

Scan of CDC Legal Epidemiology Articles, 2011-2015

PUBLIC HEALTH LAW RESEARCH:
Making the Case for Laws that Improve Health



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Scan of CDC Legal Epidemiology Articles, 2011-2015

Report of the
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Temple University Beasley School of Law

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Summary

Law is a significant factor in public health, and an important tool government can use for protecting and promoting well-being. Legal risks and interventions can only be properly understood through epidemiological and evaluation research. “Legal epidemiology,” the scientific study of law as a factor in the cause, distribution, and prevention of disease in a population, is funded and conducted by the Centers for Disease Control and Prevention (CDC), but the level of work and its distribution across the agency has not been assessed.

The EndNote library maintained for Science Clips (publications by CDC authors) was searched by CDC librarians for journal articles published by CDC staff from January 2011 to May 2015. A team at the Public Health Law Research program reviewed and coded the abstracts to produce data on key features of the articles. The Public Health Law Research program identified 225 articles in the realm of legal epidemiology, comprised of 158 scientific evaluations and 67 commentaries or other forms of non-empirical legal scholarship.

Most of the scientific studies concerned the use and impact of law as a deliberate tool of intervention. Only 13 of the empirical studies addressed the legal infrastructure of public health (powers, duties and organization of health agencies) and, despite the recognized importance of structural factors on population health, only three scientific studies addressed the incidental or unintended effects of non-health laws.

CDC scientific legal studies encompassed policy making, implementation, and impact. Literature reviews and studies scientifically mapping the characteristics and geographic distribution of law made up a quarter of all the empirical publications. Studies addressed a wide range of laws at the international, national, state, local and organizational levels. The scan did not assess the quality or rigor of the research, but did observe that only a minority of the legal epidemiology included a legally-trained co-author.

CDC’s scientific legal work was published in a total of 83 different journals. The three most frequent publishers were *Preventing Chronic Disease* (14 publications), *Journal of Public Health Management Practice* (10 publications) and *MMWR – Morbidity and Mortality Weekly Report* (9 publications).

CDC researchers make a substantial contribution to the emerging field of legal epidemiology, in both scientific research and commentary on law and its applications in public health. Results of the scan can be used to identify opportunities for the agency to better support research, professional development, networking and publication in this emerging field.

Introduction

Law is a significant factor in public health, and an important tool government can use for protecting and promoting well-being.(1, 2) Law *can* be so important to health, but research is needed to identify when and how law matters. “Legal epidemiology” is the scientific study of law as a factor in the cause, distribution, and prevention of disease in a population.(3) There is a long and rich tradition of robust legal evaluation in U.S public health,(4) although overall more and better public health law research is needed.(5, 6) As an organization committed to the use of critical science to inform prevention and control, CDC plays a leading role in funding and conducting research to monitor and evaluate health threats and interventions, including legal ones. In this paper, we describe the results of a scan of law-related scientific studies and commentaries written by CDC staff from 2011 to 2015.

The scan shows that most CDC offices, centers and divisions are contributing to the field of legal epidemiology. Most research publications addressed law as an intervention. There was far less research on the legal infrastructure of public health and its effects. Likewise, the widespread recognition of the importance of law as a structural factor in population health, and the corresponding attention given to Health in All Policies approaches, was not reflected in this sample, which contained only three studies of non-health laws having unintended or incidental health effects. Studies encompassed a wide range of laws at the international, national, state, local and organizational levels. The scan did not assess the quality or rigor of the research, but did observe that only a minority of the legal epidemiology included a legally-trained co-author. Results of the scan can be used to identify opportunities for the agency to better support research, professional development, networking and publication in this emerging field.

Methods

The EndNote library maintained for Science Clips (publications by CDC authors) was searched by CDC librarians for journal articles published by CDC staff from 2011 to May 2015. Articles are selected for inclusion in Science Clips through searches of subject databases (MEDLINE, Embase, Global Health, Scopus, Engineering Village, CINAHL). Some NIOSH-authored articles are included via self-submission. Search terms included: “law* or legislat* or policy or policies,” “regulation,” “regulatory,” and “legal.” A total of 1,017 records were retrieved. These were provided to the authors in an EndNote library. Six of these publications were administrative regulations published in the Federal Register, not journal publications. These were excluded from the study, leaving 1,011 records for coding.

Two coders reviewed all abstracts, discussing coding discrepancies until consensus was achieved. In ambiguous cases, the article itself was retrieved to complete the classification. Records were included in the final sample of articles if they met the definitions of “public health law research” or “legal scholarship.” Public health law research (PHLR) is defined as “the scientific study of the relation of law and legal practices to population health.”(7) Legal scholarship encompasses commentaries, editorials or research papers that describe or analyze laws or legal issues but do not report on or review data produced through an explicit scientific process.(6) Seven hundred eighty-six studies that had no legal epidemiology content (*i.e.*, were

neither PHLR nor legal scholarship) were excluded.¹ All included articles were coded according to topic. (See Table A1 for a list of topics.)

Records classified as PHLR were further coded for domain of public health law and study type, based on classifications developed by Burris et al.(6) A coding scheme was developed based on concepts defined by the Public Health Law Research program. (See Tables 1-2)

Table 1: Domains of Public Health Law

Code	Definition
Interventional public health	Law or legal practices that are intended to influence health outcomes or mediators directly.
Infrastructural public health law	Laws establishing the powers, duties, and institutions of public health.
Incidental public health law	Laws or legal practices that influence health but do not have an intended or apparent health purpose.

Table 2: Study Type

Study Type	Definition
Policymaking studies	Studies that identify factors influencing the likelihood that public health laws will be adopted, the nature of laws adopted, and the process through which they are adopted.
Mapping Studies	Studies that analyze the state of the law or the legal terrain and the application of laws surrounding a particular public health topic.
Implementation Studies	Studies that examine how and to what extent the ‘law on the books’ is implemented and enforced through legal practices.
Intervention Studies	Studies that assess the effect of a legal intervention on health outcomes or mediating factors that influence health outcomes.
Mechanism Studies	Studies that examine the specific mechanisms through which the law affects environments, behaviors, or health outcomes.
Reviews	Studies that use accepted scientific synthesis methods to describe and integrate a body of literature concerning the implementation or impact of law on health.

