The Efficacy of a Theory-Based, Participatory Recycling Intervention on a College Campus

Erin Largo-Wight, PhD
Department of Public Health
University of North Florida

Dedee DeLongpre Johnston, MA
Office of Sustainability
Wake Forest University

Jeff Wight, PhD
Department of Clinical and Applied Physiology and Movement Science
University of North Florida

Abstract **Recycling solid waste is an important primary prevention focus to protect environmental resources and human health. Recycling reduces energy consumption and emissions and the need to harvest raw material, which protects air, water, and land. In the study described in this article, the authors conducted an eight week field study to test the efficacy of an intervention aimed to increase can and bottle recycling on a college campus. Recycling volume was assessed in three campus buildings (two treatments and one control) over eight weeks. The control building had standard outdoor-only recycling. The treatment buildings had standard outdoor recycling plus four weeks with the treatment indoor recycling. Total can and bottle recycling volume increased 65%–250% in the treatment buildings compared to the control building. Recycling significantly increased in both the classroom ($t = -2.9$, $p < .05$) and administrative ($t = -12.4$, $p < .001$) treatment buildings compared to the control building ($t = -.13$, $p = .91$). Results suggest that convenience of receptacles alone, without education or additional promotion, resulted in significantly more recycling. Health promoters should prioritize efforts to make recycling easy and convenient.**

Introduction

Protecting the environment is increasingly recognized as a centerpiece of public health in the U.S. and around the world (McMichael, Butler, & Folke, 2003). Environmental resources such as soil, water, air, and biodiversity provide the building blocks necessary for human health. As environmental consumption increases and consequences of climate change exacerbate, consensus is growing that public health action is needed to protect environmental resources necessary for human health (Costello et al., 2009; McMichael, Butler, & Folke, 2003; McMichael et al., 2003; Patz et al., 2000).

Howard Frumkin, a past director of the National Center for Environmental Health/Agency for Toxic Substances and Disease Registry at the Centers for Disease Control and Prevention and current dean of the School of Public Health at University of Washington, and Anthony McMichael wrote (2008), "Health professionals should motivate people toward both appropriate personal behaviors and collective decisions that will protect health from the effects of climate change (p. 405)." This recent call for primary prevention action calls on health promoters to utilize behavior change theory and evidence to guide health behavior change efforts related to environmental issues (Frumkin, Hess, Luber, Malilay, & McGeehin, 2008; Howze, Baldwin, & Kegler, 2004; Largo-Wight, 2011). Environmental health efforts that involve changing human behavior should utilize health education and health promotion theories and approaches.

"Environmental health promotion" is a term representing an emerging and needed collaboration between environmental health and health education and health promotion. Environmental health promotion is the bridge between environmental health and health education (Howze et al., 2004); it is the application of preventative health approaches and behavior change theories to environmental problems. This collaboration enables two critical public health goals to be addressed—*promoting* the environment for the health of the public and *protecting* the environment for the health of the public. *Promoting* the environment involves cultivating and creating healthy places and communities that foster health outcomes among residents. *Protecting* the environment involves both strategies for development and conservation that foster and protect the health of the environment and its residents. Thus, the promotion of "environmental" health behaviors, such as recycling, to protect the environment and Earth's resources necessary for human life and health are important (Largo-Wight, 2011).

Recycling and College Campuses

An environmental health behavior that needs immediate attention is recycling solid waste (Castro, Garrido, Reis, & Menezes, 2009). Recycling solid waste protects the environment and natural resources and therefore protects and promotes the health of the public (Frumkin, Hess, Luber, Malilay, & McGeehin, 2008). Recycling is healthful in that it reduces the emissions related to waste disposal, reduces the need to harvest raw material for production of new goods, and reduces energy consumption related to production of new materials (Lansana, 1992; U.S. Environmental Protection Agency [U.S. EPA], 2013). For example, Americans recycled about 33% of total municipal solid waste in 2009, which is equivalent to saving almost 225 million barrels of oil (U.S. EPA, 2009). Despite the healthier land, air, and water-related benefits of waste recycling, recycling behavior still needs public health attention. Approximately 90% of the waste generated in the U.S. could be recycled, but Americans are recycling only about 30% of their trash (Castro et al., 2009). In a call to action, *Healthy People 2020: Improving the Health of Americans* prioritized the need to increase recycling in the U.S. over the next 10 years. Objective EH-12 aimed to increase municipal waste recycling behavior by 10% (Office of Disease Prevention and Health Promotion, 2011).

