

The Influence of Public Health Spending and Staffing on Variation in Process and Outcome of Local Health Department Food Safety Inspections

A Direct Observation of Local Public Health Study

Scott Frank, MD, MS;
Principle Investigator, DOLPH
Director, Shaker Heights Health Department
Director, Case Western Reserve University Master of Public Health Program

Michelle Menegay, MPH
Research Manger, RAPHI /DOLPH



Ohio Research Association
for Public Health Improvement

Public Health Practice-Based Research Network


 No financial disclosures

 Acknowledgements

- Robert Wood Johnson Foundation Public Health Practice Based Research Network Research Initiation (RIA) Award (ID 68673) and RIA Supplement Award (ID 69497)



Direct Observation of Local Public Health

 **Purpose:** Using the Foodborne Illness as a public health archetype, the Direct Observation of Local Public Health (DOLPH) study seeks to illuminate the structure, process, and outcome of the local health department (LHD) role in Foodborne Illness prevention, investigation, and intervention.



Winnable Battles

Tobacco



**Nutrition,
Physical Activity,
Obesity and
Food Safety**

**Healthcare-
Associated
Infections**



**Motor
Vehicle
Injuries**

**Teen
Pregnancy**



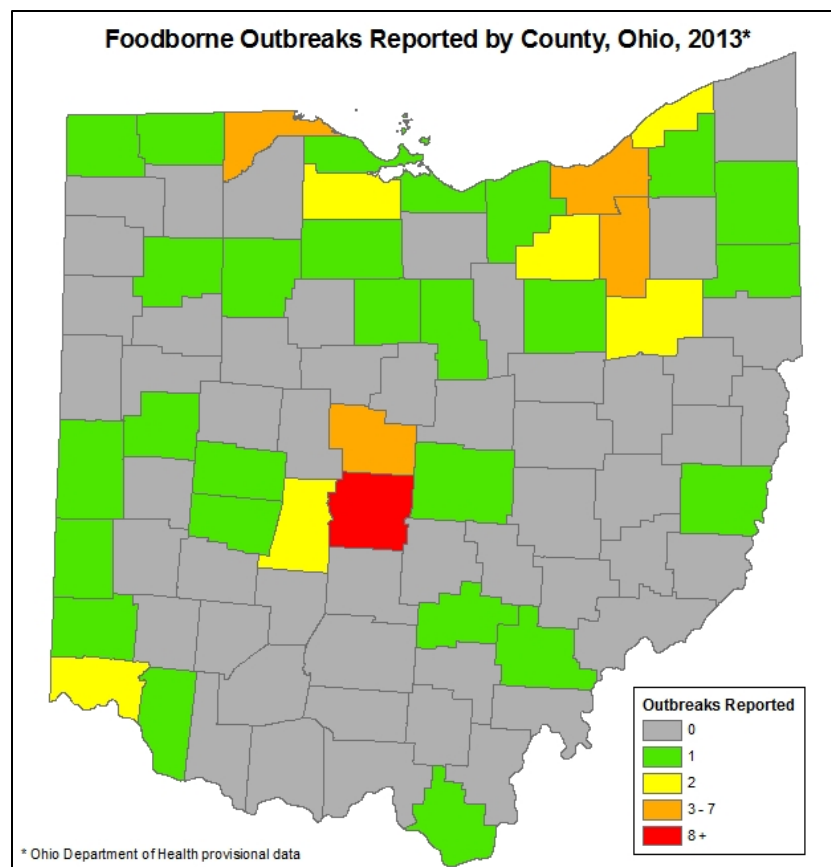
HIV

Source: <http://www.cdc.gov/winnablebattles/>



Foodborne Outbreaks, 2013*

- 78 outbreaks affecting 914 people in 37 of Ohio's 88 counties
- 5 multistate outbreaks
(2 *Listeria*, 2 *Salmonella*, 1 norovirus)