Further analyses of included articles were conducted by a single researcher. The CDC unit of authorship was provided in most records, though with varying specificity. The researcher recorded the most specific unit mentioned within a hierarchical organizational segment, based on a published CDC organizational chart.² (For example, a study that was linked to the Division of Global HIV/AIDS within the Center for Global Health was attributed to the Division of Global

¹ Such studies were usually retrieved in the Science Clips searches because the abstracts referred to policy or legislation as a background or contextual factor, or discussed “policy implications” of non-legal research. The fact that the majority of articles returned using basic legal terms were not actually legal epidemiology points to the need for the development of standard terms in the MeSH system or at CDC to accurately tag legal epidemiology studies for easier retrieval.

² Available at http://www.cdc.gov/maso/pdf/CDC_detailed.pdf. The CDC organizational chart has changed to a small degree from 2011 to 2015; some units had undergone slight name changes, which are not noted in this report.

HIV/AIDS.) Multiple attributions to hierarchically unrelated CDC units were recorded for each unrelated unit at the most specific level.

The professional credentials of the authors were determined by viewing the published article. Credentials were available in only some articles. The denominator for all professional credential statistics is the number of articles reporting credentials for the sample or subsample of included records. Coders did not attempt to identify which authors were affiliated with CDC.

The jurisdictional level of the law being studied was determined from the abstract or, if unclear, the published article. Legal scholarship (8) and PHLR studies were coded according to whether they addressed international law, national law in the United States, national law outside of the United States, state law, local law, and organizational policies. Organizational policies included private policies of institutions such as hospitals as well as school district policies. Articles could address laws at multiple levels.

Mapping studies were categorized by method of collecting data (survey, legal research, and other). The researcher also noted in each category whether reproducible methods were described and if a link to the legal data was provided.

Reviews were categorized into reviews produced under the auspices of the Community Guide to Preventive Services, other types of systematic reviews, and narrative reviews.

Results

We identified 225 articles in the realm of legal epidemiology published by CDC authors from January 1, 2011 to May 2015. PHLR studies accounted for 158 of these, while 67 were legal scholarship. (See Table 3.) The number of articles increased over all four years included in the study, though there was substantial year-to-year variation. The annual changes were in the same direction and proportionally similar between PHLR and legal scholarship, with the exception of 2014, which saw a sharp rise in PHLR studies.

Table 3: CDC Legal Epidemiology Publications, 2011-May, 2015

Year	# Legal Epidemiology	# PHLR	# Legal Scholarship
2015	22	14	8
2014	76	61	15
2013	36	26	10
2012	58	37	21
2011	33	20	13
Total	225	158	67

Table 4 displays the breakdown of PHLR studies according to the domain of public health law. Burris et al. have distinguished between PHLR that evaluates deliberate legal health interventions (“interventional PHLR”), research that studies the impact of law on the design and functioning of health systems (“infrastructural PHLR”), and research that explores the health effects of laws and legal practices that are not primarily designed to influence health.(6) These distinctions reflect important differences in historical patterns of attention and funding to legal

epidemiology. The evaluation of legal interventions has a long and important history, and remains the most well-understood and accepted area of research in legal epidemiology.(4) Recognition of the importance of law as an element of public health infrastructure and practice has been slower to crystalize, but has been growing in acceptance.(5, 9) Incidental PHLR represents the frontier of legal epidemiology, where it is addressing issues like the unintended consequences of social policies,(10) the health impact of general social policies,(11) and the role of law as a force within a social determinants of health model.(12)

Table 4: Domain of Public Health Law Research

Year	#PHLR	# Interventional	# Infrastructural	# Incidental
2015	14	11	3	0
2014	61	56	5	0
2013	26	23	2	1
2012	37	34	2	1
2011	20	18	1	1
Total	158	142 (90%)	13 (8%)	3 (2%)

The CDC publications conform to the general trends. Interventional PHLR dominates, accounting for 90 percent of studies. Infrastructural PHLR appears to be increasing in frequency, but remains a small part of total output. Six of the infrastructural studies examined organizational/structural components and their operation or effects.(13-18) Others looked at the mechanisms of impact or change within the system, such as accreditation and incentives.(19-21) System outcomes and outputs were also studied.(22-24) The incidental PHLR studies addressed side effects of medical liability,(25) possible health effects of community redevelopment,(26) and school discipline policies.(27)

The domains of PHLR are based on the attributes of the law being studied. PHLR articles were also classified by the type of study. “Intervention studies” assess the effect of a specific legal intervention (of any PHLR type) on health outcomes or mediating factors that influence health outcomes. “Implementation studies” examine how and to what extent the ‘law on the books’ is implemented and enforced through legal practices. Implementation and intervention studies made up most of the PHLR articles, amounting to 56 percent of the PHLR catalogue. “Policymaking studies,” which examine the adoption of laws, and “mapping studies,” which analyze the state of the law or the legal terrain and the application of laws surrounding a particular public health topic, were also well-represented. “Reviews” made up the smallest portion of previously identified study types, with a small set of other study types including modeling, methods, health impact assessments, and economic analysis. No “mechanism studies” were identified in the sample.

Table 5: PHLR Study Type

Year	PHLR	Policymaking	Mapping	Implementation	Intervention	Review	Other
2015	14	1	1	4	3	4	1 (Methods)
2014	61	6	9	14	22	7	2 (Modeling) 1 (Methods)
2013	26	4	4	8	8	1	1 (Economic Analysis)
2012	37	4	4	8	8	1	1 (Methods)
2011	20	7	5	9	12	3	1 (HIA)
Total	158	22 (14%)	23 (15%)	43 (25%)	53 (31%)	16 (10%)	7 (4%)

Both PHLR and legal scholarship articles were classified by the health topic addressed. (Complete tables of the breakdown of PHLR and legal scholarship by topic and year are reported in the appendix in Tables A2 and A3.) Among PHLR articles, the most researched topics were infectious disease prevention and control; alcohol, tobacco, and other drugs (ATOD); nutrition and weight status; injury and violence prevention; chronic disease; and health services. Legal scholarship articles also focused significantly on infectious disease and prevention; other leading topics were occupational health and safety and environmental health.

