WORKPLACE ENVIRONMENTAL AND POLICY PRACTICES THAT SUPPORT HEALTHY BEHAVIOR AMONG EMPLOYEES WITH PREDIABETES: IMPLICATIONS FOR EMPLOYERS

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A dissertation submitted to the faculty at the University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Doctor of Public Health in the Department of Health Policy and Management in the Gillings School of Global Public Health.

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ABSTRACT

Julie L. Osgood: Workplace Environmental and Policy Practices that Support Healthy Behavior Among Employees with Prediabetes: Implications for Employers
(Under the direction of Sandra Greene)

In the United States, 86 million people have prediabetes putting them at significant risk for type 2 diabetes in the absence of lifestyle modification. The health and economic consequences of type 2 diabetes are significant for individuals and society. In response, the U.S. Centers for Disease Control and Prevention has implemented an evidence-based National Diabetes Prevention Program (NDPP) that reduces the incidence of prediabetes and type 2 diabetes. In this program, lifestyle coaches teach participants to eat healthy foods, be physically active, deal with stress, and overcome barriers to success. Many employers offer this program to employees as a way of improving the health status and avoiding future healthcare costs associated with diabetes care and its complications.

Adults spend the majority of their waking days at their place of employment. Researchers have shown that workplace physical and social environments and policies affect health behavior, particularly when used in combination. This dissertation aims to understand how employers can optimize enrollment and support participation in worksite NDPP using physical/social environmental and policy practices.

The study was based in Maine and utilized an exploratory sequential mixed methods design. The plan for change is based on the Diffusion of Innovations theory. In this study, I found that worksites in Maine are using a variety of physical/social environment and policy

practices to promote healthy lifestyle behaviors, though there are opportunities for more. Employers struggle with barriers, including: (1) how to identify and communicate directly with employees who have prediabetes; (2) how to appropriately support and incentivize NDPP participation; (3) how to engage senior leaders and middle managers in supporting healthy behavior; and (4) how to effectively engage a diverse workforce in lifestyle behavior change. A survey of employees with prediabetes indicates that employees have noticed workplace environment and policy changes related to health behaviors. I discuss barriers preventing them from enrolling in NDPP and factors that could motivate them to do so.

This work provides employers with recommendations and a process for using environmental and policy practices to support employee lifestyle behavior change and ultimately to reduce the incidence and prevalence of prediabetes.

In memory of my beloved sister,
Christa Ellen Osgood.
January 26, 1971- September 4, 2015

She would have wanted me to finish.

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BMI	Body Mass Index
CDC	Centers for Disease Control and Prevention
DPP	Diabetes Prevention Program (refers to NIH study)
GTT	Oral Glucose Tolerance Test
NDPP	National Diabetes Prevention Program
NHLBI	National Heart, Lung, and Blood Institute
NIH	National Institutes of Health
SCT	Social Cognitive Theory

CHAPTER 1: THE TOPIC

Background

Prediabetes, which is also called impaired blood glucose tolerance or impaired fasting blood glucose, is a condition in which individuals have elevated blood glucose or hemoglobin A1C levels but not high enough to be classified as type 2 diabetes. Prediabetes is becoming more common in the United States. The U.S. Centers for Disease Control and Prevention (CDC) estimates that approximately 86 million U.S. adults ages 20 or older (i.e., more than one out of every three adults) had prediabetes in 2012 "Centers for Disease Control and Prevention" 2014).

People with prediabetes often do not have any symptoms. The CDC estimates that nine out of 10 people with prediabetes do not know they have it (CDC, 2014). However, people with prediabetes have an increased risk of developing type 2 diabetes, heart disease, and stroke. Lifestyle modification (e.g., weight loss, change in diet, and moderate physical activity) can prevent or delay type 2 diabetes. Certain people are at increased risk ("Centers for Disease Control and Prevention," 2015) for developing prediabetes and type 2 diabetes, including those with the following characteristics:

- Age >45 years;
- Overweight (Body Mass Index -BMI $\geq$25 kg/m^2);
- Physical inactivity;
- Having a first-degree relative with diabetes;
- High-risk race/ethnicity (African-American, Hispanic/Latino, American-Indian, Asian-American, or Pacific-Islander);

- Having diabetes while pregnant or giving birth to a baby weighing more than nine pounds.

Prediabetes can be diagnosed several ways ("American Diabetes Association," 2014). The hemoglobin A1C test measures average blood glucose levels for the previous two to three months. Results of the HbA1c test that range between 5.7% and 6.4% indicate prediabetes. The fasting plasma glucose test measures fasting blood glucose levels. Results of 100 mg/dl to 125 mg/dl indicate prediabetes. Lastly, the Oral Glucose Tolerance Test (OGTT) checks blood glucose levels before and after consuming glucose (usually a 75-gram load). Results between 140 mg/dl and 199 mg/dl are diagnostic for prediabetes (American Diabetes Association, 2014).

The consequences of developing type 2 diabetes are significant for individuals and society. People diagnosed with diabetes often have high blood pressure, high cholesterol, and higher risk for heart and kidney disease, stroke, eye problems, and amputations. They also can suffer a reduced quality of life and incur medical costs that are 2.3 times higher than people without the disease (CDC, 2014). Gestational diabetes, prediabetes, and undiagnosed diabetes cost over $217 billion, and one in three Medicare enrollees has diabetes (Hill et al., 2013). One study estimated the economic burden, measured by medical costs and productivity losses per case, at $10,970 for diagnosed diabetes, $5,800 for gestational diabetes, and $4,030 for undiagnosed diabetes (Dall et al., 2014). Another study estimated the total cost of diabetes in 2012 in the United States to be $245 billion, including $176 billion in direct medical costs and $69 billion in reduced productivity (American Diabetes Association, 2013).

Type 2 diabetes can be prevented or delayed with lifestyle modification. In 2002, researchers from the National Institutes of Health (NIH) published the results of a multicenter clinical research study to test whether a lifestyle intervention program (the Diabetes Prevention

Program, or DPP) could prevent or delay the development of type 2 diabetes among people with prediabetes. This study found that participants who lost weight through healthy eating and increased physical activity reduced their risk of developing type 2 diabetes by 58% (Knowler et al., 2002). Since then, numerous translation studies have been conducted, as well as a fifteen-year follow up study, which showed that the effects of the original lifestyle intervention persisted (Diabetes Prevention Program Research Group, 2015).

Based on the findings from the NIH DPP study and many other follow-up studies, the CDC developed the National Diabetes Prevention Program (NDPP), a comprehensive approach to reducing the incidence of prediabetes and type 2 diabetes involving partnerships in the public and private sectors, including "federal agencies, state and local health departments, community organizations, employers, public and private insurers, healthcare professionals, university community education programs, and businesses that focus on wellness" (Centers for Disease Control and Prevention, 2016b). The components of the NDPP include:

- workforce training to promote effective delivery of the lifestyle change program;
- a recognition program to assure program quality and fidelity;
- delivery of the lifestyle intervention, including increasing insurance coverage by public and private insurers; and
- Increase referrals and uptake of the program.

The NDPP's lifestyle change program uses trained "lifestyle coaches." During the year-long program, participants engage in sixteen educational sessions delivered approximately weekly for the first six months to learn how to incorporate healthy eating and physical activity into their daily lives. During the second six months of the program, participants meet approximately monthly to learn and practice strategies for maintaining weight loss. They receive

support from other group members and cover strategies to overcome barriers to success, such as stress (CDC, 2011). The NDPP has been implemented in numerous settings, including workplaces, at community locations (e.g., YMCA, community centers, and schools), healthcare settings (e.g., hospitals and primary care practices) and with virtual technology. Regardless of the setting that lifestyle coaches deliver the program, NDPP sites must meet certain standards in order to gain recognition from the CDC. These standards include (Centers for Disease Control and Prevention, 2011):

- The use of a CDC-approved curriculum. Programs can use a curriculum developed by CDC, or they can develop their own or use that of another organization (with permission), as long as CDC approves it.
- The ability to begin offering the lifestyle program within 6 months of receiving approval from CDC.
- The capacity and commitment to deliver the program for at least one year, including at least 16 sessions during the first six months and at least six sessions during the last six months.
- The ability to submit data on participants' progress every 12 months, including attendance, weight loss, and physical activity.
- Trained lifestyle coaches who can help build participants' skills and confidence to make lasting lifestyle changes.
- Designated individual(s) to serve as the diabetes prevention program coordinator.
- At least 50% of participants have been diagnosed with prediabetes through blood testing or have a history of gestational diabetes.

Employers have a vested interest in preventing diabetes due to the higher costs for health insurance along with the costs of absenteeism and reduced productivity. Obesity-related chronic diseases, such as type 2 diabetes, are increasingly prevalent in younger (i.e., working-age) adults (Mattke et al., 2013). To control costs and losses in productivity, many employers have implemented workplace wellness and health promotion programs to identify and assist employees at risk of further declines in their health status. Since most adults spend approximately half their day at work (Gorman et al., 2013; Hipp et al., 2015), many employers assess health risks, collect biometric data (e.g., fasting glucose and BMI), and offer incentives at the workplace to support healthy lifestyle behaviors.

There is a significant body of literature surrounding workplace wellness programs. These programs were first developed in the early 1900s, with an initial focus on worker safety and health (Oziransky, 2015). They later evolved in the 1970s "in response to cost-containment efforts combined with the workplace health promotion movement" (Reardon, 1998). Even though some have questioned whether these programs improve health outcomes, a recent study by RAND Health concluded that lifestyle management interventions through workplace wellness programs can reduce risk factors (e.g. BMI) and are "sustainable over time" and "clinically meaningful (Mattke et al., 2013)." These interventions have improved employees' weight, smoking status, and physical activity, though not cholesterol levels. The same RAND study also found evidence of lower healthcare utilization and costs after program implementation, but the findings were not statistically significant. Meanwhile, other studies have concluded that "well-designed and well-executed programs that are founded on evidence-based principles can achieve positive health and financial outcomes" and have a demonstrated return on investment (Baicker, Cutler, & Song, 2010; Goetzel et al., 2014).

However, there are some criticisms of these kinds of wellness programs. For example, despite the apparent effectiveness of these programs, some research has suggested that workplace wellness participation rates tend to be low and that only healthy employees generally participate (Linnan, Sorensen, Colditz, Klar, & Emmons, 2001). Studies that show a more limited association between workplace wellness programs and improvements in health outcomes have limitations including the use of self-reported data, small sample sizes, risk for bias, cross-sectional design, and a lack of reported outcomes (i.e. BMI, productivity measures, or healthcare utilization). (Brehm, Gates, Singler, Succop, & D'Alessio, 2011; Lemon et al., 2009; Linde et al., 2012).

The existing literature is helpful for understanding the design and implementation of successful lifestyle interventions focused on individual behavior change. However, by understanding the association between workplace environment and policy on lifestyle behavior, employers can focus their practices more effectively to support diabetes prevention. It is important for employers to understand the factors at the workplace that either support or hinder employees' efforts to sustain healthy lifestyle behaviors. Success can lead to changed health behavior, improved outcomes for individuals, and the potential avoidance of health complications resulting from type 2 diabetes. Theoretically, these changes have the potential to produce substantial cost savings for individuals and employers over time.

We know from the social ecological model (McLeroy, Bibeau, Steckler, & Glanz, 1988) and social cognitive theory (Bandura, 1986) that environment plays a role in supporting or hindering health behaviors. The social environment influences the behavior of individuals by "shaping norms, enforcing patterns of social control, providing or not providing environmental opportunities to engage in particular behaviors, reducing or producing stress, and placing

constraints on individual choice" (Institute of Medicine, 2002). Health promotion strategies often address the environment to support desired behaviors. Recent research has focused on examining workplace policy and environment in terms of how they affect employee behavior, such as healthy eating, physical activity, and weight. Many studies have concluded that the most effective approaches in improving outcomes, such as achieving a targeted BMI, combine individual interventions with policy and environmental changes. (Almeida et al., 2014; Archer et al., 2011; Brissette, Fisher, Spicer, & King, 2008; Matson-Koffman, Brownstein, Neiner, & Greaney, 2005; Park, Pan, & Lankford, 2014).

Less is known about what environmental and policy practices employers are using to promote enrollment and support participation in evidence-based chronic disease prevention programs, such as the NDPP lifestyle-change program. NDPP has been implemented in multiple settings, including workplaces. However, little is known about how workplace environmental and/or policy practices affect employees with prediabetes or their likelihood of enrolling in the program due to one or more of those factors. We do not know if location of the workplace matters (e.g., rural vs. urban; small vs. large), nor do we know if differences in these practices affect the likelihood of employee enrollment in the NDPP, based on gender, age, income, occupation, etc. For instance, would a policy that provides release time from work for participating in the program motivate employees to enroll? How about a policy that provides other financial incentives through an employee health program, or one that requires healthy food options for meetings? Would knowing that the workplace environment supported efforts to make lifestyle behavior changes encourage an employee to take the step to enroll in NDPP? In general, there is a paucity of research to determine which workplace environmental and policy

practices, or combination thereof, support employees who are participating in the program and attempting to make lifestyle behavior changes.

Research to study the workplace environment and its influence on employee health behavior is needed (Golaszewski, Allen, & Edington, 2008). By studying workplace-based diabetes prevention programs, we can better identify environmental and policy factors that support employee enrollment and participation in such programs. This information will be valuable to employers who want to increase enrollment and participation (and ultimately completion) in evidence-based diabetes prevention programs and to help reduce the risk of employees developing type 2 diabetes. This information will also aid employers who aim to develop comprehensive approaches that support health promoting behaviors for the entire workforce, such as physical activity and healthy eating.

Even though many workplace wellness programs are designed to help employees lose weight and eat healthfully, the research in this dissertation will focus on the NDPP for two reasons. First, the NDPP is evidence-based. Other workplace-based programs may not have the weight of evidence or the longitudinal evaluation that NDPP has. Second, the NDPP has a prescribed curriculum and required standards that sites must meet, thus removing variability across workplaces that will be recruited to participate in the study. The environmental and policy practices used to promote enrollment and support participation are not required by the CDC and are at the discretion of the program leaders. As a result, there is the potential for variability in these kinds of practices across different workplaces, which allows us to study how these factors affect enrollment and participation in the NDPP lifestyle change program.

Conceptual Framework

Social ecological model. The social ecological model (Figure 1) is useful in understanding factors that affect behavior. It also provides guidance for the development of successful programs through social environments. The term *ecology* refers to the interrelations between organisms and their environments (Hawley, 1950). The ecological paradigm has evolved in several disciplines, including sociology, psychology, economics, and public health (Stokols, 1992). The ecological model for promoting wellbeing presents health as a "product of the interdependence between the individual and subsystems of the ecosystem (e.g., family, community, culture, physical and social environment)" (Green, Richard, & Potvin, 1996). The "ecosystem" offers the social and economic conditions that promote health and healthy lifestyles, as well as the information and skills that individuals can use to engage in positive health behaviors (Green et al., 1996).

Figure 1. The social ecological model. Adapted from "Toward an experimental ecology of human development," by U. Bronfenbrenner, 1977, American Psychologist, 32(7), pp. 513-531.

Disease prevention and health promotion programs of the past have focused on narrow interventions that attempt to change the behaviors of individuals. Over the past twenty years, efforts have become more comprehensive and address the interdependencies among "socioeconomic, cultural, political, environmental, organizational, psychological and biological determinants of health and illness" (Stokols, Allen, & Bellingham, 1996). Social ecological models emphasize multiple levels of influence, such as individual, interpersonal, organizational, community and public policy, and the idea that behaviors both shape and are shaped by the social environment. According to Stokols (1992), the health status of individuals and groups are influenced not only by environmental factors but also by a variety of personal attributes, including genetic heritage, psychological dispositions, and behavioral patterns. Health promotion efforts should therefore be based on an understanding of the "dynamic interplay among diverse environmental and personal factors," rather than exclusively focusing on environmental, biological, or behavioral elements.

Green et al. (1996) found that preventing diabetes in high-risk populations involves the interaction of complex processes, ranging from health behaviors motivated by an individual's knowledge, attitude, and skills, in addition to how they are influenced by the broader environment (i.e., workplace, community, socioeconomic variables), which supports or hinders the individual's attempts to adopt healthy behaviors.

Social cognitive theory. The principles of social ecological models are consistent with concepts from social cognitive theory (SCT), which suggests that creating an environment conducive to change is important for adopting healthy behaviors ("Social and Behavioral Theories," 2015). SCT explains human behavior as a three-way dynamic reciprocal model, in which personal factors, environmental influences, and behavior continually interact. SCT

synthesizes concepts and processes from cognitive, behavioristic, and emotional models of behavior change, so it can be readily applied to counseling interventions for disease prevention and management. A basic premise of SCT is that people learn not only through their own experiences, but also by observing the actions of others and the results of those actions (Bandura, 1986; "Social and Behavioral Theories," 2015). This theory is important to health promotion efforts that include social ecological components, such as peer support or role models for healthy behaviors in the workplace.

Definitions

For this study, *workplace* or *worksite* refers to a place or physical location of work or employment. The term *environment* refers to either the *physical environment* such as built aspects of a workplace (e.g., stairs, sidewalks, and cafeteria) or the *social environment* (e.g., having healthy food at meetings or having colleagues who display healthy eating or physical activity behaviors). The *social environment* "influences behavior by shaping norms: enforcing patterns of social control (which can be health promoting or health damaging); providing or denying opportunities to engage in particular behaviors; and reducing or producing stress" (Institute of Medicine, 2002). *Policy* can refer to healthcare benefits, incentives (financial or material rewards) used to promote physical activity or weight loss, or include organizational policy, which is defined as written guidelines that affect all employees at a workplace. *Practices* are activities used by employers and organizations to promote or discourage health behaviors. They may include policies or the shaping of the physical or social environments.

Dissertation Aims and Research Questions

The research in this dissertation is exploratory, and the goal is to understand how employers can optimize enrollment and support participation in workplace-based diabetes

prevention programs through environmental and policy practices. The specific aims are to identify the physical and social environmental and policy practices being used by employers to: a) promote enrollment of employees with prediabetes in the diabetes prevention program; b) support employees participating in the program and attempting lifestyle behavioral change; and c) understand how these practices affect their likelihood to enroll and sustain participation in the program. The primary research question is:

How can employers optimize enrollment and support participation in workplace NDPP through physical and social environment and policy practices?

