

# Impact of a Local Public Health Laboratory as a First Responder in Vaccine Preventable Disease Investigations

Authors: S. Gradus<sup>1,3</sup> J. Navidad<sup>1</sup> M. Khubbar<sup>1</sup> B. Krause<sup>1</sup> B. Pfothner<sup>1</sup> N. Leigh<sup>1</sup> S. Coffaro<sup>2</sup> J. LeStarge<sup>2</sup> J. Katrichis<sup>2</sup> M. Stanley<sup>2,3</sup> P. Hunter<sup>2,4</sup> S. Bhattacharyya<sup>1,3</sup>

## Introduction

The impact of vaccines in preventing disease cannot be overstated and has proven to be one of the most important advancements in the history of public health. Vaccines can protect infants, children and teens from 16 potentially harmful diseases.<sup>1</sup> Of these diseases, the City of Milwaukee Health Department Laboratory (MHD) typically tests for measles, mumps, rubella and pertussis when indicated. These diseases continue to be a threat worldwide, and the U.S. population may be exposed or susceptible to cases from those not vaccinated, under vaccinated, with waning immunity or failed vaccinations.

In 2008 (the most recent report), the World Health Organization (WHO) estimated that 1.5 million deaths among children under 5 years of age were due to diseases that could have been prevented by routine vaccination.<sup>2</sup> This represents 17% of global total mortality in children under age 5. This included the following examples of mortality worldwide: pertussis (195,000) and measles (118,000).

In the U.S., the average number of cases (and deaths) in the pre-vaccine era compared to current morbidity is as follows:

Disease	Pre-vaccine era annual		Current Cases (2015)		
	Morbidity	Mortality <sup>3</sup>	USA <sup>4</sup>	Wisconsin <sup>5</sup>	Milwaukee County <sup>6</sup>
Measles	530,217	440	189	0	0
Mumps	162,344	39	1,057	45	1
Rubella	47,745	17	<10	0	0
Pertussis	200,752	4,034	32,971	509	112

<sup>1</sup> <http://www.cdc.gov/vaccines/parents/protecting-children/index.html>  
<sup>2</sup> [http://apps.who.int/immunization\\_monitoring/burden/estimates\\_burden/en/index.html](http://apps.who.int/immunization_monitoring/burden/estimates_burden/en/index.html)  
<sup>3</sup> JAMA. 2007;298(18).  
<sup>4</sup> www.cdc.gov  
<sup>5</sup> <https://www.dhs.wisconsin.gov/immunization/vpdsbyyear.pdf>  
<sup>6</sup> <http://city.milwaukee.gov/ImageLibrary/Groups/healthAuthors/DCP/PDFs/SurvNet/SurvnetDec20151.pdf>

## Acknowledgements

We would like to thank Julie Becker, Mark Zemke, and Nancy Hills for their invaluable contributions in the preparation and editing of this poster. Presenter: Steve Gradus, City of Milwaukee Health Department Laboratory, Milwaukee, WI, Phone: 414.286.3526, Email: [sgradu@milwaukee.gov](mailto:sgradu@milwaukee.gov) Presented: APHL June, 2016

Laboratories are key for vaccine preventable disease (VPD) determinations and investigations (ref. CDC):

- Virus isolation is considered among the best methods for confirming mumps infection
- Laboratory confirmation is essential for all sporadic measles cases and all outbreaks
- Clinical diagnosis of rubella is unreliable, therefore, cases must be laboratory confirmed

Behind the scenes, the public health laboratory is an essential team member in identifying, confirming and mitigating some of the most critical VPDs in the community, including mumps, measles, rubella and pertussis. As one illustration of this point, MHDL in November and December of 2015 alone performed real-time testing for 12 such cases in a matter of hours.

By utilizing the capabilities of molecular detection, serology and viral culture for VPDs, a public health laboratory can prioritize testing same day or within 24 hours, for the purpose of ensuring the safety of the local community. While the primary mission of other local clinical, reference or state public health laboratories may differ, local public health agencies can prioritize work and engender a feeling of urgency and community ownership that might be different from a more removed public health jurisdiction.

We provide several examples showing the effectiveness of a local public health laboratory responding in very near real-time within a team of local public health investigators to intervene in the spread of vaccine preventable diseases in a local community.



