

**Yale University School of Medicine
Department of Epidemiology and Public Health**

**EHS 570a
Public Health Management of Disasters**

Fall, 2005

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Course Description:

Public Health Management of Disasters. Two credits. This course addresses the role of public health in disaster preparedness and management. It will include discussion of concepts in basic science, human responses to injury and illness, public health systems, and policy. Major topics include types of disasters and their consequences; the role of public health systems in disasters; hazard assessment and community vulnerability analysis; data collection and evaluation; communications; system design, planning, and management; and mental health and environmental health issues in disasters. Practical applications of the concepts developed will be emphasized, as will both the similarities and differences between domestic and foreign disaster management. Wednesdays, 16:00-17:50 hrs, room 115.

Prerequisite:

Completion of Principles of Epidemiology I, or permission of the course director.

Grading:

Grading will be based upon 1) a brief mid-semester written project, 2) a larger small-group student project, and 3) a two-hour written final exam. The small-group project and the final exam will count equally toward the final course grade, with the mid-semester project used as a tie-breaker if needed.

Outline of sessions, learning objectives, and readings:

Note: Due primarily to the schedules of our guest speakers, topics and sessions are subject to re-scheduling. Additional readings may also be located during the semester. All changes will be posted to the BlackBoard site as soon as they are known. Updated versions of this syllabus will also be posted. Almost all of the readings are available on BlackBoard, and those that are not will be distributed in class. All PowerPoint lectures will also be posted on BlackBoard, prior to each class whenever possible.

Required Course Text:

Landesman LY. Public health management of disasters: the practice guide – second edition. American Public Health Association. ISBN 0-87553-025-7. (In stock at the Yale Medical Bookstore.)

Optional Course Texts:

Leaning J, Briggs SM, Chen LC, eds. Humanitarian crises: the medical and public health response. Harvard University Press, Cambridge MA: 1999, ISBN 0-674-15515-7. [For those with interest in complex humanitarian emergencies, this is the text to have.]

World Health Organization. Rapid health assessment protocols for emergencies. WHO, Geneva: 1999, ISBN 92-4-154515-1.

Session #1: 31 August

Public Health Response to Bioterrorism and Emerging Pathogens

This lecture will introduce the basic science of bioterrorism and infectious diseases as agents of warfare, and will then cover public health aspects of detection, mitigation, and response to both real and threatened bioterrorism events. Public health laboratory networks and technologies will also be discussed.

Guest lecturer: James L. Hadler, MD, MPH

State Epidemiologist, Connecticut Department of Public Health, Bureau of Community Health, Infectious Diseases Division

Learning objectives: be able to discuss

- a. at least four of the primary bioterrorist threat agents
- b. the major characteristics of overt vs. covert releases, and the responses to each
- c. the role of public health agencies in preparing for and responding to bioterrorism
- d. the four levels (A,B,C,D) of public health laboratories and their roles and capabilities

Landesman, Ch. 11.

Khan AS, Ashford DA. Ready or not: preparedness for bioterrorism. NEJM 2001; 345: 287-289.

Christopher GW, Cieslak TJ, Pavlin JA, Eitzen EM. Biological warfare: a historical perspective. JAMA 1997; 278: 412-417.

Geiger HJ. Terrorism, biological weapons, and bonanzas: assessing the real threat to public health. Am J Pub Health 91: 708-709, 2001.

Sidel VW, Cohen HW, Gould RM. Good intentions and the road to bioterrorism preparedness. *Am J Pub Health* 91: 716-718, 2001.

Henretig F. Biological and chemical terrorism defense: a view from the “front lines” of public health. *Am J Pub Health* 91: 718-720, 2001.

Fee E, Brown TM. Preemptive biopreparedness: can we learn anything from history? *Am J Pub Health* 91: 721-726, 2001.

Franz DR, Jahrling PB, Friedlander AM, et al. Clinical recognition and management of patients exposed to biological warfare agents. *JAMA* 1997; 278: 399-411.

Holloway HC, Norwood AE, Fullerton CS, Engel CC, Ursano RJ. The threat of biological weapons: prophylaxis and mitigation of psychological and social consequences. *JAMA* 1997; 278: 425-427.

McDade JE. Addressing the potential threat of bioterrorism: value added to an improved public health infrastructure. *Em Inf Dis* 1999; 5: 591-592.