* Ohio Department of Health provisional data

Methods

- 🌳 Previously presented
 - Interview
 - Direct observation
 - Validated protocol with strong inter-rater reliability
- 🌳 Data integration
 - Ohio Annual Financial Report



DOLPH Structural Metrics

- 🌳 Jurisdictional size
- 🌳 LHD type
 - City
 - County
 - Combined
- 🌳 Financing
 - Total budget
 - Per capita
- 🌳 Staffing
 - Total
 - RS
 - Sanitarian in training



DOLPH Process Metrics

- 🌳 Check-in time
- 🌳 Thoroughness index
 - 31 possible observations
 - Multiple performance of actions counted
- 🌳 Episodes of food safety education during inspection
- 🌳 Episodes of food safety advice during inspection
- 🌳 Effective checkout
 - Gives clear feedback and assessment
 - Discuss improvement plan
 - Offers education
 - Elicits questions
- 🌳 Check-out time



DOLPH Process Metrics



RS Professional behavior

- Introduction
- Address by name
- Private discussion at checkout
- Thank the PIC



Job Demands (RS Profile); Alpha= .79

- Competing demands in environmental health
- Insufficient time to meet expectations
- Problem relationships health department



Negative pattern of interaction

- Give feedback in negative way
- RS interrupts PIC
- Unexplained jargon
- Conflict
- Voice raised in anger



DOLPH Process Metrics

 PIC Questioning RS (PICQRS); Observational;
Alpha= .811

- Knowledge
- Judgment
- Fairness
- Authority

 RS attitude toward PIC (RS Profile); Alpha= .59

- PICs try to get away with anything to save money
- PICs dislike inspections
- PIC are cooperative (reverse code)
- PIC are cordial (reverse code)

DOLPH Outcome Metrics

- 🌳 Violations
- 🌳 Critical violations
- 🌳 Verbal corrections
- 🌳 PIC Thanks RS at conclusion
- 🌳 5 year average of FBO in jurisdiction



RESULTS



Association of LHD structural characteristics with food safety inspection outcomes

Table 1: Association of LHD structural characteristics with food safety inspection outcomes

	Total Inspections % (n)	Violations/ Inspection (mean)	p	Critical violations/ Inspection (mean)	p	Verbal correction/ Inspection (mean)	p	PIC Thank you (mean)	p	FBO 5-year average	p
Jurisdiction size <50k	7.6% (39)	2.05	.002	0.43	.064	0.87	.080	0.91	.004	.20	.000
50-200k	19.8% (102)	4.04		1.42		1.56		0.99		1.66	
200-400k	16.9% (87)	4.01		1.50		1.36		0.94		2.26	
>400k	55.8 (288)	2.73		1.28		1.72		0.87		3.69	
LHD Structure City	23.8% (92)	3.59	.000	1.09	.004	1.00	.000	0.89	.001	3.73	.000
County	42.7% (165)	2.15		0.90		1.88		0.87		3.56	
Combined	33.4% (129)	4.51		1.85		1.15		0.99		1.83	
LHD Budget <mean	57.6 (282)	3.45	.046	1.20	.294	1.33	.006	0.93	.13	1.95	.000
>mean	42.4 (208)	2.76		1.48		1.86		0.89		4.04	
Per capita budget low	35.1% (181)	2.15	.000	.90	.244	1.87	.014	0.88	.011	3.27	.000
medium	29.5% (152)	4.19		1.44		1.46		0.97		1.74	
high	35.5% (183)	3.30		1.28		1.24		0.89		3.41	
LHD FTE low	38.4% (198)	3.59	.067	1.26	.921	1.36	.004	0.99	.002	1.50	.000
medium	32.8% (169)	2.61		1.20		1.95		0.92		3.74	
high	28.9% (149)	3.18		1.33		1.27		0.94		3.52	
RS FTE low	34.1% (176)	3.66	.012	1.32	.928	1.36	.135	0.98	.000	1.58	.000
medium	23.1% (119)	3.52		1.25		1.44		0.92		3.42	
high	42.8% (221)	2.45		1.22		1.76		0.85		3.49	

