Elements of Local Public Health Infrastructure that Correlate with Best Practice Activities

Cloris Chen, MS

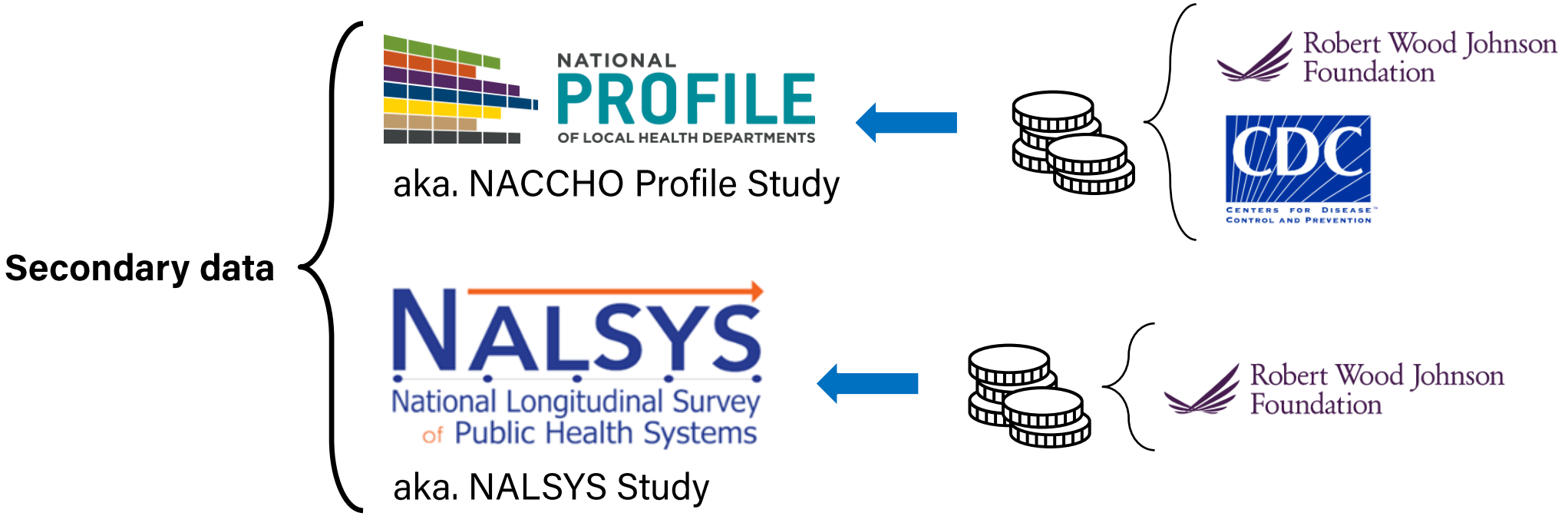
PhD Student in Engineering Education

cloris@purdue.edu

Co-authors: Vicki Simpson, Ph.D., Anju Mallur, Zachary Hass, Ph.D.

PURDUE UNIVERSITY | School of Industrial Engineering

Acknowledgements and Disclosures

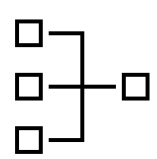


- No financial relationships with the any organizations or commercial interests to disclose
- No funding received for this study
- No conflict of interests to declare

Background

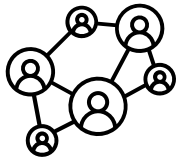
- Public health infrastructure (PHI) is essential to public health and its services. [1]

- The National Association of County and City Health Officials (NACCHO) defines that the local PHI includes [2]



Systems

Competencies



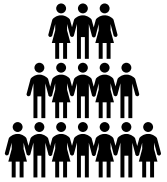
Relationships

Resources

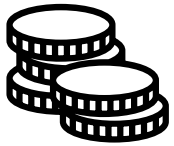
[1] Healthy People 2030, 2020
[2] NACCHO, n.d.

