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National Coordinating Center
Systems and Services Research to Build a Culture of Health

Comprehensiveness in the Delivery Systems for Population Health Activities: Longitudinal Variation

Research In Progress Webinar

Wednesday, April 12, 2017 *12:00-1:00pm ET/ 9:00-10:00am PT*

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College of Public Health
Center for Public Health Systems and Services Research

Agenda

Welcome: **Cezar B. Mamaril, PhD,** Research Assistant Professor, University of Kentucky College of Public Health

Comprehensiveness in the Delivery Systems for Population Health Activities: Longitudinal Variation

Presenter:

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Commentary:

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Questions and Discussion

Presenter

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Comprehensiveness in the Delivery Systems for Population Health Activities: Longitudinal Variation

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Systems for Action National Program Office
University of Kentucky College of Public Health

S4A Research in Progress Webinar Series • 12 April 2017

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Objectives

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- To examine the trajectories of public health system capital over time, and identify how institutional and community correlates may affect their shape.

- Use data collected through a national longitudinal survey of local public health agencies serving communities with at least 100,000 residents to identify and examine the various pathways by which public health delivery systems in the U.S. change over time.

Background

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- National Longitudinal Survey of Public Health Systems (NLSPHS)

- Cohort of 360 communities with at least 100,000 residents surveyed in 1998, 2006, 2012, 2014, and 2016

Local public health officials report:

- **Scope**: availability of 20 recommended core population health activities
- **Network**: organization contribution to each activity
- **Centrality of effort**: contributed by the governmental public health agency
- **Quality:** perceived effectiveness of each activity

Implementation of population health activities, 1998-2016

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	Activity	1998	2016	% Change
Assessment	1. Conduct periodic assessment of community health status and needs	71.5%	89.2%	24.8%
	2. Survey community for behavioral risk factors	45.8%	70.2%	53.3%
	3. Investigate adverse health events, outbreaks and hazards	98.6%	99.7%	1.1%
	4. Conduct laboratory testing to identify health hazards and risks	96.3%	96.4%	0.1%
	5. Analyze data on community health status and health determinants	61.3%	75.8%	23.7%
	6. Analyze data on preventive services use	28.4%	36.7%	29.2%
Policy/Planning	7. Routinely provide community health information to elected officials	80.9%	86.6%	7.0%
	8. Routinely provide community health information to the public	75.4%	83.7%	11.0%
	9. Routinely provide community health information to the media	75.2%	86.5%	15.0%
	10. Prioritize community health needs	66.1%	83.4%	26.2%
	11. Engage community stakeholders in health improvement planning	41.5%	65.8%	58.6%
	12. Develop a community-wide health improvement plan	81.9%	84.9%	3.7%
	13. Identify and allocate resources based on community health plan	26.2%	47.1%	79.8%
	14. Develop policies to address priorities in community health plan	48.6%	65.6%	35.0%
	15. Maintain a communication network among health-related organizations	78.8%	84.0%	6.6%
Assurance	16. Link people to needed health and social services	75.6%	50.0%	-33.9%
	17. Implement legally mandated public health activities	91.4%	92.7%	1.4%
	18. Evaluate health programs and services in the community	34.7%	41.7%	20.2%
	19. Evaluate local public health agency capacity and performance	56.3%	53.0%	-5.9%
	20. Monitor and improve implementation of health programs and policies	47.3%	52.9%	11.8%
	Mean performance of assessment activities (#1-6)	67.0%	78.0%	16.4%
	Mean performance of policy and planning activities (#7-15)	63.8%	76.4%	19.7%
	Mean performance of implementation and assurance activities (#16-20)	61.1%	58.1%	-4.9%
	Mean performance of all activities	64.1%	72.3%	12.8%

Public Health Systems Configurations

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Type of system

- **Comprehensive system capital**
  - A broad scope of recommended population health activities (>75%) supported through dense networks of contributing organizations and sectors

- **Conventional system capital**
  - A moderate scope of recommended population health activities (50%-75%) implemented through lower-density networks of contributing organizations and sectors

- **Limited system capital**
  - A narrow scope of recommended population health activities (<50%) implemented through lower-density networks of contributing organizations and sectors

