Law as a Tool for Preventing Chronic Diseases: Expanding the Spectrum of Effective Public Health Strategies

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Abstract

Law, which is a fundamental element of effective public health policy and practice, played a crucial role in many of public health's greatest achievements of the 20th century. Still, conceptual legal frameworks for the systematic application of law to chronic disease prevention and control have not been fully recognized and used to address public health needs. Development and implementation of legal frameworks could broaden the range of effective public health strategies and provide valuable tools for the public health workforce, especially for state and local health department program managers and state and national policy makers. In an effort to expand the range of effective public health interventions, the Centers for Disease Control and Prevention will work with its partners to explore the development of systematic legal frameworks as a tool for preventing chronic diseases and addressing the growing epidemic of obesity, heart disease, stroke, and other chronic diseases and their risk factors.

Introduction

This paper examines the potential need for and role of systematic legal frameworks in preventing and mitigating chronic diseases. In part 1 of this 2-part series, we describe the role and use of laws, as well as the demonstrated effectiveness of laws, in supporting selected public health interventions. In part 2, we will provide an overview of U.S. jurisprudence and legal methods relevant to public health problems and outline potential contours of legal frameworks adaptable to chronic disease prevention by offering examples from different public health domains.

The terrorist attacks of fall 2001 and events since then, including the epidemic of severe acute respiratory syndrome (SARS), have focused immense attention on public health legal preparedness and on the role of law in assuring the public's health (1,2). One prominent example is a renewed interest in quarantine, including the adequacy of relevant legal authorities and due process protections. In addition to the highly visible legal aspects of such recent problems involving acute diseases, seminal work is underway to provide options for strengthening laws essential to public health infrastructure and public health practice (3). Other commentators have examined the roles of specific legal processes, such as litigation, and of legal frameworks as tools for addressing public health problems (4,5).

Efforts of the Centers for Disease Control and Prevention (CDC) in relation to the heightened interest in the role of law in public health practice are centered in its own Public Health Law Program and in several other CDC programs, including the National Center for Chronic Disease Prevention and Health Promotion (NCCDPHP). These efforts broadly encompass approaches to assist public health practitioners at all levels to improve their understanding of the legal foundations of public health and to develop their ability to use systematic legal frameworks and laws for achieving program goals and objectives.
Achieving comprehensive public health legal preparedness to address public health emergencies is an important goal of this endeavor. Public health legal preparedness can be defined as a public health system’s attainment of specified legal benchmarks or standards essential to the preparedness of the public health system. The core elements of public health legal preparedness (Table 1) are relevant and applicable to legal preparedness in other, non-acute domains of public health, including chronic disease prevention (1).

In addition to the prominent role laws have played in response to recent public health emergencies, laws have contributed significantly to many notable public health achievements (6-8). Examples of such critical contributions include the landmark 1905 U.S. Supreme Court decision, Jacobson v Massachusetts, which upheld the constitutionality of compulsory immunization; federal requirements for fortification of foods; the Safe Drinking Water Act of 1974; warning notices on cigarette packs; and seat belt laws (6,9). Despite the historically important role for law in public health and the rapidly growing number of publications on the subject, conceptual frameworks for the application of law to public health have not yet been fully explicated, and their benefits remain only partly realized. With few exceptions, systematic legal frameworks have not been developed for preventing chronic diseases and their major risk factors.

Although the term "legal framework" is given further definition later in this 2-part article, we use this term to broadly connote a conceptual approach for addressing public health problems through logical and rational combinations of legal dimensions — including but not limited to U.S. jurisprudence, basic sources of U.S. law, legal theories, and legal mechanisms and tools — which are appropriately tailored to a specific public health problem. The term law as used here may take the form of constitutional provisions, statutory enactments, regulations, ordinances, government-initiated litigation, court rulings, or policies adopted by public-sector bodies such as school and zoning boards. Law also includes policies or treaties adopted by international bodies.