Background

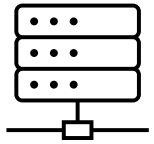
A Resilient and Strong PHI Should Include [1, 3-7]



A Competent & Diverse Public Health Workforce



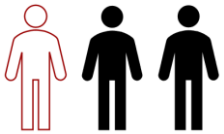
Flexible Public Health Funding & Investment



Usable Public Health Data & Robust Information Systems

[1] Healthy People 2030, 2020
[3] Baker et al., 2005
[4] DeSalvo et al., 2017
[5] Farberman et al., 2020
[6] The Public Health Alliance, 2022
[7] U.S. Census Bureau, 2023

U.S. PHI over the last few decades…



1. Public Health Workforce Has Been Understaffed, Underpaid, and Overworked. [5]

Need at least 80% increase in workforce to provide adequate infrastructure

About 1 in 3 public health professionals are considering leaving. [9]

2. The Public Health Infrastructure Has Been Chronically and Significantly Underfunded.

Overall downward trend for public health funding [5]

LHD's budgets have been reduced by 24% just over the last decade [6]

But at the same time…

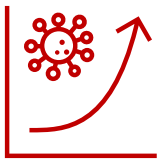
Additional $4.5 billion needed to provide a minimum level public health foundation [10]

U.S. PHI over the last few decades...

3. Public Health Data & Information Systems Have Been Fragmented and Concerning.

Many information systems fail to provide actionable and useful data to support policy decisions. [11]

44% of the LHDs reported that their current data systems are somewhat or very ineffective. [6]



4. LHDs weren't Ready for Crises (e.g. COVID-19 Pandemic) [12]

The pandemic has further exacerbated the existing public health issues and weaken the PHI. [10]

40% of the LHDs indicated the funding they received throughout the pandemic was insufficient. [6]

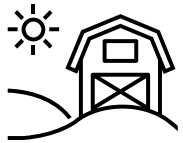
Research Questions

What characteristics of a LHD's infrastructure contribute to completing the best public health practices in the United States?

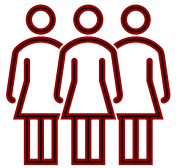
What are the elements of the LHD's infrastructure that **are associated with** the completion of best public health practices in the United States?

Are those associations moderated by **rurality**?

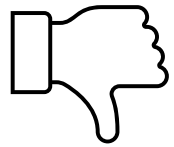
Rural vs. Urban America



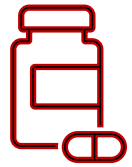
86% land area are rural [13]



15%-20% rural population [13]

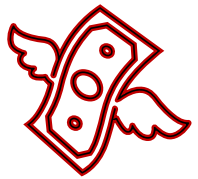


Less funding, partnerships & resources [14-15]



Sicker [14]

Older [14-15]



Poorer [14]

Vulnerable [14]

Rural areas have very different local PHI than what their urban counterparts have.

[13] Health Resources & Services Administration, 2022
[14] National Rural Health Association, 2021
[15] Skoufalos et al., 2017

Method

Data Linking

↓

Data Cleaning

↓

Analytic Dataset (n=660)

- Infrastructure variables (274 variables)
- Best practices (20 variables)

↓

Bivariate Analyses

↓

Multivariable Analyses

NATIONAL PROFILE OF LOCAL HEALTH DEPARTMENTS

NACCHO Profile Study (2019)

NALSYS National Longitudinal Survey of Public Health Systems

NALSYS Survey (2018)

Multivariable Analyses

About 42% infrastructure variables significant to at least one best practices

Significant 189 times in total to the completion of certain best practices

Results

Grouped into six thematic groups

1. Assessment for needs
2. Communication
3. Crisis response
4. Evaluation
5. Implementation
6. Planning

Model	Grouping	Model (cont.)	Grouping (cont.)
1	Assessment for Needs	16	Evaluation
2	Assessment for Needs	17	Evaluation
5	Assessment for Needs	6	Evaluation
7	Communication	10	Implementation
8	Communication	13	Implementation
18	Communication	15	Implementation
19	Communication	20	Implementation
4	Crisis Response	9	Planning
3	Crisis Response	11	Planning
14	Evaluation	12	Planning