Schools and college campuses represent a recycling intervention priority worldwide because of the potential for colleges and universities to contribute to a community's waste stream and impact environmental-related human health (American College Health Association, 2002; Ana et al., 2011; Creighton, 1998; Largo-Wight, Bian, & Lange, 2012). In recognition of the impact colleges and universities have on their communities, most higher education campuses in the U.S. provide recycling opportunities through the availability of basic recycling infrastructure on campus (Mason, Brooking, Oberender, Harford, & Horsley, 2003). Public universities' recycling rates should be improved, however. Previous studies concluded that campus recycling rates are similar to the national household and municipal recycling statistics in the U.S.; only about one-third of recyclable waste is diverted from the landfills and recovered for recycling (Chase, Dominick, Trepal, Bailey, & Friedman, 2009). Intervention studies have shown that campus recycling can be increased with effective campaigns. Previous findings have shown that multifaceted campaigns that involved increasing recycling convenience along with various education, awareness, and communication strategies increased recycling on campus (e.g., Chase et al., 2009).

Behavior Change Theory

Health behavior theories are used to guide evidenced-based behavior change programs. Theories are practical tools, based on aggregate behavioral research findings, that target the determinants of behavior change to guide study and primary prevention intervention (Glanz, Rimer, & Lewis, 2002). The Theory of Reasoned Action and Planned Behavior (TPB) is commonly used to study recycling behavior (Valle, Rebelo, Reis, & Menezes, 2005). TPB assumes that *behavioral intention*, one's commitment to act, is the strongest predictor of behavior. *Perceived behavioral control, attitude toward behavior*, and *subjective norm* are the theory's direct constructs that inform behavioral intention. Programs and interventions that are guided by TPB should involve enhancing the theory's constructs in order to facilitate behavioral intention and ultimately behavior change (Glanz et al., 2002). Essentially, health promoters using TPB to guide behavior change programs should strive for participants to assess the desired behavior as good (*attitude toward behavior*), cool (*subjective norm*), and easy (*perceived behavioral control*).

Cross-sectional findings suggest that one of TPB's constructs, *perceived behavioral control,* was a particularly strong predictor of recycling behavior (Chase et al., 2009; Chu & Chui, 2003; Kelly, Mason, Leiss, & Ganesh, 2006; Largo-Wight et al., 2012; Terry, Hogg, & White, 1999; Valle et al., 2005). In fact, *perceived behavioral control* was the single strongest predictor of recycling intention across several studies (Chase et al., 2009; Chu & Chui, 2003; Kelly et al., 2006; Terry et al., 1999). TPB's *perceived behavioral control* to recycle is similar to what some researchers call "situational factors" or "external facilitators" to recycle, which have also been shown to be an important predictor of recycling behavior (Hornick, Cherian, Madansky, & Narayana, 1995; Shultz, 2002; Stern, 2000).

Based on TPB's assumptions, *perceived behavioral control* is comprised of "self-efficacy" and "external factors" that influence the adoption of a health behavior. Thus, a behavior change program aimed to increase recycling based on TPB's *perceived behavioral control* construct should enhance self-efficacy or one's confidence in his/her ability to recycle and/or external or situational factors to recycle (convenience of receptacles on campus) (Glanz et al., 2002; National Cancer Institute [NCI], 2005; Valle et al., 2005).

Purpose

In our pilot study, we developed and tested an intervention program aimed to increase *perceived behavioral control* to recycle and ultimately recycling behavior through external factors only. We developed and tested an intervention program aimed to increase the convenience of recycling receptacles on a university campus. Specifically, we tested the efficacy of a can and bottle recycling intervention aimed to increase external factors of *perceived behavioral control* and ultimately recycling behavior as measured by recycling volume by adding more convenient and easy opportunities to recycle.

Methods

Design and Intervention

Our quasi-experimental pilot field study took place at a large southeastern university over eight-weeks. The study was designed to test the efficacy of a can and bottle recycling intervention on a college campus. This community-based participatory research (CBPR) study involved academic and community partners who collaborated to design the study and collect the data (Braun et al., 2012; Wallerstein & Duran, 2010). University custodial, grounds, and administrative staff as well as student volunteers participated in the study's conception, implementation, and data collections.

Three campus buildings were used in our study: two treatment buildings and one control building. The control building was a classroom building that maintained the university's standard recycling program. The university's standard can and bottle recycling program consisted of the presence and maintenance of outdoor recycling receptacles for cans and bottles. The outdoor recycling receptacles were large and located near the entrance of campus buildings. No indoor recycling receptacles were in the control building or on campus.