This question is divided into three separate aims (and sub-aims) and is presented with methods for achieving each:

Aim 1: To understand how workplace environments and policy support or hinder employee behavior related to diabetes prevention (i.e., physical activity, healthy eating, and weight status).

Method: Systematic review of the literature.

Aim 2: To determine what practices employers are using to promote employee enrollment and support participation in the diabetes prevention program.

2a) What physical and social environmental practices are employers using to promote enrollment and support participation?

2b) What policy practices are workplaces using to promote enrollment and support participation?

2c) In general, what are the barriers and facilitators to employee enrollment in NDPP?

2d) What are the environmental and policy barriers and facilitators that affect employee enrollment and participation in NDPP?

2e) What are the barriers and facilitators to implementing environmental and policy practices to promote enrollment and support participation in NDPP?

Method: Key informant interviews with 10 program leaders responsible for NDPP sites in Maine.

Aim 3: To determine employee awareness and perceptions of workplace environment and policy practices and their effect on motivation to enroll and participate in NDPP.

3a) How do employees who are at risk for developing type 2 diabetes perceive their work environments?

3b) Which environmental and policy practices do employees say would motivate them to enroll in NDPP?

3c) What factors facilitate or hinder completion of the program?

3d) If employees have not participated in the program, what factors hinder enrollment?

3f) What are the differences in employee preference toward environment and policy practices as motivators to enroll and participate in NDPP between employees based on:

i. Gender
ii. Age
iii. Income
iv. Occupation
v. BMI

Method: Survey of 1,258 employees with elevated blood glucose levels confirmed with biometric data.

Aim 4: To develop a plan for change, outlining how employers can optimize enrollment and support participation in workplace diabetes prevention programs through physical and social environmental and policy practices. The plan would include a discussion about where employee and employer perspectives align or depart as possible leverage points for change.

Research Interests

My interest in this work stems from a life-long passion for prevention and my work over the past eighteen years in public health and healthcare delivery systems. In the late 1990's, I was involved in researching and evaluating a tobacco control program using telephonic-based counseling. It was the precursor of what is now a statewide Tobacco HelpLine. We were trying to understand whether or not counseling delivered over the phone could help employees of a large grocery store quit smoking. We conducted a pilot test with employees in the corporate office, retail store, trucking and distribution divisions. I conducted key informant interviews in these settings to learn about employee motivation to change their behavior. It was at that time that I became fascinated by social ecology and the effect of one's work environment on behavior change.

I will never forget speaking with cashiers in the retail stores about their tobacco use. Most of them wanted to stop using tobacco and a major barrier to doing so was a perceived loss of social status and support. There was a designated smoking area outside the retail store and employees went there during their breaks. Social connections were made, in part, based on smoking status. To them, quitting meant more than giving up cigarettes; it meant giving up friends. We made sure to add program elements that used both behavior change theory and a social ecological approach (i.e., especially social support in addition to other elements) to help

the employees be successful. Since then, I have recognized the importance of the larger environment (including physical and social as well as policies), whether it is at an organizational level, a neighborhood, a city, state or national level and the opportunities we have to affect behavior change. Diabetes is such an immense challenge in the United States and given that prevention involves behavior change, I thought it was a great opportunity to explore how worksite environments can facilitate healthy behavior.

Currently I work as a senior director for a not for profit integrated healthcare delivery system whose vision is: *working together so our communities are the healthiest in America*. I am involved in improving care and outcomes for people in Maine and have done a substantial amount of work in chronic disease prevention and treatment in the areas of asthma/COPD, cardiovascular health and diabetes. For diabetes, we are working to improve clinical outcomes for patients who have been diagnosed with diabetes. In addition, we are working to increase prediabetes screening and NDPP referral through our primary care practices and we are increasing the number of sites that offer NDPP within our service area. We have plans to offer mobile NDPP to our employees and their spouses through a CDC recognized vendor in 2017. Our wellness team has already implemented several environmental and policy practices as a way to support healthy behavior. This dissertation will help inform the work at the health system in addition to other worksites across Maine and beyond.

CHAPTER 2: LITERATURE REVIEW

In order to understand how workplace environments and policies support or hinder employee behavior related to diabetes prevention (i.e., physical activity, healthy eating, and weight status), I conducted a literature review. I obtained articles from systematic searches of multiple electronic databases and bibliographic reference lists, including PubMed, CINAHL Plus with Full Text, and PsycINFO.

I developed inclusion criteria for the literature search. The review included studies involving worksites and those assessing the association between workplace environment and policy on dietary intake, weight loss, or physical activity. Also included were studies reporting any effects on prediabetes and chronic diseases such as obesity and diabetes. Obesity is a risk factor for type 2 diabetes and weight loss is associated with type 2 diabetes prevention; therefore, it was included in the literature search strategy. This review did not include studies that singularly assessed individual wellness and health promotion interventions/strategies for weight loss, physical activity, and healthy eating because the primary focus of this dissertation is the association of healthy behavior with environmental and policy strategies in the workplace. One exception was the inclusion of studies that used individual interventions that included a modification to the physical environment, such as the use of treadmill or cycling workstations to decrease worker sedentary time.

Both descriptive and analytical studies were included in the review. I also searched select government and institutional websites (e.g., CDC, American Diabetes Association, etc.)

for relevant information. American health officials and scientists recognized diabetes as an emerging epidemic in the late 1990s, and the prevalence of the disease dramatically increased in the 2000s (Engelgau et al., 2004). As a result, only studies published between 1990 and 2015 were included in this literature review to coincide with the observed rise in diabetes prevalence in the United States. Only studies written in English were included. Studies pertaining to military settings as workplaces were excluded because they are unique and not clearly generalizable to other kinds of worksites. Schools (as workplaces) were included, but only if the target population was working adults. Any studies that include children as a target population were excluded. The search strategy (Table 1) employed the following terms and the search string appeared as follows:

(workplace OR worksite OR employer) AND (environment OR culture) OR (policy OR benefit OR incentive)) AND (physical activity OR diet OR weight loss OR weight reduction) AND (chronic disease OR obesity OR diabetes OR prediabetes)

Table 1: Literature Search Strategy

Workplace	AND	Environment	OR	Policy	AND	Physical Activity	AND	Chronic Disease
OR Worksite OR Employer		OR Culture		Policies OR Benefit OR Incentive		OR Diet OR Diet, Reduction OR Weight Loss		OR Obesity OR Diabetes OR Prediabetes

The search methods and results were organized using a flowchart that demonstrates the process of initial study identification, removal of duplicates, and application of inclusion criteria (*Figure 2*). All article titles were reviewed first to identify studies that were mostly likely to provide insight into the research question regarding the association between workplace

environment and policy on the factors associated with prediabetes, diabetes, or obesity. Then, abstracts were reviewed to assess fit based on inclusion criteria. For the abstracts that met those criteria, I obtained and reviewed the full text articles, then developed a data abstraction form in Excel and used it to record information from the studies. The form included the name of the journal, article title, authors, year, study design, variables, population, data sources, analytic methods, validity score, findings/results, and limitations. Full-text articles that met the inclusion criteria were imported into EndNote x7.5, read, and further sorted into folders of studies that were included or excluded after review.

Results

Results of the literature review are captured in the flow diagram in *Figure 2*. The literature search yielded 474 references, including 299 from PubMed, 92 from CINAHL Plus with Full Text, and 83 from PsycINFO. An additional five references were identified through bibliographic references and a web search of the CDC and the American Diabetes Association websites. A total of 84 duplicates were identified and removed, leaving 395 records for title and abstract review. 301 records were eliminated based on title and abstract review, leaving 94 records eligible for full text review. Eight studies could not be located through the library or interlibrary loan, and thus were excluded.

A full text evaluation was conducted on the remaining 86 articles and 43 were eliminated based on specified inclusion/exclusion criteria, leaving 43 included for this literature review. I used the following reasons to exclude studies from the literature review: 1) The reference was not a research study, rather commentary or editorial with practice recommendations (n = 13); 2) The reference did not specifically study the association between the physical or social environment or policy on healthy lifestyle behaviors (n = 10); 3) The studies focused only on an

individual physical activity or weight intervention (n = 10); 4) The studies were not conducted at worksites or were conducted in military settings (n = 6); 5) The studies featured a high risk of bias or poor quality (n = 3); and 4) The study focused on children (n = 1).

I evaluated all studies included in the literature review for quality. The most frequent limitations in the studies that were included in the review were as follows: 1) the use of self-reported data (n = 15); 2) a small sample size, for either the number of workplaces or the number of participants studied (n = 12); and 3) cross-sectional design, which did not allow for causal conclusions (n = 10 studies). Other limitations included the short duration of the study, which by itself limits the ability to understand whether the intervention was effective over longer periods of time, and the influence of confounders inherent in multi-component interventions. More limitations are detailed in Appendix A.

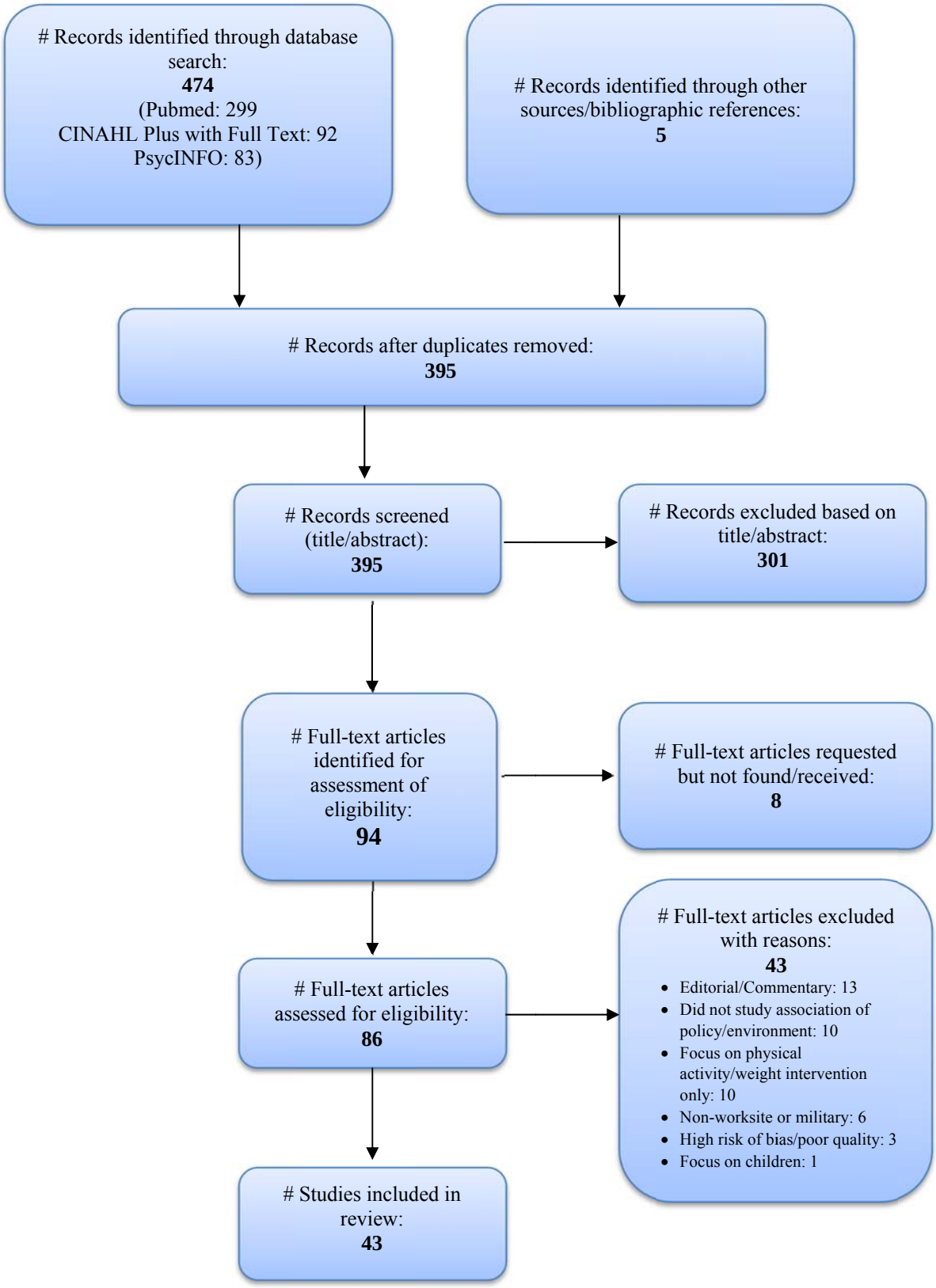


Figure 2. Flow diagram of the systematic review of literature.

The studies varied in the way they assessed different contextual factors, such as the physical environment (e.g., built environment, stairwells, or treadmill stations), social environment (e.g., peer support), and workplace policy and their association with physical activity and healthy eating behaviors and related clinical or behavioral outcomes. Table 2 describes a number of studies that looked at individual factors, such as the physical or the social environment alone, as well as studies that combined environmental factors (i.e., physical and social) together or with policy factors. Table 2 also includes the number and percentage of studies that found a positive, negative, or limited or mixed associations with clinical and/or behavioral outcomes. For the studies that were included in the review, positive associations among singular contextual factors, such as physical environment (47%) or social environment (40%), yielded a smaller percentage of positive associations than did studies that combined those contextual factors (60%). This was most apparent in the studies that combined workplace environmental and policy strategies to increase physical activity, reduce weight or BMI, or improve dietary habits. Of those studies, seven of eight found a positive association (87.5%) with clinical and behavioral outcomes. The remaining study did not test the association, but rather sought to understand employee perceptions of barriers and enablers to healthy lifestyle behaviors.

Table 2: Summary of Studies by Contextual Factor and Lifestyle Behavior Association

Contextual factor(s) studied	Total studies	# Studies that found a positive association	# Studies that found a negative association	# Studies that found a limited or mixed association	Other or N/A
Environment (physical)	17	8 (47%)	2 (12%)	7 (41%)	-
Environment (social)	7	3 (43%)	-	3 (43%)	1[a] (14%)
Environment (physical & social)	5	3 (60%)	-	1 (20%)	1[b] (20%)
Policy	6	3 (50%)	1 (16%)	1 (16%)	1[c] (16%)
Environment & Policy	8	7 (87.5%)	-	-	1[d] (12.5%)
TOTAL	43	24 (56%)	3 (7%)	12 (28%)	4 (9%)

[a]Qualitative study assessing perceptions of factors that influence sedentary behavior. [b]Focus group to assess employee perceptions regarding physical and social environments on healthy eating habits. [c]Study assessed the relationship between employment characteristics (e.g., company size, work hours) and obesity among employed U.S. adults. [d]Study surveyed employees regarding perceived barriers and enablers to healthy behaviors, but did not study specific outcomes.

Physical Environment

Of the 17 studies that looked at the physical environment, eight found a positive association. These included three observational studies looking at the use of devices placed in the physical environment to increase physical activity. Two of the studies had employees use treadmill workstations, whereby they were able to walk slowly while working. One used a "stepping" device that was placed under the employees' desks, which allowed them to move their feet and legs in order to "step" while sitting. One of the treadmill studies included 12 transcriptionists diagnosed with obesity, and even though the study found that participants expended more energy, it found that they were slower and therefore less productive because of the learning curve in working and walking at the same time (Thompson & Levine, 2011). The transcriptionists required four hours of training/acclimation before their productivity rates returned to normal. The other two papers (Levine & Miller, 2007; McAlpine, Manohar, McCrady, Hensrud, & Levine, 2007) that studied the use of a treadmill and a stepping device

found increased expenditure of energy compared to sitting. All of the studies had a low number of participants. One randomized controlled trial looked at the use of a treadmill desk at a private workplace and found that its use with 41 office workers, who were either overweight or obese, resulted in an increase in their daily steps and "light" physical activity, thus decreasing sedentary time during working hours (Schuna et al., 2014). An experimental study randomly assigned 180 undergraduate students to seated, standing, cycling and walking workstations (Sliter & Yuan, 2015). The authors looked at variables, such as boredom, task satisfaction, stress, arousal, and performance, along with BMI and exercise habits as moderators. This study showed support for the benefits of walking workstations on task satisfaction, arousal, boredom, and stress. The cycling workstations, however, were related to decreased task satisfaction and performance.

There were two studies that demonstrated a positive association with the physical environment and looked at characteristics such as having a greater availability of healthy food at lower prices in vending machines, as well as access to outdoor space and exercise rooms. Researchers conducted a comparison study using randomized pairs to assess 33 vending machines in four bus garages. Based on sales data and an employee survey, they determined that a greater availability and lower prices on targeted food and beverage items from vending machines were associated with more purchases of these items over an 18-month period (French, Hannan, et al., 2010). Almeida et al. (2014) used a two-group cluster randomized controlled trial using cross-sectional employee survey data and worksite audits in 28 small and medium sized worksites in Virginia (n = 27) and Colorado (n = 1). This study found that the presence of a cafeteria improved eating habits, and the presence of vending machines made them worse. In addition, not having access to outdoor space and exercise rooms were related to higher BMI among workers.

Researchers who assessed the built environment, specifically stairs and stair prompts, and found mixed results. They found that stair prompts were associated with a 3.21 increased likelihood of stair-use (and more so by men and people under age 65). They also found that the study's subjects were more likely to use naturally lit stairwells and those that were located closer to lobby entrances. However, there were some factors that were negatively associated with stair use, including working on a higher floor, BMI, stairwell distance from the lobby, and being female. (Ruff et al., 2014).