Model # = labels for best practices in the analyses

Assessment of Needs

Activities *increased* the chances of indicating the completion of assessment of needs best practice activities:

1. Directly providing certain services

Variable Alias	Model 1	Model 2	Model 5
Epi&Surv M&C Health Directly	3.2*		
Pri Prev Opioids Directly	3.099*		
Env Health Food Sft Edu Directly		3.073*	
B/M Health Directly		2.87*	
Lab Serv Directly			0.411*
Epidemiologist/Statistician	4.306*		4.204*
Lab Worker			2.543*
Oral HC Staff	0.234*		
Strategic Plan (≤ 3 yr)	6.297*	2.748*	
Strategic Plan (3-5 yr ago)	3.714*		
Health Imp Plan (≤ 3 yr)			2.384*
Pri Prev Mental Ill Contracted Out		4.647*	
Insp Sep Sys Contracted Out			0.14*
Env Health Air Polu NA			0.119*
Env Health Rad Cont NA			6.546*
Pol/Adv Mental Health			3.092*
Pol/Adv Oral Health	9.757*		
Budget Increased		1.794*	
Schl Clinic via Others			2.534*

Table 1 Odd's Ratios for Significant Infrastructure Variables in Needs Assessment Models

Model 1 = community needs assessment.
Model 2 = survey of the population for behavioral risk assessment
Model 5 = analysis of health priorities, adequacy of health resources, and most impacted population groups

Positive correlation

Negative correlation

Assessment of Needs

Activities *increased* the chances of indicating the completion of assessment of needs best practice activities:

1. Directly providing certain services
2. Employing certain staff

Variable Alias	Model 1	Model 2	Model 5
Epi&Surv M&C Health Directly	3.2*		
Pri Prev Opioids Directly	3.099*		
Env Health Food Sft Edu Directly		3.073*	
B/M Health Directly		2.87*	
Lab Serv Directly			0.411*
Epidemiologist/Statistician	4.306*		4.204*
Lab Worker			2.543*
Oral HC Staff	0.234*		
Strategic Plan (≤ 3 yr)	6.297*	2.748*	
Strategic Plan (3-5 yr ago)	3.714*		
Health Imp Plan (≤ 3 yr)			2.384*
Pri Prev Mental Ill Contracted Out		4.647*	
Insp Sep Sys Contracted Out			0.14*
Env Health Air Polu NA			0.119*
Env Health Rad Cont NA			6.546*
Pol/Adv Mental Health			3.092*
Pol/Adv Oral Health	9.757*		
Budget Increased		1.794*	
Schl Clinic via Others			2.534*

Table 1 Odd's Ratios for Significant Infrastructure Variables in Needs Assessment Models

Model 1 = community needs assessment.
Model 2 = survey of the population for behavioral risk assessment
Model 5 = analysis of health priorities, adequacy of health resources, and most impacted population groups

Positive correlation

Negative correlation

Assessment of Needs

Activities *increased* the chances of indicating the completion of assessment of needs best practice activities:

1. Directly providing certain services
2. Employing certain staff
3. Developing an agency-wide strategy and community health improvement plans

Variable Alias	Model 1	Model 2	Model 5
Epi&Surv M&C Health Directly	3.2*		
Pri Prev Opioids Directly	3.099*		
Env Health Food Sft Edu Directly		3.073*	
B/M Health Directly		2.87*	
Lab Serv Directly			0.411*
Epidemiologist/Statistician	4.306*		4.204*
Lab Worker			2.543*
Oral HC Staff	0.234*		
Strategic Plan (≤ 3 yr)	6.297*	2.748*	
Strategic Plan (3-5 yr ago)	3.714*		
Health Imp Plan (≤ 3 yr)			2.384*
Pri Prev Mental Ill Contracted Out		4.647*	
Insp Sep Sys Contracted Out			0.14*
Env Health Air Polu NA			0.119*
Env Health Rad Cont NA			6.546*
Pol/Adv Mental Health			3.092*
Pol/Adv Oral Health	9.757*		
Budget Increased		1.794*	
Schl Clinic via Others			2.534*