**Discussion**

The Role of Law in Addressing Selected Public Health Interventions

Two overarching goals of our national public health agenda are to increase the quality and number of years of healthy life and to eliminate health disparities (10). For chronic diseases, these goals necessitate a comprehensive strategy that includes interventions for prevention and control of categorical diseases and their risk factors, individual behavioral change, environmental change, improvements in clinical and preventive services, and organizational change (11). Promoting patient compliance and health providers’ adherence to established best practices in all persons — regardless of patients’ racial/ethnic background, sex, geographic determinants, or socioeconomic status — is also important. These interventions can be accomplished through a variety of mechanisms, including health education, development and use of information systems, and development and implementation of policies and guidelines. Policies, in turn, can be implemented as regulations, ordinances, other laws, or as organizational practices.

Achievement of these overarching national goals requires a strengthening of the public health infrastructure and development of adequate capacity to undertake the core public health functions of assessment, policy development, and assurance (12). In all of these areas, the role of law can be crucial. For example, identifying and strengthening key components of the public health infrastructure — such as the development of a diverse and competent public health workforce, information and communication systems, and health department surveillance and laboratory capacities — can be important purposes of appropriate legislation (13,14). Similarly, legislation can help provide state or local governments with the power to encourage or induce health care providers, allied health professionals, and businesses to promote and protect the public’s health in order to increase the quality and number of years of healthy life (15). Laws can play pivotal roles in the elimination of disparities in access to and delivery of quality health care (16-18). In addition, appropriate laws undergird the broader mission of state and local public health agencies in assessing the burden of chronic diseases, setting priorities, allocating resources, and delivering health services (14).

Laws work to achieve their desired results in a variety of ways. Some laws directly require a behavioral change on the part of individuals in the target population — such as seat belt laws — whereas others directly change the environment — such as community water fluoridation or food fortification laws — and require no new action on the part
of the target population to be effective. Other laws are more complex in their mechanism of inducing a change. For example, some laws, such as smoking bans, require a behavioral change that ultimately results in an environmental change with beneficial effects on the target population. Other laws require an organizational policy change that ultimately leads to a behavioral change, such as required insurance-industry coverage of smoking cessation services, a requirement that leads to an increased demand for and delivery of the services, which eventually yields greater cessation rates. These examples and still other laws have been used to address chronic diseases and injuries (Table 2). As discussed in the following sections, 3 of these laws — smoking bans, blood alcohol concentration (BAC) laws, and food fortification regulations — demonstrate the impact and effectiveness of legislation on specific public health problems. A fourth example, a legal framework for tobacco control, illustrates the potential role of international law to address chronic diseases and their major risk factors.

1. Smoking bans and restrictions

Tobacco use is the single largest cause of preventable premature death in the United States (11,21,22), and exposure to environmental tobacco smoke (ETS) is an important preventable cause of illness and death (23-25). Reducing smoking indoors is one means to reduce exposure to ETS, and this outcome can be brought about by policies, regulations, or laws. Smoking bans, which prohibit smoking entirely, and restrictions, which limit smoking to designated areas, were thus developed to limit smoking in workplaces and other public areas.

Complex mechanisms underlie the relationship between smoking bans or restrictions and chronic disease prevention. To start, the laws require a change of behavior on the part of smokers who must delay or avoid smoking in indoor settings. This behavioral change, in turn, results in an improved environment and thus does not require individuals in the target population to take any action. For smoking bans and restrictions to be effective, they must bring about a measurable improvement in the environment — specifically, reductions in exposure to the components of ETS, such as nicotine vapor.

To investigate whether there was measurable improvement in the environment, Hopkins and colleagues conducted a systematic literature review as part of the Guide to Community Preventive Services (26). They identified 10 studies that evaluated the effect of smoking bans in workplaces. The studies showed an average 72% reduction in exposure to components of ETS. Smoking bans were more effective in reducing ETS exposures than were smoking restrictions, and bans were effective in a wide variety of public and private workplaces and health care settings. These findings suggest that the effectiveness of smoking bans should extend to most indoor workplaces in the United States.

2. Laws on blood alcohol concentration

In 2000, alcohol-related motor-vehicle crashes resulted in 17,380 deaths and more than 300,000 injuries in the United States (27). The BAC at which the majority of drivers are impaired can be established as the legal per se limit for motor vehicle operation (illegal per se means that a BAC above the set limit is a violation in and of itself and that actual impairment need not be demonstrated). Until recently, most states set this level at 0.1%. As early as 1983, however, some states lowered the BAC limit to 0.08%.