Variation in Public Health System Configurations Over Time

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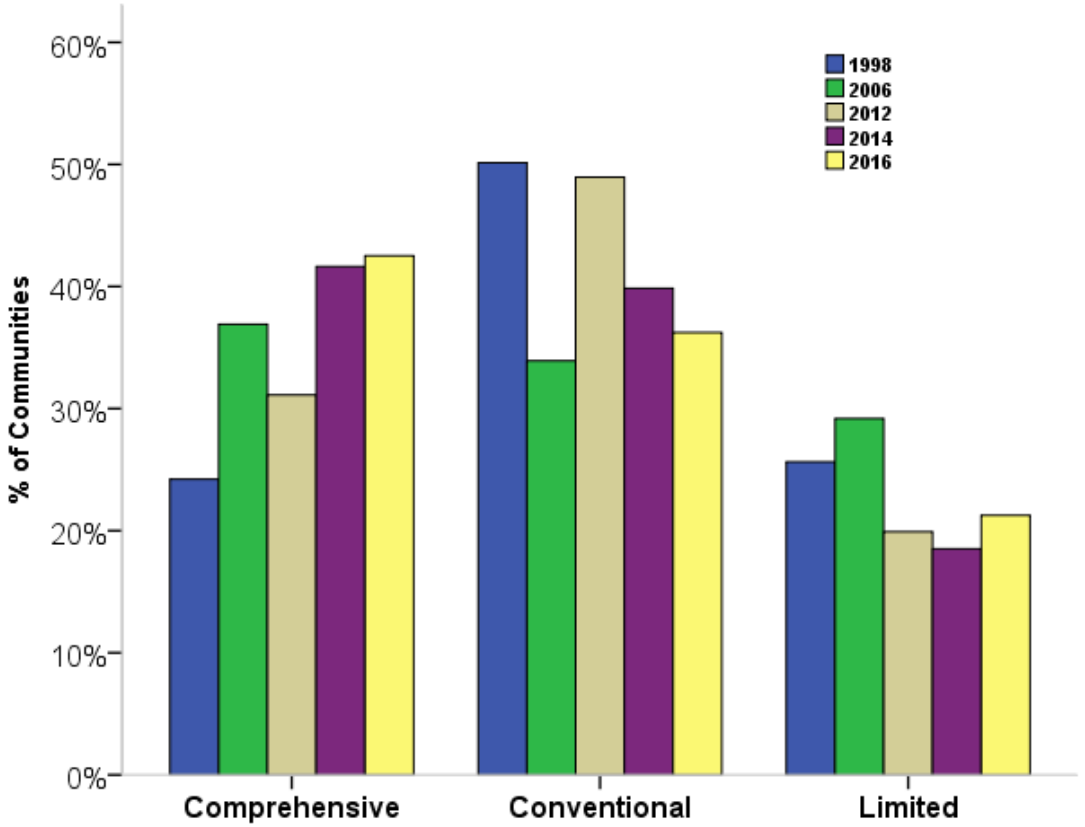
Systems frequently migrated from one configuration to another over time, with an overall trend toward offering a broader scope of services and engaging a wider range of organizations (Mays et al. 2016).



Questions of Interest

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1. What are the trajectories followed by public health delivery systems over time?
   - What are the sequence patterns of the individual trajectories?
   - How can we compare and classify these sequence patterns?

2. Once the classes of sequence patterns are identified, what characteristics of the community influence pathways by which public health delivery systems in the U.S. change over time?

Analytical Strategy

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- Sequence analysis will be used to describe and compare the trajectories followed by the public health delivery systems over time.

- The trajectories will be classified based on whether they show upward or downward slopes to identify the pathways by which public health delivery systems in the U.S. change over time

- A multinomial logistic model will be estimated to identify how institutional and community correlates are associated with the pathways

Sample used

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- Data collected through a national longitudinal survey of local public health agencies serving communities with at least 100,000 residents for 2012, 2014, and 2016

- Sample restricted to 143 communities with at least 100,000 residents that have complete information (no missing data) for 2012, 2014, and 2016.

- Data linkages (in progress for 2016):
  - Information on local public health agency and system (National Association of County and City Health Officials Profile Survey)
  - Community characteristics (Census and Area Health Resource File)

Sequence Analysis

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- Sequence analysis is a technique used to analyze categorical time series in order to obtain classes of individual trajectories.