Structure, violations, critical violations

Violations

- Most in:
 - Larger jurisdiction
 - **Lower RS FTE**
- Fewest in:
 - County LHDs
 - **Lower budget**
 - **Lowest per capita budget**
 - **Most RS FTE**

Critical violations

- Little variation
- More in combined LHDs

Structure, verbal corrections and “Thank You”



Verbal corrections

- Generally inverse with violations
- More in:
 - County LHDs
 - higher budget
 - **lower per capita budget**
 - medium total FTE



Thanks

- Most in
 - medium jurisdictions,
 - Combined LHDs
 - Medium per capita budget
 - **Lowest LHD and RS FTE**



Structure and FBO



Foodborne Outbreaks

- Significantly related to all structural characteristics
- Most in:
 - Large jurisdictions
 - City LHDs
 - **Lower total budget**
- Fewest in:
 - **Medium per capita budget**
 - Lowest LHD and RS FTE



Association of structural LHD characteristics with food safety inspection process

	Check-in time	p	Thoroughness Index (mean)	p	Food Safety Education Incidents (mean)	p	Food Safety Advice Incidents (mean)	p	Effective Checkout (mean)	p	Check-out time	p	
Jurisdiction size	<50k	1.13	.276	24.79	.000	1.53	.657	2.03	.406	5.10	.000	1.94	.035
	50-200k	0.97		37.96		2.07		2.49		4.26		1.72	
	200-400k	1.08		28.59		1.79		2.42		4.88		1.58	
	>400k	1.08		26.63		1.75		2.67		5.92		1.87	
LHD Structure	City	1.08	.006	26.61	.033	2.24	.689	2.36	.443	4.74	.000	1.73	.678
	County	0.92		26.89		1.89		2.28		5.90		1.66	
	Combined	1.04		33.93		2.11		2.64		5.52		1.64	
LHD Budget	<mean	1.15	.000	31.42	.010	1.62	.024	2.51	.720	4.76	.000	1.88	.007
	>mean	0.94		26.12		2.37		2.59		6.12		1.67	
Per capita budget	low	0.93	.000	26.98	.000	2.24	.061	2.36	.355	5.75	.000	1.63	.007
	medium	1.05		36.08		1.94		2.54		4.79		1.85	
	high	1.21		25.64		1.48		2.72		5.40		1.92	
LHD FTE	low	1.05	.000	33.35	.004	1.90	.129	2.36	.268	4.65	.000	1.72	.003
	medium	.91		25.93		2.14		2.54		5.93		1.69	
	high	1.26		27.10		1.46		2.78		5.63		2.02	
RS FTE	low	1.02	.491	33.35	.007	1.78	.262	2.25	.041	4.48	.000	1.75	.004
	medium	1.09		25.22		2.18		2.97		5.94		1.60	
	high	1.08		27.61		1.63		2.54		5.73		1.94	

Structure and Process

Food safety education and advice

- Little variation by structure

Thoroughness

- More in:
 - County LHDs,
 - higher total budget,
 - **lower per capita budget**
 - medium total FTE



Structure and Transitions

- 🌳 Check in and check out time
 - Much variation, less time spent with lower per capita budget and less personnel

- 🌳 Checkout effectiveness
 - Significant variation for all structural variables
 - Best in:
 - small and large jurisdictions
 - County and combined LHDs
 - Low and high per capita budget
 - High total budget and more LHD and RS FTE



Association of structural LHD characteristics with Sanitarians attitudes and behaviors