Studies that did not find associations (or found mixed/limited results) with the physical environment were often the ones that were measuring clinical outcomes, such as BMI or weight. A group-randomized clinical trial of a multi-component weight loss and obesity prevention program by Nigg et al. (2010) using a validated environmental assessment tool did not find an association between workplace environmental factors and BMI among hotel employees in Hawaii. Another multi-component group-randomized trial by Linde et al. (2012) studied several environmental changes, such as food selection, promotion of walking and stair-use, weight self-monitoring, and education, failed to find changes in BMI in six worksites in the Twin Cities metro area. A cross-sectional cohort study of metropolitan bus drivers also failed to find an association between worksite environmental interventions and BMI, but these findings may be a result of the bus drivers spending most of their days outside the worksite (French, Harnack, et al., 2010). The authors of three other studies also showed limited association between the physical environment and physical activity and healthy eating behavior, which suggested that worksite environmental modifications might raise awareness and support employees' efforts to change their behavior, but by themselves have a limited impact (Brehm et al., 2011; D. M. DeJoy et al., 2011; D. M. DeJoy et al., 2012). In a review of studies that had been funded by the National

Heart, Lung, and Blood Institute (NHLBI), researchers studying innovative environmental interventions for weight control concluded that approaches combining environmental, policy, and individual interventions were promising at improving diet and physical activity behavior (Pratt et al., 2007).

Social Environment

There were seven studies that examined the social environment in the literature review, which included factors such as peer support, changes to social norms, perceived commitment to employee health and levels of stress, and hostile work environments. Researchers in three of the studies showed positive associations between social environmental factors and physical activity and healthy eating behavior, three had mixed results, and one was a qualitative descriptive work. Using data from the 2010 National Health Interview Survey, Luckhaupt, Cohen, Li, and Calvert (2014) found that people who worked more than 40 hours per week and had exposure to a hostile work environment were associated with an increased prevalence of obesity. They also identified an association between certain occupations and increased obesity prevalence, including healthcare, community and social services, protective services, office and administrative support, public administration, and architecture. Stress was examined in a group-randomized worksite intervention study by Barrington, Ceballos, Bishop, McGregor, and Beresford (2012), which found that higher levels of perceived stress among healthy working adults in the Seattle metro area were associated with lower levels of eating awareness (i.e., being deliberately mindful and present when eating), lower physical activity, and less walking. Among participants with lower eating awareness, higher levels of stress were associated with fewer servings of fruit and vegetables and greater consumption of fast food meals. In this study, BMI was not associated

with perceived stress, but associations were detected with proximal obesity-related behavioral indices, such as soft drink consumption.

A site-randomized trial of 899 employees from six hospitals within a single healthcare system looked at employee perceptions of organizational commitment to employee health and coworker normative physical activity and healthy-eating behavior. The authors found that a greater perception of organizational commitment to employee health was associated with lower BMI, and perception of coworkers' positive health behavior was associated with fruit and vegetable intake, saturated fat consumption, and physical activity (Lemon et al., 2009). In other words, co-workers who ate healthfully and exercised spread this normative behavior to others and influenced their eating and physical activity behaviors. Another study by Tamers et al. (2011) assessed the role of perceived worksite co-worker social support on obesogenic behaviors and could not find a conclusive relationship except between the variables physical activity, and fruit and vegetable intake. Tabak, Hipp, Marx, and Brownson (2015) found differences between "social/organizational characteristics" and demographic characteristics. For example, seeing co-workers engage in healthy behaviors, such as eating fruits and vegetables, or taking exercise, was related to employees' fruit and vegetable intake and physical activity. The authors also observed that healthy behaviors, such as fruit and vegetable consumption and physical activity, increased with worksite size.

Lastly, two qualitative studies were included in the literature review. One study by de Souza et al. (2014) evaluated a 12-month multi-component obesity prevention program at a hospital worksite. The authors found that in addition to changing social norms around physical activity and healthy eating behaviors, they observed that peer-helpers contributed to creating a social environment that promoted health. The second study found employee perceptions that

acted as barriers to reducing sedentary time, including jobs that required all-day sitting and the perceived pressure by employees to spend the day at their workstations. Facilitators to reducing sedentary behavior included having a specific purpose for getting up and moving, getting physical or mental relief from sitting, and peer support (Cole, Tully, & Cupples, 2015).

Combination of Physical and Social Environments

Several studies examined a combination of practices/factors in the physical and social environments and their association with physical activity and healthy eating behavior. Of these studies, three of them identified factors that both supported and hindered employee behavior. A qualitative study of nurses by Phiri, Draper, Lambert, and Kolbe-Alexander (2014) identified stress and shift-work to be negatively associated with healthy lifestyle behavior. In addition, they identified factors that hindered participation in worksite health promotion activities, including lack of facilities (i.e., showers), time, interest, staff shortages, and fatigue. They also found that unhealthy eating habits were associated with the higher cost of healthy food in the hospital cafeteria. An uncontrolled pretest-posttest study by Lara et al. (2008) of 335 Mexican Ministry of Health office workers found that changes to the physical and sociocultural environment through the incorporation of 10-minute exercise breaks during the paid workday were associated with improvements in body measures and composition. Gates, Brehm, Hutton, Singler, and Poeppelman (2006) used a community-based participatory research model in four manufacturing companies to identify environmental practices that would support healthy eating and physical activity as a low-cost option for companies that were interested in promoting health, but lacked the resources for individual interventions. In this work, focus group participants identified both physical and social environmental factors to increase healthy eating and physical activity behavior. They included promotional signs, walking paths, changes to food, educational

strategies, and the use of advisory groups. Lastly, Thorndike (2011) reviewed the literature that looked at workplace interventions for reducing obesity and cardiometabolic risk and discussed some of the mixed results of studies that assessed the physical and social environments. She points out the difficulty in obtaining follow-up data from employees as a limiting factor to interpreting some of the studies.

Policy

There were five studies in the literature survey that contained policy implications. Of these five, two studies assessed organizational policy related to the number of hours worked and having time for education and short breaks for physical activity. Bennie, Timperio, Crawford, Dunstan, and Salmon (2011) surveyed over 800 employed adults, ages 18-70, in Melbourne, Australia and found that worker sedentary time was reduced by providing male employees short breaks for physical activity and by providing female workers information about the benefits of this practice. Data from over 15,000 employed adults from the 2010 National Health Interview Survey revealed that the odds of being obese were significantly greater among adults who worked at a company with between 100 and 499 employees compared to a workplace that had only 1 to 24 employees. The same trend was observed at companies in which employees worked greater than 50 hours per week compared with those that worked 30 or fewer hours (Park et al., 2014).

The remaining articles looked at forms of incentives to change employee behavior, including financial incentive models for weight loss. Kullgren et al. (2013) compared group versus individual incentives for weight loss among 105 employees with a BMI between 30-40 kg/m^2 at Children's Hospital in Philadelphia. The authors concluded that the group-based financial incentive was more effective than individual incentives for promoting weight loss. This

result seems to point to the interconnectedness between social environmental factors and incentive policy. In contrast, Abraham, Feldman, Nyman, and Barleen (2011) looked at worksite incentives around gym memberships and found the use of financial incentives in modifying clinical and behavioral outcomes to be questionable. What seemed to matter more to employees was the time cost of exercise and their proximity to a gym facility. They also found that employee attitudes about exercise were important and that prior exercise was a strong determinant for program participation. A systematic review by Archer et al. (2011) looked at incentives among other strategies to prevent and control obesity in the workplace. They identified both competitions and incentives in the worksite for weight loss to be "promising," however, they were unable to determine the sustainability of any of the practices. Lastly, a randomized controlled trial by Patel et al. (2016) using financial incentives (i.e., health insurance premiums and lotteries) failed to show statistically significant differences in weight change between the control and intervention groups.

Overall, the use of workplace policy practices to affect healthy behaviors showed mixed results in the literature and it is clear that more longitudinal studies are needed to assess longer term clinical and behavioral outcomes, such as BMI, healthy eating and physical activity.

Combination of Environment and Policy

Some studies looked at the combination of environmental and policy strategies as a way to improve physical activity and healthy eating. In this literature survey, eight studies were identified, and seven of them examined the combined association of these factors and found positive associations. The study designs included systematic literature reviews, in-depth interviews, cluster-randomized trials, and cross-sectional designs. Lemon et al. (2014) examined a multi-level weight-gain prevention intervention integrated within the organizational culture

among public high school employees. It included both physical/social environmental and policy interventions, such as access to fitness facilities and locker rooms, availability of healthy lunch options, elimination of sugar sweetened beverages, point of purchase nutritional information in cafeterias, group walking, and more. Dodson, Lovegreen, Elliott, Haire-Joshu, and Brownson (2008) also found that a combination of strategies (e.g., accessible stairways, fitness facilities, equipment, counseling, and fitness testing) were important for meeting physical activity recommendations among 977 workers from Missouri, Tennessee, and Arkansas. In addition to noting the positive contributions of environmental and policy strategies in promoting physical activity, Escoffery, Kegler, Alcantara, Wilson, and Glanz (2011) identified a combination of barriers in small and rural worksites, including a lack of vending machines/cafeterias and supportive programs to promote healthy eating and physical activity.

Other studies supported this combination of environmental and policy strategies for promoting healthy behaviors (Arena et al., 2013; Brissette et al., 2008; Catlin, Simoes, & Brownson, 2003; Matson-Koffman et al., 2005). An online survey of 111 employees from 55 organizations identified barriers (e.g., long hours) and enablers of healthy lifestyle behaviors, which included both environmental and policy strategies similar to those identified in other works, such as access to healthy food in the workplace, access to gym/shower facilities, having colleagues to exercise with, flexible work hours, etc. (Blackford, Jancey, Howat, Ledger, & Lee, 2013).

Discussion

Overall, evidence supports an association between worksite physical (e.g., stairs, sidewalks, and cafeterias), social (e.g., peer support), and policy (e.g., flexible work schedules, some financial incentives) practices with healthy lifestyle behaviors, such as physical activity

and healthy eating. However, when these practices were examined on their own, they often had limited or no effect on clinical outcomes such as BMI. For example, altering the physical environment to include treadmill workstations decreased sedentary time, but did not result in changes in weight or BMI. Many of the studies did not assess the longer-term sustainability of behavior change results. Furthermore, while diabetes risk factors were studied, none of the research sought to understand how the workplace environment affected employee progression from the prediabetes state to diagnostic diabetes, nor did they assess whether environmental or policy supports were associated with employee participation in evidence-based programs such as the NDPP.

Research in several areas was scant. Only five studies examined the social environment of the workplace, and of the two that identified positive associations, one study was qualitative and demonstrated evidence of changing social norms around eating and physical activity, but did not measure clinical outcomes or sustainability over time. The study concluded that peer helpers (i.e., respected members of a social network from whom others seek advice) contributed to creating a health-promoting environment, but the method used to identify them was subjective. In addition, the researchers interviewed only the peer helpers and not the people they were coaching so the opinions were one-sided. Lastly, the effect of the peer helpers could not be separated from a larger obesity prevention intervention (de Souza et al., 2014). The other study was based on a large, representative sample of workers in the United States, but relied on self-reported data using a cross-sectional design. The researchers pointed out that it is not possible to know if hostile work environments promote obesity or if workers with obesity are more likely to experience harassment or other behaviors that produce stress (Luckhaupt et al., 2014). Of the three studies with mixed results, two were cross-sectional studies, which limit inferences about

causality, and relied on self-reported data (Barrington et al., 2012; Lemon et al., 2009). Therefore, additional prospective studies are needed to examine aspects of the social environment and their effect on clinical and behavioral outcomes.

Few studies considered both the physical and the social environment of the workplace. A literature review by Thorndike (2011) looked at workplace interventions to reduce obesity and cardiometabolic risk. The researcher found mixed results and pointed out the difficulty in obtaining follow-up data from employees. The methods of the review were not described, so it is difficult to ascertain why certain studies were chosen. Focus groups conducted by Gates et al. (2006) sought to understand factors to increase healthy eating and physical activity, but only studied a small number of worksites (n = 4), and thus the results may be challenging to externally validate . Phiri et al. (2014) also conducted focus groups to identify factors associated with nurse participation in worksite health promotion activities and noted the challenge of focus group attendance, particularly night shift workers, and the fact that the group interview format may have led to the suppression of some opinions. A study by Lara et al. (2008) found an association between 10-minute exercise breaks during work hours for employees of the Mexican Ministry of Health and improved body composition measures. However, this study did not have a control group, and there was a selection bias toward healthier workers. A cross-sectional study by Nelson et al. (2014) used self-reported data to examine relationships among workplace characteristics, physical activity, and BMI. Based on their findings, the authors recommended that worksite health promotion interventions include policies aimed at improving decision latitude and job flexibility, as well as decreasing workplace harassment. Even though decision latitude and job flexibility were identified as predictors of physical activity, more research is

needed to determine whether policies aimed at those characteristics are also predictors of physical activity (or other lifestyle behaviors).

This review identified few studies that primarily focused on workplace policy, even though some touched on policy questions. This could be a limitation of this literature review methodology or could point out gaps in the literature. Of the studies that looked at policy-related components, three touched on incentives (Abraham et al., 2011; Archer et al., 2011; Kullgren et al., 2013), and one described associations between employment characteristics and obesity (Park et al., 2014). These studies have policy implications insofar as they have identified an association between people who are obese and those who work greater than 50 hours per week (Park et al., 2014). Only one study examined an organizational policy (allowing workers to take physical activity breaks during working hours) as a way to reduce sedentary time (Bennie et al., 2011). In that study, there was a lack of consistency in the definition of what constituted a "short physical activity break." None of the studies examined organizational policy or practice as a predictor of employee participation in diabetes prevention programs. The studies based on examining financial incentives provided some insight into practices leading to participation in weight loss programs, but they suffered from attrition and lacked long-term follow-up.

This review has several limitations. First, it was time bound (1990-2015) and limited to studies published in English. Second, eight studies could not be located for inclusion in the results section. Third, only three databases were searched, so it is possible that other relevant studies could have been identified. Lastly, the choice of search terms may have led to finding fewer studies specifically related to policy, since "policy" can mean many things – from policy related to health benefits to organizational policy and practice. It is evident from Table 2 that many factors have implications for policy and organizational practice (e.g., Should an

organization allow treadmill stations or flexible schedules?), but some may not be explicit (e.g., having a policy or practice to include smaller portioned meals in cafeterias, or a policy that establishes a wellness coordinator or peer helpers).

Therefore, what does the literature reveal about the original research question: *How do workplace environments and policy support or hinder employee behavior related to diabetes prevention (i.e., physical activity, healthy eating, and weight status)?* Tables 3 and 4 include characteristics and potential implications learned from the studies – keeping in mind that all studies have limitations, particularly the difficulty in demonstrating improvement in clinical outcomes, such as BMI. Many of these factors contributed to creating a supportive environment and raised employee awareness about lifestyle behavior. Worksite environment and policy practices appeared most effective, however, when used in combination with more intensive individualized interventions, creating a comprehensive approach to lifestyle behavior. These findings have implications for employers who are investing in programs or interventions designed to promote healthy lifestyle behaviors. They point to the importance of looking at the issue through a socio-ecological lens to ensure that the context of the environment supports the desired behavior.

Table 3: Workplace Environmental and Policy Practices that Support Healthy Behavior

	Potential Implications		
	Environment (Physical)	Environment (Social)	Organizational Policy/Practice
Access and proximity to fitness facility with showers and equipment	X		
Stairwells that are close by, well-lit, have signage encouraging use	X		
Access to walking paths	X		
Workplace neighborhood with bike facilities, interesting things to look at, low crime rate	X		
Access to alternative workstations (walking, cycling, standing)	X		X
Employee attitudes about fitness		X	
History of prior exercise		X	
Enhanced opportunities for physical activity combined with health education	X	X	X
Use of peer helpers		X	X
Perception of co-worker normative behaviors		X	
Perception of organizational commitment to employee health		X	X
Working fewer than 30 hours per week			X
Education promoting benefits of exercise			X
Nutritional counseling/nutrition knowledge		X	X
"Prescriptions" for exercise			X
Short physical activity breaks during work hours			X
Greater job flexibility/decision latitude		X	X
Flexible work hours			X
Presence of cafeteria	X		
Availability of healthy food choices and lower cost of those items	X		X
Availability of small portioned meals	X		X
Some financial incentives			X
Elimination/reduction of sugar sweetened beverages	X		X
Point of purchase nutritional information in cafeterias	X		X
Supervisors who are supportive of healthy lifestyle behavior		X	
Presence of wellness coordinator at worksite		X	X

Table 4: Workplace Environmental and Policy Practices that Hinder Healthy Behavior

	Potential Implications		
	Environment (Physical)	Environment (Social)	Organizational Policy/Practice
Employee attitudes about fitness		X	
Hostile/stressful environments		X	X
Low levels of eating awareness		X	X
No access to walking paths or outdoor space	X		
No access/proximity to fitness facility	X		
Lack of availability of healthy food choices and higher priced healthy items	X		X
Lack of job flexibility/decision latitude			X
Jobs that require all day sitting	X		X
Workplace neighborhood without bike facilities, interesting things to look at, high crime rate	X		
Presence of vending machines with unhealthy choices/absence of vending with healthy choices	X		X
Access to sugar sweetened beverages	X		X
Absence of point of purchase nutritional information in cafeterias	X		X

CHAPTER 3: METHODOLOGY

Study Design and Methods

In addition to the literature review, this dissertation includes a qualitative and a quantitative study. A qualitative study was completed to determine what practices employers are using to promote employee enrollment and support participation in the diabetes prevention program. Specifically, I wanted to learn about the specific (physical and social) environmental and policy practices that employers in Maine are using to promote enrollment and support participation in NDPP. I also wanted to identify general barriers and facilitators to employee enrollment in NDPP as well as those specific to environmental and policy practices. The setting for this study included worksites that offered the NDPP to their own employees in the state of Maine (United States).

A quantitative study was completed to determine employee awareness and perceptions of workplace environment and policy practices and their effect on motivation to enroll and participate in NDPP. Specifically, I wanted to understand how employees who are at risk for developing type 2 diabetes perceive their work environments. I was also interested in understanding what environmental and policy practices employees say would motivate them to enroll in NDPP as well as factors that either facilitate or hinder completion of the program. Lastly, I was interested in whether or not there were differences in employee motivators in terms of environmental and policy practices based on gender, age, income, occupation and BMI. The setting for the quantitative study was a large, integrated healthcare delivery system in Maine.