The two treatment buildings were of similar square footage to the control building. One treatment building was an administrative building that housed office and administrative staff. The other treatment building was a classroom building, like the control building, that had classrooms utilized for course meetings daily. The treatment buildings, like the control building, also had the university's standard outdoor recycling receptacles as well as our study's recycling intervention, the addition of indoor recycling receptacles for can and bottle recycling. The indoor recycling receptacles were married with the existing trash cans in each classroom, hallway, and office. The intervention consisted of the addition of indoor receptacles only; no education or promotion efforts were conducted.

For the entirety of the eight week study, the control building offered only one recycling option: outdoor recycling receptacles. In the treatment buildings, the recycling options varied. During the first four weeks of the study, only outdoor recycling receptacles were available in the two treatment buildings. This four week period was used to establish baseline data. During the second four weeks of the study, both indoor and outdoor recycling receptacles were available in the two treatment buildings.

TABLE **1**

Ordinal Recycling Volume Measurement

Measurement	Recycling Data Form							
Ordinal data	1	2	3	4	*5*	*6*	*7*	*8*
Capacity full	0%–25%	26%–50%	51%–75%	76%–100%	*101%–125%*	*126%–150%*	*151%–175%*	*176%–200%*

Note. Italicized ordinal 5–8 were used by the researchers to normalize weekly data when a receptacle needed to be emptied twice in a week.

Data Collections

Data collections involved measuring the can and bottle recyclable volume from the study's campus buildings for eight weeks. The unit of analysis was the buildings rather than the individual. No human participants were involved in our study.

Data were collected from the treatment buildings' outdoor receptacles for eight weeks total. Treatment buildings' outdoor data were collected for four weeks during the baseline data collection period and for four weeks during the treatment condition period. The treatment buildings' indoor data were also collected during the treatment condition period. Data were collected from the control building's outdoor receptacle for four weeks total: two weeks during the baseline data collection period and two weeks during the treatment condition period (Table 1).

Outdoor recycling data were measured by university grounds staff. When collecting the recyclables from the outdoor receptacles, the grounds staff indicated the receptacle's fullness of cans and bottles as a percentage. The grounds staff completed the "recycling data form" by choosing one of four ordinal options to best represent the receptacle's can and bottle volume. The data form measured the weekly volume with short ordinal scales with natural order categories or ordered levels. The form's natural order or categories or levels were 0%–25% full, 26%–50% full, 51%–75% full, and 76%–100% full. Additional natural order categories of fullness were added during data analysis to normalize the data to represent total volume by week. The natural order percentage form options were converted to ordinal numbers for data analysis (Table 1).

The intervention data collections were collected by an administrative staff and trained students. The indoor recycling receptacles were smaller than the outdoor receptacles. To maintain consistent data collection methods, the contents from indoor receptacles were transferred into a bag used in the outdoor receptacles prior to volume estimation.

Results

The normalized data are presented in Table 2. When indoor recycling opportunities were made available, total recycling volume increased in the treatment classroom and administrative buildings by 65% and 250%, respectively. An independent samples *t*-test revealed that the total building recycling volume significantly increased in both of the treatment buildings and did not change in the control building. The recycling volume in the treatment classroom building ($t = -2.9$, $p < .05$) and treatment administrative building ($t = -12.4$, $p < .001$) had a significant increase in recycling from the baseline to the posttest. No significant increase in recycling volume in the control building occurred ($t = -.13$, $p = .91$).

Discussion

The findings from our pilot field intervention study support previous cross-sectional findings on the importance of TPB's *perceived behavioral control* construct for increasing recycling behavior (Chase et al., 2009; Chu & Chui, 2003; Kelly et al., 2006; Largo-Wight et al., 2012; Terry et al., 1999; Valle et al., 2005). In our study, the increase in the external factor to recycle—added recycling bins for behavioral ease and convenience—resulted in significant increases in can and bottle recycling behavior in both treatment buildings compared to the control building.

Prior to our study, a concern was that adding receptacles would result in a less efficient recycling program. The concern was that adding recycling receptacles without education or promotion would not increase recycling behavior, but instead would result in a distribution of the recycling volume among the many receptacles, adding to university staff workload. This did not happen. The findings of our pilot study demonstrate that the volume of recycling significantly increased as a result of the increase of receptacles alone. And the increase was dramatic: the total volume increased by 130% when indoor recycling receptacles were made available.