Model 1 = community needs assessment.
Model 2 = survey of the population for behavioral risk assessment
Model 5 = analysis of health priorities, adequacy of health resources, and most impacted population groups

Positive correlation

Negative correlation

Table 1 Odd's Ratios for Significant Infrastructure Variables in Needs Assessment Models

Assessment of Needs

Activities *increased* the chances of indicating the completion of assessment of needs best practice activities:

1. Directly providing certain services
2. Employing certain staff
3. Developing an agency-wide strategy and community health improvement plans
4. Actively involved in policy/advocacy activities

Variable Alias	Model 1	Model 2	Model 5
Epi&Surv M&C Health Directly	3.2*		
Pri Prev Opioids Directly	3.099*		
Env Health Food Sft Edu Directly		3.073*	
B/M Health Directly		2.87*	
Lab Serv Directly			0.411*
Epidemiologist/Statistician	4.306*		4.204*
Lab Worker			2.543*
Oral HC Staff	0.234*		
Strategic Plan (≤ 3 yr)	6.297*	2.748*	
Strategic Plan (3-5 yr ago)	3.714*		
Health Imp Plan (≤ 3 yr)			2.384*
Pri Prev Mental Ill Contracted Out		4.647*	
Insp Sep Sys Contracted Out			0.14*
Env Health Air Polu NA			0.119*
Env Health Rad Cont NA			6.546*
Pol/Adv Mental Health			3.092*
Pol/Adv Oral Health	9.757*		
Budget Increased		1.794*	
Schl Clinic via Others			2.534*

Model 1 = community needs assessment.
Model 2 = survey of the population for behavioral risk assessment
Model 5 = analysis of health priorities, adequacy of health resources, and most impacted population groups

Positive correlation

Negative correlation

Table 1 Odd's Ratios for Significant Infrastructure Variables in Needs Assessment Models

Communication

Activities *decreased* the chances of indicating the completion of communication best practice activities:

1. Contracting out certain activities
2. Providing certain activities through other organizations in the community
3. Vacant staff positions

Variable Alias	Model 7	Model 8	Model 18	Model 19
Serv Obe Prev	2.466*			2.393*
Env Health Haz Resp NA		0.072*	0.125*	
Env Health Food Sft Edu Directly		0.274*		
Epi&Surv CD Directly	2.466*			
Epi&Surv C/I Disease Directly			5.094*	
Pri Prev CD Directly			2.463*	
Pri Prev CD via Others		0.183*		
Pol/Adv Obe/Phys Act			1.855*	
Pol/Adv Housing		3.702*		
Pol/Adv Fund Local PH		2.229*		
Screening Diabetes Directly		2.031*		
Insp Sep Sys Contracted Out			0.203*	
Ani Cont NA				0.082*
Epidemiologist/Statistician			0.446*	
Pub Info Professional			2.423*	
Oral HC Staff				7.011*
# Hired		1.008*		
# Vacant FTEs		0.974*		

Model 7 = network of communication that includes health organizations, media, and general public.
Model 8 = efforts to inform public officials about health impacts of decisions under their consideration.
Model 18 = public informed about current health status, health care needs, health behaviors, and health policy issues.
Model 19 = media given regular reports on health issues affecting the community.

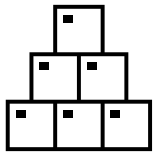
Positive correlation

Negative correlation

Table 2 Odd's Ratios for Significant Infrastructure Variables in Communication Models

Findings

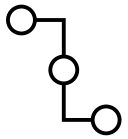
Different types of services or activities and how they are provided by the LHDs contribute differently to completing the best practices.



Some elements of infrastructure are more frequently associated with the completion of best practices than others.

Several types of elements are strongly and positively associated with completing most of the 20 best practices.