Table 6 shows the breakdown of study type by topic for all topics that had ten or more PHLR articles in the sample. Infectious disease prevention and control accounts for nearly half of all the studies. There are further clumps within that topic: all but one of the 11 mapping studies concern either HIV or immunization law, as did 11 of the 16 Implementation studies. Intervention studies within this topic were more diverse, including studies of directly-observed therapy and contact investigation policies for tuberculosis,(28, 29) Ebola quarantine,(30) expedited partner therapy(25, 31), and food safety rules.(32) Similarly, all but two of the 13 intervention studies in ATOD focused on the impact of tobacco control policies. The other two addressed the perennial PHLR topic of road injury and alcohol,(33) and the rapidly emerging policy challenge of reducing opioid overdose.(34)

Table 6: PHLR Health Topic by Study Type (Topics with ≥ 10 Studies)

	Policymaking	Mapping	Implementation	Intervention	Review	Other
Alcohol, Tobacco, and Other Drugs (ATOD)	3	1	2	13	5	0
Chronic Disease	3	1	0	3	0	3
Health Services	1	3	3	3	0	0
Infectious Disease Prevention and Control	4	11	16	11	3	1
Injury and Violence Prevention	1	1	4	5	1	
Nutrition and Weight Status	3	2	4	4	1	2

PHLR articles spanned a range of levels of a law. Most studies were of US state, federal, or local law. Two focused on international law and 19 examined national law outside of the US. Notably, 10 percent of studies concerned policies at the organizational level, including schools,(27) hospitals,(35) and businesses.(36) Many of these studies were about the policies of schools or child care centers, and focused on nutrition and weight status or physical activity. Also striking, almost half of all PHLR articles about local law were concerned with laws in New York City. Overall, intervention and implementation studies predominated, but, as would be expected in a federal system, mapping studies were an important feature of state-level work. Intervention studies also made up a large proportion of articles studying state law, which is again consistent with the role of states as primary health regulators – and policy innovators. Twelve percent of studies examined law at multiple levels, often seeking to understand legal impacts at the national, state, and local levels in the US.

Table 7: PHLR Study Type by Level of Law Assessed*

Study Type	International Law	National Law		State Law	Local Law	Org Policy	Multiple Levels
		US	Non-US				
Policymaking	0	3	1	4	6	1	7
Mapping	0	1	4	13	0	6	0
Implementation	1	12	8	9	6	4	0
Intervention	0	11	6	18	7	4	3
Reviews	0	2	0	4	0	1	9
Other	1	1	0	1	2	0	0
TOTAL	2 (1%)	30 (19%)	19 (12%)	49 (32%)	21 (14%)	16 (10%)	19 (12%)

*N= 156; level of law was not identifiable in two modeling studies.

A total of 87 PHLR articles identified at least one CDC unit as a source of the work. Seven articles identified multiple Offices, Centers, or Divisions that were hierarchically unrelated, for a total of 97 attributions. At least one PHLR article was attributed to 36 Offices, Centers, or Divisions. In legal scholarship, 32 identified at least one CDC unit as the source, with one article noting both the Division on Smoking and Health and the Division of Reproductive Health as sources, for a total of 33 attributions. Twenty-one Offices, Centers, or Divisions were identified as sources of legal scholarship articles. The complete results are reported in Table A4.

Table 8 reports PHLR and legal scholarship aggregated at the Center and Office level. A total of 14 Offices or Centers were identified as a source of PHLR articles; legal scholarship was attributed to 11. The range of PHLR attributions among those reporting any was one to 25, with a median of six. The range of legal scholarship attributions among those reporting any was one to seven, with a median of three. (Units with no attributions are excluded from the calculation of the median and range.)

Table 8: PHLR and Legal Scholarship by CDC Office and Center

CDC Organizational Chart	PHLR	Legal Scholarship
Center for Global Health	8	3
National Institute for Occupational Safety and Health	8	5
Office of Minority Health and Health Equity		1
Office of the Associate Director for Science	1	
Office of Public Health Preparedness	1	
Office for State, Tribal, Local and Territorial Support	4	3
National Center for Health Statistics	4	1
Center for Surveillance, Epidemiology and Laboratory Services	1	
National Center on Birth Defects and Developmental Disabilities	1	
National Center for Chronic Disease Prevention and Health Promotion	25	7
National Center for Environmental Health/Agency for Toxic Substances and Disease Registry	6	4
National Center for Injury Prevention and Control	8	2
National Center for Immunization and Respiratory Diseases	9	4
National Center for Emerging and Zoonotic Infectious Diseases	6	2
National Center for HIV/AIDS, Viral Hepatitis, STD and TB Prevention	15	1
Total	97	33
Range	1-25	1-7
Median	6	3

Table 9 lists the Offices and Centers with PHLR attributions above and below the median.

Table 9: Units with Any Attributions

≥ 6 PHLR Articles	<6 PHLR Articles
Center for Global Health	Office of the Associate Director for Science
National Institute for Occupational Safety and Health	Office of Public Health Preparedness
National Center for Chronic Disease Prevention and Health Promotion	Office for State, Tribal, Local and Territorial Support
National Center for Injury Prevention and Control	National Center for Health Statistics
National Center for Immunization and Respiratory Diseases	Center for Surveillance, Epidemiology and Laboratory Services
National Center for HIV/AIDS, Viral Hepatitis, STD and TB Prevention	National Center on Birth Defects and Developmental Disabilities
National Center for Environmental Health/Agency for Toxic Substances and Disease Registry	
National Center for Emerging and Zoonotic Infectious Diseases	

The professional disciplines of authors is an indicator of both interdisciplinarity and the role of lawyers in CDC scientific research. The professional degrees of authors were listed in 78 of the 158 PHLR studies. (See Table 10.) Among these, 14 (18 percent) had at least one author with a law degree. Mapping studies, which require collection and analysis of legal information, had the highest proportion of JD authors, but even in this category more than half of the studies did not have JDs on the author team.