BAC laws are hypothesized to exert their effect primarily through powerful psychological deterrence of alcohol consumption (28). Most drivers are never stopped and tested for suspected alcohol-impaired driving (28). By virtue of their threatened penalties (e.g., loss of driver's license, jail time, fines, public humiliation), these laws deter drivers from consuming alcohol or cause them to limit their consumption before driving.

Because of the hypothesized mechanism of action of these laws, and because such a small proportion of drivers is ever stopped and tested for suspected alcohol-impaired driving, establishing the effectiveness of 0.08% BAC laws requires measurable reductions in alcohol-related motor-vehicle crashes. In particular, fatal alcohol-related crashes provide a sensitive measure of the effectiveness of 0.08% BAC laws. A systematic literature review conducted as part of the Guide to Community Preventive Services identified 9 studies that evaluated the effectiveness of 0.08% BAC per se laws (29). Each study evaluated 0.08% BAC laws in one or more of the 16 states that implemented the laws before January 1, 1998. After implementation of the laws, the median decrease in fatal alcohol-related motor-vehicle crashes was 7%. On the basis of these studies, the estimated number of lives that could be saved annually if all states were to enact 0.08% BAC laws ranges from 400 to 600.
3. **Food fortification for the prevention of nutritional deficiency diseases**

Regulation has played a substantial role in reducing and eliminating nutritional deficiency diseases in the United States. At the outset of World War II, the high percentage of recruits who were ineligible for military service because of nutritional deficiency diseases prompted the Council on National Defense to request that the National Academy of Sciences establish a Food and Nutrition Board (FNB)(30). At the time, niacin deficiency accounted for approximately 100,000 cases of pellagra annually, and pellagra was the eighth or ninth leading cause of death in many southern states (31). The cause of pellagra was unknown before 1937 (32). One of the first activities of the FNB was to establish recommended intake levels of approximately a dozen nutrients, including niacin. Enrichment of bread was effected by the Food Distribution Order No. 1 issued on December 29, 1942, which became effective January 18, 1943. Several states instituted mandatory enrichment laws for bread and flour at the same time (31). Enrichment laws were followed in a short time by a decrease in pellagra-related morbidity and mortality. More recently, in 1998, the Food and Drug Administration mandated the addition of 140 mcg of folic acid per 100 gm of cereal-grain products (33) to reduce the prevalence of neural tube defects (NTDs) (20). This strategy appears to have produced a 19% reduction in the frequency of NTDs (20).

4. **International legal framework for tobacco control**

Policy interventions offer a great opportunity to influence decisions on tobacco use at the societal level. Experience in the United States and in other developed countries indicates that policy interventions have a substantially greater impact than do interventions that target individuals. International law now represents a tool for such policy interventions. International law can be defined as the rules that regulate the relations among sovereign states and other actors (e.g., international organizations and individuals) in the international system (34). Treaties — written agreements among sovereign states, the obligations of which are legally binding — are one of the classic sources of international law (34).

In 1999, the World Health Organization (WHO) initiated the Framework Convention on Tobacco Control (FCTC) as an international treaty focusing on a health issue (34). In May 2003, the treaty text of the FCTC was unanimously adopted by the World Health Assembly (35). This landmark health treaty will be put into force when 40 member states have signed and ratified it. The FCTC is both an international legal framework for tobacco control (e.g., addressing international cigarette smuggling issues) and a framework for a broad range of legal, regulatory, and policy approaches (e.g., excise taxes, clean indoor air policies, restrictions or bans on advertising and promotion, package warnings and labeling, product regulations, and ingredient disclosures) that all WHO member states are encouraged to implement.

**Rationale for Legal Frameworks**

The examples discussed above demonstrate the value of laws and regulations in preventing and controlling diseases and injuries, as well as the effectiveness of laws in helping to achieve program goals and objectives. In addition, they highlight the rationale and need for more comprehensive, systematic frameworks of legal theories and authorities to support the prevention and control of a broader array of chronic diseases (36).