Between 1995 and 2010, diabetes tripled in Maine and was the 7th leading cause of death. As of 2014, 7.4% of Mainers had prediabetes (Maine Center for Disease Control and Prevention, 2014). As a result, the Maine Center for Disease Control and Prevention and its Diabetes Prevention and Control Program included diabetes prevention in their 10-year statewide cardiovascular health and diabetes strategic plan (2011–2020), including opportunities for worksites and worksite wellness programs (Maine Department of Health and Human Services, 2011).

The integrated healthcare delivery system that participated in the quantitative study (employee survey) is comprised of 11 member and four affiliated hospitals, a medical laboratory, an accountable care organization, a home health agency, and physician practices spanning 11 of Maine's 16 counties as well as one county in New Hampshire. The health system employs approximately 18,000 employees in urban and rural locations. As of January 2016, the health system offered the NDPP at two sites and was actively planning to add more.

Employees of the health system must complete both a health risk assessment and biometric screening in order to gain access to healthcare benefits. Beginning in 2015, this requirement was extended to covered spouses. The requirement resulted in a very high percentage of employee/spouse completion of these two actions (~90% since 2012). In 2015, the health system changed the fasting blood glucose testing requirement from annually to once every three years to align with evidence-based practice recommendations (American Diabetes Association, 2014).

In this research study, I utilized an exploratory sequential mixed methods design. Mixed methods research is "an approach to inquiry involving collecting both quantitative and qualitative data, integrating the two forms of data, and using distinct designs that may involve

philosophical assumptions and theoretical frameworks" (Creswell, 2014). An exploratory sequential mixed methods design means that data collection occurred in two phases, beginning with a qualitative study that later built into quantitative data collection and analysis (Figure 3).

Phase one of the research was a qualitative case study of worksites in Maine that offered the NDPP to their employees and have pending or full recognition from the CDC. There were 13 sites eligible to participate in the study, and 10 agreed to do so. Note that many programs offer classes that are open to the public in addition to their own employees. These sites were eligible to participate in the study, but the focus was on the employee cohort as a target population. I conducted key informant interviews with NDPP leaders at the 10 worksites that agreed to enroll in the study in order to determine what practices related to the physical and social environment were being used to promote employee enrollment in the diabetes prevention program and to support employees attempting health behavior change. I conducted one follow-up interview with a site that had implemented a significant number of practices. An example of social support is a worksite that has a peer support program designed to promote healthy eating and physical activity. In addition, I sought to identify policy practices used to promote enrollment in the diabetes prevention program. An example of a policy practice is an employer that provides incentives (e.g., financial or material) for an employee to participate in the program. I also sought to understand the barriers and facilitators to implementing environmental and policy practices to promote enrollment and support participation in diabetes prevention programs, as well as other more general barriers. To obtain this information, I conducted key informant interviews with employee wellness program leaders responsible for overseeing the diabetes prevention program at the different worksites.

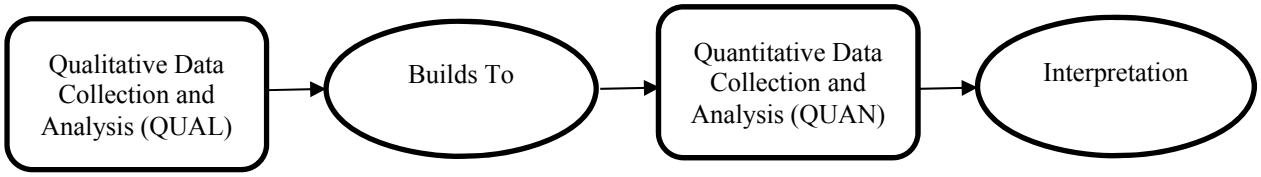


Figure 3. Exploratory sequential mixed methods study design. Reprinted from *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches (4th ed.)* (p.220), by J. W. Creswell, 2014, Thousand Oaks, California: SAGE Publications, Inc.

Phase two of the study used information from the phase one qualitative study regarding the practices used to promote the NDPP and support employees who participated. I developed and tested a survey instrument to assess employee perceptions of their work environment in order to determine how physical and social environmental or policy practices affected employee motivation to enroll in the diabetes prevention program. The study was designed to gather general data on employee observations about their worksites and then used branch logic to gather more specific data based on whether or not the employee had enrolled or completed NDPP.

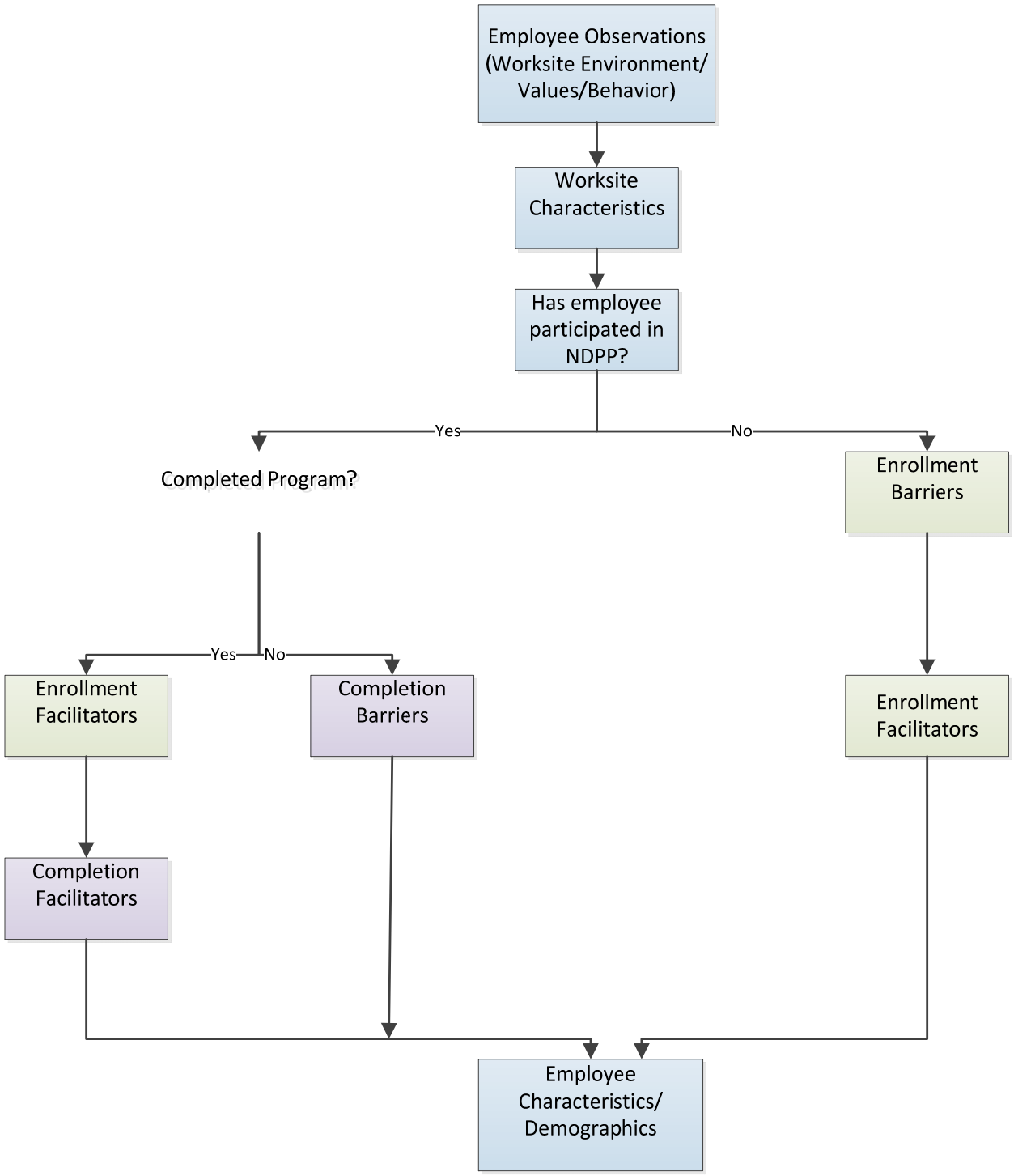


Figure 4. Employee survey design and branch logic.

Employees were asked about their perceptions of their current worksite, using questions from other validated instruments with permission from the authors to minimize the number of new questions (Hoehner, Budd, Marx, Dodson, & Brownson, 2013; Tabak et al., 2015). In addition, I collected data regarding the worksite itself (e.g., urban vs. rural, size) and the employees' demographic information (e.g., gender, age, income, occupation). The draft instrument was assessed for readability according to health literacy principles (MaineHealth, 2010). It was modified to achieve a fifth grade reading level. Some questions were modified slightly to achieve the readability goal, and I obtained permission to use the modified versions from the authors (Appendix H). I also developed new questions using the findings from the qualitative study. For instance, if several worksite-based NDPP programs were using financial incentives to promote enrollment in the program, I included "financial incentives" as a factor in assessing what motivated, or would motivate, an employee to enroll.

After the survey was drafted, I sent it to 13 people with varying backgrounds and expertise (including survey design) for comment and feedback. Reviewers were asked to comment on: 1) whether they understood the questions and response categories; 2) whether the electronic tool worked (i.e., could it be read with whatever browser they were using, did the buttons to select choices work, etc.); 3) a sense for how long it took to complete; and 4) any other substantive feedback based on their experience and expertise. The survey was revised with this input before it was sent into the field in full production status. On June 20, 2016, the survey was distributed to 1,258 employees in the health system who met the inclusion criteria, specifically blood glucose levels between 100–125 mg/dl.

Study Limitations

Both phases of the study had limitations. I recruited from 13 eligible worksites that offered the NDPP to their own employees. A limitation of the qualitative study is that there were only 13 eligible sites in Maine, and therefore generalization to a larger set of worksites (i.e., outside of Maine) could be a challenge. In addition, while I consulted with experts in qualitative data analysis and coding, I was the only coder, and therefore I could have introduced bias into the results because my interpretation of the findings were unavoidably shaped by my background, female gender, culture, history, and socioeconomic origin (Creswell, 2014). Similarly, the key informants may have misclassified their responses or interpreted the questions through their own personal lenses and experiences, even though I reviewed definitions of terms that I would use during the study at the outset. In some cases, the survey respondents were not able to answer all of the questions due to tenure, experience, or involvement in a particular aspect of the work. Lastly, this research study did not include an audit of environmental and policy practices at the worksites and collected only limited evidence that the practices were actually implemented and known to employees. For example, a worksite may have had a relevant written policy that could affect employee health behavior, but the key informant (or employees generally) may not have been aware of it.

The data collected through the survey in phase two were self-reported by employees and therefore at risk for being inaccurate. As with any voluntary survey, selection bias was possible. Financial incentives were not used to encourage completion of the survey, but other factors could lead to selection bias. Given that the survey was related to health behavior change, it is possible that people who were not interested in changing their health behavior (e.g. physical activity, healthy eating) chose not to participate. Similarly, those who have already taken steps to improve

their health behavior, or who are contemplating doing so, may have been more likely to complete the survey. In addition, there is a possibility of social desirability bias since the survey asks for height and weight as well as an assessment of motivation to make lifestyle changes. Employees who were not contemplating lifestyle behavior change may have been reluctant to be forthcoming. Furthermore, the researcher used a convenience sample based on access to a population of employees who are at risk for developing type 2 diabetes. Since the biometric data used to filter the respondents is from 2014 (the time of the last required employee biometric screening), it is possible that the people identified are no longer at risk if they have already lost weight through healthy eating and physical activity to improve their fasting blood glucose levels, or they may have actually developed type 2 diabetes. The research design was cross-sectional and did not include collecting NDPP enrollment and participation data, therefore it only assessed what employees said and not what they subsequently did related to NDPP enrollment and participation. Actual NDPP enrollment and participation data were not accessible to the researcher and were beyond the scope of this study.

IRB Considerations/Confidentiality Issues

I was required to obtain Institutional Review Board (IRB) approval from both the University of North Carolina (UNC) and the Maine Medical Center (MMC) IRBs. Both IRBs agreed to collaborate and ultimately, MMC deferred to the UNC IRB. I submitted the IRB application to UNC with information intended to satisfy both institutions. Key personnel from both IRBs met to discuss the application once it was submitted. The application was reviewed and deemed exempt from further review in late March, 2016.

Measures were taken to ensure confidentiality of all research subjects. Some identifiers were used in the collection of data. Key informant names appeared on informed consent forms

and in audio files and written transcripts. These data were kept in password-protected files and will be destroyed upon acceptance of the final dissertation. In addition, while direct quotes were used, no names were attributed to the informants. Within the survey, employee identifiers included only worksite location.

I identified a psychological risk to employees who take the survey, insofar as they may have experienced embarrassment resulting from questions that were personal in nature (i.e., height, weight, age, and income). I minimized this risk by making these questions optional.

Methodology for Phase One: Qualitative Case Study

Data sources. At the time of recruitment for the qualitative study, there were 13 NDPP sites that had pending or full CDC recognition in Maine. Only those who offered the program to their own employees were eligible to participate (Table 5). Of these worksites, I recruited 10 for the study. Key informant interviews were conducted with the leader responsible for the design and oversight of the diabetes prevention program at each respective site.

Table 5*:* Study Eligibility Within National Diabetes Prevention Program Worksites

	DPP offered to employees *only*	**DPP offered to employees *and* community members**	**DPP offered to community members *only***
1		X	
2	X		
3	X		
4		X	
5		X	
6		X	
7		X	
8		X	
9	X		
10		X	
11	X		
12			X
13		X	
14			X
15		X	
16			X
17			X
TOTAL	4	9	4
TOTAL ELIGIBLE TO PARTICIPATE	4	9	0

Potential subjects were contacted by email to request participation in the study. A brief description of the study was shared using a standardized script in English (see APPENDIX C: Key Informant Interview Guide). Face to face or telephone meetings were scheduled for all subjects who agreed to participate in the study. In-person interviews were conducted if the site was no greater than a two-hour drive from Portland, Maine. Interviews lasted between 30 and 45 minutes and were conducted in a private room to ensure confidentiality. The subject was asked to sign an informed consent form, developed by the UNC IRB and approved by the Maine Medical Center IRB. The sessions were recorded using a Sony digital IC recorder. The audio files were stored in a password protected folder, and the recordings were transcribed for analysis by a professional transcription service. Participation in the study was voluntary, and no

monetary or explicit non-monetary incentives were offered for participation. In addition, there were no costs to the subjects other than their time.

A key informant interview guide (see Appendix C) was developed and submitted to the UNC IRB for approval. The interview guide contained a set of introductory questions to help the researcher understand the site followed by a set of standardized open-ended questions focused on the research aims. Questions were sent to key informants ahead of time to help them prepare. Some questions required them to gather data before the interview (e.g., number of employees at worksite location, number of employees enrolled/completed NDPP).

It is important to note that of the 13 worksites that offered the NDPP to employees in Maine, nine also offered the program to community members. Most of the sites did not have the ability to "separate" the data to know which of the participants were employees and which were community members. Of the sites that were interviewed in the qualitative study, two of them were also part of the quantitative study (*Figure 5*).

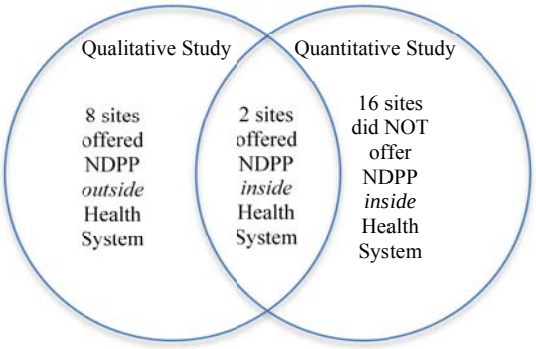


Figure 5. Site overlap between qualitative and quantitative research phases.

Delimitations

Purposeful selection was used to identify both sites and key informants to assist with answering the research questions (Creswell, 2014). The qualitative study included only CDC recognized (or pending recognition) worksites in Maine that offered the NDPP to their employees. These sites have agreed to adhere to the CDC's *Diabetes Prevention Recognition Program Standards,* and thus the program is consistent across the different sites (Centers for Disease Control and Prevention, 2011). Worksites that offered the NDPP to community members only were excluded from the study because the primary focus of this dissertation is on environmental and policy practices that worksites are using to promote employee enrollment participation in the program. Also, I chose to select key informants who had a role in leading or overseeing the NDPP at their worksites because they were thought to have the most working knowledge regarding worksite strategies.

Data Management Plan

The qualitative study required the collection and storage of confidential data in several formats (e.g., audio files, Word documents, transcribed documents, data analysis software files, returned surveys, etc.). The location of the data files was password protected, and only the researcher had access to all of the files. The key informant interviews were recorded using a digital audio recorder. The audio records were shared with a professional transcription service (via a shared password-protected Dropbox folder) and subsequently transcribed. The transcription files were uploaded into the same password-protected folder upon completion. In addition, the researcher took handwritten notes during the interviews, which were later added to

Word documents to capture initial impressions. Written notes were destroyed using a confidential shredding service once the Word documents were created.

Data Analysis Plan

I used a conceptual model to guide the qualitative data analysis procedures (Figure 6). The model contained key factors in the environmental and policy realms as well as anticipated barriers and facilitators related to implementation. The Social Ecological Model provided the theoretical support for the conceptual model of the qualitative research study. The conceptual model guided the development of a data codebook for key informant interviews with worksites that offered the NDPP to employees.