Perkins BA, Popovic T, Yeskey K. Public health in the time of bioterrorism. *Emerging Infectious Dis* 2002;8:1015-1018. (NOTE: This issue of EID contains a host of articles on the 2001/2002 anthrax events – excellent reading for those with interest, but not required.)

Session #2: 7 September

Overview of types of hazards and disasters, and their consequences.

What constitutes a disaster? How do the various definitions of a disaster differ, and how are they similar? What are *man-made* and *natural* disasters? What is the historical context of disasters from the public health perspective? General introductory material and course logistics will also be covered.

Lecturers: D. Cone & L. Degutis

Learning objectives: Knowledge and understanding of:

- a. disaster terminology, including the concepts of vulnerability, risk, prevention, mitigation, response, and recovery.
- b. principle disaster types and their effects on human populations.

Landesman, Ch. 1.

Waeckerle JF, Lillibridge SR, Burkle FM, Noji EK. Disaster medicine: challenges for today. *Ann Emerg Med* 1994; 23: 715-718.

Lechat MF. Accident and disaster epidemiology. *Pub Health Rev* 1993-4; 21: 243-253.

Noji EK. Disaster epidemiology: challenges for public health action. *J Pub Health Policy* 1992; 13: 332-340.

Koenig KL, Dinerman N, Kuehl AE. Disaster nomenclature--a functional impact approach: the PICE system. *Acad Emerg Med* 1996; 3: 723-727.

Durham B. The background and history of manmade disasters. *Top Emerg Med* 2002; 24: 1-14.

Cone DC, Weir SD, Bogucki S. Convergent volunteerism. (editorial) *Ann Emerg Med* 2003; 41: 457-462.

Session #3: 14 September

Roles and Responsibilities of Public Health

Why should public health professionals be concerned about disasters and their management? What is the history of the public health role in disaster preparedness and response? Why is it anticipated that the effects of disasters on human populations will increase? How can the public health sector help communities develop the ability to handle the most common health-related problems resulting from disasters? What is the functional model of public health disaster response?

Lecturer: L. Degutis

Learning objectives: In-depth understanding of

- a. why public health professionals must be an integral part of the complete range of disaster activities.
- b. the roles and responsibilities of these professionals in disaster preparedness and response.
- c. the functional model of public health disaster response.

Landesman Ch. 2.

Carr SJ, Leahy SM, London S, Sidhu S, Vogt J. The public health response to the Los Angeles 1994 earthquake. *Am J Pub Health* 1996; 86: 589-590.

Saylor LF, Gordon JE. The medical component of natural disasters. *Am J Med Sci* 1957; 234: 342-362.

O'Carroll PW, Friede A, Noji EK, Lillibridge SR, Fries DJ, Atchison CG. The rapid implementation of a statewide emergency health information system during the 1993 Iowa flood. *Am J Pub Health* 1995; 85: 564-567.

One Year After the Terrorist Attacks: Is Public Health Prepared? A Report Card from the American Public Health Association. <http://www.apha.org/united/reportcardfile.htm>

Gautman K. Organizational problems faced by the Missouri DOH in providing disaster relief during the 1993 floods. *J Pub Health Management & Practice* 1998; 4: 79-86.

Bioterrorism and emergency readiness competencies for all public health workers. The Columbia University School of Nursing Center for Health Policy, November 2002: www.nursing.hs.columbia.edu/institute-centers/chphsr/btcomps.pdf

Session #4: 21 September

Complex Humanitarian Emergencies

What is a complex humanitarian emergency, and why are public health issues so important in regions and populations affected by complex emergencies? Who are the four "major participants" in complex emergency management and relief, and what are their roles? What is the

difference between a refugee and an internally displaced person? What are the three phases of refugee emergencies? How are the nutrition and medical needs of refugees assessed and met?

Lecturer: D. Cone

Learning objectives: Understand the principles of

- a. refugee medical care and the public health needs of displaced persons
- b. complex emergency “relief” phases and components

Special issue, *Prehosp Disaster Med*, 16:4 (Oct-Dec 2001)

Full text available at <http://pdm.medicine.wisc.edu/TOC164.htm>

Required articles: Burkle FM. Complex emergencies: an introduction. (pp 182-183); Schull MJ, Shanks L. Complex emergencies: expected and unexpected consequences. (pp 192-196);

Griekspoor A, Sondorp E. Enhancing the quality of humanitarian assistance: taking stock and

future initiatives (pp 209-215); VanRooyen MJ, Hansch S, Curtis D, Burnham G. Emerging issues and future needs in humanitarian assistance. (pp 216-222). The remainder of the issue is optional.