Our intervention study had many strengths. Our study was grounded in the emerging field of environmental health promotion and guided by behavior change theory with impor-

TABLE **2**

Normalized Ordinal Recycling Volume

Buildings	Baseline Period				Treatment Period			
	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
Treatment *Administration*	**1.8**	**2.8**	**2.8**	**3.1**	**1.5** 7.0[i]	**3.5** 7.0[i]	**3.0** 6.0[i]	**2.8** 6.0[i]
Treatment *Classroom*	**7.0**	**5.6**	**4.2**	**3.0**	**4.0** 7.0[i]	**3.1** 4.0[i]	**3.1** 3.0[i]	**5.6** 3.0[i]
Control *Classroom*	–	**3.0**	**3.0**	–	–	**3.0**	–	**3.0**

Note. **Bold** denotes outdoor data; [i] = indoor data and treatment condition.

tant public health application (Frumkin & McMichael, 2008; Largo-Wight, 2011). Our study effectively utilized social and behavioral public health theories and approaches to address a critical environmental need. In addition, the intervention was simple and practical. Simply adding convenient recycling receptacles, without education or promotional efforts, dramatically increased recycling behavior and volume. Evidenced-based simple and practical solutions are public health's "best buys" (Brownson, Fielding, & Maylahn, 2009; Hawe, Shiell, & Riley, 2004). This pilot study identified a "best buy" for increasing recycling behavior—add receptacles to make recycling easy and convenient. Based on the findings of this field study and past cross-sectional findings, environmental heath promoters should strive to make recycling convenient and easy first and this should be the priority over other more complex behavioral and educational strategies.

Limitations and Future Research

The primary limitation of our pilot study was the lack of experimental control as a result of the CBPR approach. In this study, like all CBPR studies, academic and community partners collaborated to design the study and collect the data (Braun et al., 2012; Wallerstein & Duran, 2010). In our study, grounds staff measured outdoor recycling volume during routine waste disposal. Recording the recycling volume for our study was added workload for the staff and required collaboration, approval, and flexibility from both partners. Although the lack of experimental control during the data collections is a noted weakness, the CBPR approach is also a strength of this study. In fact, CBPR field design and community partner involvement bridge research and practice and enhance the relevance of the findings to best inform policy and decision making (Braun et al., 2012; Wallerstein & Duran, 2010).

A second and related weakness was the level of measurement. The data collected in this study were ordinal as opposed to continuous. A data collection form was used to measure ordinal level data with short order natural form categories or ordered levels (ordered percentage full). In this study, the level of data is a minor limitation because the data collection methods were the most precise measure of the data (Agresti, 1996; Shavelson, 1996) given the CBPR design. In addition, ordinal and even lower-order dichotomous data are common in health-related research studies. In fact, many times continuous data are effectively dicotomitized into categorical or ordinal data for ease of data collection (Agresti, 2010) in CBPR health research (e.g., Chobanian et al., 2003), as was done in our study.

If feasible, future replication studies should collect continuous data by counting recycled items. This would provide continuous data and account for the size of recycled cans and bottles and crushed items. If such data collections prove infeasible due to the enormous effort and labor that would be needed, however, future researchers should consider height-volume estimations, similar to the data collection form used in our study, with the noted confidence in ordinal data with ordered levels (Agresti, 2010). And because of the dramatic increase in recycling volume (65%–265%) in our study, it may be less practically important for replication studies to invest in counting items as these precise data collection methods may not significantly add to evidenced-based practice recommendations.

Future field studies may also assess the efficacy of additional conditions, such as educational and social marketing, moral obligation, social norms, and pro-environmental self- identity (e.g., Largo-Wight et al., 2012), to examine the potential benefit, if any, of the additional program investment. Community and other settings should also be included in future research.

Conclusion

Our study focused on promoting recycling behavior in a high-impact waste setting, college campuses (Creighton, 1998; Largo-Wight et al., 2012). Our study's intervention aimed at increasing *perceived behavioral control* to recycle, a theory-based, strong predictor of recycling in previous studies (Chase et al., 2009; Chu & Chui, 2003; Kelly et al., 2006; Largo-Wight et al., 2012; Terry et al., 1999; Valle et al., 2005) among university students and staff. The findings of this pilot suggest that simply pairing recycling receptacles with garbage cans within treatment buildings resulted in a dramatic increase in recycling volume (65%–265%) over the eight week study. This may represent a public health "best-buy" in that the solution was practical and cost-effective with a huge environmental health return on investment (Brownson et al., 2009; Hawe et al., 2004). Environmental heath promoters should prioritize efforts to make recycling easy and convenient above other efforts such as education, health communication, or promotion campaigns.

