SCHOOL OF PUBLIC HEALTH • UNIVERSITY of WASHINGTON
Environmental & Occupational Health Sciences

Climate Change and Occupational Health

ENVH 592

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Dept of Environmental & Occupational Health Sciences
Health Sciences Bldg, F-226A (543-0916)
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Spring 2015
1 credit
M, 2:30-3:50
SOCC 348

NOTE: Course meets 7 times: Apr 6, 13, 27 (no class Apr 20), May 4, 11, 18, June 1

Course Description

This course examines the impact of heat exposure on worker health and productivity within in the context of a changing climate. We will explore current methods of measuring heat exposure, the potential health effects of extreme heat exposure, and projected impacts of heat exposure based on current climate models. The course will feature recently conducted research in Central America and will include participation (by phone) of Dr. Jennifer Crowe at the Universidad Nacional in Costa Rica.

Learning Objectives

At the end of this course, students will be able to

- Describe current methods for measuring heat exposure in working populations
- Explain the primary signs and symptoms of heat-related illness
- Describe at least one potential long-term effect of chronic heat exposure
- Explain the known and likely impact of heat exposure on worker productivity
- Demonstrate a general understanding of how climate models can be used to project future impacts of heat exposure on worker health and productivity

Assignments

- Serve as primary discussant for one (or two) reading(s) (40%)
- Serve as secondary discussant/rapporteur for one (or two) reading(s) (30%)
- Participate in class discussions (30%)

Readings

We have two articles per class session and seven class sessions, so a total of 14 articles. With 7 students, this means you are each responsible for one class session.

Primary Discussant Assignment

Perform a brief presentation of an assigned article. This presentation will serve as a summary of the article and should include key points, findings, data, and conclusions. The presentations should serve as a starting point for discussion in the class on the specific topic.

Secondary Discussant/Rapporteur

For the week that you are primary discussant we ask that you serve as secondary discussant for the other article assigned for that week. You should provide a critical review (constructive criticism appreciated) of the article, and provide some response or commentary to supplement the primary discussant's presentation. As secondary discussant you may wish to provide some additional background and context for the week's topic.

Please email Grant with your top 3 choices of topics to present. Following the first class, a final presentation list will be provided. Email final presentations to Grant prior to the class for presentation. Please keep presentations to 15 minutes or less to provide ample time to discuss the topic amongst the class.

Participation
Students should attend all classes. Active participation includes comments, questions, and remarks for all of the material presented. Students will read all articles presented prior to the class session.

Students with Disabilities
To request academic accommodations due to a disability, please contact Disability Resources for Students, 448 Schmitz, 206-543-8924 (voice), 206-543-8925 (TTY). If you have a letter from Disability Resources for Students indicating that you have a disability that requires academic accommodations, please present the letter to me so we can discuss the accommodations you might need in this class.

Academic Integrity
Students at the University of Washington (UW) are expected to maintain the highest standards of academic conduct, professional honesty, and personal integrity. The UW School of Public Health (SPH) is committed to upholding standards of academic integrity consistent with the academic and professional communities of which it is a part. Plagiarism, cheating, and other misconduct are serious violations of the University of Washington **Student Conduct Code** (WAC 478-120). We expect you to know and follow the university's policies on cheating and plagiarism, and the **SPH Academic Integrity Policy**. Any suspected cases of academic misconduct will be handled according to University of Washington regulations. For more information, see the University of Washington **Community Standards and Student Conduct** website.

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SCHEDULE

Date	Instructor	Topic	Readings**
4/6	Fenske	Climate and work	Bennett & McMichael 2010 Roelefs & Wegman 2014
4/13	Spector	Heat stress and heat-related illness	Spector et al. 2014 Sawka et al. 2011
4/20		**No Class**	
4/27	Quiller	Measuring heat exposure	Lemke and Kjellstrom 2012 Lundgren et al. 2013
5/4	Fenske	Heat exposure and worker productivity	Kjellstrom 2015 Kuklane et al. 2015
5/11	Fenske	Projection of impacts of heat exposure	Kjellstrom et al. 2013 Dunne et al. 2013
5/18	Quiller	Heat and kidney function	Wesseling et al. 2014 Johnson et al. 2014
5/25		**Memorial Day**	
6/1	Crowe	Workplace heat exposure in Central America	Crowe et al. 2013 Kjellstrom and Crowe 2011