Table 10: PHLR Articles with a JD Author

Study Type	Author Degrees Listed	JD Author	Study Type %
Policymaking	11	1	9%
Mapping	15	7	47%
Implementation	18	1	6%
Intervention	22	3	14%
Reviews	9	2	22%
Other	3	0	0%
Total	78	14	

A more detailed examination of the mapping studies shows more about when JDs are included in study teams. Methodological research suggests that primary legal research in standard legal databases (rather than surveys of officials or scans of websites) is the most reliable means of determining the gathering state statutes and regulations.(37, 38) As Table 11 shows, more than three-fourths of the mapping studies identified did not use primary legal research; however,

most of these studies were surveys used to obtain organizational policies or non-US national laws or policies not contained in standard databases of laws and regulations. In the studies in which lawyers were authors, all used primary legal research, including one that supplemented legal research with a survey to gather policies not included in the legal sources.(15) Reproducible methods were consistently provided in articles relying on primary legal research. Links to the legal data, recommended in a Delphi study of standards for policy surveillance,(39) were generally not provided.

Table 11: Features and Authors of Mapping Studies

Study Type and Elements	#	Author degrees listed	JD author
Survey	12	5	2
<i>Reproducible methods described</i>	1		
<i>Link to legal data provided</i>	0		
Legal research	7	7	6
<i>Reproducible methods described</i>	5		
<i>Link to legal data provided</i>	2		
Other	6	4	0
<i>Reproducible methods described</i>	2		
<i>Link to legal data provided</i>	1		
Total	25*	16*	8*

*Sums include one study that used both survey and legal research methods.

There were a total of 16 reviews of PHLR, covering a wide range of topics. Of these, two were completed under the auspices of the Community Guide. There were four other systematic reviews. The remaining ten were narrative reviews. See Table 12. Table A5 provides details on topics, levels of law, and JD authorship.

Table 12: PHLR reviews by category

Type of Review	Amount
Community Guide	2
Other Systematic Review	4
Narrative	10

CDC's PHLR work product in this sample was published in a total of 83 different journals. The three most frequent publishers were *Preventing Chronic Disease* (14 publications), *Journal of Public Health Management Practice* (ten publications) and *MMWR -- Morbidity and Mortality Weekly Report* (nine publications). The mean number of publications per journal publishing any PHLR was just under two. Table 13 lists all publications publishing two or more PHLR articles in the sample. A complete list is provided in Table A6.

Table 13: Journals Publishing Two or More PHLR Articles

Journals with ≥ 2 PHLR Articles	
Accident Analysis and Prevention	
American Journal of Infection Control	
American Journal of Preventative Medicine	
American Journal of Public Health	
Annals of Epidemiology	
Child Abuse and Neglect	
Emerging Infectious Disease Journal	
Health Affairs (Millwood)	
Health Promotion Practice	
International Journal of Tuberculosis and Lung Disease	
Journal of Adolescent Health	
Journal of Environmental Health	
Journal of the International AIDS Society	
Journal of Public Health Management Practice	
Journal of School Health	
Journal of School Nursing	
MMWR Mortality Weekly Report	
Nicotine and Tobacco Research	
PLoS One	
Preventing Chronic Disease	
Public Health Reports	
Sexually Transmitted Diseases	
Vaccine	
Zoonoses and Public Health	
Total	24

Legal scholarship articles were published in 47 journals, with the number of articles published per journal ranging from one to seven. The most frequent publishers were the *Journal of Law, Medicine, and Ethics* (seven publications), *Journal of Public Health Management and Practice* (three publications) and *Preventing Chronic Disease* (three publications). The mean number of articles published by an individual journal was roughly 1.5 with a total of 13 journals publishing two or more articles of legal scholarship. Table 14 lists all publications that published two or more legal scholarship articles in this sample. A complete list is provided in Table A7.

Table 14: Journals Publishing Two or More Legal Scholarship Articles

Journals with ≥ 2 Legal Scholarship Articles	
African Journal of Midwifery and Women's Health	
American Journal of Preventative Medicine	
American Journal of Public Health	
Clinical Infectious Diseases	
Disaster Medicine and Public Health Preparedness	
Global Health Promotion	
Industrial Health	
Journal of Law, Medicine and Ethics	
Journal of Medical Toxicology	
Journal of Public Health Management and Practice	
The Lancet	
Preventing Chronic Disease	
Vaccine	
Total	13

Discussion

This scan was not designed to assess the rigor or significance of CDC's legal epidemiology work product. Nor was it intended to assess a gap between "needs" for PHLR or legal scholarship and CDC's output. The scan shows that production of legal epidemiological research goes on in most CDC units and spans a wide range of the health topic areas in which CDC works. There appears to be a trend towards more legal epidemiology publications, but the inclusion of only the first four months of 2015 in this scan makes it impossible to confirm here. The chronic difficulty in identifying PHLR and legal scholarship could be addressed by developing standard key words or MeSH terms for the field, the adoption of which CDC could support and encourage. CDC's legal epidemiology research in this sample was focused on interventional public health law. In spite of CDC's role in providing guidance and technical assistance to state, local, and tribal health agencies, there is far less research on the legal infrastructure of public health and its effects. Likewise, the widespread recognition of the importance of law as a structural factor in population health, and the corresponding attention given to Health in All Policies approaches, are not reflected in this sample, which contained only three studies of incidental public health law.

Nearly a third of PHLR studies (46 total) focused on infectious disease and prevention policies. A quarter of these (11 total) studied the impact of either policies on the international level or national law outside of the US. The vast majority of US-based studies (at the national, state, local, and organizational levels) focused on influenza, while most studies conducted abroad focused on tuberculosis and/or HIV/AIDS. ATOD also represented a significant portion of PHLR study topics. Most of these studies were conducted at the state level and evaluated the impact of a policy intervention on particular health outcomes.

On the other hand, the topics given little or no public health law attention were also important in CDC work and amenable to legal intervention. The following topics were studied fewer than five times since 2011: disabilities; food safety; health policymaking; maternal, infant, and child

health; mental health; preparedness; and social determinants of health. Hearing, health communication, LGBT health, and oral health were not the focus or primary focus of any studies in the sample.

Legally credentialed authors are not typically included on research teams, despite the interdisciplinary quality of CDC's staff and work. Even in mapping studies, which require the skills for which lawyers are trained, lawyers are authors on less than half the studies for which author credentials were provided. (We cannot, of course, generalize from this subsample to CDC legal epidemiology overall, nor does this scan capture the full range of products CDC produces that may be created with lawyer staff assistance.)

