

REGENSTRIEF CENTER
FOR HEALTHCARE ENGINEERING

Applying the principles of
Engineering, Management & Science
to improving Healthcare delivery.

Impact of Federal Bioterrorism Funding on Local Health Department Preparedness Activities:

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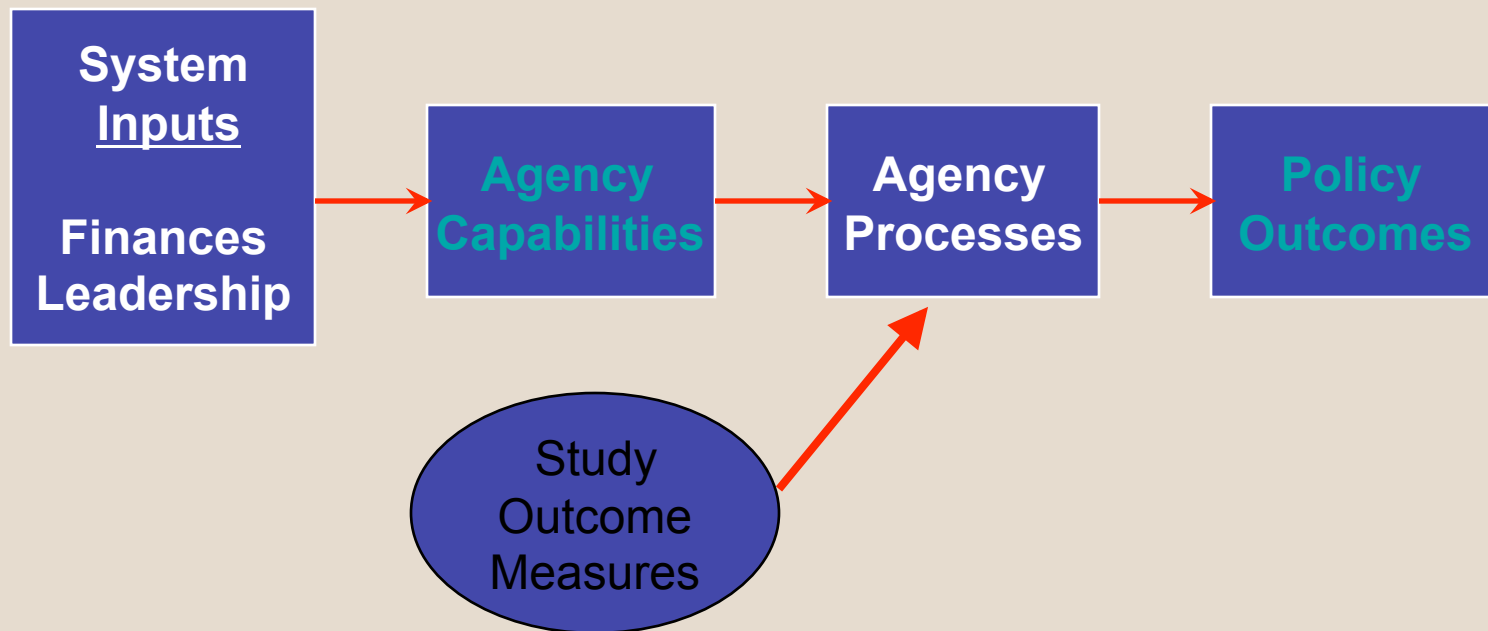
Discovery Park

PURDUE
UNIVERSITY

Problem

- Over \$5 Billion dollars allocated to state and local health departments for preparedness activities since 9/11
- What is the impact of this funding?
- Is it resulting in preparedness activities at the local level?

Model



Handler A, Issel M, Turnock B. Conceptual Framework to Measure Performance of the Public Health System. *American Journal of Public Health* 2001;91(8):1235-1239.