Acknowledgements: This project could not have been completed without the support of Derrick Bacon, assistant director of the physical plant, and Dale Morris, recycling and solid waste coordinator, at the University of Florida.

Corresponding Author: Erin Largo-Wight, Associate Professor, Department of Public Health, University of North Florida, 1 UNF Drive, Jacksonville, FL 32224. E-mail: largo.wight@unf.edu.

References on page 30

References *continued from page 29*

Agresti, A. (1996). *An introduction to categorical data analysis*. Hoboken, NJ: John Wiley & Sons.

Agresti, A. (2010). *Analysis of ordinal categorical data* (2nd ed.). Hoboken, NJ: John Wiley & Sons.

American College Health Association. (2002). *Healthy campus 2010: Making it happen*. Retrieved from http://www.acha.org/topics/hc2010.cfm

American Public Health Association. (2008). *Climate change: Our health in balance*. Retrieved from http://archive.nphw.org/nphw08/NPHW%20toolkit%202008.pdf

Ana, G.R.E.E., Oloruntoba, E.O., Shendell, D., Elemile, O.O., Benjamin, O.R., & Sridhar, M.K.C. (2011). Solid waste management problems in secondary schools in Ibadan, Nigeria. *Journal of Environmental Health, 74*(2), 24–28.

Braun, K.L. Nguyen, T.T., Tanjasiri, S.P., Campbell, J., Heiney, S.P., Brandt, H.M., Smith, S.A., Blumenthal, D.S., Hargreaves, M., Coe, K., Ma, G.X., Kenerson, D., Patel, K., Tsark, J., & Hébert, J.R. (2012). Operationalization of community-based participatory research principles: Assessment of the National Cancer Institute's Community Network Programs. *American Journal of Public Health, 102*(6), 1195–1203.

Brownson, R.C., Fielding, J.E., & Maylahn, C.M. (2009). Evidence-based public health: A fundamental concept for public health practice. *Annual Review of Public Health, 30*, 175–201.

Castro, P., Garrido, M., Reis, E., & Menezes, J. (2009). Ambivalence and conservation behaviour: An exploratory study on the recycling of metal cans. *Journal of Environmental Psychology, 29*(1), 24–33.

Chase, N.L., Dominick, G.M., Trepal, A., Bailey, L.S., & Friedman, D.B. (2009). "This Is Public Health: Recycling Counts!" description of a pilot health communications campaign. *International Journal of Environmental Research and Public Health, 6*(12), 2980–2991.

Chobanian, A.V., Bakris, G.L., Black, H.R., Cushman, W.C., Green, L.A., Izzo, J.L., Jones, D.W., Materson, B.J., Oparil, S., Wright, J.T., Jr., Roccella, E.J., & the National High Blood Pressure Education Program Coordinating Committee. (2003). Seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. *Hypertension*, 42(6), 1206–1252.

Chu, P.Y., & Chui, J.F. (2003). Factors influencing household waste recycling behavior: Test of an integrated model. *Journal of Applied Social Psychology, 33*(3), 604–626.

Costello, A., Abbas, M., Allen, A., Ball, S., Bell, S., Bellamy, R., Friel, S., Groce, N., Johnson, A., Kett, M., Lee, M., Levy, C., Maslin, M., McCoy, D., McGuire, B., Montgomery, H., Napier, D., Pagel, C., Patel, J., de Oliveira, J.A., Redclift, N., Rees, H., Rogger, D., Scott, J., Stephenson, J., Twigg, J., Wolff, J., & Patterson, C. (2009). Managing the health effects of climate change. *Lancet, 373*, 1693–1733.

Creighton, S.H. (1998). *Greening the ivory tower: Improve the environmental track record of universities, colleges, and other institutions*. Cambridge, MA: MIT Press.

Frumkin, H., Hess, J., Luber, G., Malilay, J., & McGeehin, M. (2008). Climate change: The public health response. *American Journal of Public Health, 98*(3), 435–445.

Frumkin, H., & McMichael, A.J. (2008). Climate change and public health: Thinking, communicating, acting. *American Journal of Preventive Medicine, 35*(5), 403–410.

Frumkin, H., McMichael, A.J., & Hess, J.J. (2008). Climate change and the health of the public. *American Journal of Preventive Medicine, 35*(5), 401–402.

