Published in final edited form as:

J Occup Environ Med. 2010 January ; 52(0 1): S1–S3. doi:10.1097/JOM.0b013e3181c8527e.

Worksite Environmental Interventions for Obesity Control: An Overview

Stephenie C. Lemon, Ph.D. and

University of Massachusetts Medical School

Charlotte Pratt, Ph.D.

Prevention and Population Science Program, National Heart, Lung, and Blood Institute, National Institutes of Health

The increasing prevalence of overweight and obesity in the United States is well-documented,¹ as is the subsequent impact on morbidity and mortality.^{2, 3} This public health epidemic is affecting all segments of the U.S. population, regardless of gender, race/ethnicity and socioeconomic position.¹ In recent years, numerous intervention approaches to reducing overweight and obesity, conducted in a wide range of populations and settings, have been published in the scientific literature.⁴ While much has been learned about how individual characteristics impact diet and physical activity behaviors, there is a growing appreciation that environmental factors impact dietary and physical activity behaviors, which in turn influence overweight and obesity.⁵

Worksites are promising settings in which to develop, test and disseminate obesity control programs,⁶ as the majority of the U.S. adult population spends a substantial amount of time at work,⁷ allowing access to large numbers of adults of diverse socio-economic and ethnic backgrounds. Within the worksite setting, environmental factors, including availability of energy-dense foods, limited access to healthy foods, and high rates of sedentary behavior with limited opportunity for physical activity may contribute to employee overweight and obesity. However, numerous worksite characteristics may facilitate multi-component intervention approaches that combine environmental-and individually-targeted strategies, including established communications systems, physical environment characteristics such as on-site cafeterias and exercise rooms, and existing social relationships among co-workers.⁸ Interventions that use ecological frameworks,^{9, 10} taking into consideration worksite characteristics and individuals within the context of their social and physical environments also have tremendous potential for providing convenient, accessible and healthy food options to improve employee eating and physical activity behaviors.

In 2004, the National Heart, Lung, and Blood Institute (NHLBI) funded seven independent research projects to test the effectiveness of multi-component weight control interventions at worksites that include environmental changes alone or in combination with individually-targeted strategies.¹¹ The studies were conducted in a variety of worksites across the US. The participating institutions and their collaborative worksites included: Emory University (Lighten-Up program targeting manufacturing facilities), Kaiser Permanente, HI (Weight, Worksite and Wellness (3W) program targeting hotels), Tulane University (ACTION! program targeting elementary school employees), the University of Massachusetts Medical School (Step Ahead program targeting hospitals), the University of Rochester (Images of Health Worksite program targeting medium and large businesses), the University of

Washington (PACE program targeting small and medium business) and the University of Minnesota (Route H program targeting metropolitan bus transit workers). Each study included a one-year developmental phase, a two-year intervention and two-year follow-up assessments. The primary outcome of each study was change in body mass index (BMI) from baseline to two-year follow-up.

This supplement to the Journal of Occupation and Environmental Medicine includes a series of manuscripts that evaluate various aspects of the funded studies, including environmental and cost-related findings, process evaluation, and the impact of acute and chronic psychosocial work stressors on BMI. Two guest editors were responsible for collaborating with the JOEM Managing Editor during the review process for this supplement. Manuscripts were submitted through the JOEM electronic submission Website. The peer review process was intended to include valuable input from external reviewers with expertise in range of disciplines, including diet, physical activity, organizational theory, process evaluation, health economics and behavioral science. Lists of potential reviewers were provided to and approved by the JOEM Managing Editor. Each manuscript was blindly reviewed by two expert reviewers. A guest editor was responsible for reviewing manuscript critiques, requesting manuscript revisions and ensuring that revised manuscripts appropriately addressed reviewer critiques. The JOEM Managing Editor was responsible for email communication with the reviewers and with the corresponding authors.

Consistent with the environmental focus of the NHLBI initiative, four of the articles presented in this supplement present findings on the impact of their multi-component interventions on environmental factors. Within a worksite setting, interventions addressing the food and physical activity environment can include healthy food availability in cafeterias and vending machines, access to indoor and outdoor opportunities for physical activity, including onsite exercise facilities and walking routes, signage that promote healthy food choices and stair walking and policies, such as benefits for gym memberships.¹² Methods to accurately assess environmental characteristics and changes in these characteristics are essential to determining the impact of interventions targeting environmental change for weight control promotion.

Nigg and colleagues¹³ examined the association between worksite environmental characteristics, measured by a modified version of the Checklist of Health Promotion Environments (CHEW),¹⁴ and employee BMI among employees at 30 hotels on the island of Oahu, HI. No overall association was observed. The authors conducted analysis stratified by hotel size and unionization status, and found that the size and structure of the worksite environment may interact with intervention efforts, suggesting that future studies may require consideration of these factors in the development of environmental interventions.