Study Design

- 2005 NACCHO Survey of Local Health Departments
- Assess impact of CDC and HRSA BT funds on FTEs hired, EP Coordinator, LHD-run syndromic surveillance systems, 5 preparedness activities
- Assessed endogeneity of EP Coordinator in predicting outcome measures with Hausman test, results not statistically significant, but remains a concern theoretically.
- Simultaneous Bivariate PROBIT and Two-step Probit/OLS estimation (NLOGIT 4.0) to control for this.
- Presence of a PH Lab, Epidemiologist used as instruments
- No endogeneity in model predicting EP Coordinator via Hausman test

Employment of Emergency Preparedness Coordinator

Variable	Coefficient
<i>Constant</i>	-4.061
Population Served	
<i>% Caucasian</i>	0.014
% Hispanic	0.005
Resources	
<i>Log10(Population)</i>	0.480
<i>Log10(Per Capita Budget)</i>	0.567
Percent from Local Appropriations	0.004
Percent from State direct sources	0.005
<i>CDC Bioterrorism funds (\$100K)</i>	0.304
HRSA Bioterrorism funds (\$100K)	0.018
Leadership and Management	
Local Board of Health	-0.052
Part of State Agency	0.230
Full Time Director	-0.004
Director Tenure	-0.009
Director - Public Health Degree?	-0.090
Director - Medical Degree?	-0.007
Director - Nursing Degree?	-0.006
Other Factors	
<i>Employs Epidemiologist?</i>	0.880
Experienced Actual PH Emergency?	-0.065
State Preparedness Scale	-0.026

Probit

Log Likelihood = -375.16

PPV= 0.882

NPV= 0.722

Strong Direct AND
Indirect Impact

Staff Hired

Variable	Direct Effects		Indirect Effects		Total Effects	
	Coefficient	Sig	Coefficient	Sig	Coefficient	Sig
Constant	-2.462	0.091	-2.4126	0.006		
% Caucasian	-0.003	0.627	0.007	0.908	0.004	0.944
% Hispanic	0.032	<0.001	0.003	0.968	0.035	0.586
<i>Log10(Population)</i>	<i>0.561</i>	<i>0.036</i>	0.252	0.131	0.813	0.010
<i>Log10(Per Capita Budget)</i>	<i>-0.499</i>	<i>0.095</i>	<i>0.297</i>	<i>0.090</i>	-0.202	0.559
Percent from Local Appropriations	-0.005	0.216	0.002	0.976	-0.003	0.956
Percent from State direct sources	-0.0007	0.892	0.0029	0.963	0.0022	0.972
CDC Bioterrorism funds (\$100K)	0.428	<0.001	0.159	0.023	0.587	<0.001
HRSA Bioterrorism funds (\$100K)	-0.093	0.002	0.009	0.857	-0.084	0.162
Local Board of Health	0.133	0.523	-0.027	0.820	0.106	0.659
Part of State Agency	-0.107	0.662	0.120	0.392	0.013	0.962
Full Time Director	0.026	0.926	-0.0002	0.999	0.026	0.933
Director Tenure	0.001	0.896	-0.005	0.939	-0.003	0.958
Director - Public Health Degree?	-0.124	0.541	-0.047	0.710	-0.171	0.475
Director - Medical Degree?	0.263	0.233	-0.003	0.969	0.260	0.275
Director - Nursing Degree?	0.252	0.180	-0.003	0.949	0.248	0.198
Employs Emergency Preparedness Coordinator?	2.258	0.002				
Employs Epidemiologist?			0.460	0.032		
Experienced Actual PH Emergency?	0.195	0.229	-0.034	0.725	0.161	0.394
Has Public Health Laboratory?			0.077	0.349		
State Preparedness Scale	0.016	0.805	-0.014	0.832	0.002	0.981
λ	-1.096	0.0156				
N	769					
R-Square	0.868					