Limitations

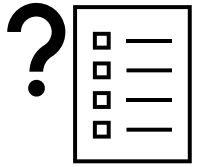


Causal relationships between variables potentially distorted

- Infrastructure variables collected after best practice variables

May contain inaccurate data

- Most likely from one person at each LHD
- Relied on one person's knowledge



Under-coverage in dataset

- Not all LHDs responded to both surveys
- May not be representative

References

1. Healthy People 2030. (2020). *Public Health Infrastructure*. https://health.gov/healthypeople/objectives-and-data/browse-objectives/public-health-infrastructure

2. NACCHO. (n.d.). *Public Health Infrastructure and Systems*. Retrieved January 16, 2023, from https://www.naccho.org/programs/public-health-infrastructure

3. Baker, E. L., Potter, M. A., Jones, D. L., Mercer, S. L., Cioffi, J. P., Green, L. W., Halverson, P. K., Lichtveld, M. Y., & Fleming, D. W. (2005). The public health infrastructure and our nation's health. *Annual Review of Public Health*, *26*, 303–318. https://doi.org/10.1146/annurev.publhealth.26.021304.144647

4. DeSalvo, K. B., Claire Wang, Y., Harris, A., Auerbach, J., Koo, D., & O'Carroll, P. (2017). Public health 3.0: A call to action for public health to meet the challenges of the 21st century. *Preventing Chronic Disease*, *14*(9). https://doi.org/10.5888/pcd14.170017

5. Farberman, R. K., Lieberman, D. A., Delgado, D., Thomas, C., Senior, J. D., Cunningham, J., Mcintyre, K., Becker, L., Horton, K., Research, J. D., Seiler, N., Dwyer, G., Vanecek, A., Karacuschansky, A., Ostrom, A., Christopher, G., Fleming, D., Harris, R. T., Gibson, S. M., … Gracia, C. J. N. (2020). *The Impact of Chronic Underfunding on America's Public Health System*. https://www.tfah.org/wp-content/uploads/2020/04/TFAH2020PublicHealthFunding.pdf

6. The Public Health Alliance. (2022). *Supporting Communities and Local Public Health Departments During COVID-19 and Beyond* (Issue July).

7. U.S. Census Bureau. (2023, January). *National Poverty in America Awareness Month: January 2023*. https://www.census.gov/newsroom/stories/poverty-awareness-month.html

References (Cont.)

8. de Beaumont Foundation. (2021). *Staffing Up: Workforce Levels Needed to Provide Basic Public Health Services for All Americans* (Issue October). https://phnci.org/uploads/resource-files/Staffing-Up-Research-Brief.pdf

9. de Beaumont Foundation. (2022). *The Impact of the COVID-19 Pandemic: Rising Stress and Burnout in Public Health* (Issue March). https://debeaumont.org/wp-content/uploads/dlm_uploads/2022/03/Stress-and-Burnout-Brief_final.pdf

10. Maani, N., & Galea, S. (2020). COVID-19 and Underinvestment in the Public Health Infrastructure of the United States. *The Milbank Quarterly*, *98*(2), 250–259. https://doi.org/10.1111/1468-0009.12463

11. Indiana Department of Health. (2022). *Indiana Governor's Public Health Commission Report*. https://www.in.gov/health/files/GPHC-Report-FINAL-2022-08-01_corrected.pdf

12. Spinner, T. (2020). *NACCHO Highlights Needed Supports for Local Health Department Response to COVID-19*. NACCHO. https://www.naccho.org/blog/articles/naccho-highlights-needed-supports-for-local-health-department-response-to-covid-19

13. Health Resources & Services Administration. (2022, March). *Defining Rural Population*. https://www.hrsa.gov/rural-health/about-us/what-is-rural

14. National Rural Health Association. (2021). *NRHA 2021 Advocacy*.

15. Skoufalos, A., Clarke, J. L., Ellis, D. R., Shephard, V. L., & Rula, E. Y. (2017). Rural Aging in America: Proceedings of the 2017 Connectivity Summit. *Population Health Management*. https://doi.org/10.1016/B978-0-323-48552-4.00002-0

THANK YOU!