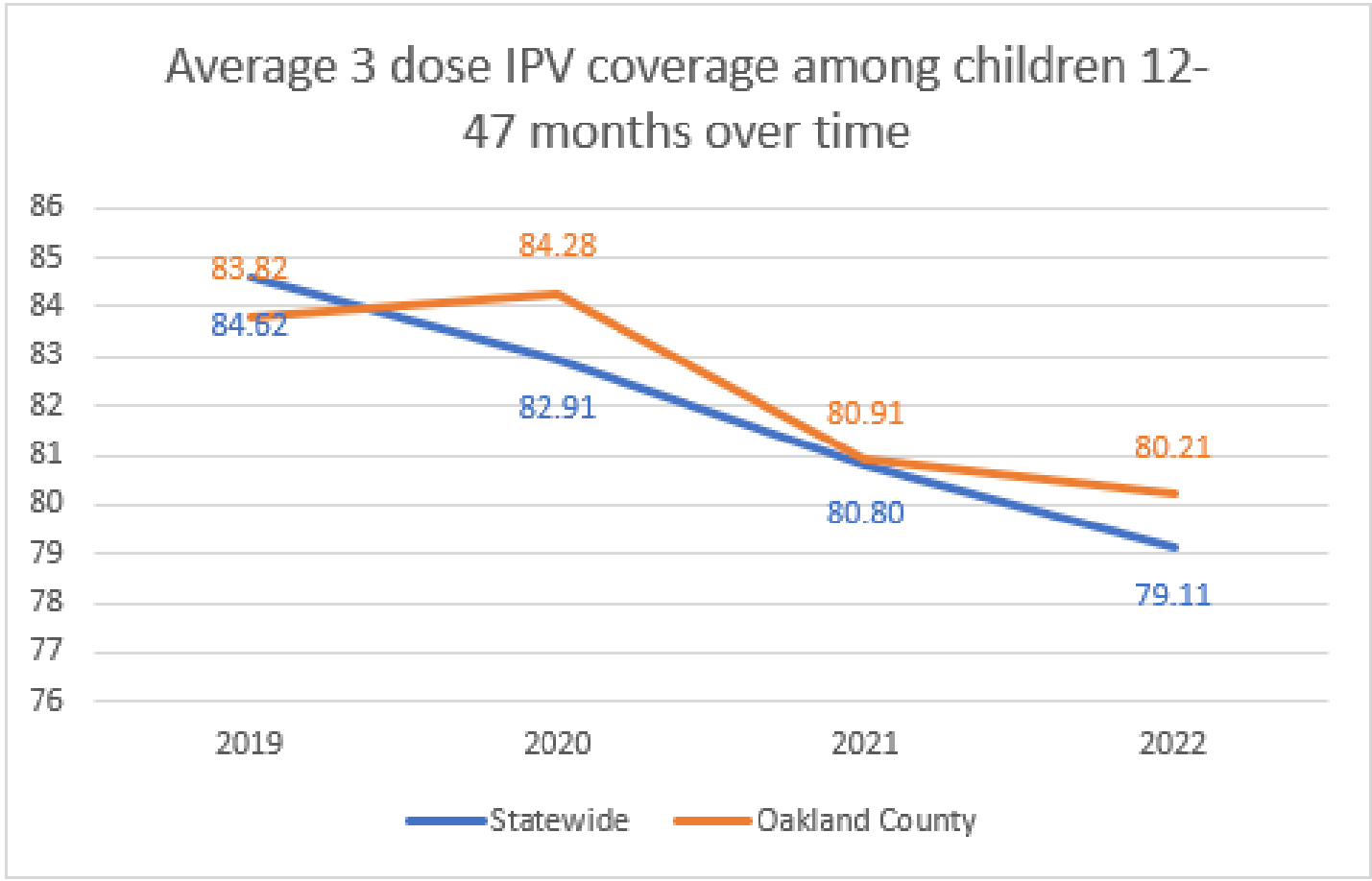
Key results

- IPV coverage levels (12-47 months old kids) for ≥ 3 doses:
  - **Statewide**: ↓ by **5.5 percentage points** [84.6% (2019) to 79.1% (2022)]
  - **Oakland county**: ↓ by **3.6 percentage points** [83.8% (2019) to 80.2% (2022)]