Overall Preparedness Activity

Variable	Direct Effects		Indirect Effects		Total Effects	
	Coefficient	Sig	Coefficient	Sig	Coefficient	Sig
Constant	0.441	0.509	-0.468	0.219		
% Caucasian	0.007	0.008	0.001	0.908	0.008	0.500
% Hispanic	0.003	0.412	0.0005	0.968	0.004	0.779
Log10(Population)	0.234	0.043	0.049	0.285	0.283	0.023
Log10(Per Capita Budget)	0.327	0.015	0.058	0.259	0.385	0.008
Percent from Local Appropriations	0.001	0.573	0.0004	0.976	0.001	0.909
Percent from State direct sources	0.004	0.059	0.0006	0.963	0.005	0.683
CDC Bioterrorism funds (\$100K)	-0.005	0.578	0.031	0.208	0.026	0.317
HRSA Bioterrorism funds (\$100K)	0.003	0.816	0.002	0.858	0.005	0.770
Local Board of Health	0.142	0.158	-0.005	0.822	0.137	0.185
Part of State Agency	-0.363	<0.001	0.023	0.456	-0.340	0.002
Full Time Director	0.773	<0.001	-0.0004	0.999	0.773	<0.001
Director Tenure	0.007	0.153	-0.001	0.939	0.006	0.636
Director - Public Health Degree?	-0.009	0.927	-0.009	0.710	-0.018	0.857
Director - Medical Degree?	0.020	0.853	-0.0007	0.969	0.019	0.859
Director - Nursing Degree?	0.200	0.027	-0.0006	0.949	0.200	0.028
Employs Emergency Preparedness Coordinator?	0.885	<0.001				
Employs Epidemiologist?			0.089	0.217		
Experienced Actual PH Emergency?	0.412	<0.001	-0.007	0.731	0.405	<0.001
Has Public Health Laboratory?			0.015	0.426		
State Preparedness Scale	-0.018	0.556	-0.003	0.834	-0.020	0.533
λ	-0.213	0.200				
N	777					
R-Square	0.318					

- ***No direct impact*** from CDC, HRSA preparedness funds
- ***Strong indirect impact*** from having a preparedness coordinator
- Problem with scale is low reliability – Cronbach's $\alpha < 0.5$
- Take a look at individual activities

Prepared or Reviewed a Written Emergency Plan

Variable	Index Preparedness	
	Coefficient	Sig
Constant	-0.042	0.982
% Caucasian	-0.002	0.740
% Hispanic	0.008	0.642
Log10(Population)	0.091	0.765
Log10(Per Capita Budget)	-0.105	0.698
Percent from Local Appropriations	-0.001	0.748
Percent from State direct sources	-0.003	0.748
CDC Bioterrorism funds (\$100K)	-0.043	0.537
HRSA Bioterrorism funds (\$100K)	0.085	0.816
Local Board of Health	0.149	0.556
Part of State Agency	-0.633	0.065
Full Time Director	0.425	0.019
Director Tenure	0.005	0.688
Director - Public Health Degree?	-0.026	0.948
Director - Medical Degree?	-0.064	0.712
Director - Nursing Degree?	0.080	0.677
Employs Emergency Preparedness Coordinator?	2.028	<0.001
Experienced Actual PH Emergency?	0.295	0.084
State Preparedness Scale	-0.018	0.890

Probit

N = 777

Log Likelihood = -530.996

$\rho = -0.944 (<0.001)$

No direct effects

Very strong impact

From hiring

EP Coordinator

Part. In Drills and Exercises

<i>Variable</i>	<i>Coefficient</i>	<i>Sig</i>
Population Served		
% Caucasian	0.008	0.206
% Hispanic	-0.002	0.908
Log10(Population)	0.725	0.018
Log10(Per Capita Budget)	0.696	0.024
Percent from Local Appropriations	-0.003	0.117
Percent from State direct sources	0.004	0.627
CDC Bioterrorism funds (\$100K)	0.523	0.204
HRSA Bioterrorism funds (\$100K)	1.216	0.787
Local Board of Health	-0.234	0.428
Part of State Agency	-0.667	0.107
Full Time Director	0.345	0.329
Director Tenure	0.007	0.460
Director - Public Health Degree?	-0.099	0.825
Director - Medical Degree?	-0.289	0.384
Director - Nursing Degree?	0.189	0.581
Employs Emergency Preparedness Coordinator?	-0.262	0.768
Experienced Actual PH Emergency?	0.276	0.263
State Preparedness Scale	-0.020	0.892