Beresford and colleagues¹⁵ conducted an evaluation of the feasibility of using an environmental checklist to measure worksite physical environmental characteristics and assessed the impact of their intervention on the worksite environment in 35 small to medium business in the greater Seattle area. Using the modified version of the CHEW,¹⁴ they examined changes in environmental characteristics from baseline to two year follow-up. Their manuscript makes specific recommendations for improving the validity of the EA checklist. The analysis of change in worksite environmental characteristics in response to the intervention found that only changes in the physical activity and nutrition information environments were significantly improved.

Baker and colleagues¹⁶ sought to determine the ability of the Environmental Assessment Tool (EAT) to detect changes in response to an environmental intervention promoting physical activity and healthy eating behaviors that support weight control. Developed and

initially validated during the formative and baseline data collection stages of this study,¹⁷ the EAT was designed to measure worksite environmental characteristics related to nutrition, physical activity, weight management and organizational support. Results support the ability of the EAT to detect changes in the nutrition, weight management and organizational support sub-scales, but not for physical activity.

French and colleagues¹⁸ examined the impact of a vending pricing intervention that was one strategy included in a multi-component intervention conducted among workers at four metropolitan transit workers in Minnesota. The vending intervention included making at least 50% of the options healthy items and reducing the cost of these items at least 10%. The intervention achieved a 10-42% increase in the sale of healthy vending items. More research is needed to link sales data to caloric intakes as well as body mass index.

The costs of overweight and obesity are staggering, both in terms of direct medical expenditures and in indirect costs.¹⁹ Worksite efforts to control overweight and obesity may be attractive to employers because such efforts have the potential to lower health care costs, including reductions in direct medical care costs, health insurance costs, absenteeism and disability claims, and improvements in productivity.²⁰ Two studies in this supplement address the economic costs associated with weight reduction.

Goetzel and colleagues²¹ conducted an analysis of baseline data of four of the participating studies. The purpose was to examine the impact of overweight and obesity on health care utilization, absenteeism and productivity loss and costs associated with these outcomes in a diverse population of US employees using biometrically collected weight and height data. Findings confirm the strong association between overweight and obesity and these cost-related measures across diverse occupational settings. Compared to normal weight employees, those who were overweight were more likely to experience increased costs due to presenteeism, or on the job productivity loss. ; obese workers had greater costs associated with doctor and emergency room visits, absenteeism and productivity loss, compared to normal weight workers.

Meenan and colleagues²² conducted an economic evaluation of the 3W intervention, conducted at 30 hotels on the island of Oahu, Hawaii. Economic outcomes investigated included productivity loss, absenteeism and health care utilization. Findings indicated that the intervention had a positive impact on productivity loss, but the results did not translate into overall cost savings, suggesting that longer term follow-up may be required.

Multi-component interventions that target environmental and individual levels are challenged by the complexity of intervention implementation. Systematic process evaluation is essential to evaluating intervention implementation and interpreting study findings.²³ Johnson and colleagues²⁴ present the results of a systematic process evaluation of their study conducted among public elementary schools in the greater New Orleans area. Using a variety of data sources, intervention dose, fidelity, reach, dose received and context were examined. The authors observed that while dose delivered and received were substantial and consistent across intervention sites, reach was more variable.

While worksite environmental characteristics are important to study in relation in employee overweight and obesity, work-related stressors are under-studied potential risk factors for overweight and obesity.²⁵ Fernandez and colleagues²⁶ examined the baseline association of acute and chronic psychosocial stressors on BMI among employees at six Kodak worksites in Rochester, NY. Job insecurity was examined as an acute work stressor, while psychological demands and decision latitude were examined as chronic work stressors. Findings from this study suggest that high job strain, but not the acute measure of job

insecurity, is associated with employee BMI. Results further support unhealthy physical activity behaviors as mediators of this association.

The articles presented in this supplement provide valuable insights into the impact of overweight and obesity in the worksite, work-related factors that influence overweight and obesity, methodological approaches to implementing and evaluating worksite interventions with environmental change components and the impact of these interventions on environmental and cost-related outcomes.

On behalf of the investigators funded under the NHLBI worksite initiative, we hope that readers will benefit from our experiences.