CDC. Famine-affected, refugee and displaced populations: recommendations for public health issues. *MMWR* 1992; RR-13.

Burkholder B, Toole MJ. Complex humanitarian emergencies. *Lancet* 1995; 346: 1012-1015.

Seaman J. Disaster epidemiology: or why most international disaster relief is ineffective. *Injury* 1990; 21: 5-8.

Burkle FM. Lessons learnt and future expectations of complex emergencies. *BMJ* 1999; 319: 422-426.

Optional text: Leaning J., Briggs S. M., and Chen L. C. (eds.), *Humanitarian Crises: The Medical and Public Health Response*. Harvard University Press, 1999.

Session #5: 28 September

Social and Mental Health Issues in Disasters

The role of public health in the varied social and psychosocial impacts of disasters will be examined. The ability of the public health system to help restore the social and psychological function of a community affected by a disaster and reduce the occurrence and severity of adverse mental health outcomes through prevention, assessment, and response will be covered.

Lecturer: Steven J. Berkowitz, MD, Assistant Professor of Pediatrics, Yale Child Study Center

Learning objectives: Be able to

- a. describe the principle social and psychosocial effects of disasters
- b. identify groups that may be at increased risk for these effects
- c. discuss strategies for preventing and mitigating these effects

Landesman, Ch. 9.

Burkle FM. Acute-phase mental health consequences of disasters. *Ann Emerg Med* 1996; 28: 119-128.

Weisaeth L, Knudsen Ø, Tonnessen A. Technological disasters, crisis management and leadership stress. *J Hazardous Materials* 2002; 93: 33-45.

Pfefferbaum B, Nixon SJ, Tucker PM, et al. Posttraumatic stress responses in bereaved children after the Oklahoma City bombing. *J Amer Acad Child Adol Psych* 1999; 38: 1372-1379.

Holloway HC, Norwood AE, Fullerton CS, Engel CC Jr, Ursano RJ. The threat of biological weapons: Prophylaxis and mitigation of psychological and social consequences. *JAMA* 1997; 278: 425-427.

Norwood AE, Ursano RJ, Fullerton CS. Disaster psychiatry: principles and practice. *Psych Quart* 2000; 71: 207-226.

Litz BT, Gray MJ, Adler AB. Early intervention for trauma. *Clin Psych Sci Prac* 2002; 9: 112-134.

Session #6: 5 October

Assessment, Part I: Risk assessment

Public health risk assessment, hazard identification, and vulnerability analysis will be discussed. Developing technologies for modeling risks will be explored.

Lecturer: D. Cone

Learning objectives: Be able to discuss

- a. the role of public health risk assessment in overall disaster management
- b. the key elements of hazard identification and vulnerability analysis
- c. The epidemiologic aspects of risk assessment

Landesman, Ch. 5.

Arnold JL. Disaster medicine in the 21st century: future hazards, vulnerabilities, and risks. *Prehosp Disaster Med* 2002; 17: 3-11.

Chen K, Blong R, Jacobson C. Towards an integrated approach to natural hazards risk assessment using GIS: with reference to bushfires. *Environ Management* 2003;31:546-560.

Malilay J, Henderson A, McGeehin M, Flanders WD. Estimating health risks from natural hazards using risk assessment and epidemiology. *Risk Anal* 1997; 17:353-8.

Rotz LD, Khan AS, Lillibridge SR, Ostroff SM, Hughes JM. Public health assessment of potential biological terrorism agents. *Emerg Infect Dis* 2002;8:225-230.

Wirén E. Risk and risk evaluation. *Prehosp Disaster Med* 1994; 9:6-8.

Optional readings: Higgs G. Researching applications of geographical information systems in health: an introduction. *Health & Place* 2002; 8: 1-2. This issue of the journal "Health & Place" (available through the Yale medical library ejournals) contains an editorial and four articles with examples of GIS applications in public health.