Conclusions

CDC researchers make a substantial contribution to the emerging field of legal epidemiology, in both scientific research and commentary on law and its applications in public health. A deliberate effort to support shared methods and tools, especially in the area of legal mapping, would contribute to more accessible and useful products. The development and use of standard keywords for work in legal epidemiology would facilitate monitoring and evaluation of CDC work in this field.

References

1. Frieden TR. Government's role in protecting health and safety. *N Engl J Med* 2013;368(20):1857-9.
2. Frieden TR. A Framework for Public Health Action: The Health Impact Pyramid. *Am J Public Health* 2010;100(4):590-595.
3. Burris S, Ashe M, Levin D, Penn M, Larkin M. A Transdisciplinary Approach to Public Health Law: The Emerging Practice of Legal Epidemiology. *Ann Rev Pub Health In Press*;37.
4. Burris S, Anderson E. Legal Regulation of Health-Related Behavior: A Half Century of Public Health Law Research. *Annual Review of Law and Social Science* 2013;9(1):95-117.
5. Ibrahim JK, Burris S, Hays S. Public Health Law Research: Exploring Law in Public Health Systems. *Journal of Public Health Management and Practice* 2012;18(6):499-505
6. Burris S, Wagenaar AC, Swanson J, Ibrahim JK, Wood J, Mello MM. Making the case for laws that improve health: a framework for public health law research. *Milbank Q* 2010;88(2):169-210.
7. Wagenaar A, Burris S, editors. *Public Health Law Research: Theory and Methods*. San Francisco: Joseph Wiley and Sons; 2013.
8. Maiorana A, Kegeles S, Fernandez P, Salazar X, Caceres C, Sandoval C, et al. Implementation and evaluation of an HIV/STD intervention in Peru. *Evaluation and Program Planning* 2007;30:82-93.
9. Burris S, Mays GP, Douglas Scutchfield F, Ibrahim JK. Moving from intersection to integration: public health law research and public health systems and services research. *Milbank Q* 2012;90(2):375-408.
10. Maantay J. Zoning, equity, and public health. *American Journal of Public Health* 2001;91(7):1033-41.
11. Komro KA, Burris S, Wagenaar AC. Social Determinants of Child Health: Concepts and Measures for Future Research. *Health Behavior and Policy Review* 2014;1(6):432-445.
12. Burris S, Kawachi I, Sarat A. Integrating Law and Social Epidemiology. *Journal of Law, Medicine & Ethics* 2002;30:510-21.
13. **Carlson V**, Chilton MJ, **Corso LC**, Beitsch LM. Defining the functions of public health governance. *Am J Public Health* 2015:e1-e8.
14. Dolen V, Talkington K, **Bhatt A**, **Rodewald L**. Structures, roles, and procedures of state advisory committees on immunization. *J Public Health Manag Pract* 2013.
15. **Martin DW**, Lowery NE, Brand B, **Gold R**, **Horlick G**. Immunization Information Systems: a decade of progress in law and policy. *J Public Health Manag Pract* 2014.
16. **McCarthy CF**, Kelley MA, **Verani AR**, **St Louis ME**, **Riley PL**. Development of a framework to measure health profession regulation strengthening. *Eval Program Plann* 2014;46c:17-24.
17. **Neri EM**, Stringer KJ, **Spadaro AJ**, **Ballman MR**, **Grunbaum JA**. Common pathways toward informing policy and environmental strategies to promote health: a study of CDC's Prevention Research Centers. *Health Promot Pract* 2014.
18. Yeager VA, **Hurst D**, Menachemi N. State barriers to appropriating public health emergency response funds during the 2009 H1N1 response. *Am J Public Health* 2015:e1-e6.
19. **Everett Jones S**, Doroski B, Glick S. Association between state assistance on the topic of indoor air quality and school district-level policies that promote indoor air quality in schools. *J Sch Nurs* 2015.
20. Thielen L, Leff M, **Corso L**, Monteiro E, Fisher JS, Pearsol J. A study of incentives to support and promote public health accreditation. *J Public Health Manag Pract* 2014;20(1):98-103.