References

1. Ogden CL, Carroll MD, Curtin LR, McDowell MA, Tabak CJ, Flegal KM. Prevalence of overweight and obesity in the United States, 1999-2004. *JAMA*. 2006; 295:1549-1555. [PubMed: 16595758]
2. Gregg EW, Cheng YJ, Cadwell BL, et al. Secular trends in cardiovascular disease risk factors according to body mass index in US adults. *JAMA*. 2005; 293:1868-1874. [PubMed: 15840861]
3. Calle EE, Rodriguez C, Walker-Thurmond K, Thun MJ. Overweight, obesity, and mortality from cancer in a prospectively studied cohort of U.S. adults. *N Engl J Med*. 2003; 348:1625-1638. [PubMed: 12711737]
4. Franz MJ, VanWormer JJ, Crain AL, et al. Weight-loss outcomes: a systematic review and meta-analysis of weight-loss clinical trials with a minimum 1-year follow-up. *J Am Diet Assoc*. 2007; 107:1755-67. [PubMed: 17904936]
5. Papas MA, Alberg AJ, Ewing R, Helzlsouer KJ, Gary TL, Klassen AC. The built environment and obesity. *Epidemiol Rev*. 2007; 29:129-143. [PubMed: 17533172]
6. Katz DL, O'Connell M, Yeh MC, et al. Public health strategies for preventing and controlling overweight and obesity in school and worksite settings: a report on recommendations of the Task Force on Community Preventive Services. *MMWR Recomm Rep*. 2005; 54(RR-10):1-12. [PubMed: 16261131]
7. 2008 American Community Survey: work status in the past 12 months. [2009 September 30, 2009] 2008. Available from: http://factfinder.census.gov/servlet/STTable?_bm=y&-qr_name=ACS_2008_1YR_G00_S2303&-geo_id=01000US&-ds_name=ACS_2008_1YR_G00_-&-lang=en&-redoLog=false
8. Chapman LS. Reducing obesity in work organizations. *Am J Health Promot*. 2004; 19(suppl1):1-8. [PubMed: 15460102]
9. Stokols D. Establishing and maintaining healthy environments. Toward a social ecology of health promotion. *Am Psychol*. 1992; 47:6-22. [PubMed: 1539925]
10. Sallis, JF.; Owen, N.; Fisher, EB. Ecological models of health behavior. In: Glanz, K.; Rimer, BK.; Viswanath, K., editors. *Health Behavior and Health Education Theory, Research, and Practice*. 4. San Francisco, CA: Jossey-Bass; 2008.
11. Pratt CA, Lemon SC, Fernandez ID, et al. Design characteristics of worksite overweight and obesity control interventions supported by the National Heart, Lung, and Blood Institute. *Obesity*. 2007; 15:2171-2180. [PubMed: 17890484]
12. Vartanian LR, Schwartz MB, Brownell KD. Effects of soft drink consumption on nutrition and health: a systematic review and meta-analysis. *Am J Public Health*. 2007; 97:667-675. [PubMed: 17329656]
13. Nigg CR, Albright C, Williams R, Nichols C, Renda G, Stevens VJ, et al. Are physical activity and nutrition indicators of the Checklist of Health Promotion Environments at Worksites (CHEW) associated with employee obesity among hotel workers? *J Occup Environ Med*. 2010
14. Oldenburg B, Sallis JF, Harris D, Owen N. Checklist of Health Promotion Environments at Worksites (CHEW): development and measurement characteristics. *Am J Health Promot*. 2002; 16:288-99. [PubMed: 12053440]

15. Beresford SAA, Bishop SK, Brunner NL, Duncan GE, McGregor BA, McLerran DF, et al. Environmental assessment at worksites following a multilevel intervention to promote activity and changes in eating: The PACE project. *J Occup Environ Med.* 2010
16. Baker KM, DeJoy DM, Wilson MG, Bowen HM, Goetzel RZ. Application of the Environmental Assessment Tool (EAT) as a process measure for a worksite weight management intervention. *J Occup Environ Med.* 2010
17. DeJoy DM, Wilson MG, Goetzel RZ, Ozminkowski RJ, Wang S, Baker KM, et al. Development of the Environmental Assessment Tool (EAT) to measure organizational physical and social support for worksite obesity prevention programs. *J Occup Environ Med.* 2008; 50:126–137. [PubMed: 18301169]
18. French SA, Hannah PJ, Harnack LJ, Mitchell NR, Toomey TL, Gerlach A. Pricing and availability intervention in vending machines at four bus garages. *J Occup Environ Med.* 2010
19. Finkelstein EA, Trogdon JG, Cohen JW, Dietz W. Annual medical spending attributable to obesity: payer- and service-specific estimates. *Health Aff (Millwood).* 2009; 28:w822–831. [PubMed: 19635784]
20. Heinen L, Darling H. Addressing obesity in the workplace: the role of employers. *Milbank Q.* 2009; 87:101–122. [PubMed: 19298417]
21. Goetzel RZ, Gibson TB, Short ME, Chu BC, Waddell J, Bowen J, et al. Results of a multi-site analysis examining relationships among body mass index, medical utilization and worker productivity. *J Occup Environ Med.* 2010
22. Meenan RT, Vogt TM, Williams AE, Stevens VJ, Albright CL, Nigg C. Economic evaluation of a worksite obesity prevention and intervention trial among hotel workers in Hawaii. *J Occup Environ Med.* 2010
23. Steckler, A.; Linnan, L., editors. *Process Evaluation for Public Health Interventions and Research.* San Francisco, CA: Jossey-Bass; 2002.
24. Johnson CC, Lai Y, Rice J, Rose D, Webber LS. ACTION Live: Using process evaluation to describe implementation of a worksite wellness program. *J Occup Environ Med.* 2010
25. Siegrist J, Rodel A. Work stress and health risk behavior. *Scand J Work Environ Health.* 2006; 32:473–81. [PubMed: 17173203]
26. Fernandez ID, Su H, Winters PC, Liang H. Association of workplace chronic and acute stressors with employee weight status: Data from worksites in turmoil. *J Occup Environ Med.* 2010