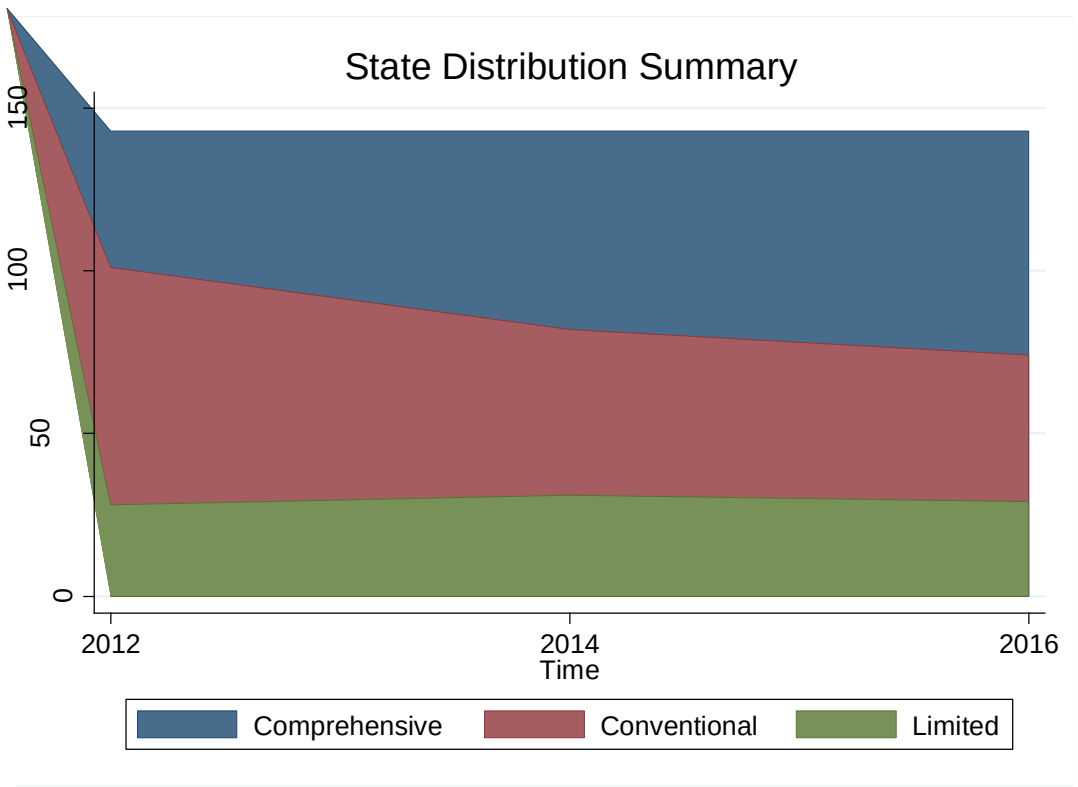
- Sequence analysis arise in biology, where DNA sequences constitute the basic foundation of life, and the social sciences, where researchers investigate life courses, marital histories, and employment profiles (Abbott, 1995; Billari and Piccarreta, 2005; Elzinga, 2006).

- Sequence analysis is a non-parametric method to process sequence data, sequences being defined as series of states or events in the trajectories of statistical individuals.

- Sequence analysis includes tools to compare sequences, to cluster them, and to extract prototypical sequences.

Examples of State Sequence

- Sequences are time series with categorical data. The following three states are observed during the 3 years:
  - CP Comprehensive public health systems
  - CV Conventional public health systems
  - LM Limited public health systems



Pathways Identified

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- 27 specific sequences and individual trajectories are identified in the sample. Some examples are:
  - CP-CP-CP, LM-CV-CP, CV-CV-CV, LM-LM-CV, and LM-LM_LM

- Six Classes of trajectories :
  - (1) Stable comprehensive
  - (2) Increasing to comprehensive
  - (3) Decreasing to conventional
  - (4) Stable conventional
  - (5) Increasing to conventional
  - (6) Limited