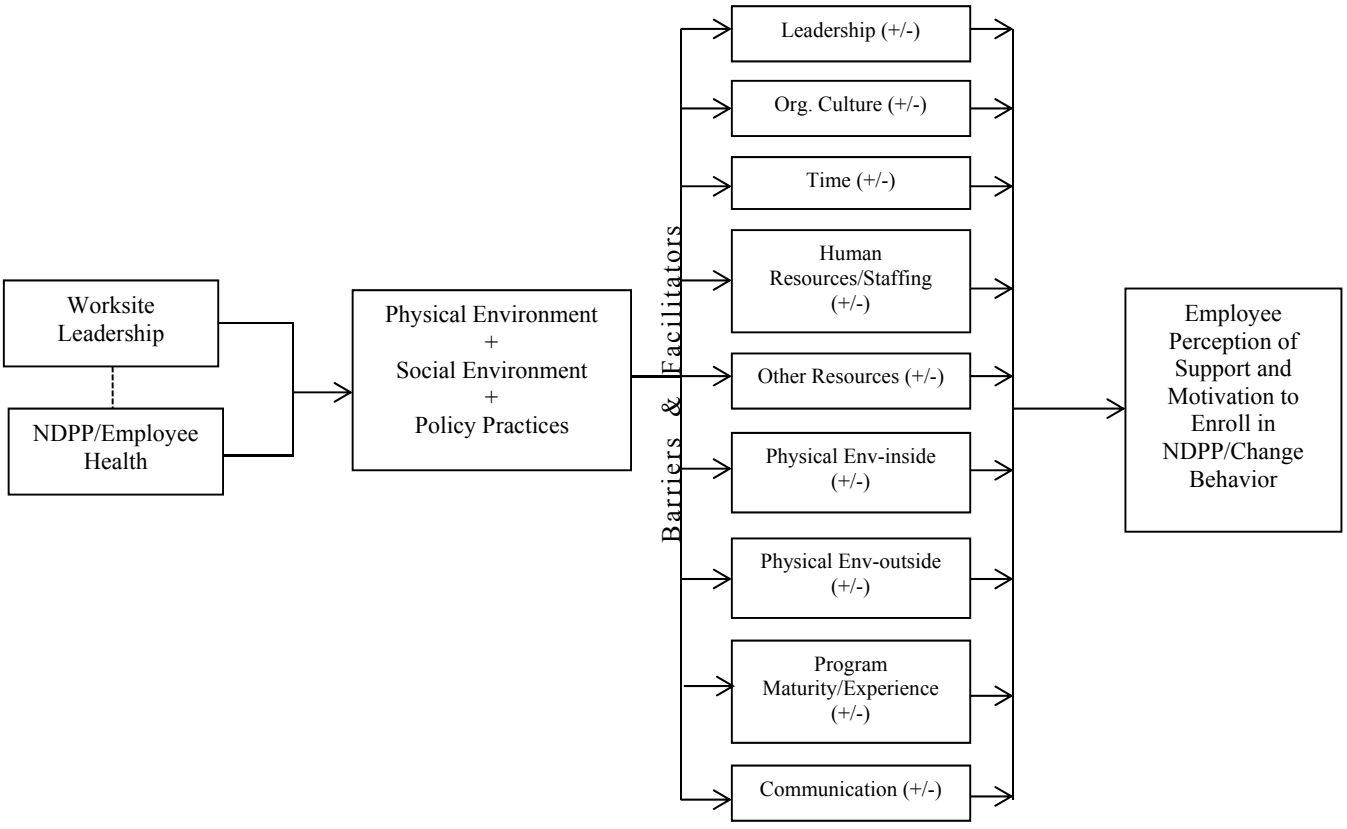


Figure 6. Conceptual model for key informant interviews.

I used Creswell's approach for qualitative data analysis (Figure 7; (Creswell, 2014). Data from the key informant interviews were digitally recorded and transcribed by a professional transcription service. After the interviews were completed and transcribed, I read the transcripts in full and wrote memos to capture key ideas and themes. I then tested the thematic elements within the conceptual framework and determined that several additional codes were needed. I identified 11 codes and two sub-codes including:

1. Enrollment/Participation
    a. Identifying employees with Prediabetes (Sub-Code)
2. Policy
    a. Incentives (Sub-Code)
3. Program Structure/Organization
4. Communication
5. Physical Environment (Outside)
6. Physical Environment (Inside)
7. Social Environment
8. Staffing/HR
9. Time (Barrier)
10. Organizational Culture
11. Leadership

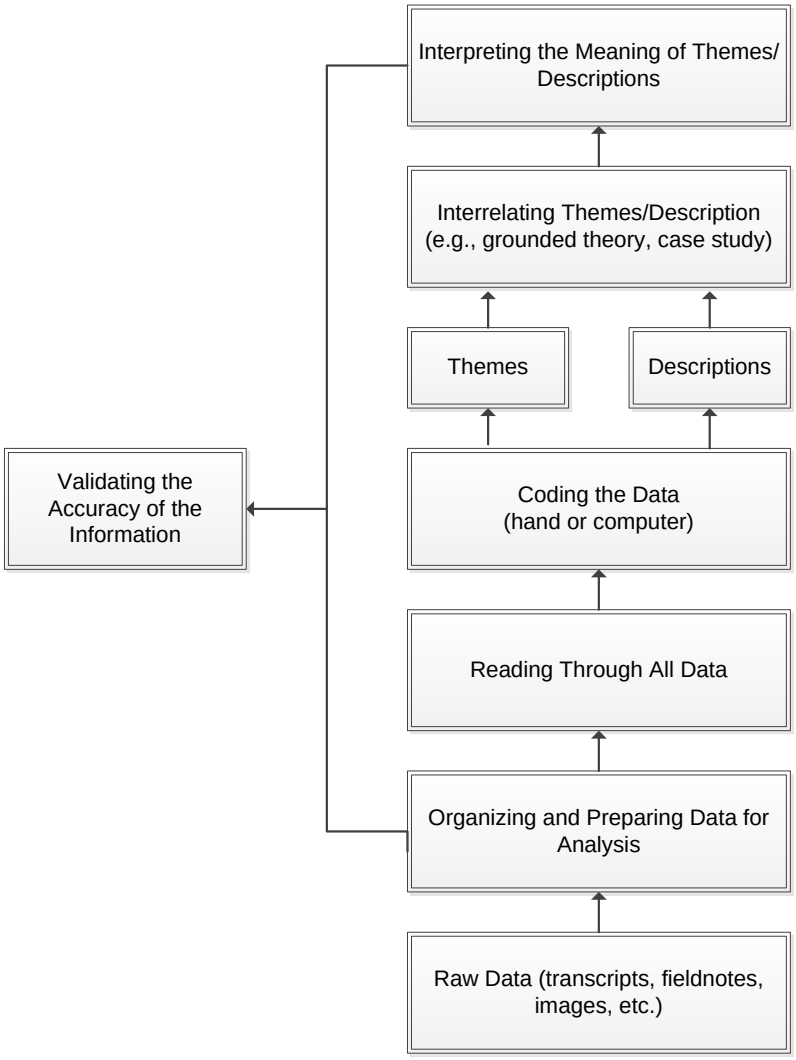


Figure 7. Approach to data analysis for the phase one qualitative research. Reprinted from *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches (4th ed.)* (p.197), by J. W. Creswell, 2014, Thousand Oaks, California: SAGE Publications, Inc.

I analyzed the transcribed data using MaxQDA version 12 (Release 12.1.3) to understand how worksites were using specific environmental and policy practices to support employees in making lifestyle behavior changes. I also explored the data for an explicit lack of environmental and policy practices. Sites were analyzed separately (i.e., within-case analysis) so that I could compare and contrast themes and patterns according to the NDPP worksite location. I also wrote memos to reflect on commonalities between the text units in order to identify missing

information and to discuss what they revealed about my qualitative conceptual model. This iterative process allowed me to modify the interview probes after the first few interviews to further understand findings that were not part of the initial questionnaire. For example, during the first few interviews, key informants mentioned the use of food as a reward for achievements and/or celebrations (i.e., "employee appreciation"). While not tied directly to the NDPP, this finding spoke to the social environment of the organization, and the question was included in subsequent interviews.

A cross-case analysis allowed the data to be analyzed in a way that enabled me to compare among worksites and summarize the practices being used to promote enrollment and support participation in the NDPP, as well as to capture the barriers and facilitators related to implementation. This analysis method also allowed me to develop a deeper analysis of themes across worksites and enabled comparison by different factors, such as organization size.

Results from the qualitative study informed the quantitative study. The most frequently used environmental and policy practices were inserted into the employee survey to assess whether those factors had (or would have) an impact on employees' motivation to enroll in the NDPP.

Methodology for Phase Two: Quantitative Study

Data sources. For the quantitative study, I developed a cross-sectional survey and tested it for distribution to 1,258 employees of a large health system who were known through biometric data to have prediabetes (i.e., blood glucose levels between 100–125 mg/dl). I established content validity by asking for feedback from specialists in survey research and health literacy/education. The survey was pilot tested with 13 people with varying levels of education, background, and expertise. Based on that feedback, I modified the instrument before it was sent

into the field in full production status (see Appendix F).

A link to the final survey was sent on June 20, 2016, to the targeted employees by an email through a third party vendor (WebMD) via a secure site. Subjects received a message that they had a secure email waiting for them. They were required to log on to the secure WebMD site using their existing username and password to access the email. The email contained a consent form, which outlined the purpose of the study, study procedures, potential risks, privacy/confidentiality, and the subjects' rights. Participants consented to participate by clicking on the link to the survey. A second email was sent as a reminder on June 28, 2016. The email subject line was based on digital marketing research principles that have demonstrated increased open-rates (see APPENDIX G: Quantitative Survey Reminder Email G; (Grimshaw, 2015; MacArthur, 2016). A final email reminder was sent on July 11, 2016. The survey remained open until August 1, 2016.

I requested and received summary data from WebMD for the entire cohort of employees who received the survey recruitment email. These data included age group, gender, education level, ethnicity, BMI, cigarette and alcohol use, and exercise frequency. I used this information to assess the both the representativeness of the survey participants compared to the entire cohort and potential respondent bias (see Chapter 4, Results for Phase Two: Quantitative Study).

Definitions of Key Terms/Variables

The electronic survey included a number of data points that served as the independent and dependent variables in the analysis (Table 6). Variables of interest were classified according to the type (i.e., continuous or categorical) and categorized (i.e. interval, nominal, or ordinal). The specific independent variables came from the qualitative study so that they could represent actual practices being used or considered by worksites that offered the NDPP in Maine.

Table 6: Independent and Dependent Variables

Variable	Variable Type
Dependent Variable	
Motivation to enroll in NDPP	Categorical (Ordinal)
Independent Variables	
Worksite characteristics	
Employee observations of coworkers	Categorical (Ordinal)
Worksite physical environmental practices	Categorical (Ordinal)
Worksite social environmental practices	Categorical (Ordinal)
Worksite policy practices	Categorical (Ordinal)
Covariates	
Income	Continuous (Interval)
Age	Continuous (Interval)
Gender	Categorical (Nominal)
BMI	Continuous (Interval)

Delimitations

I used a convenience sample of employees who worked for a large integrated healthcare delivery system in Maine. The organization had approximately 18,000 employees at 14 sites across the state of Maine and New Hampshire at the time of survey administration. Filters were applied to limit the sample to only employees (not spouses or family members) who were covered by the organization's benefits and who had prediabetes as of the last year that the screening was implemented.

Data Management Plan

The quantitative study required the collection and storage of confidential data in several formats (e.g., Word documents, Excel spreadsheets, data analysis software files, returned surveys, etc.). A simple spreadsheet was developed to catalogue the various data elements, file formats, and storage locations. The location of the data files was password protected, and only the researcher had access to all of the files.

I developed the electronic survey for employees using the Research Electronic Data Capture (REDCap) tool. REDCap is "a secure, web-based application for building and managing online surveys and databases" (Tufts Clinical and Transitional Science Institute, 2015). The data were collected using electronic data capture, in which data were entered directly by the research subjects. A database assigned a unique subject identifier that had no meaning external to the study database (Hulley et al., 2007). The study database was stored on REDCap servers and was password protected.

A third party vendor (WebMD) distributed the survey link via email to employees to ensure confidentiality. Employees who met the filtering criteria (i.e., blood glucose levels between 100–125 mg/dl) received an email introducing the survey and asking them to participate. There were three subsequent email reminders sent over a period of six weeks. Employees who received the email were required to log in to their WebMD account using an existing username and password to access the link to the survey. Neither the researcher nor other employees at the health system were able to see the names of individuals receiving the survey.

Raw data from the survey and the data dictionary were exported into Microsoft Excel 2010 and IBM SPSS Statistics 24. Additionally, summary reports were accessed using the REDCap software program. These reports were saved in a password protected folder.

Data Analysis

I assessed the dataset for fidelity prior to beginning analysis, querying for missing values and values outside a permissible range. I received summary statistics for all independent variables for the individuals who received the link to the survey. These data allowed me to compare between the entire population with prediabetes with those who responded to the survey, which enabled me to test for selection bias.

I used summary statistics to describe the characteristics of the employees who responded to the survey compared to the entire group (i.e. comparison group) of employees who received the invitation to participate in the research study. These included elements such as the total number of respondents, mean age, percentages for gender, worksite, occupation, smoking status, and others. I used cross tabulations to examine percent gender, income, education, BMI, and other characteristics by environmental and policy practices perceived to motivate enrollment in the NDPP. Descriptive statistics were included in the analysis. I also conducted bivariate analyses for each independent variable to determine its relationship with the dependent variables. Pearson's chi-squared and Fisher's Exact tests were used for categorical independent variables with 0.05 as the alpha criterion for establishing statistical significance.

CHAPTER 4: RESULTS

Results for Phase One: Qualitative Study

I conducted 10 key informant interviews between April 7, 2016 and June 3, 2016 and one follow up interview on November 17, 2016. I interviewed the leaders of worksite-based NDPP in Maine. The purpose of conducting these interviews was to determine what practices employers are using to promote employee enrollment and support participation in the national diabetes prevention program. Specific aims for this qualitative research study included:

- What physical and social environment practices are employers using to promote enrollment and support participation in the NDPP?
- What policy practices are workplaces using to promote enrollment and support participation?
- *In general*, what are the barriers and facilitators to employee enrollment in NDPP?
- What are the environmental and policy barriers and facilitators that affect employee enrollment and participation in NDPP?
- What are the barriers and facilitators to implementing environment and policy practices to promote enrollment and support participation in NDPP?

Sites were categorized as either urban or rural based on the Census 2010 Urban and Rural Classification and Urban Area Criteria (U.S. Census Bureau, 2016). A description of the sites in terms of the number of employees and their urban/rural classification can be found in Table 7.

Sites varied in how long they have been offering NDPP between 1 and 4 years. All but two of the sites conduct health risk assessments and collect biometric data from employees, including BMI and fasting glucose levels. Nine of the sites were healthcare provider organizations, and all ten sites operate some parts of their organization on a 24 hour, seven day a week basis, with workers covering all shifts. The number of employees who have ever enrolled in NDPP varied from fewer than 10 to nearly 100. None of the sites use value based insurance/reimbursement for their own employee participation in NDPP, and many key informants were unfamiliar with the concept.

Table 7: Description of Workplaces, Qualitative Study

	Workplace size & urban/rural classification		
Worksite identification	Small (1-499 employees)	Medium (500-1,500 employees)	Large (>1,500 employees)
Site 1			X, Rural
Site 2		X, Rural	
Site 3	X, Rural		
Site 4		X, Rural	
Site 5	X, Rural		
Site 6		X, Rural	
Site 7		X, Rural	
Site 8			X, Urban
Site 9			X, Rural
Site 10		X, Urban	

Within-case Analysis

A within-case analysis explores each site individually, which allows for an in-depth study of a particular case:

> "In order to discern how the processes or patterns that are revealed in that case support, refute, or expand (a) a theory that the researcher has selected or (b) the propositions that

the researcher has derived from a review of the literature and/or experience." (Paterson, 2016)

Tables 8-17 provide a within-case analysis and examine environment and policy practices at each workplace separately. The analysis is divided into three sections. The first looks at practices used to promote employee enrollment in NDPP. The second examines practices used to support healthy lifestyle behavior. The third captures the most significant barriers or challenges to healthy lifestyles *as reported by the key informant,* not what the researcher may believe to be the greatest challenges or barriers. The latter will be discussed in the in-depth qualitative analysis section of this dissertation.

The physical environment is divided into two parts, including the "inside" environment (e.g. cafeteria, signage promoting lifestyle behavior inside the building, etc.) and the "outside" environment (e.g. walking trails, signage promoting lifestyle behavior outside the building, etc.). The social environment:

> "Influences behavior by shaping norms: enforcing patterns of social control (which can be health promoting or health damaging); providing or denying opportunities to engage in particular behaviors; and reducing or producing stress, for which engaging in specific behaviors might be an effective short-term coping strategy." (Institute of Medicine, 2002)

Policy refers to healthcare benefits or incentives (e.g., financial or material rewards) used to promote physical activity or weight loss. An organization policy can be defined as a written set of guidelines affecting all employees at a workplace. The literature review in Chapter 2 suggested that the combination of environmental and policy strategies for promoting health behavior was associated with improved health outcomes, such as BMI.

The following definitions will be used to describe these specific environmental and policy practices:

- Physical Environment (Inside)

  Gym: A dedicated room or center with fitness equipment. Can mean anything from a cardiac rehab room that employees are allowed to use to a fully equipped, on-site fitness facility used by employees.

  Healthy cafeteria: The organization has taken steps to improve the food choices it offers. In some cases, this means that they have implemented a guidance system to raise awareness of more nutritious food choices (e.g. a "stoplight" or similar "star" system to indicate healthy food choices, or recommend frequency).

  Healthy vending: The organization offers healthy choices within vending machines.

  Indoor walking path: An area with signage inside a building that promotes walking (e.g. a quarter-mile loop inside a building).

  Point of decision signs: Signage used to promote an aspect of the physical environment, such as taking the stairs versus the elevator.

  Sit/stand workstations: The organization provides workstations where employees can sit or stand.

- Physical Environment (Outside)

  Walking trails/maps: The organization promotes walking by providing access to walking trails and encourages their use by printing and distributing trail maps.

  Point of decision signs: Signage is used to promote an aspect of the physical environment, such as parking far from the building to encourage walking.

Bike racks: Dedicated locations to store/lock bicycles that are used to encourage bicycling to work.

- Social Environment

Encouragement to stand/move: The deliberate action of an organization to actively encourage employees to stand or move with regular frequency. For example, some organizations actively encourage people to stand or move every 60 minutes. They may use computer screen reminders or announcements to reinforce the behavior.