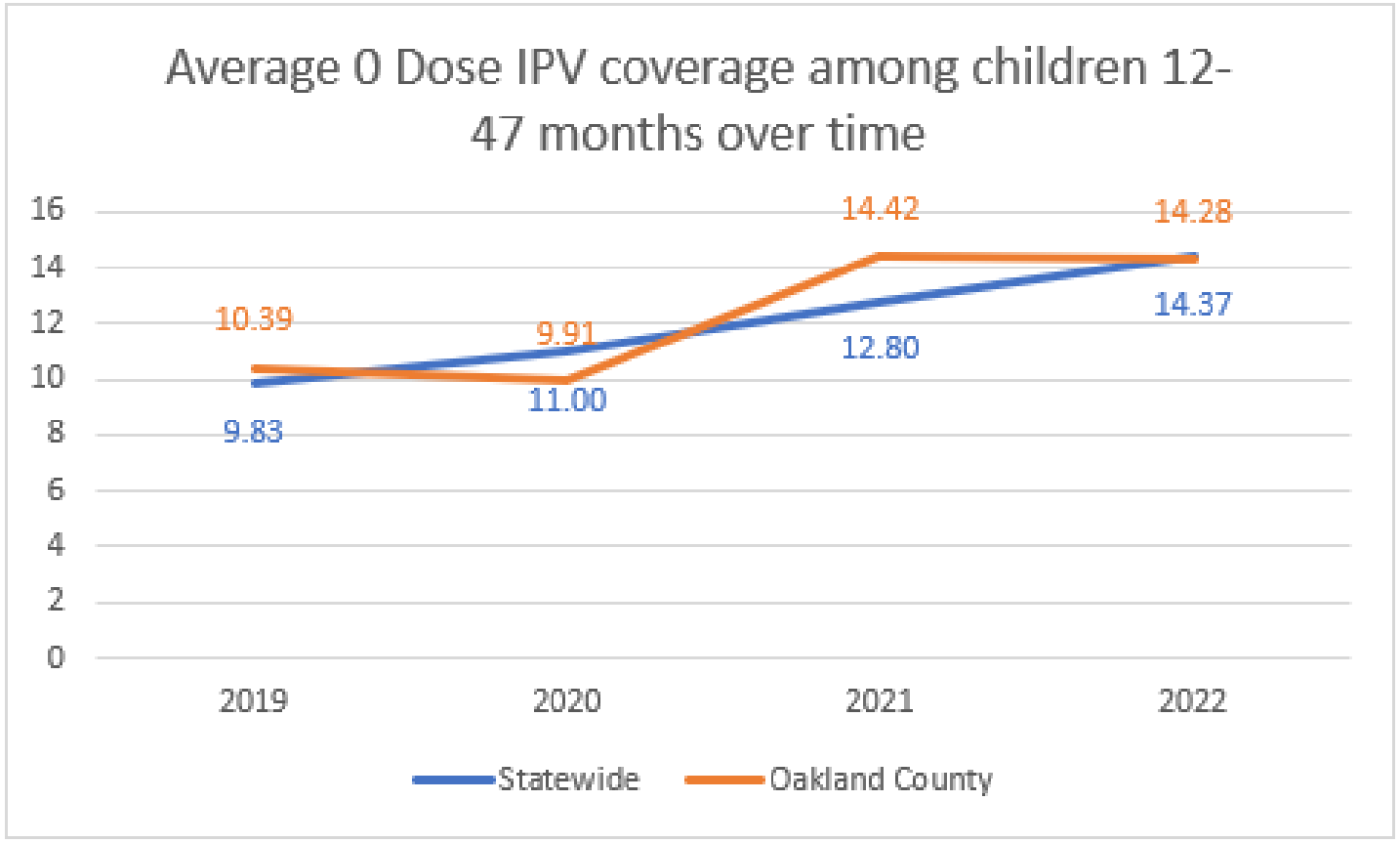
- Population with 0 IPV doses:
  - **Statewide**: ↑ by **4.6 percentage points** [9.8% (2019) to 14.4% (2022)]
  - **Oakland county**: ↑ by **3.9 percentage points** [10.4% (2019) to 14.3% (2022)]

- Minimum coverage at the zip code level in Oakland county decreased by **6.6 percentage points** from 69.7 (2019) to 63.1 (2022) for one of the zip codes