Classification of Sequences

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Sequence Pattern	Stable comprehensive	Increasing to comprehensive	Decreasing to conventional	Stable conventional	Increasing to conventional	Limited	Total
CP-CP-CP	21						21
CV-CP-CP		17					17
CV-CV-CP		7					7
LM-LM-CP		6					6
CV-LM-CP		6					6
LM-CP-CP		4					4
LM-CV-CP		3					3
CP-LM-CP		3					3
CP-CV-CP		2					2
CP-CV-CV			4				4
CV-CP-CV			3				3
CP-LM-CV			3				3
CP-CP-CV			2				2
CV-CV-CV				21			21
LM-CV-CV					5		5
CV-LM-CV					3		3
LM-LM-CV					2		2
LM-CP-CV					2		2
CV-CV-LM						7	7
CV-CP-LM						5	5
CV-LM-LM						4	4
CP-CP-LM						4	4
LM-CP-LM						3	3
CP-LM-LM						2	2
LM-CV-LM						1	1
CP-CV-LM						1	1
LM-LM-LM						2	2
Total	21	48	12	21	12	29	143

The Multinomial logit Model

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- The dependent variable is a categorical variables representing the six pathways identified before.

- The model is:

$$\eta_{ij} = log\frac{\pi_{ij}}{\pi_{iJ}} = \alpha_j + x_i'\beta_j$$

where α_j is a constant, β_j is vector of regression coefficients, for j=1,2,…,J-1, and X is a series of covariates which include:

- Expenditures per capita in 2012 and change in expenditures per capita between 2012 and 2016
- Proportion of non-white in 2012 and change in proportion of non-white between 2012 and 2016
- Unemployment rates in 2012 and change in unemployment rates between 2012 and 2016
- Per capita income in 2012 and change in per capita income between 2012 and 2016
- Insurance rates in 2012 and change in insurance rates between 2012 and 2016
- Physicians per capita in 2012 and change in physicians per capita between 2012 and 2016
- Have a local board of health in 2012

Preliminary Bivariate Results

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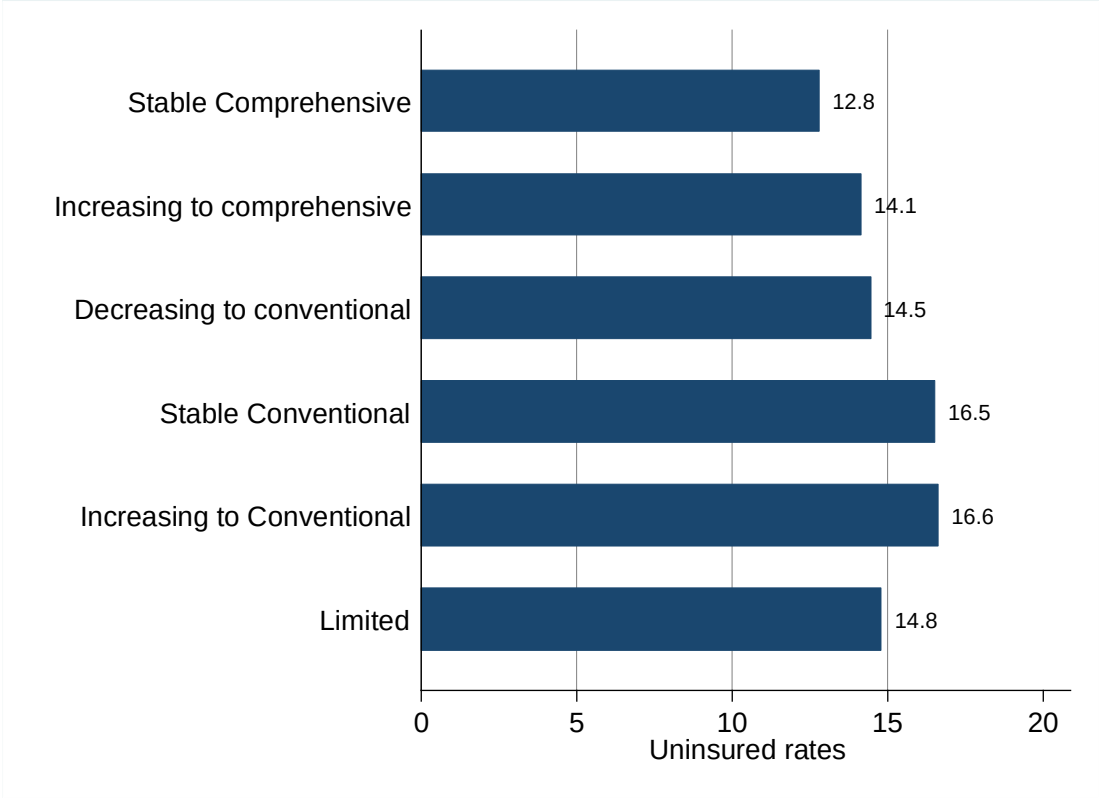
- Communities with public health systems identified as either stable comprehensive or increasing towards comprehensive are more likely to have:
  - Higher per capita public health expenditures
  - A local board of health
  - Lower uninsured rates