Group classes: Opportunities for employees to attend health or educational sessions as a group. They may include things like healthy cooking classes, fitness classes, mindfulness or stress reduction classes.

Food as reward: The organization has a practice of using food to reward employees. For example, many organizations conduct employee recognition events where food is central to the activity (e.g. ice cream social, pizza party). Some organizations use food to incentivize or reward specific behavior (e.g., a team that meets a quarterly goal receives a pizza party).

Health champions: People within an organization who have a formal defined role in promoting healthy behaviors.

Leadership support: Visible, actively engaged leaders who promote and advance healthy lifestyle behaviors through environmental and policy practices. In addition, leaders are strong contributors to the social environment and help promote a culture of health.

Positive health culture: The overall culture (i.e. norms that influence behavior) at the organization is supportive of healthy behaviors.

- Policy

Financial incentives: Employees are given some kind of monetary incentive for participating in the NDPP. Some organizations offer incentives to people when they complete the core classes; others provide monetary incentives when employees reach or maintain weight loss goals. Some offer combinations of monetary incentives (e.g., one incentive for completing core classes and a second incentive when a weight loss goal is met or maintained for a certain period of time).

Free NDPP: The program is offered at no cost (other than time) to employees. If an employer promoted the benefit while trying to recruit employees into NDPP, it will be included in the "used to promote enrollment in NDPP" category. Otherwise, it will appear in the "used to facilitate healthy lifestyle behavior" category.

Healthy vending policy: A written document specifying healthy food and/or drink options that may be placed in company vending machines. These policies most often provide nutritional guidelines that prohibit choices with little or no nutritional value (e.g., sugar-sweetened beverages, candy bars, etc.).

Material incentive: Employees are given a non-monetary reward to participate or complete the NDPP (e.g., water bottles, recipes, books, etc.).

Release time: Employees are permitted to attend the NDPP during working hours (in order to attend all or part of NDPP classes).

Department variation in any of the preceding practices means that instead of an organization-wide practice, department (or unit) level managers have discretion over activities, funding, and even social and cultural norms.

The results of the key informant interviews follow. Findings for each site are described separately in the within-case analysis.

Site One

Site 1 was a large organization in a rural area of Maine. The organization conducts health risk assessments with employees, and collects biometric data, including BMI and fasting glucose. They use these data to identify and outreach to employees who are eligible for NDPP. This site has a wellness coordinator and the organization uses health coaches to conduct employee outreach and promote enrollment in the NDPP. They have implemented the most environmental and policy practices (within the study) to support employees who are participating in the program and more generally to support and promote healthy lifestyle behaviors organization-wide, regardless of their risk for developing type 2 diabetes. This was the only site that mentioned deliberate use of behavioral economics in its cafeteria. The behavioral economics approach, made popular and accessible by the book *Nudge*, uses food placement as a way to encourage food choice (Thaler, 2009). For instance, the organization may place healthy foods at the cash register or in more easily accessible locations than less healthy options.

In 2012, this site received a substantial grant to make NDPP available throughout the region they serve. They used it to train lifestyle coaches, and they worked with primary care practices to encourage referrals of both community members and employees to NDPP. In

addition, the organization's leaders have had a focus on wellness for over a decade. Their efforts evolved from an initiative in the human resources department and evolved into a comprehensive program designed to help employees meet their health goals. Leaders support the effort financially and, in more recent years, very visibly and vocally. They have deliberately created health champions, and managers regularly engage in conversations about promoting and supporting employee health. When the organization built a new physical plant a couple of years ago, it designed the physical space with health in mind. The designers intentionally created attractive staircases as a prominent feature. They designed the cafeteria so that a large salad bar was front and center, and they created a teaching kitchen to demonstrate healthy cooking. They created relaxing and natural spaces to reduce stress and put in walkways and trails around the building. All of these efforts, beginning with a strong commitment from leadership, helped to create a culture that facilitated a process for decision-makers to consider health in a very deliberate way.

Table 8: Site One Characteristics

	Physical environment (inside)	Physical environment (outside)	Social environment	Policy
Used to promote enrollment in the NDPP	• None	• None	• Health Coaches	• Financial Incentive • Free NDPP
Used to facilitate healthy lifestyle behavior	• Healthy vending • Sit/stand workstations • Healthy cafeteria (including use of behavioral economics) • Point of decision signs: stairs	• Walking trails/maps • Point of decision signs: park far away • Bike racks	• Positive health culture • Encouragement to stand/move • Health champions (in departments) • Group classes (physical activity, healthy eating, healthy mind) • Leadership Support	• Free NDPP • Financial incentives • Healthy vending policy
Most significant healthy lifestyle challenges/ barriers	• Department variation (budget for sit/stand workstations)		• Department variation (health champions) • Food as reward	

Site Two

Site 2 was a medium-sized organization in a rural part of Maine. The organization conducts health risk assessments with employees, and collect biometric data, including BMI and fasting glucose, but they do not use these data to engage or outreach to employees to promote enrollment in NDPP. Instead, they cast a broad net using organization-wide flyers and email to market the program. They do not have a wellness coordinator or a health coach beyond the individual who facilitates the NDPP. They are new to the program and have been offering it to employees for less than one year. So far, they are most reliant on information about the NDPP spreading through "word of mouth" communications with employees who have enrolled in the

program. They do not have any policies in place that guide health behavior, nor do they offer financial or material incentives for participation in the NDPP. They reported having a culture that supports employees taking walks on breaks as well as support from the human resources department leaders.

Table 9: Site Two Characteristics

	Physical environment (inside)	Physical environment (outside)	Social environment	Policy
Used to promote enrollment in the NDPP	• None	• None	• None	• None
Used to facilitate healthy lifestyle behavior	• Gym • Point of decision signs: stairs • Healthy cafeteria (reduced saturated fat)	• None	• Positive health culture • Leadership Support (Human Resources)	• None
Most significant healthy lifestyle challenges/ barriers	• Sugar-sweetened beverages in cafeteria • Unhealthy vending			• No incentives/ policies

Site Three

Site 3 was a small organization in a rural part of Maine. They conduct health risk assessments with employees but do not collect biometric data, including BMI and fasting glucose. They have a wellness coordinator who recruits employees for the NDPP primarily through organization-wide email and a wellness fair. Site 3 is new to the NDPP, and they have been offering it to employees for less than one year. The organization has done some work to

increase healthy options in their cafeteria. For example, they removed sugar-sweetened beverages and now offer flavored water. They also reduced portion sizes and have reduced sodium in cafeteria recipes. They reported being particularly challenged by being located in an economically depressed area of the state.

Table 10: Site Three Characteristics

	Physical environment (Inside)	Physical environment (Outside)	Social environment	Policy
Used to promote enrollment in the NDPP	• None	• None	• None	• None
Used to facilitate healthy lifestyle behavior	• Gym • Indoor walking "path" • Healthy cafeteria	• None	• None	• Material incentives
Most significant healthy lifestyle challenges/ barriers	• Jobs that require all day sitting			

Site Four

Site 4 was a medium-sized organization in a rural part of Maine. They conduct health risk assessments with employees, and collect biometric data, including BMI and fasting glucose but they do not use these data to engage or outreach to employees to promote enrollment in the NDPP. Instead, they cast a broad net using organization-wide brochures, newsletters and email to market the program. They use health coaches and a wellness coordinator and have been offering

NDPP to employees for three years. This site was focused on creating a social environment that supports health behavior, and the organizers recognized areas they would like to improve.

Table 11: Site Four Characteristics

	Physical environment (Inside)	Physical environment (outside)	Social environment	Policy
Used to promote enrollment in the NDPP	• None	• None	• None	• None
Used to facilitate healthy lifestyle behavior	• Gym • Healthy vending	• Walking trails/maps	• Group classes • Leadership support	• Free NDPP
Most significant healthy lifestyle challenges/ barriers			• Food as reward	• Lack of policy for food served at meetings

Site Five

Site 5 was a small organization in a rural part of Maine. They do not conduct health risk assessments nor do they collect biometric data of any kind. They have a wellness coordinator and a health coach and have been offering the NDPP for less than one year. They promote the NDPP to employees primarily through communications from the wellness committee. Emphasis was placed on social support for people in the NDPP, and they have found success with coaching people to create individualized strategies that work for them. It is a small community where everyone knows everyone, and they have tried to use this to their advantage when it comes to promoting healthy lifestyles. They reported being particularly challenged by being located in an

economically depressed area of the state that features a low socioeconomic status and a high rate of unemployment.

Table 12: Site Five Characteristics

	Physical environment (inside)	Physical environment (outside)	Social environment	Policy
Used to promote enrollment in the NDPP	• None	• None	• None	• None
Used to facilitate healthy lifestyle behavior	• None	• Walking trails/map	• Group classes (healthy cooking) • (Informal) health champions	• None
Most significant healthy lifestyle challenges/ barriers	• No gym • No place for employees to eat lunch		• Food as reward	

Site Six

Site 6 was a medium-sized organization in a rural part of Maine. This site conducts health risk assessments with employees, including the collection of BMI and fasting glucose levels. However, they do not use these data for NDPP recruitment purposes and instead rely on organization-wide emails, flyers, and intranet messaging. They use health coaches and have a wellness coordinator and have been offering the NDPP to employees for approximately four years.

Table 13: Site Six Characteristics

	Physical environment (inside)	Physical environment (outside)	Social environment	Policy
Used to promote enrollment in the NDPP	• None	• None	• None	• None
Used to facilitate healthy lifestyle behavior	• Healthy vending • Indoor walking path • Gym • Healthy cafeteria	• Walking trails/maps	• Leadership support • Positive health culture	• Financial incentive for health and wellness activities
Most significant healthy lifestyle challenges/ barriers	• No access to community gym	• Rural roads with no shoulder make walking hazardous	• Food as reward	• No release time for people to attend NDPP classes • Lack of policy for food served at meetings

Site Seven

Site 7 was a medium-sized organization in a rural part of Maine. This organization conducts a health risk assessment with its employee population, including the collection of biometric data (BMI and fasting glucose). They have been offering the NDPP to employees and the community for approximately four years, although fewer than 10 employees have enrolled during that time and fewer than five have ever completed the program. The reason for these low participation rates is because the organization does not market the program specifically to employees. The key informant reported never being privy to any kind of employee data, including aggregated data that may highlight type 2 diabetes risk factors. Instead, this

organization markets the NDPP to community members and relies on referrals by local physician practices.

The key informant noted that the organization had been going through a lot of changes and felt that efforts to make improvements to the environment or to implement policies to facilitate healthy lifestyles were hampered by an overall perception of 'change fatigue' and low morale. There was sensitivity toward not wanting to add to perceptions of loss, which often comes with change. For example, a proposal was made to leadership to eliminate soda from the cafeteria and was denied because of concerns of harming employee morale.

Table 14: Site Seven Characteristics

	Physical environment (inside)	Physical environment (outside)	Social environment	Policy
Used to promote enrollment in the NDPP	• None	• None	• None	• None
Used to facilitate healthy lifestyle behavior	• Healthy cafeteria • Point of decision signs: stairwells • Gym	• Point of decision signs (paved walking route)		• Release time • Free NDPP • Financial incentives (for physical activity)
Most significant healthy lifestyle challenges/ barriers	• Sugar-sweetened beverages available • Unhealthy vending • Safety session required to use fitness room (perceived barrier)		• Department variation (leadership support) • Negative health culture • "Change fatigue" • Food as reward	• No incentives for spouses to improve lifestyle behavior

Site Eight

Site 8 was a large organization in an urban part of Maine. This organization conducts health risk assessments only with employees who sign up for a wellness program. They conduct biometric screening, including BMI and fasting glucose, once an employee joins the wellness program. They have been offering the NDPP to employees for approximately three years, and fewer than a dozen have ever completed the program. This organization has struggled with retaining employees after the weekly core classes end and the monthly classes begin. They recruit for the program using broad marketing techniques, such as organization-wide newsletters and messages on the intranet. The organization has made attempts to improve its health culture and has had some challenges. For example, some attempts have been made to highlight healthier food choices in their cafeteria using *icons* as small signs to signal healthy options but, according to the key informant, "It is not clear that people know what [they] mean". Wellness program staff also created some walking maps, but they were never updated nor distributed widely. They started a wellness committee, and membership fell off by more than two-thirds in the first several months.

Table 15: Site Eight Characteristics

	Physical Environment (Inside)	Physical Environment (Outside)	Social Environment	Policy
Used to promote enrollment in the NDPP	• None	• None	• None	• None
Used to facilitate healthy lifestyle behavior	• Gym			• Financial incentive for gym use
Most significant healthy lifestyle challenges/ barriers	• Few places to eat lunch besides desk	• Proximity to fast food • Out of date walking maps	• Challenged wellness committee • Department variation (leadership support)	• Need supervisor approval to attend NDPP class

Site Nine

Site 9 was a large organization in a rural part of Maine. This organization conducts health risk assessments with employees and collects biometric data, including BMI and fasting glucose. They have been offering the NDPP for approximately three years and have enrolled approximately 90 employees (60 of whom have completed the program). The organization uses health coaches and has a full time wellness coordinator who is tasked with delivering wellness programs. They reported that they do not have a way to send targeted NDPP recruitment messages to employees using biometric data filters due to privacy/confidentiality policies. Instead, they conduct highly visible events to engage employees in learning about the program. The NDPP recruitment messages tie health screening information to the program, that is, they

say to employees, “If your results were in the red, this might be a program to help you.” In addition, they use organization-wide email, brochures and intranet to promote the NDPP, though they felt that there was still insufficient communication about the program. They offer half paid time for any wellness class, including NDPP. So, an employee could attend an hour-long session and be paid 30 minutes is considered a lunch break and 30 minutes paid time. They believe that a lot of people sign up because of this policy and because of the positive culture they have created around health behavior.

Table 16: Site Nine Characteristics

	Physical environment (inside)	Physical environment (outside)	Social environment	Policy
Used to promote enrollment in the NDPP	• None	• None	• None	• Financial incentives • Release time
Used to facilitate healthy lifestyle behavior	• Gym • Healthy cafeteria (healthy food subsidized)	• Walking trails/map • Bike racks with signage promoting use	• Group classes • Positive health culture • Leadership support	• Financial incentives • Release time to participate in NDPP • Free NDPP
Most significant healthy lifestyle challenges/ barriers	• Unhealthy vending		• Department variation (leadership support)	• Food as reward

Site Ten

Site 10 was a medium-sized organization in an urban part of Maine. They conduct health risk assessments with employees and collect biometric data, including BMI and fasting glucose.

They have been offering the NDPP to employees and the community for approximately one year, though few employees have enrolled. Their recruitment to date has centered on the use of a one-time health fair where they conducted a screening in hopes to identify people with prediabetes. The key informant felt that the organization did a good job with NDPP recruitment in the community but that employees lacked awareness about both the program and their risk for developing type 2 diabetes.

Table 17: Site Ten Characteristics

	Physical environment (Inside)	Physical environment (outside)	Social environment	Policy
Used to promote enrollment in the NDPP	• None	• None	• None	• None
Used to facilitate healthy lifestyle behavior	• Healthy cafeteria • Healthy vending • Gym	• Walking trails/maps	• Positive health culture	• Financial incentive (for wellness in general) • Free NDPP
Most significant healthy lifestyle challenges/ barriers	• Availability of sugar-sweetened beverages			• Lack of NDPP specific financial incentives

Cross-Case Analysis

A cross-case analysis is a way of looking across cases (in this case workplaces) to examine themes, similarities and differences (Mathison, 2016). Tables 18-22 provide a descriptive summary of the environmental and policy practices that the studied organizations are using to facilitate health behaviors. From these data, we can see how many organizations are using specific environmental and policy practices. We can also examine the worksite characteristics that organizations are placing emphasis (i.e., physical environment, social environment, etc.). For example, it is clear from Table 18 that more organizations have focused on changes to the inside physical environment than the outside. It also appears that some practices, such as financial incentives, are used more than others.

Table 18: Health Behavior Facilitators Across Sites by Characteristic

	Work site number										
	1	2	3	4	5	6	7	8	9	10	Frequency
Physical environment (inside)											
Gym		X	X	X		X	X	X	X	X	8
Healthy cafeteria	X	X	X			X	X		X	X	7
Healthy vending	X			X		X				X	4
Indoor walking path			X			X					2
Point of decision signs	X	X					X				3
Sit/stand workstations	X										1
Physical environment (outside)											
Walking trails/maps	X			X	X	X			X	X	6
Point of decision signs	X						X				2
Bike racks	X								X		2
Social environment											
Encouragement to stand/move	X										1
Group classes	X			X	X				X		4
Healthy champions	X				X						2
Leadership support	X	X		X		X			X		5
Positive health culture	X	X				X			X	X	5
Policy											
Financial incentives for health and wellness activities	X					X	X	X	X	X	6
Free NDPP	X			X			X		X	X	5
Healthy vending	X										1
Material incentives			X								1
Release time							X		X		2

By examining the environmental and policy practices by frequency, it allows us to view the number of environmental and policy practices each organization has implemented as well as the number of organizations who have implemented the practice. For example, eight out of the 10 work sites have a gym or fitness facility that employees can use, and many are making improvements to their cafeterias. In contrast, only one organization has a policy to guide the kinds of food that can be placed in vending machines. It is worth noting that all work sites have implemented between two and 15 of these practices, and we learned from the systematic review

of literature in Chapter 2 that the combination of practices appears to be associated with changes in outcomes, as opposed to singular changes.

An examination of the environmental and policy practices by organization size (Table 19) reveals both expected and unexpected results. We might have assumed that smaller organizations have fewer resources (both human and financial), and therefore implementing these practices may not be feasible. However, the absence of low- or no-cost practices (i.e., leadership support and a positive health culture) is surprising. Conversely, we might expect that large organizations would have the resources (both human and financial) to implement multiple practices, which appears to be the case in two out of three large organizations. However, it is surprising that the organization with the lowest number of environmental and policy practices implemented happens to be a large organization (site 8). The next section discusses challenges and barriers, and it is clear that site 8 also struggles with a significant number of reported barriers, which may hint as to why this organization has so few health promoting practices in place. That said, additional studies would be needed to fully understand all the reasons and could be important for organizations hoping to improve the health status and outcomes among their employee populations.