Probit

N = 777

Log Likelihood = -523.902

$\rho = -0.437 (0.397)$

No direct or
indirect effects

Reviewed Legal Authority

Variable	Index Preparedness	
	Coefficient	Sig
Constant	-2.504	0.016
% Caucasian	0.006	0.633
% Hispanic	0.006	0.417
Log10(Population)	0.069	0.633
Log10(Per Capita Budget)	0.184	0.366
Percent from Local Appropriations	0.005	0.210
Percent from State direct sources	0.004	0.410
CDC Bioterrorism funds (\$100K)	0.059	0.177
HRSA Bioterrorism funds (\$100K)	0.010	0.916
Local Board of Health	0.177	0.167
<i>Part of State Agency</i>	<i>-0.509</i>	<i>0.001</i>
<i>Full Time Director</i>	<i>0.699</i>	<i>0.002</i>
Director Tenure	-0.005	0.342
Director - Public Health Degree?	0.066	0.651
Director - Medical Degree?	-0.038	0.806
Director - Nursing Degree?	0.126	0.176
<i>Employs Emergency Preparedness Coordinator?</i>	<i>1.123</i>	<i>0.003</i>
<i>Experienced Actual PH Emergency?</i>	<i>0.528</i>	<i><0.001</i>
State Preparedness Scale	0.033	0.632

Probit

N = 777

Log Likelihood = -751.513

$\rho = -0.370$ (0.200)

No direct effects

Very strong impact

From hiring

EP Coordinator

Assessed Staff EP Competency

Variable	Coefficient	Sig
% Caucasian	-1.359	0.166
% Hispanic	0.004	0.554
Log10(Population)	0.0007	0.860
Log10(Per Capita Budget)	0.103	0.484
Percent from Local Appropriations	0.137	0.326
Percent from State direct sources	0.0002	0.928
CDC Bioterrorism funds (\$100K)	0.003	0.262
HRSA Bioterrorism funds (\$100K)	-0.005	0.753
Local Board of Health	0.003	0.892
Part of State Agency	0.047	0.826
Full Time Director	-0.014	0.942
Director Tenure	0.304	0.061
Director - Public Health Degree?	0.011	0.128
Director - Medical Degree?	-0.084	0.652
Director - Nursing Degree?	-0.173	0.418
Employs Emergency Preparedness Coordinator?	0.130	0.092
Experienced Actual PH Emergency?	0.813	0.060
<i>State Preparedness Scale</i>	<i>0.519</i>	<i><0.001</i>

Probit

N = 777

Log Likelihood = -792.23

$\rho = -0.257 (0.341)$

No direct or
indirect effects

Staff EP Training

Variable	Coefficient	Sig
% Caucasian	-4.019	0.084
% Hispanic	0.005	0.437
Log10(Population)	0.006	0.660
Log10(Per Capita Budget)	0.565	0.292
Percent from Local Appropriations	0.502	0.205
Percent from State direct sources	0.001	0.763
CDC Bioterrorism funds (\$100K)	0.005	0.434
HRSA Bioterrorism funds (\$100K)	0.352	0.158
Local Board of Health	1.057	0.786
Part of State Agency	0.353	0.105
Full Time Director	-0.015	0.949
Director Tenure	0.567	0.018
Director - Public Health Degree?	0.023	0.007
Director - Medical Degree?	0.013	0.957
Director - Nursing Degree?	0.283	0.226
Employs Emergency Preparedness Coordinator?	0.812	<0.001
Experienced Actual PH Emergency?	0.737	0.602
State Preparedness Scale	0.447	0.010