Next Steps

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- Focus on the three typologies as an ordinal variable and develop a model for ordinal longitudinal data

- Use a Markov chain transition model to evaluate changes between time points.
  - For example, a first-order Markov model in which Y_t is assumed to depend on the state at t-1, but not on responses in earlier occasions.

- Two advantages: use the full sample of the 360 communities with at least 100,000 residents and include the rural communities.

Some Preliminary Conclusions

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- These findings support the evidence of an overall trend toward offering a broader scope of services and engaging a wider range of organizations.
  - 21 communities remain stable over time, 48 communities show upward trend toward comprehensive and 12 other ones show upward trend toward conventional.

- A closer look at the stable comprehensive public health system and the examination of factors that allow them to remain stable over time can lead to strategies that may help other public health systems deliver a more comprehensive set of population health services in a more effective manner.

Limitations

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- Reduced sample: Only 143 communities with complete information are included in most part of the study
- Self-reported survey may not reflect all relevant activities and contributing organizations in the community
- Data on concentration, value, and quality of the population health delivery services were not collected from the NLSPHS survey

Commentary

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Questions and Discussion

Webinar Archives

http://systemsforaction.org/research-progress-webinars

Upcoming Webinars

Thursday, April 20, 1-2pm ET/ 10-11am PT

Integration of Health Care and Public Health to Improve HIV Early Detection and Control

Deborah Porterfield. MD, MPH, and Christine A. Bevc, PhD, MA, RTI International and UNC Chapel Hill School of Public Health

Wednesday, May 3, 12-1pm ET/ 9-10am PT

Implementation and Diffusion of the New York City Macroscope Electronic Health Record Surveillance System

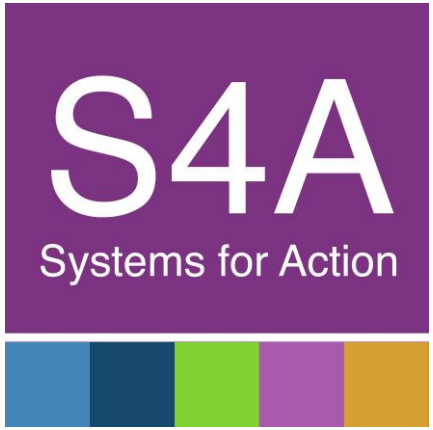
Katharine (Tina) McVeigh, PhD, MPH, New York City Department of Health and Mental Hygiene

Thursday, April 20, 1-2pm ET/ 10-11am PT

Cross-Jurisdictional Resource Sharing and the Scope and Quality of Public Health Services

Justeen Hyde, PhD, Investigator, VA Center for Healthcare Organization & Implementation Research and Debbie Humphries, PhD, MPH, Clinical Instructor in Epidemiology, Yale School of Public Health; a Public Health PBRN DIRECTIVE Project

Thank you for participating in today's webinar!



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For more information about the webinars, contact:

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Acknowledgements

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Speaker Bios

Dominique Zéphyr, MA, provides analytical and statistical expertise to the Systems for Action National Program Office intramural research activities, in the areas of survey sampling, analysis of complex sample survey data, multi-level modeling, structural equation modeling, and analysis of experimental and non-experimental data. He completed his graduate studies at Vanderbilt University, where he obtained two Master's degrees in Economics and Latin American Studies.

Philip Huang, MD, MPH, has served as the Medical Director and Health Authority for Austin Public Health since April 2008. He formerly served as Medical Director for Chronic Disease Prevention at the Texas Department of State Health Services for more than 15 years. Dr. Huang served two years as an Epidemic Intelligence Service (EIS) officer with the Centers for Disease Control and Prevention assigned to the Illinois Department of Public Health where he conducted infectious disease outbreak investigations and epidemiologic studies in chronic disease. He is an author or co-author of numerous publications related to public health, chronic disease, and tobacco use prevention, and is Board Certified in Family Medicine.