21. Zimmerman RK, Albert SM, Nowalk MP, Yonas MA, **Ahmed F**. Use of standing orders for adult influenza vaccination: a national survey of primary care physicians. *Am J Prev Med* 2011;40(2):144-8.
22. **Kohl KS, Arthur RR, O'Connor R**, Fernandez J. Assessment of public health events through International Health Regulations, United States, 2007-2011. *Emerg Infect Dis* 2012;18(7):1047-53.
23. **Luo H, Sotnikov S**, Shah G, **Galuska DA, Zhang X**. Variation in delivery of the 10 essential public health services by local health departments for obesity control in 2005 and 2008. *J Public Health Manag Pract* 2013;19(1):53-61.
24. **McCarthy CF, Zuber A**, Kelley MA, **Verani AR, Riley PL**. The African Health Profession Regulatory Collaborative (ARC) at two years. *Afr J Midwifery Womens Health* 2014:4-9.
25. **Cramer R, Hogben M**, Handsfield HH. A historical note on the association between the legal status of expedited partner therapy and physician practice. *Sex Transm Dis* 2013;40(5):349-51.
26. Maclennan CF, Ghosh TS, Juliusson L, Vogt RL, **Boehmer TK**. Derby district redevelopment in Colorado: case study on the Health Impact Assessment process. *J Environ Health* 2012;75(1):8-13.
27. **Matjasko JL**. How effective are severe disciplinary policies? School policies and offending from adolescence into young adulthood. *J Sch Psychol* 2011;49(5):555-72.
28. **Coleman MS, Marienau KJ, Marano N, Marks SM, Cetron MS**. Economics of United States tuberculosis airline contact investigation policies: a return on investment analysis. *Travel Med Infect Dis* 2014;12(1):63-71.
29. **Bloss E**, Chan PC, **Cheng NW**, Wang KF, Yang SL, **Cegielski P**. Increasing directly observed therapy related to improved tuberculosis treatment outcomes in Taiwan. *Int J Tuberc Lung Dis* 2012;16(4):462-467.
30. Nyenswah T, **Blackley DJ**, Freeman T, **Lindblade KA**, Arzoaquoi SK, **Mott JA**, et al. Community quarantine to interrupt Ebola virus transmission - Mawah Village, Bong County, Liberia, August-October, 2014. *MMWR Morb Mortal Wkly Rep* 2015;64(7):179-182.
31. **Cramer R, Leichter JS, Stenger MR, Loosier PS, Slive L**. The legal aspects of expedited partner therapy practice: do state laws and policies really matter? *Sex Transm Dis* 2013;40(8):657-62.
32. Vugia DJ, Tabnak F, **Newton AE**, Hernandez M, **Griffin PM**. Impact of 2003 state regulation on raw oyster-associated *Vibrio vulnificus* illnesses and deaths, California, USA. *Emerg Infect Dis* 2013;19(8):1276-80.
33. Sebege M, **Naumann RB, Rudd RA, Voetsch K, Dellinger AM**, Ndlovu C. The impact of alcohol and road traffic policies on crash rates in Botswana, 2004-2011: a time-series analysis. *Accid Anal Prev* 2014;70c:33-39.
34. Johnson H, **Paulozzi L**, Porucznik C, **Mack K**, Herter B. Decline in drug overdose deaths after state policy changes - Florida, 2010-2012. *MMWR Morb Mortal Wkly Rep* 2014;63(26):569-74.
35. **Miller BL, Ahmed F, Lindley MC, Wortley PM**. Increases in vaccination coverage of healthcare personnel following institutional requirements for influenza vaccination: a national survey of US hospitals. *Vaccine* 2011.
36. **Biddle EA, Keane PR**. Action Learning: a new method to increase tractor rollover protective structure (ROPS) adoption. *J Agromedicine* 2012;17(4):398-409.
37. LaFond C, Toomey TL, Rothstein C, Manning W, Wagenaar AC. Policy evaluation research. Measuring the independent variables. *Eval Rev* 2000;24(1):92-101.
38. Tremper C, Thomas S, Wagenaar AC. Measuring Law for Evaluation Research. *Eval Rev* 2010;34(3):242-266.

39. Presley D, Reinstein T, Webb-Barr D, Burris S. Creating Legal Data for Public Health Monitoring and Evaluation: Delphi Standards for Policy Surveillance. *The Journal of Law, Medicine & Ethics* 2015;43(s1):27-31.

Appendix

Table A1: Topic codes*

Alcohol, Tobacco, and Other Drugs (ATOD)	Health Services
Disabilities	Infectious Disease Prevention and Control
Food Safety	Lesbian, Gay, Bisexual, Transgender (LGBT)
Health Policy Making	Mental Health
Hearing	Occupational Health and Safety
Injury and Violence Prevention	Physical Activity
Maternal, Infant, and Child Health	Public Health Infrastructure
Nutrition and Weight Status	Oral Health
Chronic Disease	Preparedness
Environmental Health	Social Determinants
Health Communication	

* Topics taken from <http://publichealthlawresearch.org/topics>

Table A2: # of PHLR articles per year

Topic	# of PHLR Articles Per Year					Total
	2015	2014	2013	2012	2011	
Alcohol, Tobacco, and Other Drugs (ATOD)	2	13	4	4	1	24
Disabilities		1				1
Food Safety	1	1				2
Health Policymaking			2			2
Hearing						
Injury and Violence Prevention		2	3	7		12
Maternal, Infant, and Child Health				2	2	4
Nutrition and Weight Status	1	8	1	1	4	15
Chronic Disease	1	6		1	2	10
Environmental Health	1	2	1	2	1	7
Health Communication						
Health Services	1	3	3	3		10
Infectious Disease Prevention and Control	3	14	9	12	8	46
Lesbian, Gay, Bisexual, Transgender (LGBT)						
Mental Health	1					1
Occupational Health and Safety		4	1	2	1	8
Physical Activity	1	3		1	1	5
Public Health Infrastructure	1	2	2	1		6
Oral Health						
Preparedness	1	2				3
Social Determinants				1		1

* Blank cells represent 0 articles in that topic area for the year

Table A3: # of Legal Scholarship articles per year

Topic	# of Legal Scholarship Articles Per Year					Total
	2015	2014	2013	2012	2011	
Alcohol, Tobacco, and Other Drugs (ATOD)	2	1			1	4
Disabilities						0
Food Safety				1		1
Health Policymaking			1	2	1	4
Hearing						
Injury and Violence Prevention			1	2		3
Maternal, Infant, and Child Health			1	2		3
Nutrition and Weight Status		1		1		2
Chronic Disease		1		4		5
Environmental Health	2	1	1	1	1	6
Health Communication			1			1
Health Services		3			1	4
Infectious Disease Prevention and Control	1	2	2	4	1	10
Lesbian, Gay, Bisexual, Transgender (LGBT)						
Mental Health						
Occupational Health and Safety	1	4		1	5	11
Physical Activity			2			2
Public Health Infrastructure	1	2			2	5
Oral Health						
Preparedness	1		1	2		4
Social Determinants				1	1	2

* Blank cells represent 0 articles in that topic area for the year

Table A4: PHLR and Legal Scholarship by most specific CDC unit identified

CDC Organizational Chart	PHLR	Legal Scholarship
<i>Center for Global Health</i>	1	
Division of Global HIV/AIDS	5	3
Division of Parasitic Diseases and Malaria		
Global Immunization Division	1	
Division of Global Health Protection	1	
<i>National Institute for Occupational Safety and Health</i>	6	4
Health Effects Laboratory Division		
Education and Information Division		
Division of Applied Research and Technology		
Division of Respiratory Disease Studies		
Division of Safety Research		
Division of Surveillance, Hazard Evaluations & Field Studies		1
National Personal Protective Technology Lab		
Division of Compensation Analysis and Support		
Office of Mine Safety and Health Research	2	
Division of Mining Science and Technology		
Division of Mining Research Operations		
Spokane Mining Research Division		
World Trade Center Health Program		
Western States Division		
Office of the Chief Operating Officer		
Office of the Chief of Staff		
Office of Equal Employment Opportunity		
Office of Minority Health and Health Equity		
Office on Women's Health		1
Diversity and Inclusion Management Program		
CDC - Washington Office		
Office of the Associate Director for Science	1	
Office of Science Quality		
Office of Scientific Integrity		
Office of Technology and Innovation		
Office of the Associate Director for Communication		
Division of Public Affairs		
Division of Communication Services		
Office of the Associate Director for Policy		
Policy Research, Analysis and Development Office		