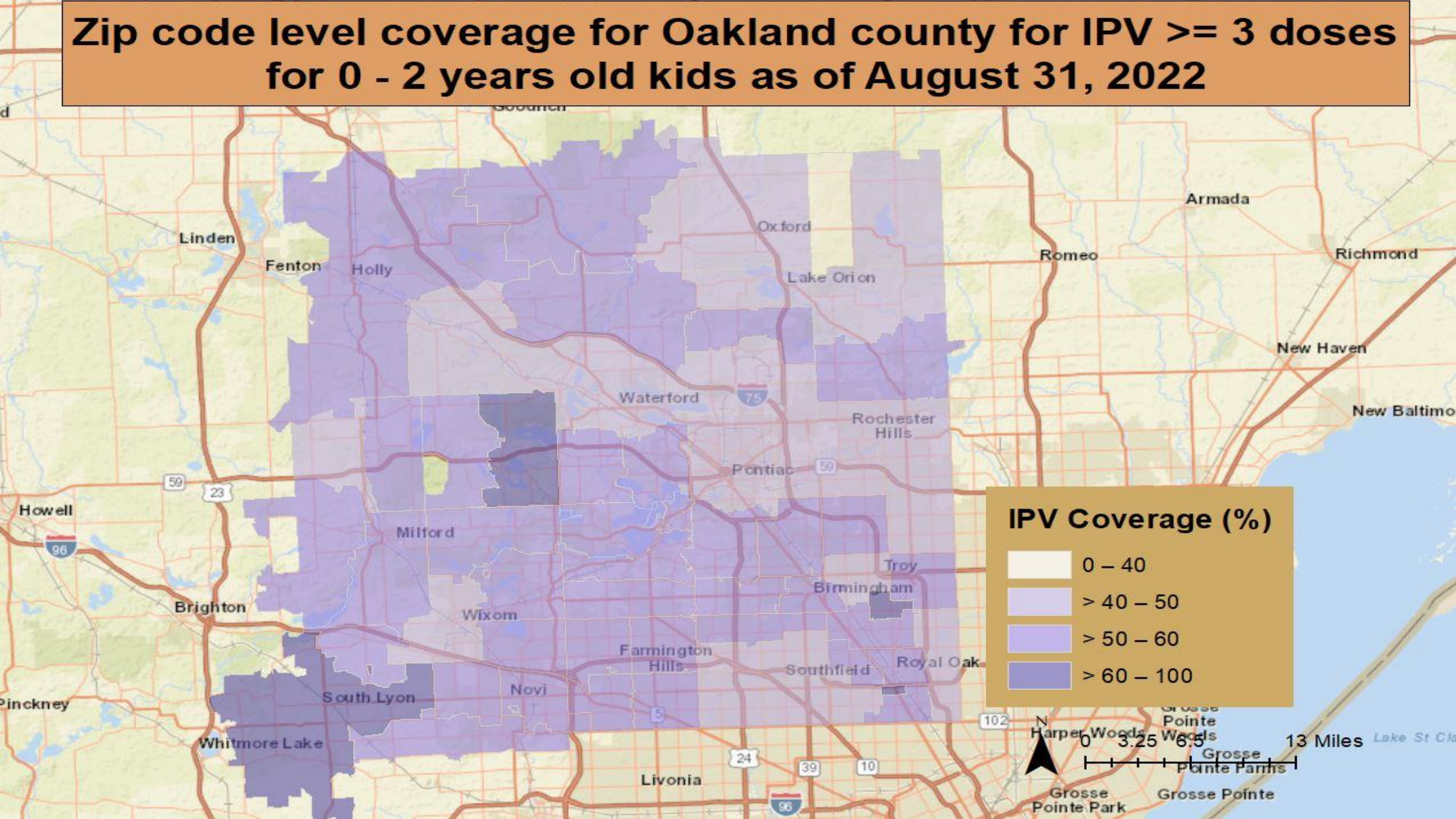
IPV coverage level ≥ 3 doses



Population with 0 IPV doses



Zip code level coverage for Oakland county for IPV >= 3 doses for 0 - 2 years old kids as of August 31, 2022



CONCLUSION

Reflections

- Assessing polio vaccine coverage data from IISs to:
  - ➢ direct public health efforts to the areas that are high risk and where wastewater surveillance could be focused.

- Wastewater surveillance:
  - ➢ an effective strategy to monitor poliovirus community transmission
  - ➢ wide wastewater testing not recommended as there are no specific funding streams

- Efforts to sample wastewater for polio should be prioritized within communities of greatest vulnerability.

Next steps

- Wastewater surveillance for Polio to be carried out at two sites in Oakland county!
- IPV coverage levels by race / ethnicity to identify vulnerable communities?
- Assessing IPV coverage levels in adults in vulnerable communities?
- Collaboration b/w Immunization and Environmental divisions at the State, and two-way communication with Local health departments!

Project Team

Division of Immunization

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- Ryan Malosh, Epidemiology Section Manager
- Terri Adams, Division Director
- Joseph Coyle, Bureau Director

Division of Environmental Health

- Kelly Geith, Epidemiologist
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