** Full references for these readings are provided on the following page.

DATE	READINGS
4/6	**Bennett** CM, **McMichael** AJ. Climate change impacts on working people: non-heat related impacts of climate change on working populations. *Global Health Action* 3, 5640, 2010. **Roelofs** C, **Wegman** D. Workers: the climate canaries. *Am J Pub Health* 104, 1799-1801, 2014. [News article] Gaarder N, Ward A. "Outdoor workers are taking heat wave seriously." World Herald News Service, August 28, 2013. [News article] Breit P. "Heat wave cranks up the temperature at cleaning plant: Grandview's Pride Cleaners plant can feel like 110 degrees inside." KMBC, Kansas City, August 28, 2013.
4/13	**Spector** JT, Krenz J, Rauser E, Bonauto DK. Heat-related illness in Washington State agriculture and forestry sectors. *Am J Ind Med* **57**, 881-895, 2014. **Sawka** MN, Leon LR, Montain SJ, Sonna LA. Integrated physiological mechanisms of exercise performance, adaption, and maladaption to heat stress. *Compr Physiol* 1, 1883-1928, 2011.
4/27	**Lemke** B, **Kjellstrom** T. Calculating workplace WBGT from meteorological data: a tool for climate change assessment. *Ind Health* 50, 267-278, 2012. Lundgren K, Kuklane K, Gao C, Holmér I. Effects of Heat Stress on Working Populations when Facing Climate Change. *Ind Health* 51, 3-15, 2013.
5/4	**Kjellstrom** T. Impact of climate conditions on occupational health and related economic losses: a new feature of global and urban health in the context of climate change. *Asia Pac J Public Health,* 2015. **Kuklane** K, Lundgren K, Gao C, Löndahl J, Hornyanszky ED, Östergren et al. Ebola: improving the design of protective clothing for emergency workers allows them to better cope with heat stress and help to contain the epidemic. *Ann Occup Hyg* 59(2), 258-261, 2015.
5/11	**Kjellstrom** T, Lemke B, Otto M. Mapping occupational heat exposure and effects in South-East Asia: ongoing time trends 1980-2011 and future estimates to 2050. *Ind Health* 51:56-57, 2013. **Dunne** JP, Stouffer RJ, John JG. Reductions in labour capacity from heat stress under climate warming. *Nature Climate Change* Published on-line Feb 24, 2013.
5/18	**Wesseling** C, van Wendel de Joode B, Crowe J, Rittner R, Jakobsson K. Mesoamerican nephropathy in Costa Rica: geographical distribution and time trends of chronic kidney disease mortality between 1970 and 2012. *Occup Environ Med* 71, Suppl. 1:A27, 2014. **Johnson** RJ, Glaser J, Sánchez-Lozada LG. Chronic kidney disease of unknown etiology: a disease related to global warming? *Medicc Review **16**,* 79-80, 2014.
6/1	**Crowe** J, Wesseling C, Solano BR, et al. Heat exposure in sugarcane harvesters in Costa Rica. *Am J Ind Med* 2013;56(10):1157-1164. **Kjellstrom** T, **Crowe** J. Climate change, workplace heat exposure, and

	occupational health and productivity in Central America. *Int J Occup Environ Health* 17, 270-281, 2011.