Session #7: 12 OctoberPrinciples of Disaster Planning, Prevention, and Mitigation

Topics to be covered include the importance of public health leadership in disaster planning, common misperceptions about responder behavior during disasters, and the “paper plan” syndrome as it relates to disaster preparedness.

Lecturer: L. Degutis

Learning objectives: Be able to

- a. differentiate between prevention and mitigation, as they relate to disaster preparedness
- b. outline the essential steps in disaster planning for hospitals, communities, and states
- c. outline the problems with the “trauma focus” common to many disaster plans

Landesman, Ch. 7.

Morrow BH. Identifying and mapping community vulnerability. *Disasters* 1999; 23: 1-18.

Auf der Heide E. Disaster planning, part II: Disaster problems, issues, and challenges identified in the research literature. *Emerg Med Clin NA* 1996; 14: 453-480.

Benson C. Twigg J. Myers M. NGO initiatives in risk reduction: an overview. *Disasters* 2001; 25: 199-215.

Christoplos I, Mitchell J, Liljelund A. Re-framing risk: the changing context of disaster mitigation and preparedness. *Disasters* 2001; 25: 185-198.

Anonymous. Mitigation emerges as major strategy for reducing losses caused by natural disasters. Board of Natural Disasters. *Science* 1999; 284: 1943-1947.

Session #8: 19 OctoberAssessment, Part II: Rapid Health Assessment and Surveillance

Essential concepts of rapid health assessment, disaster epidemiology, public health surveillance, emergency information systems, disaster data collection, and disaster informatics will be covered.

Lecturer: L. Degutis

Learning objectives: Be able to

- a. list the goals and objectives of the rapid health assessment
- b. identify appropriate measures for environmental hazards and human impact
- c. identify pre-, intra-, and post-disaster epidemiologic activities
- d. identify the three-step process of disaster information systems
- e. list major issues in initiating a post-disaster surveillance system, and the seven attributes of such a system
- f. list major types and sources of data collected during the relief phase of a disaster

Landesman, Ch. 4.

Glass RI, Noji EK. Epidemiologic surveillance following disasters. In: Halperin W, Baker EL, eds. *Public health surveillance*. NY: Van Nostrand Reinhold, 1992: 195-205.

Lillibridge SR, Noji EK, Burkle FM Jr. Disaster assessment: the emergency health evaluation of a population affected by a disaster. *Ann Emerg Med* 1993; 22: 1715-1720.

Wetterhall SF, Noji EK. Surveillance and epidemiology. In: Noji EK, ed. *The public health consequences of disasters*. NY: Oxford University Press, 1997: 37-64.

Community needs assessment and morbidity surveillance following an earthquake - Turkey, August 1999. *MMWR* 1999; 48(50): 1147-1150.

Community needs assessment and morbidity surveillance following an ice storm - Maine, January 1998. *MMWR* 1998; 47(17): 351-354.

Malilay J, Flanders WD, Brogan D. A modified cluster-sampling method for post-disaster rapid assessment of needs. *Bull World Health Org* 1996; 74: 399-406.

Hlady WG, Quenemoen LE, Armenia-Cope RR, et al. Use of a modified cluster sampling method to perform rapid needs assessments after Hurricane Andrew. *Ann Emerg Med* 1994; 23: 719-725.

Bradt DA, Drummond CM. Rapid epidemiological assessment of health status in displaced populations—an evolution toward standardized minimum essential data sets. *Prehosp Disaster Med* 2002; 17: 178-185.

Noji EK. Disaster epidemiology. *Emerg Med Clin NA* 1996; 14: 289-300.

Optional text: WHO. *Rapid health assessment protocols for emergencies*. Geneva, World Health Organization, 1999.

Session #9: 26 October

Structure and Organization of Disaster Response

This session will introduce the essentials of domestic emergency response at the operational level. Topics covered will include the organizations that participate in emergency preparedness and response, their roles and responsibilities in a disaster, and their interactions with public health. The Federal Response Plan will be used as the functional framework for multi-jurisdictional response in the U.S. Disaster communications will also be covered.

Lecturer: D. Cone

Learning objectives: Be able to

- a. describe the incident command system, and its application to the public health aspects of disaster management
- b. describe the typical state and federal response to disasters, particularly in relation to local responses
- c. list regional, national, and international agencies with roles in disaster response, and the functions they carry out

Landesman, Ch. 3 & 6.