The basic elements of a conceptual legal framework include definitions of key terms, delineation of scope, and articulation of a logic model or chain of causation. A logic model for the role of law in chronic disease prevention could trace the flow of causality involving laws, agents of intervention (i.e., the entities to which laws apply), the behavior of those agents (some behaviors affect the sources of chronic disease while others affect those susceptible to chronic disease), and health outcomes or status. Successful identification and implementation of legal frameworks based on this logic model depend, in part, on a fuller understanding of the spectrum of legal theories and methods relevant to public health practice.

**Caveat lector**

It is important to emphasize that the use of legal frameworks in public health practice has limitations. Nor can law alone prevent chronic diseases. The process by which laws are passed sometimes can be arduous and fraught with controversy. Even when appropriate legislation is eventually enacted, the levels of application and enforcement can vary a law’s effectiveness in achieving the intended public health goals. Legal frameworks and laws should therefore not be used in isolation but should be viewed as only one of several tools to be employed in the public health practice armamentarium.
Conclusion

Laws have played a decisive and fundamental role in advancing the public’s health. Their contribution is particularly evident in the prevention and control of communicable diseases, which were the leading causes of death at the turn of the 20th century, and in the realm of injury prevention. Today, the leading causes of death and disability are chronic diseases, especially diseases of the heart, cancer, and stroke. For most of these chronic diseases, however, there are no systematically developed frameworks for the application of law to preventive efforts. In the relatively few instances where the role of law has been fully applied to the prevention and control of chronic diseases and their risk factors (e.g., tobacco control and prevention), the observed impact and effectiveness demonstrate the public health benefits they offered.

The time has come for a full exploration of comprehensive legal frameworks for preventing and controlling the growing epidemics of obesity, heart disease, stroke, and other chronic diseases and their related major risk factors. These frameworks will be a crucial addition to the tools available to the public health workforce, especially state and local health department program managers as well as state and national policy makers. They also can assist program managers’ interaction with city mayors, legislators, governors, and other policy makers. Their successful development, implementation, and continuing evaluation for effectiveness will require a broadly collaborative, multidisciplinary effort guided by both scientific and legal expertise. In an effort to expand the spectrum of effective public health interventions, the CDC will work with its partners to explore the development of these systematic legal frameworks as a tool for preventing chronic diseases and protecting and promoting the public’s health.

In the second part of this paper, we provide an overview of pertinent U.S. jurisprudence, including current legal theories and methods, examine examples of legal frameworks in public health, and conclude by suggesting specific options for exploring the development of systematic legal frameworks for preventing chronic diseases.

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References

1. Moulton AD, Gottfried RN, Goodman RA, Murphy AM, Rawson RD. What is public health legal preparedness? J Law Med Ethics. Forthcoming.
2. Gerberding JL, Moulton AD, Goodman RA, Ransom MM. Public health law, 2002-2003: year of achievement. J Law Med Ethics. Forthcoming.
3. The Turning Point Public Health Statute Modernization National Collaborative. The Turning Point Model State Public Health Act: a tool for assessing public health laws. Available from: URL: http://www.turningpointprogram.org/Pages/MSPH/Afinal.pdf
4. Vernick JS, Mair JS, Teret SP, Sapsin JW. Role of litigation in preventing product-related injuries. Epidemiol Rev 2003;25:90-8.
5. Perdue WC, Stone LA, Gostin LO. The built environment and its relationship to the public’s health: the legal framework. Am J Public Health 2003;93:1390-4.
6. Moulton AD, Goodman RA, Cahill K, Baker EL. Public health legal preparedness for the 21st century. J Law Med Ethics 2002;30:141-3.
7. Centers for Disease Control and Prevention. Ten great public health achievements-United States, 1900-1999. MMWR Morb Mortal Wkly Rep 1999 Apr 2;48 (12):241-3.
8. Centers for Disease Control and Prevention. Achievements in public health, 1900-1999: changes in the public health system. MMWR Morb Mortal Wkly Rep 1999 Dec 24;48 (50):1141-7.
9. Jacobson v Massachusetts, 197 U.S. 11 (1905).
10. U.S. Department of Health and Human Services. Healthy people 2010: understanding and improving health, 2nd ed. Washington (DC): U.S. Government Printing Office; 2000 Nov.