	Professional Behavior (mean)	p	Negative attitudes about PICs (mean)	p	Negative Pattern of Interaction (mean)	p	Competing Demands (mean)	p	PICQRS (mean)	p
Jurisdiction size <50k	2.18	.071	4.00	.125	0.16	.065	10.00	.000	0.24	.279
50-200k	1.81		4.75		0.62		6.53		0.02	
200-400k	1.66		4.43		0.28		6.06		0.08	
>400k	1.74		4.16		0.55		4.77		0.13	
LHD Structure City	1.99	.015	4.07	.000	0.22	.000	6.68	.000	0.24	.047
County	1.58		3.79		0.79		4.25		0.12	
Combined	1.59		5.09		0.22		5.47		0.02	
LHD Budget <mean	1.91	.002	4.71	.000	0.35	.002	6.84	.000	0.08	.224
>mean	1.58		3.90		0.68		4.09		0.15	
Per capita budget low	1.58	.013	3.67	.000	0.72	.001	4.34	.000	0.11	.885
medium	1.90		5.20		0.52		6.79		0.09	
high	1.89		4.39		0.25		5.94		0.12	
LHD FTE low	1.87	.000	4.71	.000	0.42	.000	6.52	.000	0.06	.393
medium	1.51		3.73		0.83		4.31		0.15	
high	2.05		4.61		0.21		5.87		0.11	
RS FTE low	1.82	.340	4.47	.000	0.46	.005	6.72	.000	0.07	.640
medium	1.93		4.90		0.21		5.28		0.12	
high	1.72		3.89		0.67		4.85		0.13	

Structure and RS Attitudes and behaviors

Professional behavior

- Best in:
 - City LHDs
 - Lower total budget
 - Higher per capita budget
- Worse in:
 - Medium LHD FTE

Competing demands

- Significant variation for all structural variables
- Most in:
 - City LHDs
 - Low total budget
 - Low LHD and RS FTE
- Fewest in:
 - Largest Jurisdictions
 - Low per capita budget



Structure and RS Attitudes and behaviors

Negative attitudes toward PICs

- Most in:
 - Combined LHDs
 - Low total budget
- Fewest in:
 - Low per capita budget
 - Medium LHD FTE
 - High RS FTE

Negative pattern of interaction

- Most in:
 - County LHD
 - High budget
 - Low per capita budget
 - Medium LHD FTE
- Fewest in:
 - Medium RS FTE



Inspection Process Characteristics

Association with Inspection Outcomes

		Violations	p	Critical violations	p	Verbal corrections	p	PIC Thanks*	p	FBO 5 year avg	p
Check in time	none	3.25	.390	1.81	.397	1.88	.350	0.76	.002	3.15	.172
	1 to 4 minutes	3.45		1.39		1.61		0.92		2.90	
	5 to 10 minutes	2.52		0.93		1.24		0.98		2.35	
	More than 10 minutes	2.38		1.13		1.08		1.00		3.13	
Thoroughness	low	1.66	.000	0.51	.000	0.83	.000	0.85	.001	2.84	.167
	medium	3.13		1.34		1.69		0.92		2.90	
	high	5.79		2.63		2.11		0.99		2.50	
Food safety education	low	1.70	.000	0.46	.000	.78	.000	0.91	.556	2.69	.009
	medium	3.49		1.50		1.13		0.89		2.53	
	high	3.90		2.30		2.15		0.92		3.06	
Food safety advice	low	1.06	.000	0.40	.000	0.60	.000	0.91	.588	3.15	.182
	medium	2.38		0.89		1.22		0.90		2.81	
	high	5.02		2.35		2.42		0.93		2.68	
Effective checkout	low	1.78	.000	.46	.000	0.70	.000	.89	.621	2.16	.158
	medium	3.50		1.56		1.71		.92		2.96	
	high	4.08		1.98		2.19		.92		2.62	
Check out time	0 to 4 minutes	2.27	.000	0.92	.003	1.29	.001	0.89	.367	2.75	.409
	5 to 10 minutes	3.58		1.52		1.45		0.91		2.89	
	11 to 20 minutes	4.10		1.65		2.22		0.96		3.32	
	More than 20 minutes	8.43		2.63		2.53		0.95		2.38	