Bissell R, Becker B, Burkle F. Health care personnel in disaster response. *Emerg Med Clin NA* 1996; 14: 267-288.

Koenig KL. Strip and shower: the duck and cover for the 21st century. *Ann Emerg Med* 2003; 42:391-4.

Koenig KL. Homeland security and public health: role of the Department of Veterans Affairs, the US Department of Homeland Security, and implications for the public health community. *Prehospital Disaster Med.* Oct-Dec 2003;18(4):327-333.

Schultz CH, Koenig KL, Lewis RJ. Implications of hospital evacuation after the Northridge, California, earthquake. *N Engl J Med* 2003; 348:1349-55.

Berman MA, Lazar EJ. Hospital emergency preparedness - lessons learned since Northridge. *N Engl J Med* 2003; 348:1307-8.

Homeland Security Presidential Directive/HSPD-5: Management of Domestic Incidents, 28 February 2003.

Session #10: 2 November

Public Health Response to Chemical / Hazardous Materials Disasters (with off-campus activity[†])

The role of public health in both localized (e.g. tanker truck spill) and large-scale (e.g. Bhopal) chemical disasters will be discussed. Local emergency planning committees (LEPC's), industrial hazmat management, the SARA Title III "superfund," and the unique concerns of the chemical transportation industry will be covered.

Lecturer: D. Cone

Learning objectives: Be able to discuss

- a. the public health response to a chemical disaster
- b. the roles of field personnel and hospitals in decontamination
- c. public health aspects of surveillance, record-keeping, and mitigation of chemical-related health problems

Burgess JL, Kovalchick DF, Harter L, Kyes KB, Lymp JF, Brodtkin CA. Hazardous materials events: evaluation of transport to health care facility and evacuation decisions. *Am J Emerg Med* 19: 99-105, 2001.

Wetter DC, Daniell WE, Treser CD. Hospital preparedness for victims of chemical or biological terrorism. *Am J Pub Health* 2001; 91: 710-716.

Tucker JB. National health and medical services response to incidents of chemical and biological terrorism. *JAMA* 1997; 278: 362-368.

Levitin HW, Siegelson HJ. Hazardous materials. Disaster medical planning and response. *Emerg Med Clin NA* 1996; 14: 327-348.

Resuscitation, Vol 42, Issue 2 (Oct 1999).

The following article required reading, and the remainder of the issue (available on the medical library ejournals site) is optional – the articles contrasting the UK and French approaches are particularly interesting:

Moles TM. Emergency medical services systems and HAZMAT major incidents, pages 103-116.

Landesman LY, Markowitz SB, Rosenberg SN. Hospital preparedness for chemical accidents: the effect of environmental legislation on health care services. *Prehosp Disaster Med* 1994; 9: 154-159.

Hsu EB, Grabowski JG, Chotani RA, Winslow JA, Alves DW, VanRooyen MJ. Effects on local emergency departments of large-scale urban chemical fire with hazardous materials spill. *Prehospital Disaster Med* 2002; 17:196-201.

Session #11: 9 November

Public Health Aspects of Environmental Services During Disasters

The key role of a sanitary environment as part of the foundation for health in disasters will be examined. The needs of displaced populations and the environmental problems arising from both slow- and rapid-onset emergencies will be studied.

Lecturer: D. Cone

Learning objectives: Understand

- a. issues related to food and water supply, shelter, and vector control in disaster circumstances
- b. essentials of environmental surveillance and quantitative monitoring of environmental services

Landesman, Ch. 8.

Peterson EA, Roberts L, Toole MJ, Peterson DE. The effect of soap distribution on diarrhoea: Nyamithuthu Refugee Camp. *Int J Epi* 1998; 27: 520-524.

O'Carroll PW et al. The rapid implementation of a statewide emergency health information system during the 1993 Iowa flood. *Am J Pub Health* 1995; 85: 564-567. [On the BlackBoard site from the 10 September lecture – relevant here also.]

Esrey S. et al. Effects of improved water supply and sanitation on ascariasis, diarrhoea, dracunculiasis, schistosomiasis, and trachoma. *Bull WHO* 1991; 69: 609-621.