11. McLeroy KR, Bibeau D, Steckler A, Glanz K. An ecological perspective on health promotion programs. Health Education Quarterly 1988;15 (4):351-77.

12. American Public Health Association. The essential services of public health. Available from: URL: http://www.apha.org/ppp/science/10ES.htm#notes.1994

13. Baker EL, Blumenstock JS, Jensen J, Morris RD, Moulton AD. Building the legal foundation for an effective public health system. J Law Med Ethics 2002;30:4851.

14. Gostin LO, Hodge JG. State public health law — assessment report. Available from: URL: http://www.turningpointprogram.org/Pages/PHL%20Assessment%20-%20Slides.pdf

15. Gottin LO. Public health law in a new century. Part I: law as a tool to advance the community's health. JAMA 2000;283:2837-41.

16. Shin MS. Redressing wounds: finding a legal framework to remedy racial disparities in medical care. Calif Law Rev 2002;90:2049-100.

17. U.S. Commission on Civil Rights. The health care challenge: acknowledging disparity, confronting discrimination, and ensuring equality. Vol. 1, The role of governmental and private health care programs and initiatives. Washington (DC): U.S. Commission on Civil Rights; 1999. 287 p.

18. U.S. Commission on Civil Rights. The health care challenge: acknowledging disparity, confronting discrimination, and ensuring equality. Vol 2, The role of federal civil rights enforcement efforts. Washington (DC): U.S. Commission on Civil Rights; 1999. 438 p.

19. Centers for Disease Control and Prevention, Community Guide Branch, Task Force on Community Preventive Services. Guide to community preventive services [cited 2003 Oct 22]. Available from: URL: www.thecommunityguide.org

20. Honein MA, Paulozzi LJ, Mathews TJ, Erickson JD, Wong L-YC. Impact of folic acid fortification on the US food supply on the occurrence of neural tube defects. JAMA 2001;285:2981-6.

21. Changes in cigarette related disease risks and their implications for prevention and control [monograph online]. National Cancer Institute, Smoking and Tobacco Control Program. Bethesda (MD): National Institutes of Health, National Cancer Institute; 1997 Feb [cited 2003 Dec 2]. Smoking and tobacco control monograph 8. Available from: URL: http://cancercontrol.cancer.gov/trcb/monographs/8/index.html

22. McGinnis JM, Foege WH. Actual causes of death in the United States. JAMA 1993;270 (18):2207-12.

23. California Environmental Protection Agency. Health effects of exposure to environmental tobacco smoke, final report. Sacramento: California Environmental Protection Agency, Office of Environmental Health Hazard Assessment; 1997 Sep.

24. U.S. Environmental Protection Agency. Respiratory health effects of passive smoking: lung cancer and other disorders. Washington (DC): U.S. Environmental Protection Agency, Office of Research and Development, Office of Health and Environmental Assessment; 1992 Dec.

25. U.S. Office on Smoking and Health. The health consequences of involuntary smoking: a report of the Surgeon General. Rockville (MD): U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, Center for Health Promotion and Education, Office on Smoking and Health; 1986 Jan 1. 359 p.

26. Hopkins DH, Briss PA, Ricard CJ. Reviews of evidence regarding interventions to reduce tobacco use and exposure to environmental tobacco smoke. Am J Prev Med 2001;20:16-66.

27. National Highway Traffic Safety Administration. Traffic safety facts 2001: a compilation of motor vehicle crash data from the Fatality Analysis Reporting System and the General Estimates System. Washington (DC): U.S. Department of Transportation, National Highway Traffic Safety Administration; 2002 Dec. 220 p.

28. DeJong W, Hingson R. Strategies to reduce driving under the influence of alcohol. Annu Rev Public Health 1998;19:359-78.

29. Shults RA, Elder RW, Sleet DA, Nichols JL, Alao MO, Carande-Kulis VG, et al. Reviews of evidence regarding interventions to reduce alcohol-impaired driving. Am J Prev Med 2001;21 (4 suppl):66-88.