Glanz, K., Rimer, B.K., & Lewis, F.M. (Eds.). (2002). *Health behavior and health education: Theory, research, and practice*. (3rd ed.). San Francisco: Jossey-Bass.

Hawe, P., Shiell, A., & Riley, T. (2004). Complex interventions: How "out of control" can a randomized controlled trial be? *British Medical Journal, 328*(7455), 1561–1563.

Hornick, J., Cherian, J., Madansky, M., & Narayana, C. (1995). Determinants of recycling behavior: A synthesis of research results. *Journal of Socio-Economics, 24*(1), 105–127.

Howze, E.H., Baldwin, G.T., & Kegler, M.C. (2004). Environmental health promotion: Bridging traditional environmental health and health promotion. *Health Education and Behavior, 31*(4), 429–440.

Kelly, T.C., Mason, I.G., Leiss, M.W., & Ganesh, S. (2006). University community responses to on-campus resource recycling. *Resources, Conservation and Recycling, 47*(1), 42–55.

Lansana, F.M. (1992). Distinguishing potential recyclers from nonrecyclers: A basis for developing recycling strategies. *Journal of Environmental Education, 23*(2), 16–23.

Largo-Wight, E. (2011). Cultivating healthy places and communities: Evidenced-based nature contact recommendations. *International Journal of Environmental Health Research, 21*(1), 41–61.

Largo-Wight, E., Bian, H., & Lange, L. (2012). An empirical test of an expanded version of Theory of Planned Behavior in predicting recycling behavior on campus. *American Journal of Health Education, 43*(2), 66–73.

Mason, I.G., Brooking, A.K., Oberender, A., Harford, J.M., & Horsley, P.G. (2003). Implementation of a zero waste program at a university campus. *Resources, Conservation and Recycling, 38*(4), 257–269.

McMichael, A.J., Butler, C.D., & Folke, C. (2003). New visions for addressing sustainability. *Science, 302*(5652), 1919–1920.

McMichael, A.J., Campbell-Lendrum, D.H., Corvalan, C.F., Ebi, K.L., Githeko, A.K., Scheraga, J.D., & Woodward, A. (2003). *Cli-*

References

mate change and human health: Risks and responses. Geneva: World Health Organization.

National Cancer Institute. (2005). *Theory at a glance: A guide for health promotion practice* (2nd ed.). Retrieved from http://www.cancer.gov/cancertopics/cancerlibrary/theory.pdf

Office of Disease Prevention and Health Promotion. (2011). *Healthy people 2020: Improving health of Americans, objective EH-12*. Washington DC: U.S. Department of Health and Human Services.

Patz, J.A., McGeehin, M.A., Bernard, S.M., Ebi, K.L., Epstein, P.R., Grambsch, A., Gubler, D.J., Reiter, P., Romieu, I., Rose, J.B., Samet, J.M., & Trtanj, J. (2000). The potential health impacts of climate variability and change for the United States: Executive summary of the Report of the Health Sector of the U.S. National Assessment. *Environmental Health Perspectives, 108*(4), 367–376.

Schultz, P.W. (2002). Knowledge, information, and household recycling: Examining the knowledge-deficit model of behavior change (pp. 67–82). In T. Dietz & P.C. Stern (Eds.), *New tools for environmental protection: Education, information, and voluntary measures*. Washington DC: National Academies Press.

Shavelson, R.J. (1996). *Statistical reasoning for the behavioral sciences* (3rd ed.). Boston: Allyn & Bacon.

Stern, P.C. (2000). Toward a coherent theory of environmentally significant behavior. *Journal of Social Issues, 56*(3), 407–424.

Terry, D.J., Hogg, M.A., & White, K.M. (1999). The theory of planned behaviour: Self identity, social identity and group norms. *British Journal of Social Psychology, 38*(Pt. 3), 225–244.

U.S. Environmental Protection Agency. (2009). *Municipal solid waste generation, recycling, and disposal in the United States: Facts and figures*. Retrieved from http://www.epa.gov/osw/nonhaz/municipal/msw99.htm

U.S. Environmental Protection Agency. (2013). *Reduce, reuse, recycle*. Retrieved from http://www2.epa.gov/recycle

Valle, P.O., Rebelo, E., Reis, E., & Menezes, J. (2005). Combining behavior theories to predict recycling involvement. *Environment and Behavior, 37*(3), 364–396.

Wallerstein, N., & Duran, B. (2010). Community-based participatory research contributions to intervention research: The intersection of science and practice to improve health equity. *American Journal of Public Health, 100*(S1), S40–S46.