## Case History #1: One Case of Mumps at University of Wisconsin-Milwaukee



- Urban campus 15 minutes from downtown Milwaukee
- 28,000+ students
- Mumps case: Day before Thanksgiving break – November 2015

### Late Tuesday before 4-day Thanksgiving Break

- UWM Health Services contacts MHD
  - suspect Mumps case
- MHDL specimen: receipt 11/24/15 @ 4:47 p.m.
  - Reported 11/25/15 @ 11:42 a.m.
- TAT Mumps confirmation: 18 hour 55 minutes
- Campus-wide notification results (see right) sent to students on Holiday break



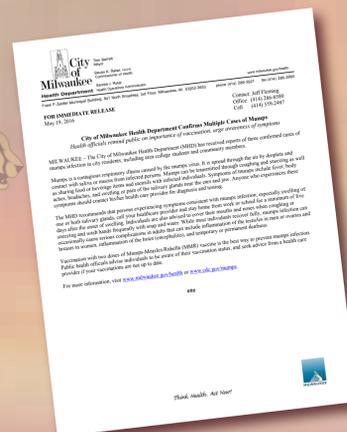
## Case History #2: Local PHL vs. Commercial Reference Lab: May 2016



- **Day 1:** Saturday evening: MHD Epidemiologist contacted by local clinic seeking Mumps test.
  - Clinic sends specimen to commercial lab in another state seeking rapid results.
- **Day 3:** Tuesday morning: due to urgency MHD tests & results POSITIVE Mumps within 4hrs
- **Day 5:** Thursday, Commercial lab results received: POSITIVE Mumps, 5 days after collection

## Case History #3: Local Cluster Investigation: May 2016

Case #	Date Received in Lab	Time Received in Lab	Time Reported by Lab	Turnaround Time by Lab	PCR Results	Patient Information (All 4 cases had parotid swelling)	Age & Gender
1	May 12, 2016	1:18 PM	3:15 PM	1:57	POS	Student attends College "A"	20 F
2	May 13, 2016	2:24 PM	5:10 PM	2:46	POS	Student attends College "A"	21 F
3	May 17, 2016	12:33 PM	3:17 PM	2:44	POS	Bartender frequented by College "A" students	26 M
4	May 19, 2016	7:51 AM	10:54 AM	3:03	NEG	Works in area of College "A"	32 F
<b>Average Mumps PCR Turnaround Time:</b>				<b>2:37</b>			



## Results

### 2015 VPD Test Results Turn-Around Time n=53

PCR	# Tests	# Patients	# Agencies	Turnaround Time Hours:Minutes	
				Average	Median
Mumps	18	18	6	8:20	4:46
Measles	11	9	4	11:16	11:06
Rubella	7	5	4	35:31	20:52
Pertussis	17	17	3	10:06	4:39
Total	53	49	7	13:24	4:55
TAT	#	%			
Same Day:	33	(62)		4:00	4:00
Next Day:	16	(30)		19:23	20:07
*2-3 Days:	4	(4)		67:00	71:24

\*weekend

## Methods

### PCR methods

- CDC modified method validated in house for: Measles, Mumps, Rubella.
- CDC modified multiplex real-time Taqman PCR assay for 3 Bordetella species:
  - *B. pertussis* • *B. parapertussis* • *B. holmesii*

### Serological methods

- Commercial ELISA based serology for measles, mumps, and rubella IgG.
- IgM: send out

### PT programs

- Wisconsin State Laboratory of Hygiene (WSLH) and College of American Pathologists (CAP) proficiency program for IgG serology of Rubella, Measles, and Mumps; real time RT-PCR proficiency for viral agent and pertussis from WSLH

### # Staff Trained

- 2: serology testing; 5: real time RT-PCR

### Affiliations:

- <sup>1</sup>City of Milwaukee Health Department Laboratory, Milwaukee, WI
- <sup>2</sup>City of Milwaukee Health Department, Milwaukee, WI
- <sup>3</sup>University of Wisconsin-Milwaukee, Zilber School of Public Health
- <sup>4</sup>University of Wisconsin-Madison, School of Medicine and Public Health