Office of Public Health Preparedness		
Division of State and Local Readiness	1	
Division of Strategic National Stockpile		
Division of Select Agents and Toxins		
Division of Emergency Operations		
Office for State, Tribal, Local and Territorial Support	3	
Division of Public Health Performance Improvement	1	
Public Health Law Program		3
Office of Public Health Scientific Services		
<i>National Center for Health Statistics</i>	3	1
Office of Analysis and Epidemiology		
Division of Vital Statistics	1	
Division of Health Care Statistics		
Division of Health Interview Statistics		
Division of Health Nutrition and Examination Surveys		
<i>Center for Surveillance, Epidemiology and Laboratory Services</i>	1	
Division of Laboratory Systems		
Division of Public Health Information and Dissemination		
Division of Scientific Education and Professional Development		
Division of Health Informatics and Surveillance		
Office of Noncommunicable Diseases, Injury and Environmental Health		
<i>National Center on Birth Defects and Developmental Disabilities</i>	1	
Division of Birth Defects and Developmental Disabilities		
Division of Human Development and Disability		
Division of Blood Disorders		
<i>National Center for Chronic Disease Prevention and Health Promotion</i>	2	
Division of Cancer Prevention and Control	1	
Division of Diabetes Translation	1	3
Division of Nutrition, Physical Activity, and Obesity	8	1
Division of Reproductive Health		1
Office on Smoking and Health	9	1
Division for Heart Disease and Stroke Prevention	3	
Division of Population Health		
Division of Community Health	1	1
Division of Oral Health		
<i>National Center for Environmental Health/Agency for Toxic Substances and Disease Registry</i>	4	

Division of Environmental Hazards and Health Effects	1	1
Division of Emergency and Environmental Health Services		3
Division of Laboratory Sciences	1	
<i>National Center for Injury Prevention and Control</i>	2	1
Division of Violence Prevention	3	1
Division of Unintentional Injury Prevention	3	
Division of Analysis, Research, and Practice Integration		
Office of Infectious Diseases		
Influenza Coordination Unit		
<i>National Center for Immunization and Respiratory Diseases</i>	5	2
Immunization Services Division	4	
Influenza Division		1
Division of Viral Diseases		
Division of Bacterial Diseases		1
<i>National Center for Emerging and Zoonotic Infectious Diseases</i>		
Division of Foodborne Waterborne, and Environmental Diseases		
Division of Global Migration and Quarantine	4	
Division of Healthcare Quality Promotion	2	1
Division of High-Consequence Pathogens and Pathology		
Division of Preparedness and Emerging Infections		1
Division of Scientific Resources		
Division of Vector-Borne Diseases		
<i>National Center for HIV/AIDS, Viral Hepatitis, STD and TB Prevention</i>	2	
Division of HIV/AIDS Prevention	3	
Division of Sexually Transmitted Disease Prevention	4	
Division of Tuberculosis Elimination	2	
Division of Viral Hepatitis Prevention		1
Division of Adolescent and School Health	4	
Total	97	33

Table A5: PHLR literature reviews

	Study	Com Guide	Other Sys. review	Narrative	National law		State Law	Local Law	Org Policy	JD author	
					US	Non-US				Listed	Y/N
2011	Rammohan V, Hahn RA, Elder R, Brewer R, Fielding J, Naimi TS, et al. Effects of dram shop liability and enhanced overservice law enforcement initiatives on excessive alcohol consumption and related harms: two community guide systematic reviews. Am J Prev Med 2011;41(3):334-43.	1					1			1	0
2012	Chesson HW. Sexonomics: a commentary and review of selected sexually transmitted disease studies in the economics literature. Sex Transm Dis 2012;39(3):161-6.			1			1			1	0
2012	Fluke JD, Goldman PS, Shriberg J, Hillis SD, Yun K, Allison S, et al. Systems, strategies, and interventions for sustainable long-term care and protection of children with a history of living outside of family care. Child Abuse Negl 2012;36(10):722-31.			1	1		1	1	1	0	
2012	Verbeek JH, Kateman E, Morata TC, Dreschler WA, Mischke C. Interventions to prevent occupational noise-induced hearing loss. Cochrane Database Syst Rev 2012;10:CD006396.		1		1					0	
2013	Fiebelkorn AP, Seward JF, Orenstein W. A global perspective of vaccination of healthcare personnel against measles: systematic review. Vaccine 2013.			1	1	1	1			0	

2014	Babb S, McNeil C, Kruger J, Tynan MA. Secondhand smoke and smoking restrictions in casinos: a review of the evidence. Tob Control 2014.			1			1			0	
2014	Courtney B, Hodge JG, Jr., Toner ES, Roxland BE, Penn MS, Devereaux AV, et al. Legal preparedness: care of the critically ill and injured during pandemics and disasters: CHEST consensus statement. Chest 2014;146(4 Suppl):e134S-44S.			1	1		1	1	1	1	1
2014	Haegerich TM, Paulozzi LJ, Manns BJ, Jones CM. What we know, and don't know, about the impact of state policy and systems-level interventions on prescription drug overdose. Drug Alcohol Depend 2014;145c:34-47.			1			1			0	
2014	Huang YA, Lasry A, Hutchinson AB, Sansom SL. A systematic review on cost effectiveness of HIV prevention interventions in the United States. Appl Health Econ Health Policy 2014.	1								0	
2014	Kennedy SM, Davis SP, Thorne SL. Smoke-free policies in U.S. prisons and jails: a review of the literature. Nicotine Tob Res 2014.			1					1	1	0
2014	Lippy C, DeGue S. Exploring alcohol policy approaches to prevent sexual violence perpetration. Trauma Violence Abuse 2014.			1			1	1		1	0
2014	Verbeek JH, Kateman E, Morata TC, Dreschler WA, Mischke C. Interventions to prevent occupational noise-induced hearing loss: a Cochrane systematic review. Int J Audiol 2014;53 Suppl 2:S84-96.	1			1					0	