Table 19: Health Behavior Facilitators Across Sites by Organization Size

Environmental and policy practices	Small sites (1-499 employees)		Medium sites (500-1,500 employees)					Large sites (>1,500 employees)		
	3	5	2	4	6	7	10	1	8	9
Physical environment (inside)										
Gym	X		X	X	X	X	X		X	X
Healthy cafeteria	X		X		X	X	X	X		X
Healthy vending				X	X		X	X		
Indoor walking path	X				X					
Point of decision signs			X			X		X		
Sit/stand workstations								X		
Physical environment (outside)										
Walking trails/maps		X		X	X		X	X		X
Point of decision signs						X		X		
Bike racks								X		X
Social environment										
Encouragement to stand/move								X		
Group classes		X		X				X		X
Healthy champions		X						X		
Leadership support			X	X	X			X		X
Positive health culture			X		X		X	X		X
Policy										
Financial incentives					X	X	X	X	X	X
Free NDPP				X		X	X	X		X
Healthy vending								X		
Material incentives	X									
Release time						X				X
TOTAL	4	3	5	6	8	7	7	15	2	10

We can examine the barriers reported by key informants in the same way that Table 19 looked at facilitators. Table 20 organizes challenges by characteristic (i.e., physical environment, social environment, etc.). Organizations struggle with different barriers, some that are within their control (e.g., department variation with leadership support and the presence of health champions) and some that are beyond their control (e.g., proximity to fast food).

Table 20: Health Behavior Challenges/Barriers Across Sites by Characteristic

	Work site number										
	1	2	3	4	5	6	7	8	9	10	Frequency
Physical environment (inside)											
Department variation (budget for sit/stand stations)	X										1
Sugar-sweetened beverages in cafeteria		X					X			X	3
Unhealthy vending		X					X		X		3
Jobs that require all day sitting			X								1
No gym					X	X					2
No place to eat lunch					X			X			2
No place to walk						X					1
Physical environment (outside)											
Proximity to fast food								X			1
Out of date walking maps								X			1
Social environment											
Department variation (health champions)	X										1
Food as reward	X			X	X	X			X		5
Department variation (leadership support)							X	X	X		3
Negative health culture							X				1
Challenged wellness committee								X			1
Policy											
No financial incentives		X				X				X	3
Lack of policy for food served at meetings				X		X					2
No release time						X					1
No incentives for spouses							X				1
Supervisor approval required to attend NDPP								X			1
TOTAL	3	3	1	2	3	6	5	6	3	2	

Looking at frequency, it is clear that five key informants reported that the organization's use of food as a reward serves as a barrier to employees who are trying to adopt or maintain healthy lifestyle behaviors. This practice occurred at nearly every site, but only five informants identified it as a challenge. Other barriers included having sugar-sweetened beverages in the

cafeteria, vending machines with unhealthy food, and a lack of financial incentives for employees to enroll and/or complete the NDPP.

Lastly, an examination of barriers according to the size of the organization reveals that small organizations reported few challenges, while most challenges recorded were reported by one medium-sized and one large organization (Table 21). Note that site 8 is a large organization with the fewest implemented environmental and policy practices of all the sites documented. The fact that they report the highest number of challenges/barriers (7) may help to explain some of the reasons why they have not implemented more environmental and policy practices.

Table 21: Health Behavior Challenges/Barriers Across Sites by Organization Size

Health behavior challenges/barriers	Small sites (1-499 employees)		Medium sites (500-1,500 employees)					Large sites (>1,500 employees)		
	3	5	2	4	6	7	10	1	8	9
Physical environment (inside)										
Department variation (budget for sit/stand stations)								X		
Sugar-sweetened beverages in cafeteria			X			X	X			
Unhealthy vending			X			X				X
Jobs that require all day sitting	X									
No gym		X			X					
No place to eat lunch		X							X	
No place to walk					X					
Physical environment (outside)										
Proximity to fast food									X	
Out of date walking maps									X	
Social environment										
Department variation (health champions)								X		
Food as reward		X		X	X			X		X
Department variation (leadership support)						X			X	X
Negative health culture						X			X	
Challenged wellness committee									X	
Policy										
No financial incentives			X		X		X			
Lack of policy for food served at meetings				X	X					
No release time					X					
No incentives for spouses						X				
Supervisor approval required to attend the NDPP									X	
TOTAL	1	3	3	2	6	5	2	3	7	3

In-depth qualitative analysis: Key findings. An in-depth analysis was conducted in order to go beyond the descriptive analyses that catalogued site activity in terms of the environmental and policy practices work sites have implemented. The following interconnected themes around organizational culture and issues emerged during the interviews and are presented in order of importance.

Organizations struggled to identify employees with prediabetes. According to the CDC, one in three adults in the U.S. over the age of 20 has prediabetes ("Centers for Disease Control and Prevention," 2014). Given the number of people affected, we would not necessarily assume that it would be difficult to find employees with prediabetes with the goal of enrolling them in the NDPP. However, the other fact from the CDC – that nine out of 10 people with prediabetes do not know it – may be part of the problem.

Work sites that participated in the study tended to use very broad-based, organization-wide communication channels when recruiting for the NDPP. They send emails, use newsletters, post flyers, message on intranet systems, perhaps host a health fair, and use other passive communication methods to promote the program. The majority of the sites are not using the biometric data that they have collected to target communication/messaging. In some cases, key informants reported not having access to these data and, in other cases, they are simply marketing the program along with other wellness initiatives that use similar methods. Several organizations were not promoting the NDPP to employees at all, even though they offer the program. Instead, organizers have chosen to focus their marketing and communications on the local community outside the employee population. Therefore, employees who do not know that they are at risk for developing type 2 diabetes are probably less likely to read emails or newsletters that are promoting the NDPP.

There were three NDPP leaders that mentioned that they did not believe that local primary care providers were diagnosing or coding prediabetes. As an employer, they were concerned about being the one to tell employees about their risk status and as such seemed reluctant to use biometric data, such as blood glucose levels, to market directly to people with prediabetes. One worksite was particularly proactive with a solution for this problem. They conducted "proactive outreach" through primary care practices, in which they work with the physician practice to identify people at risk of prediabetes and then conduct outreach from the physician's office to refer the employee or community member to the NDPP at the worksite (Key Informant C, 2016). Another site developed a referral mechanism within its electronic medical record system so that providers could easily check a box to generate a referral to the NDPP.

Very few organizations were talking about physical and social environments or policies they were using to recruit employees into the NDPP. Some informants pointed to financial incentives or release time that was made available to employees, but few discussed other aspects that are available or the fact that release time is available. Few discussed other aspects with the potential recruits, like free or discounted gym membership or healthy food in the cafeteria, because those things are available to all employees. This may be a missed opportunity to highlight aspects of the worksite that are available to assist someone who is trying to make lifestyle behavior changes. Several key informants talked about how the NDPP competes with other wellness offerings – often opportunities that are sometimes less time intensive to earn incentives. One informant said that she used to encourage employees to enroll in NDPP after they completed a shorter wellness program but she, "saw on the website that they're asking people not to do more than one program (Key Informant I, 2016)." Another said that they offer

another program "very, very similarly structured" to the NDPP, which targets obesity (Key Informant G, 2016). Whether or not that program is evidence-based and produces comparable results to the NDPP remains unclear.

Social support is critical at the beginning of NDPP and during the post-core.

According to social cognitive theory, the social environment plays a role in health behavior (Bandura, 1986). Study participants talked a lot about the need to provide ongoing support, mentoring, and coaching to employees who participate in the NDPP. In addition, many learned that it is necessary to be very explicit about the commitment (i.e., time and effort) that the program requires in order to be successful. Several NDPP health coaches learned this by observing attrition very early on in the program whereby from class session to session, attendance dropped. This pattern repeated itself when the course began again with a new cohort.

> "You know I got there and there were…10 people and then [in subsequent classes] there were only like 3 or 4 people showing up and I'm like, what the heck is going on? And so then my second [NDPP course], I didn't know any different; the same thing happened (Key Informant J, 2016)."

The lifestyle coaches learned that they needed to be very explicit with program participants about the commitment (i.e., time and effort) involved. Several sites instituted a social contract that employees literally had to sign as a way of stating their commitment. Using this method, the worksites reported improved retention rates following the implementation of the contract. One participant described how she discussed the contract as a two-way street where both the health coach and the employees were making a commitment together:

> "I have them sign it and like before you sign, this is your commitment to me saying that, you know, you're going to show up for me; I'm showing up for you and you need to show up for me (Key Informant J, 2016)."

The sites that instituted a contract seemed to generate immediate results. As one participant put it, "Something has to change. And then the third class I did, I did the contract and that's when I saw a marked change (Key Informant J, 2016)."

Of the ten key informants, nine of them reported struggling to retain employees in the NDPP when the weekly core classes transitioned to monthly classes. One key informant said, "The first class we taught, we did the 16 weeks straight and then we broke into the post-core; they didn't like being let go for a month on their own (Key Informant A, 2016)." Most worksites adopted one of two strategies. The first was an "open door" policy, in which employees could stop in to see the lifestyle coach or weigh in because that kept them accountable to the program. The second strategy included adding extra classes, such as every other week, and one site developed a Facebook page with class participants so that they could support one another virtually at any time.

> "We've been adding extra classes in here and there or a time where people can stop in and get weighed and stuff because what we're finding is they don't like to go that long in between classes; they like the accountability of coming in and getting on the scale and you know at least every other week. So, we do have some people that stop in on a regular basis (Key Informant A, 2016)."

Leadership plays an important role in organizational culture and the physical and social environments. Not surprisingly, this study demonstrated that leaders play an important role in shaping the health culture of an organization. This was reinforced by the key informants over and over. Many attributed their organizations' successes at implementing environmental and policy practices that supported healthy behavior to supportive leaders, sometimes right down to the bread in the cafeteria:

> "Our CEO is firmly committed, firmly committed to a healthy work environment. I can't think of anybody else in any other [site] I've worked where you'd get a call from the CEO making sure there was only whole grain bread served in the cafeteria (Key Informant I, 2016)."

Leadership in one organization included health in their set of core values, which set a clear expectation to employees at all levels. As one key informant noted, "So we actually have one of our core values is safe and healthy living so as a company, we encourage all employees to support that and live by that, the, one of the core values (Key Informant G, 2016)." This same organization puts those values into action:

> "So and I think this is really fantastic is that the support from leadership to allow folks; for example, on, in [a department] to step away… and take the time to attend whether it be this class or a fitness class or we do lunch and learns with various topics about nutrition and sleep and stress. I think that support from leaders says a lot about our culture. You know you're not going to get docked for doing that so I think that's really, really great (Key Informant G, 2016)."

In contrast, two key informants spoke about the lack of leadership support and involvement and its effect on their work. For example, one site experienced tremendous success

with employees when they began offering the NDPP to employees, and they wanted to communicate that with the rest of the organization as a way of increasing enrollment and participation. A high level leader within the organization agreed to help send out a communication but never followed through. The key informant did not feel that it was something she could do alone and was crestfallen.

While I expected to find a relationship between leadership and both the social environment and organizational culture, a surprising result came from a code co-occurrence analysis that revealed a relationship between leadership and the indoor physical environment (*Figure 8*). A code co-occurrence model displays data segments with overlapping codes so that the researcher can visualize see connections based on a minimum defined number of intersections. The numbers in the figure correspond to how many times the concepts were used together. I found that participants talked a lot about the role leaders played not only with the social environment and the organization culture but also the physical environment. A deeper analysis revealed several ways that leaders did this, including:

- Eliminating a fast food restaurant from within the workplace;
- Shaping policies around the use (or not) of vending machines and the kinds of food that were in them;
- Building gyms or fitness facilities for employee use (and allowing or disallowing employees' spouses to use them);
- Having a role in approving cafeteria redesigns to facilitate health behavior (including the choice of a food vendor).

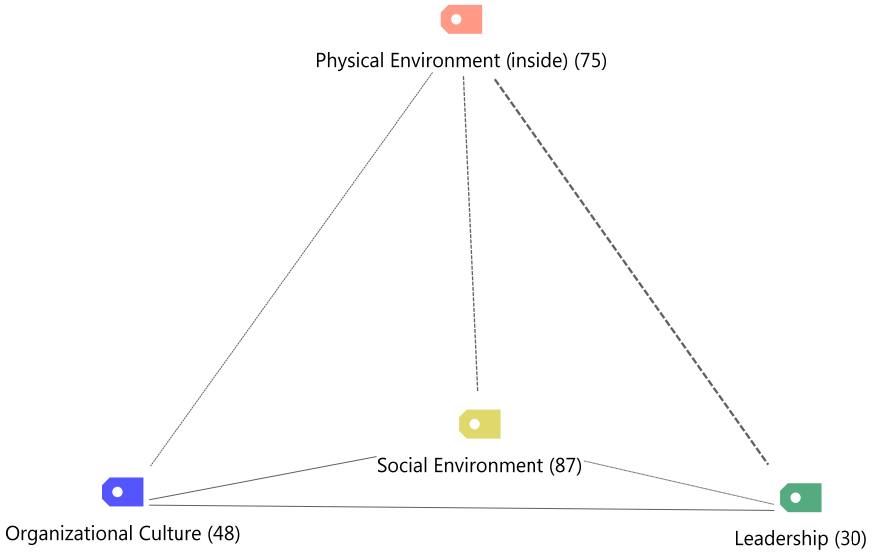


Figure 8. Code co-occurrence model.

Department/unit managers play a substantial role in health culture. A theme that came up at every site was the role that middle managers played in shaping the environment as it relates to employee participation in the NDPP and in health behaviors more broadly. None of the organizations included in the study have explicit guidelines, expectations, or policies for managers in terms of their role in health behavior. As a result, all of the organizations experienced significant variation from department to department. For example, one informant said, "It's all depending on the manager and what they present and so I think that they are probably 50/50 [meaning supportive of health behavior] (Key Informant J, 2016)." The key informant went on to say, "I know that some departments aren't allowed to go on walks unless like, because we get 15 minutes break." And finally, another informant described:

> "It all depends on the supervisor basically. If your supervisor will give you a little extra time because half hour lunch, you can't really walk very far and still get your lunch; you

> can barely get to the cafeteria and back before your half hour is up (Key Informant H, 2016)."

Key informants spoke of managers who were very supportive of health behavior, including holding direct conversations with the staff about not eating lunch at their desks and taking, "a little bit of time for yourself (Key Informant A, 2016)." They noted that if the manager personally values health and healthy behavior, they are more apt to be role models and support their team members.

Key informants also spoke about managers who made employees feel "afraid" to ask if they could take a walk or participate in an NDPP class that was scheduled during the work day. One site required employees to obtain their manager's permission to attend the NDPP classes. There were also examples of role models responsible for reinforcing unhealthy behavior, like smoking.

> "Again, I think it differs building to building and you know I hate to compare it to school but you know it's not cool to do some of those things sometimes. Like I know right off the bat; one building that comes to mind… still struggle with smoking and we are a smoke free campus; all of our buildings are smoke free. And it's still, they have the highest smoking rate and it's still kind of viewed as cool to go and do that you know on your breaks. So the negativity around trying to better yourself or for whatever reason (Key Informant G, 2016)."

Only one site indicated that they were thinking about strategies to engage middle managers in supporting health culture and behaviors.

Key informants feel a moral obligation toward health. Whether it is because *health* is built into the worksites' values or mission, or because the organization plays a direct role in healthcare delivery, many key informants expressed the idea that, as employees, they had a sense of moral obligation to take care of their health. One key informant spoke to the notion that employees who work for a healthcare organization have an interest in health for themselves:

> "Well certainly…every one of us…that works for the organization has some kind of vested interested in healthy, you know, lifestyles and,… health promotion and illness prevention, just given that we're all working for a healthcare organization (Key Informant F, 2016)."

Another put it more bluntly when she said, "We should be…practicing what we preach (Key Informant A, 2016)." Still another expressed the idea that taking care of themselves was also a way to promote health within the broader community:

> "If you go to a hospital and you see somebody that's not taking caring of themselves, you're going to think, why do I need to take care of my heart when that person right there is taking care of me and she's in the same position I am? So I really feel like that… if we can keep our staff looking healthy and feeling healthy and being healthy, we'll promote the health of our community as well (Key Informant B, 2016)."

It is not known whether this sentiment is felt more broadly by the employee population. Obviously key informants all play a significant role in promoting lifestyle behavior change, which lend bias to this finding.

Other general barriers to employee enrollment and participation in the NDPP. All of the sites struggled with identifying a good time of day to schedule NDPP classes. As mentioned previously, the workforce in all of the organizations studied worked in shifts covering 24 hours. Most worksites have tried various schedules including early morning, lunchtime, mid-day, evening and yet none work for everyone. On this subject, one informant stated:

> "[Employees] don't have the time to attend the program after work because by the time they do a 12 hour shift, they're exhausted and they just want to go home (Key Informant A, 2016)."

All of the sites reported having employees in the NDPP who worked different shifts, which made it even more challenging to find a time that would work for most employees. One informant mentioned the time of year as being important for enrollment. A different informant, who had tried a lot of different starting months, was convinced that beginning the program in September and January yielded the best results.

Financial constraints emerged as a barrier for some worksites. Most sites wanted financial incentives for employees to enroll and complete the NDPP. Those that offered financial incentives (between $50 and $250) wanted more of an incentive. A few sites struggled with having sufficient funds to run the program, and one site was unable to get the organization to pay for some small material incentives: "We don't have a budget (Key Informant H, 2016)." Lastly, while many of the organizations were self-insured, none reported engaging their insurance companies in discussions about partnering to reduce the incidence and prevalence of prediabetes or covering the cost of the NDPP.