Probit

N = 777

Log Likelihood = -751.513

$\rho = -0.370$ (0.200)

No direct effect
81% increased
probability if you have
An EP coordinator

Local-run Syndromic Surveillance

<i>Variable</i>	<i>Coefficient</i>	<i>Sig</i>
% Caucasian	-0.259	0.793
% Hispanic	0.004	0.273
Log10(Population)	0.003	0.615
Log10(Per Capita Budget)	-0.259	0.162
Percent from Local Appropriations	-0.232	0.217
Percent from State direct sources	-0.004	0.101
<i>CDC Bioterrorism funds (\$100K)</i>	<i>-0.009</i>	<i>0.007</i>
HRSA Bioterrorism funds (\$100K)	0.031	0.078
Local Board of Health	0.021	0.581
Part of State Agency	-0.154	0.388
Full Time Director	-0.021	0.911
Director Tenure	0.366	0.089
Director - Public Health Degree?	-0.0008	0.908
Director - Medical Degree?	0.042	0.688
Director - Nursing Degree?	0.318	0.068
Employs Emergency Preparedness Coordinator?	0.145	0.207
<i>Experienced Actual PH Emergency?</i>	<i>1.254</i>	<i><0.001</i>
<i>State Preparedness Scale</i>	<i>0.548</i>	<i><0.001</i>

Probit

N = 777

Log Likelihood = -751.513

r = -0.370 (0.200)

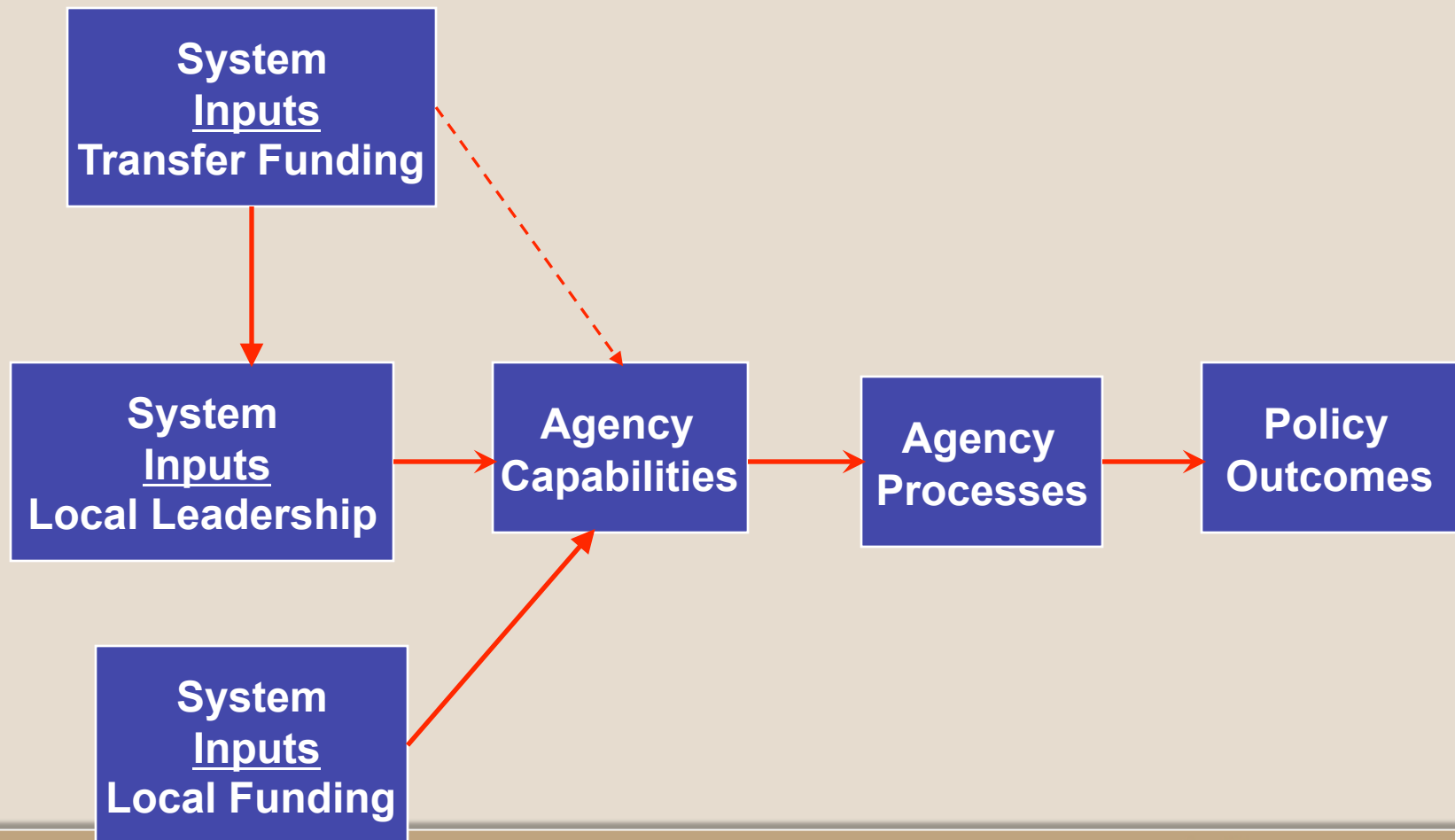
Small, but ***adverse***
impact from
CDC funding!