30. Darby WJ. The Food and Nutrition Board: a personal perspective. Directions in nutrition and food science; proceedings of the 50th anniversary symposium. Washington (DC): National Academy Press; 1992.

31. Park YK, Sempos CT, Barton CN, Vanderveen JE, Yetley EA. Effectiveness of food fortification in the United States: the case of pellagra. Am J Public
32. Fouts PJ, Helmer OM, Lepkovsky S, Jukes TH. Treatment of human pellagra with nicotinic acid. Proc Soc Exp Biol Med 1937;37:405-7.

33. Food and Drug Administration. Food standards: amendment of standards of identity for enriched grain products to require addition of folic acid. Fed Regist 1996; 61:8781-807.

34. Fidler DP, Perez TD, Cetron MS. International considerations. In: Goodman RA, Rothstein MA, Hoffman RE, Lopez W, Matthews GW, editors. Law in public health practice. New York: Oxford University Press; 2003. p. 93-119.

35. World Health Organization. Updated status of the WHO framework convention on tobacco control [cited 2003 Nov 19]. Available from: URL: http://www.who.int/tobacco/fctc/signing_ceremony/countrylist/en/

36. Moulton AD, Matthews GW. Strengthening the legal foundation for public health practice: a framework for action. Am J Public Health 2001;91:1369.

### Tables

#### Table 1.

Core Elements of Public Health Legal Preparedness

| Core Element                                      | Selected Examples                                                                 |
|---------------------------------------------------|-----------------------------------------------------------------------------------|
| **Essential legal authorities**                   | Authorization for disease reporting                                               |
|                                                   | Interventions such as quarantine and smoking restrictions                         |
|                                                   | Health worker licensure and liability protection                                  |
| **Competency of public health professionals to apply those laws** | Technical assistance to health departments                                        |
|                                                   | Training and certification                                                        |
| **Information on public health law best practices** | Inventory of state and local public health laws and ordinances                     |
|                                                   | Assessment of the impact and effectiveness of existing public health laws         |
| **Coordination across jurisdictions and disciplines** | Partner disciplines such as law enforcement and emergency medical services        |
|                                                   | Federal and state judiciaries                                                     |
|                                                   | Private bar                                                                        |
## Table 2.
**Selected Laws for the Prevention of Chronic Diseases and Injuries***

| Law                                         | Public Health Issue Addressed              | Effectiveness† | How It Works                                                                 |
|---------------------------------------------|-------------------------------------------|----------------|-----------------------------------------------------------------------------|
| Smoking bans or restrictions                | Exposure to environmental tobacco smoke   | Strong evidence| Requires behavioral change to change the environment                         |
| Tobacco excise taxes                        | Tobacco initiation and use                | Strong evidence| Incurs a financial disincentive to invoke behavior change                    |
| Required coverage of cessation services costs| Tobacco use                                | Sufficient evidence| Requires organizational change that promotes behavioral change             |
| Zoning and land use requirements            | Physical inactivity                       | Review in progress| Requires environmental change to facilitate behavioral change              |
| Child safety seat use laws                  | Unintentional injuries of children        | Strong evidence| Directly requires behavioral change                                          |
| Safety belt use laws                        | Unintentional injuries of older children, adolescents, and adults | Strong evidence| Directly requires behavioral change                                          |
| Blood alcohol concentration limit of 0.08% for operators of motor vehicles | Unintentional injuries of older children, adolescents, and adults | Strong evidence| Primarily provides powerful psychological deterrent to invoke behavioral change; also provides disincentive to invoke behavioral change through fines and other penalties |
| Sobriety checkpoints for motor vehicle operators | Unintentional injuries of older children, adolescents, and adults | Strong evidence| Provides psychological deterrent to invoke behavioral change                |
| Fluoridation of community water supplies    | Dental caries                             | Strong evidence| Directly changes the physical environment requiring no action on the part of the target population |
| Food fortification                          | Nutritional deficiencies                 | Strong evidence| Directly changes the physical environment requiring no action on the part of the target population |

* Laws used to denote restrictions, bans, regulations, ordinances, or public policies, as well as legislation.
† As determined and defined in the Guide to Community Preventive Services (19) or, in the case of food fortification, by Honein et al (20).