2015	Calancie L, Leeman J, Jilcott Pitts SB, Khan LK, Fleischhacker S, Evenson KR, et al. Nutrition-related policy and environmental strategies to prevent obesity in rural communities: a systematic review of the literature, 2002-2013. <i>Prev Chronic Dis</i> 2015;12:E57.		1				1	1	1	1	0
2015	Carlson V, Chilton MJ, Corso LC, Beitsch LM. Defining the functions of public health governance. <i>Am J Public Health</i> 2015:e1-e8.			1			1	1	1	1	1
2015	Jacob V, Qu S, Chattopadhyay S, Sipe TA, Knopf JA, Goetzel RZ, et al. Legislations and policies to expand mental health and substance abuse benefits in health insurance plans: a community guide systematic economic review. <i>J Ment Health Policy Econ</i> 2015;18(1):39-48.	1			1		1		1	1	0
2015	Kearns MC, Reidy DE, Valle LA. The role of alcohol policies in preventing intimate partner violence: a review of the literature. <i>J Stud Alcohol Drugs</i> 2015;76(1):21-30.			1			1	1		1	0
Total		2	4	10	6	1	12	6	6	9	2

Table A6: Journals publishing CDC PHLR

Journal Title	Number
Accident Analysis and Prevention	2
Addictive Behaviors	1
African Journal of Midwifery and Women's Health	1
AIDS and Behavior	1
American Journal of Health Behavior	1
American Journal of Infection Control	3
American Journal of Preventative Medicine	8
American Journal of Public Health	6
American Journal of Tropical Medicine and Hygiene	1
Annals of Epidemiology	2
Annals of Internal Medicine	1
Applied Health Economics and Health Policy	1
Archives of Pathology and Laboratory Medicine	1
Australian and New Zealand Journal of Public Health	1
BMC Public Health	1
Bulletin of the World Health Organization	1
Cancer	1
Chest	1
Child Abuse and Neglect	2
Clinical Infectious Diseases	1
Cochrane Database of Systematic Reviews	1
Drug and Alcohol Dependence	1
Emerging Infectious Disease Journal	3
Environmental Health	1
Environmental Research	1
European Journal of Public Health	1
Evaluation and Program Planning	1
Family and Community Health	1
Global Heart	1
Health Affairs (Millwood)	3
Health Policy and Planning	1
Health Promotion Practice	2
Infection Control and Hospital Epidemiology	1
Injury Prevention	1
Injury	1
International Journal of Audiology	1
International Journal of Environmental Research and Public Health	1
International Journal of Tuberculosis and Lung Disease	2
Journal of Acquired Immune Deficiency Syndromes	1
Journal of Adolescent Health	2
Journal of Agromedicine	1
Journal of the American Dietetic Association	1

Journal of the American Medical Directors Association	1
Journal of Child Nutrition and Management	1
Journal of Community Health	1
Journal of Environmental Health	2
Journal of Environmental and Public Health	1
Journal of Food Protection	1
Journal of the International AIDS Society	2
Journal of the International Association of Providers of AIDS Care	1
Journal of Mental Health Policy and Economics	1
Journal of Obstetric, Gynecologic, and Neonatal Nursing	1
Journal of Occupational and Environmental Hygiene	1
Journal of Occupational and Environmental Medicine	1
Journal of Physical Activity and Health	1
Journal of Policy Analysis and Management	1
Journal of Public Health Management Practice	10
Journal of Public Health Policy	1
Journal of Safety Research	1
Journal of School Health	5
Journal of School Nursing	2
Journal of School Psychology	1
Journal of Studies on Alcohol and Drugs	1
Journal of Environmental Health	1
Marine Policy	1
Maternal and Child Health Journal	1
MMWR Mortality Weekly Report	9
MMWR Surveillance Summary	1
New England Journal of Medicine	1
Nicotine and Tobacco Research	3
PLoS One	3
Preventing Chronic Disease	14
Preventative Medicine	1
Public Health Reports	3
Risk Analysis	1
Sexually Transmitted Diseases	3
Telemedicine Journal and E-Health	1
Tobacco Control	1
Traffic Injury Prevention	1
Trauma, Violence and Abuse	1
Travel Medicine and Infectious Disease	1
Vaccine	6
Zoonoses and Public Health	2
Total	158
Number of Journals	83
Range	1 to 14

Median	1
Mean	1.903614

Table A7: Journals publishing CDC Legal Scholarship

Journal Title	Number
Accident Analysis and Prevention	1
Advances in Nutrition	1
African Journal of Midwifery and Women's Health	2
American Journal of Preventative Medicine	2
American Journal of Public Health	2
The Annals of Family Medicine	1
Annual Review of Public Health	1
Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science	1
BMC Public Health	1
Cancer	1
Clinical Governance	1
Clinical Infectious Diseases	2
Diabetes Management (London, England)	1
Disaster Medicine and Public Health Preparedness	2
Emerging Infectious Diseases	1
Environmental Justice	1
Family and Community Health	1
Family Practice	1
Frontiers in Bioengineering and Biotechnology	1
Global Health Promotion	2
Health Affairs (Millwood)	1
Health and Place	1
Health Research Policy and Systems	1
Industrial Health	2
Journal of the American Geriatrics Society	1
Journal of ASTM International	1
Journal of Environmental Health	1
Journal of Law, Medicine and Ethics	7
Journal of Medical Toxicology	2
Journal of Nanoparticle Research	1
Journal of Policy Analysis and Management	1
Journal of Public Health Management and Practice	3
Journal of Safety Research	1
The Lancet	2
The Lancet Infectious Diseases	1
Maternal and Child Health Journal	1
Nicotine and Tobacco Research	1
The Oncology Nurse	1
Pediatrics	1
Philosophical Transactions of the Royal Society B: Biological Sciences	1

Preventing Chronic Disease	3
Seminars in Dialysis	1
Sexually Transmitted Diseases	1
Tropical Medicine and International Health	1
Vaccine	2
Vector-Borne and Zoonotic Diseases	1
Veterinary Clinics of North America: Small Animal Practice	1
Total	67
Number of Journals	47
Range	1 to 7
Median	1
Mean	1.4255319