Additional Readings

Adam-Poupart A, Labréche F, Smargiass A, Duguay P, Busque MA, Gagné C, Rintamäki H, Kjellstrom T, Zayed J. Climate Change and Occupational Health and Safety in a Temperate Climate: Potential Impacts and Research Priorities in Quebec, Canada. Ind Health **51**, 68-78

Gubernot DM, Anderson GB, Hunting KL. Characterizing Occupational Heat-Related Mortality in the United States, 2000-2010: An Analysis Using the Census of Fatal Occupational Injuries Database. *Am J Ind Med* **58,** 203-211, 2015

Sheffield PE, Herrera JG, Lemke B, Kjellstrom T, Romero LE. Current and future heat stress in Nicaraguan work places under a changing climate. Ind Health. 2013;51(1):123--127

Spector JT, Sheffield PE. Re-evaluating occupational heat stress in a changing climate. *Ann Occup Hyg* **58**, 936-42, 2014

Lam K, Krenz J, Palmández P, Ngrete M, Perla M, Murphy-Robinson H, Spector JT. Identification of barriers to the prevention and treatment of heat-related illness in Latino farmworkers using activity-oriented, participatory rural appraisal focus group methods. BMC Public Health 13, 1004-doi, 2013

Johnson RJ, Glaser J, Sánchez-Lozada LG. Chronic Kidney Disease of Unknown Etiology: A Disease Related to Global Warming? *Medicc Review **16**,* 79-80, 2014

Woodward A, Smith KR, Campbell-Lendrum D, et al. Climate change and health: on the latest IPCC report. Lancet. 2014;383(9924):1185-1189.

Schulte PA, Chun H. Climate change and occupational safety and health: establishing a preliminary framework. J Occup Environ Hyg. 2009;6(9):542-554.

Riley K, Delp L, Cornelio D, Jacobs S. From agricultural fields to urban asphalt: the role of worker education to promote California's heat illness prevention standard. *New Solutions* 2012;22(3):297-323.

Gubernot DM, Anderson GB, Hunting KL. The epidemiology of occupational heat exposure in the United States: a review of the literature and assessment of research needs in a changing climate. Int J Biometeorol. 2013;Epub ahead of print.

Smith S. Heat Blamed for Death of Massachusetts Postal Worker. 2013. Available at: http://ehstoday.com/safety/heat-blamed-death-massachusetts-postalworker. Accessed March 29, 2014.

Public Citizen. Statement: With Hundreds of Workers Dying, OSHA's Denial of Petition for a Heat Stress Standard Is Shortsighted. 2012. Available at: http://www.citizen.org/hrg2042. Accessed March 29, 2014.

California Division of Occupational Safety and Health. (2006) California code of regulations, title 8, section 3395 heat illness prevention [Internet]. Available at http://www.dir.ca.gov/Title8/3395.html. Accessed 1 August 2014.

Centers for Disease Control and Prevention. (2008) Heat-related deaths among crop workers--United States, 1992-2006. Morbidity Mortal Wkly Rep; 57: 649–53. Available at http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5724a1.htm. Accessed 1 August 2014.

d'Ambrosio Alfano F, Malchaire J, Palella BI et al. (2014) The WBGT index revisited after 60 years of use. Ann Occup Hygiene.

ISO. (1989) Standard 7243. Hot environments -- estimation of the heat stress on working man, based on the WBGT-index (wet bulb globe temperature). Geneva, Switzerland: International Organization for Standardization.

ISO. (2004a) Standard 7933. Ergonomics of the thermal environment–analytical determination and interpretation of heat stress using calculation of the predicted heat strain. Geneva, Switzerland: International Organization for Standardization.

ISO. (2004b) Standard 9886. Evaluation of thermal strain by physiological measurements. Geneva, Switzerland: International Organization for Standardization. Jackson LL, Rosenberg HR. (2010) Preventing heat-related illness among agricultural workers. J Agromedicine; 15:200–15.

Washington State Legislature. (2014) Chapter 296-62-095 WAC outdoor heat exposure. Available at http://apps.leg.wa.gov/WAC/default.aspx?cite=296-62&full=true#296-62-095. Accessed 1 August 2014.

Quandt SA, Wiggins MF, Chen H et al. (2013) Heat index in migrant farmworker housing: implications for rest and recovery from work-related heat stress. Am J Public Health; 103: e24–6.

Stoecklin-Marois M, Hennessy-Burt T, Mitchell D et al. (2013) Heat-related illness knowledge and practices among California hired farm workers in the MICASA study. Ind Health; 51: 47–55.