Final technical report of the public health investigation to assess potential exposures to airborne and settled surface dust in residential areas of lower Manhattan: Executive Summary. New York City Department of Health and Mental Hygiene and the U.S. Agency for Toxic Substances Disease Registry, 2002.

Logue JN. Disasters, the environment, and public health: improving our response. *Am J Public Health* 1996; 86:1207-10.

Merryman RE. The role of environmental health personnel in hazardous materials emergency response. *Journal of Environmental Health* 1986; 49: 145-147.

Hatch D, Waldman RJ, Lungu GW, Piri C. Epidemic cholera during refugee resettlement in Malawi. *Int J Epi* 1994; 22: 1292-1299.

Optional: Lange JL et al. Exposures to the Kuwait oil fires and their association with asthma and bronchitis among Gulf War veterans. *Env Health Perspectives* 2002; 110: 1141-1146

Optional: Duff EMW et al. Neural tube defects in Jamaica following Hurricane Gilbert. *Am J Pub Health* 1994; 84: 473-476.

Session #12: 16 November

Evaluation Methods for Assessing the Medical and Public Health Response

Basic concepts and research methods for the evaluation of the medical and public health response to disasters will be studied. The recent evolution from “case studies” to systematic evaluation will be the focus, with emphasis on recently developed tools and techniques that can be applied in the field.

Lecturer: L. Degutis

Learning objectives: Understand

- a. the uses and purposes of evaluation studies
- b. the various design options and data collection tools available for use in disaster evaluation studies
- c. how to analyze evaluative data to assess and improve preparedness and response

Landesman Ch. 13.

Ono Y. Risk factors for death in the 8 April 1998 Alabama tornadoes. Quick Response Report #145, Boulder, Colorado: Natural Hazards Research and Applications Information Center, University of Colorado.

May AK, McGwin G, Leland L, et al. The April 8, 1998 tornado: assessment of the trauma system response and the resulting injuries. *J Trauma* 2000; 48: 666-672.

Pretto EA, Angus DC, Abrams JI, et al. An analysis of prehospital mortality in an earthquake. *Prehosp Disaster Med* 1994; 9: 107-124.

Bissell RA, Pretto E, Angus DC, et al. Post-preparedness medical disaster response in Costa Rica. *Prehosp Disaster Med* 1994; 9: 96-106.

Burkle FM, McGrady KAW, Newett SL, et al. Complex, humanitarian emergencies: III. Measures of effectiveness. *Prehosp Disaster Med* 1995; 10: 48-56.

23 November: No class – Thanksgiving Recess

Session #13: 30 November: Student Project Presentations

7 December: Reading Week

Please read Landesman, Ch. 10 (“Disasters and people with disabilities”) and Ch. 12 (“Public health considerations in recovery and reconstruction”).

14 December: Final Exam‡Off-Campus Activity:

Tour of New Haven Emergency Operations Center (Session #10, 2 November 2005)

The class will convene at the regularly scheduled time at the New Haven Emergency Operations Center (400 Orange Avenue, New Haven). Following the lecture on chemical and hazardous materials disasters, students will receive a tour of this facility. At the EOC, representatives of all agencies with involvement in local disaster response gather to coordinate and implement needed disaster response activities. The focus of the tour will be on communications systems and inter-agency coordination.

Hosts:

James Moore, Deputy Director of Emergency Management, City of New Haven

John Gustafson, Executive Director, South-Central Connecticut Regional Emergency Communications System

Lt. Andrew Campion, 911 Dispatch Supervisor, New Haven Fire Department

Additional Course Objectives: Concepts

Without reference to sources, the student will be able to define and use the following terms:

Bioterrorism

Community vulnerability analysis

Consequence management

Crisis management

Complex emergency

Convergent volunteerism

Disaster

a. natural disaster

b. man-made disaster

c. catastrophic disaster

Disaster medical assistance team

Emergency support function

Federal response plan

Hazard analysis

Incident command system

Internally displaced person

Mitigation

National Disaster Medical System

Office of Foreign Disaster Assistance

Potential injury creating event (PICE)

Refugee

Risk assessment

Scales: Richter, Modified Mercalli, Fujita, Saffir-Simpson

Span of control

Surveillance

Triage

Unity of command

Vulnerability analysis

Weapons of mass destruction