Inspection Process and Outcomes

 More violations, critical violations and verbal corrections all related to more:

- Thoroughness
- Food safety Education
- Food safety advice
- Effective checkout
- Check out time

 Thank You related to more:

- Check in time
- Thoroughness

 FBO related to more:

- Food safety education



Association of Sanitarians attitudes and behaviors with inspection outcomes

	Violations	p	Critical violations	p	Verbal corrections	p	PIC Thanks*	p	FBO 5 year avg	p
Professional Behavior low	3.41	.748	1.66	.233	1.46	.973	0.81	.000	2.94	.800
medium	3.16		1.25		1.51		0.94		2.91	
high	3.55		1.20		1.48		0.97		2.80	
Negative attitudes about PIC low	2.01	.000	0.87	.207	1.54	.072	.96	.002	3.13	.059
medium	3.83		1.37		1.39		.93		3.19	
high	3.21		1.44		1.93		.84		2.71	
Negative Interaction Pattern low	3.19	.199	1.18	.000	1.33	.000	0.92	.235	2.72	.001
medium	4.17		2.58		1.92		0.95		3.53	
high	3.59		2.43		3.36		0.85		3.53	
Competing Demands low	3.52	.004	1.04	.357	1.00	.000	0.87	.049	3.53	.001
medium	3.61		1.40		1.46		0.94		2.83	
high	2.20		1.43		2.06		0.88		2.64	
PICQRS none	3.18	.004	1.30	.027	1.56	.391	0.92	.102	2.83	.010
any	5.64		2.47		2.10		0.82		4.40	

RS attitudes and behaviors and outcomes

- 🌳 Professional behavior related to more thanks
- 🌳 Negative attitudes about PIC related to:
 - More violations
 - Less thanks
- 🌳 Negative pattern of interaction related to more:
 - Critical violation
 - Verbal corrections
 - FBOs
- 🌳 Competing demands related to:
 - Fewer violations
 - More verbal corrections
 - Lower FBO
- 🌳 PIC Questions RS related to more:
 - Violations
 - Critical violations
 - FBO



Limitations

- 🌳 Convenience sample
- 🌳 Preliminary analysis
- 🌳 Complex and interrelated data set
- 🌳 Novel methodology for Public Health requires replication
- 🌳 More analysis ongoing
- 🌳 No measure of number of FSE or number of inspections/jurisdiction
- 🌳 Student observer influence RS actions (reported at 7%)

Strengths

- 🌳 Good inter-rater reliability
- 🌳 Different approach
- 🌳 Detailed data available
- 🌳 Geographic spread
- 🌳 Ability to combine original research with publicly available data
- 🌳 Decreased error variation

The Story (Key Findings)

- 🌳 Its not just what we do that matters, but how we do what we do
- 🌳 Differences in results based on jurisdictional size and LHD type with medium sized jurisdictions and combined LHDs performing best
- 🌳 Apparent inverse relationship between violations and verbal corrections
- 🌳 Less variation in critical violations than violations and verbal corrections
- 🌳 Verbal corrections seem to be used more with lower resources

Key Findings

- 🌳 Difficult to interpret FBO as an outcome
- 🌳 When more violations are present, more education, advice, and check out occur
- 🌳 Competing demands decrease effectiveness
- 🌳 Negative attitudes and behavior are associated with more problems (violations, verbal correction, FBO)
- 🌳 Apparent inverse relationship of the impact of total budget and per capita budget
- 🌳 There are mixed and paradoxical findings related to public health spending, process and outcomes that imply lower resources LHDs struggle to perform effectively, but at times outperform higher resourced programs

Conclusion

- 🌳 High complexity
- 🌳 Structure matters
- 🌳 Process matters
- 🌳 The nature (causal direction) of associations is difficult to discern
- 🌳 Findings should influence policy and workforce development

Questions, Comments?