~1% ***less likely*** to have per
\$1 million in CDC BT funds

Summary

- Federal funds have no significant *direct* impact on local preparedness activities *except* for a positive effect on review of legal emergency powers
- *Leadership* (FT Director, EP Coordinator, or Epidemiologist) is primarily responsible for preparedness activities
- Federal BT funds have an *indirect* effect on preparedness activities through increasing hiring of EP staff

Revised Model



Conclusion

- Federal funds do spur preparedness activities, but the mechanism is indirect, through encouraging the development of leadership resources
- This suggests that future federal transfer programs to improve public health should include efforts to develop local public health leadership
- Lesson from **Joint Urban Warrior** exercise – you can only do what the indigenous government wants done
- This also raises the question for further research regarding whether federal preparedness funds have spin-off effects in improving overall public health system

Variable	Service												
	EMERG	IMM	SCREEN	EPI	CDT	MCH	REG	EHS	PREV	FOOD	WATER	CHA	HIP
Population Served													
% Caucasian													
% Hispanic							P			P			
Budget													
Log10(Population)			P		P	P						P	P
Log10(Per Capita Budget)		P	P	P	P	P			P			P	P
CDC Bioterrorism funds (\$100K)					N					N	N		
HRSA Bioterrorism funds (\$100K)					P					P	P		
Percent from Local Appropriations					N	N		P					
Percent from State direct sources													
Percent from Patient Sources													
Percent from Regulatory Fees	N	N	N		N	N	P	P	N		P	N	N
Leadership and Management													
Local Board of Health		P	P				P	P	P	P	P		
Part of State Agency	N	P						N					
Full Time Director	P				N							P	
Director Tenure							P						
Director - Public Health Degree?							P						
Director - Medical Degree?								N			N		
Director - Nursing Degree?		P					N	N		N	N		
Other Factors													
Employs Emergency Preparedness Coordinator?	P			P	P								
Experienced Actual PH Emergency?	P			P	P	P		P	P		P		P
State Preparedness Score													

Direct impact of CDC program on LHD programs appears negative or non-existent

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