Results for Phase Two: Quantitative Study

The primary aim of the quantitative study was to determine employee awareness and perceptions of workplace environmental and policy practices, as well as their effect on motivation to enroll and participate in the NDPP. Other specific aims included:

- How do employees who are at risk of developing type 2 diabetes perceive their work environments?
- Which environmental and policy practices do employees say would motivate them to enroll in the NDPP?
- What factors facilitate or hinder completion of the program?
- If employees have not participated in the program, what factors hinder enrollment?
- How do the differences in employee preference toward environmental and policy practices as motivators to enroll and participate in the NDPP break-down in terms of demographics, including:
    i. Gender
    ii. Age
    iii. Income
    iv. Occupation
    v. BMI

A survey and several reminders were sent to 1,258 employees and remained in the field from June 20 until August 1, 2016. A total of 103 employees completed the survey, representing a response rate of 8.2%. The data were captured in RedCap software and then exported to IBM SPSS Statistics software (version 24) for analysis. The database was cleaned and checked for

field validation errors. A total of eight cases were removed because all the fields were blank, leaving 95 cases for analysis.

Figure 9 provides a diagram of the survey branch logic and the number of employees who responded to each section.

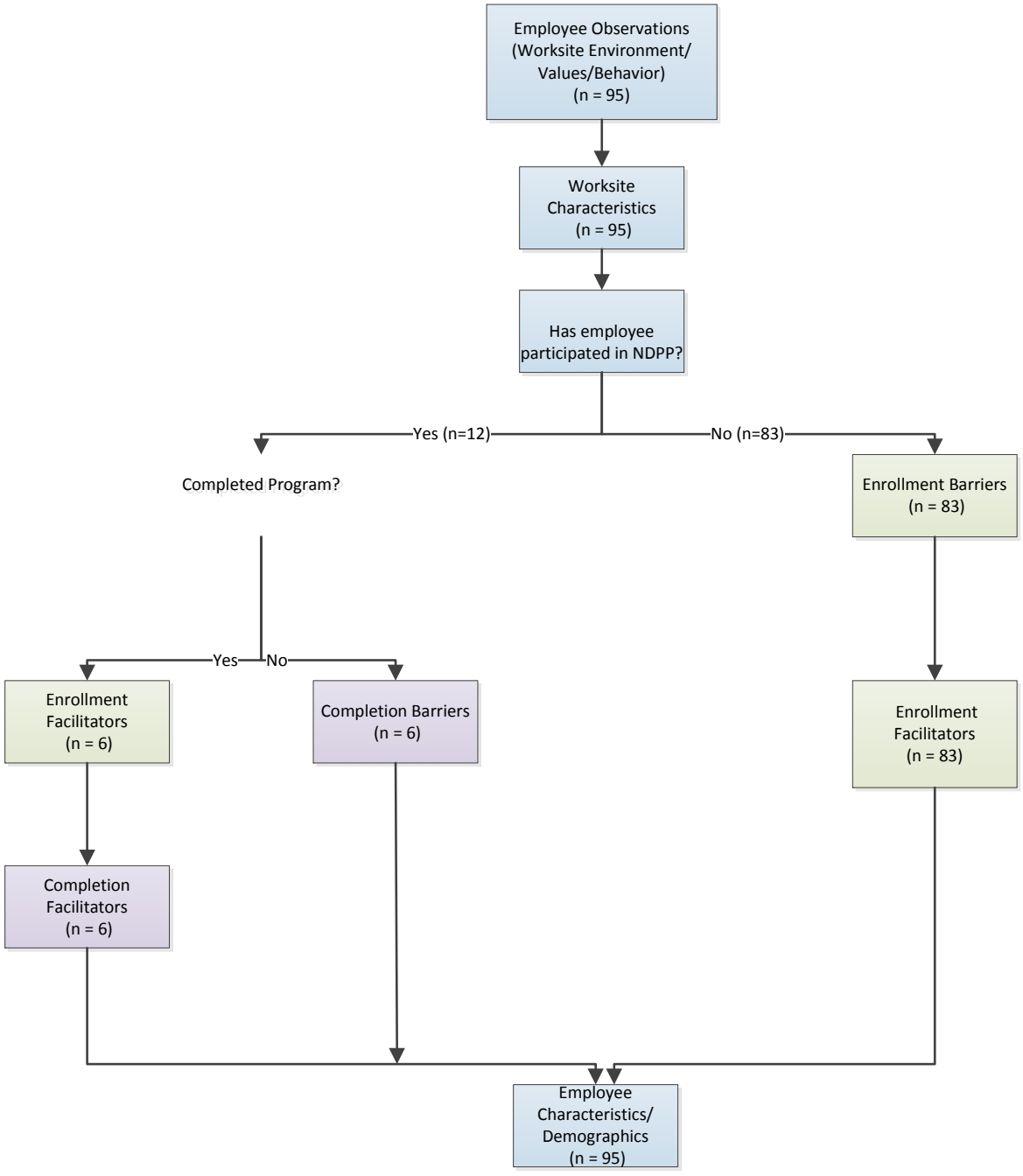


Figure 9. Employee survey branch logic and response totals.

Descriptive statistics. Summary data were collected from a third party vendor on the entire cohort who met the study inclusion criteria so that a comparison could be made between the entire group and the group who consented to take the survey. There were some important findings, which are summarized in Table 22. The majority of employees who met the study inclusion criteria and were sent the link for the survey were male (84.5%). However, the majority of survey respondents were female (77.1%). Nearly half (48.1%) of the employees who completed the survey were in the 50-59 age range, and the average age of respondents was similar for both groups (53 for the comparison group and 54 for survey participants). The employees who completed the survey had higher levels of education and had slightly lower use of cigarettes than the comparison group (1.2% compared to 3.9%, respectively). Fewer survey participants were overweight (30.6% vs. 42.9% in the comparison group), while a higher percentage was obese (56.9% compared to 41.4%). These differences between groups and the low response rate mean that the survey data cannot be generalized to the entire cohort.

Table 22: Comparison between all employees with prediabetes and survey respondents

Demographics	All employees with prediabetes (N = 1,258)		Survey respondents (valid percent) (n = 95)	
	N	%	n	%
Sex				
Male	1063	84.5%	19	22.9%
Female	195	15.5%	64	77.1%
Age				
Average age	52.9	N/A	54	N/A
29 or less	11	0.9%	1	1.0%
30-39	134	10.7%	7	9.1%
40-49	300	23.8%	11	14.3%
50-59	458	36.4%	37	48.1%
60 +	355	28.2%	21	27.3%
Ethnicity				
Hispanic/Latino	5	0.4%	1	1.2%
White/Caucasian	1204	95.7%	82	97.6%
Black or African American	6	0.5%	0	0%
Asian	15	1.2%	2	2.4%
Other/unknown	28	2.2%	0	0%
Education				
High school graduate or less	326	25.9%	9	10.7%
Some college or vocational school	358	28.5%	29	34.5%
College: four years or more	509	40.5%	46	54.8%
Unknown	65	5.2%	N/A	N/A
Addictive Behavior				
Cigarette use	49	3.9%	1	1.2%
BMI				
Normal (18.5-25)	N/A	N/A	9	12.5%
Overweight (BMI >25 and <30)	540	42.9%	22	30.6%
Obese (BMI >30)	521	41.4%	41	56.9%

Employees who completed the survey came from one of twelve different organizations across the health system. Respondents had a variety of occupations (Table 23), including clerical/administrative support (25%), nursing (23.8%), and non-clinical professionals (16.7%).

Table 23: Occupation of Survey Participants

	Occupation	Frequency	Percent	Valid percent	Cumulative percent
Valid	Clerical/administrative Support	21	22.1	25.0	25.0
	Information services	8	8.4	9.5	34.5
	Management/leadership	4	4.2	4.8	39.3
	Nursing	20	21.1	23.8	63.1
	Clinical support	1	1.1	1.2	64.3
	Physician	4	4.2	4.8	69.0
	Professional-clinical	10	10.5	11.9	81.0
	Professional-non-clinical	14	14.7	16.7	97.6
	Service/maintenance support	2	2.1	2.4	100.0
	Total	84	88.4	100.0	
Missing	System	11	11.6		
Total		95	100.0		

The majority of survey participants worked four (15.5%) or five days (70.2%) per week for 36-40 hours (53.6%) or more than 40 hours (36.9%). Most of them worked the day shift (83.1%), though some (9.6%) worked both day and night shifts and a minority (7.2%) reported working the night shift only. About a third of participants have worked for the organization for more than 15 years, and over 60% have more than eight years of tenure at their job (Table 24). Married employees made up the majority of survey participants (72%) followed by never married (12.2%), divorced (9.8%), separated (2.4%), members of unmarried couples (2.4%), and widowed (1.2%).

Table 24: Survey Participant Job Tenure

Job tenure (years)		Frequency	Percent	Valid percent	Cumulative percent
Valid	1-3 years	19	20.0	22.6	22.6
	4-7 years	12	12.6	14.3	36.9
	8-11 years	17	17.9	20.2	57.1
	12-15 years	10	10.5	11.9	69.0
	More than 15 years	26	27.4	31.0	100.0
	Total	84	88.4	100.0	
Missing	System	11	11.6		
Total		95	100.0		

Employee perceptions and observations of work environments. In order to understand how employees who are at risk for developing type 2 diabetes perceive their work environments, I asked several questions using two previously validated survey instruments (Hoehner et al., 2013; Tabak et al., 2015). These were modified slightly (with permission) to achieve literacy standards (i.e. 5th grade reading level). The results indicate that over half of survey respondents (63%) received encouragement to participate in fitness related events. About half say they were getting encouragement to join fitness/wellness centers. However, the majority indicated that they were not seeing information that encouraged them to walk, take the stairs, walk/bike to work, participate in organized physical activity, such as classes or sports programs (Table 25). When it comes to what employees observe about their co-workers, the majority (87%) report seeing their co-workers eating fruits and vegetables. Just over 60% reported seeing their co-workers being physically active during work breaks. Only half of survey participants reported seeing their co-

workers taking alternative transportation to work (i.e., walking or biking), which is not surprising given some of the comments from key informants about the challenges of alternate commuting, particularly in the more rural areas of Maine (Table 26).

In order to better understand employee perceptions about the social environment and broader health culture at their worksite, the survey asked employees to indicate their level of agreement with statements relating to their perceptions about whether or not the organization, their co-workers, and managers valued healthy workers and lifestyles (Table 27). The majority of the respondents agreed that their organizations valued healthy workers and healthy lifestyles (92% and 86% respectively). The questions about co-workers being good role models and managers valuing healthy lifestyles fell into a normal distribution with more people either agreeing or disagreeing with the statements. This survey shows that more than half of the respondents reported that their managers valued healthy workers and healthy lifestyles, but about one-third indicated that their managers did not place the same value on health. How this impacts subordinate behavior is outside the scope of this study. Graphs of these results can be found in Appendix I.

Table 25: Employee Observations At Work

I see information at my workplace that…	Often/ sometimes % (*n*)	Rarely/ never % (*n*)
Encourages me to participate in fitness related events such as road races, charity walks, triathlons, and bike rides.	63% (60)	37% (35)
Encourages me to be physically active at wellness/fitness centers.	51% (48)	49% (47)
Encourages me to participate in physical activities such as exercise classes, dance lessons, and sports programs.	48% (45)	52% (49)
Encourages me to walk to places around my worksite.	40% (38)	60% (57)
Encourages me to take the stairs.	36% (34)	64% (61)
Encourages me to walk or bike to work.	22% (20)	78% (72)

Table 26: Employee Observations About Co-Workers

I see co-workers…	Often/ sometimes % (*n*)	Rarely/ Never % (*n*)
Eating fruits and vegetables.	87% (80)	13% (12)
Being physically active during their work breaks.	61% (57)	39% (36)
Walking, biking, or taking public transportation to get to work.	50% (46)	50 (46)

Table 27: Employee Perceptions of Social Environment & Health Culture

	Strongly agree % (*n*)	Agree % (*n*)	Disagree % (*n*)	Strongly Disagree % (*n*)
My organization values healthy workers.	18% (17)	75% (70)	7% (6)	0% (0)
My organization values healthy lifestyles.	18% (16)	73% (66)	10% (9)	0% (0)
My manager values healthy workers.	14% (13)	51% (47)	31% (29)	4% (4)
My manager values healthy lifestyles.	14% (13)	50% (46)	32% (29)	4% (4)
My co-workers are good role models for making healthy food choices.	13% (12)	48% (45)	34% (32)	4% (4)
My co-workers are good role models for a physically active lifestyle.	13% (13)	50% (46)	33% (30)	4% (4)

Table 28 provides cross tabulations of employee observations with income, age, sex and BMI. Note that the income category of <$29,000 was omitted because it contained fewer than 5 cases. Bivariate associations were explored between workplace observations and income, age, sex, and BMI. Pearson's chi-square and Fisher's exact tests were run and, because the results were similar, only the Pearson's chi-square results were reported. The workplace observation variables were dichotomized with often/sometimes being reported in the table. There was a statistically significant difference between the observation, "I see information at my workplace that encourages me to participate in fitness related events, such as road races, charity walks, triathlons, and bike rides" and income, with people in the highest income bracket more likely to respond positively to this statement.

Table 28: Workplace Observations by Employees with Prediabetes

	Income % (*n*)			Age % (*n*)			Sex % (*n*)		BMI % (*n*)			Total
	$30-49K	**$50-69K**	**>$70K**	**28-44**	**45-54**	**55-65**	**Male**	**Female**	**Normal (BMI=18.5-25)**	**Overweight (BMI >25 and <30)**	**Obese (BMI >30)**	
Total	20% (15)	18% (14)	57% (44)	11% (8)	24% (18)	65% (49)	23% (19)	77% (64)	13% (9)	31% (22)	57% (41)	95
I see information at my worksite that… Encourages me to take the stairs.												
Often/sometimes	40% (6)	43% (6)	39% (17)	50% (4)	28% (5)	37% (18)	37% (7)	36% (23)	44% (4)	36% (8)	39% (16)	40% (29)
Total	15	14	44	8	18	49	19	64	9	22	41	73
Chi-sq p	0.118			0.083			0.897		0.931			
Encourages me to walk to places around my worksite.												
Often/sometimes	53% (8)	43% (6)	39% (17)	38% (3)	28% (5)	43% (21)	32% (6)	44% (28)	33% (3)	45% (10)	44% (18)	42% (31)
Total	15	14	44	8	18	49	19	64	9	22	41	73
Chi-sq p	0.143			0.483			0.422		0.800			
Encourages me to participate in fitness related events such as road races, charity walks, triathlons, and bike rides.												
Often/sometimes	67% (10)	29% (4)	70% (31)	75% (6)	61% (11)	59% (29)	53% (10)	64% (41)	44% (4)	55% (12)	73% (30)	62% (45)
Total	15	14	44	8	18	49	19	64	9	22	41	73
Chi-sq p	.023*			0.665			0.092		0.463			
Encourages me to be physically active at wellness/fitness centers.												
Often/sometimes	60% (9)	43% (6)	52% (23)	25% (2)	28% (5)	59% (29)	42% (8)	52% (33)	1% (1)	68% (15)	49% (20)	52% (38)
Total	15	14	44	8	18	49	19	64	9	22	41	73
Chi-sq p	0.443			0.312			0.188		0.097			
Encourages me to participate in physical activities such as exercise classes, dance lessons, and sports programs.												
Often/sometimes	53% (8)	29% (4)	51% (22)	38% (3)	28% (5)	50% (24)	47% (9)	44% (28)	22% (2)	59% (13)	45% (18)	47% (34)
Total	15	14	43	8	18	48	19	63	9	22	40	73
Chi-sq p	0.600			0.464			0.273		0.352			

Workplace characteristics. The survey asked respondents to provide information about particular characteristics at their workplaces that were shown in the systematic review of literature to be supportive of healthy lifestyles (especially when used in combination, see Chapter 2). The results of the survey revealed both facilitators and barriers to health behaviors (i.e., physical activity and healthy eating) at the workplace. A majority of respondents (87.9%) indicated that their organization provided financial incentives for improved health behavior. However, a majority also indicated some factors that were related to the physical environment (e.g. lack of showers, gym, jobs that require all day sitting, etc.) hindered healthy lifestyle behaviors. Table 29 provides a summary of the survey and is color-coded by responses that correspond to facilitators of health behavior (green) and items that were shown in the literature as contributing to hindering health behavior (red). The presence of a cafeteria that serves food is color-coded yellow because its effect on health behavior depends on what is being done within the cafeteria (e.g., smaller portions, behavioral economic strategies, presence/absence of sugar sweetened beverages, etc.). An issue that came up in the qualitative study about the challenge of finding times to offer lifestyle behavior programs that are convenient for a broad employee population also appears in the survey in which 51% of employees responded that their workplace did not provide programs to help them improve their health at times convenient for them.

Table 29: Workplace Characteristics

Characteristic	Yes % (*n*)	No % (*n*)	Not sure/ don't know % (*n*)
My workplace offers financial incentives to help me improve my health.	87.9% (80)	8.8% (8)	3.3% (3)
I have a job that requires sitting for a majority of my work day.	69.6% (64)	30.4% (28)	0% (0)
I am able to flex my work hours to meet my needs.	46.7% (42)	50% (45)	3.3% (3)
My workplace has showers.	42.9% (39)	52.7% (48)	4.4% (4)
My workplace offers programs to help me improve my health at times that are convenient for me.	38% (35)	51.1% (47)	10.9% (10)
I have access to alternative workstations, such as standing or walking stations.	38% (35)	59.8% (55)	2.2% (2)
My workplace has a gym or exercise facility.	14.3% (13)	83.5% (76)	2.2% (2)
My workplace has a cafeteria that serves food.	52.2% (48)	45.7% (42)	2.2% (2)

Enrollment/completion barriers and motivators (NDPP participants). Of the employees who completed the survey, 12 of them indicated prior participation in the NDPP and six reported that they had completed the program. For the six who did not complete the NDPP, the survey asked them what had prevented them from doing so. Responses were dichotomized into "quite a bit/somewhat" and "very little/not at all" (see Tables 35-37 in Appendix J). Note that the sample numbers were very small, and thus the results cannot be generalized to a larger population. There was agreement among the group that they found it hard to get enough physical activity on work days. Other barriers included the NDPP class schedule, not understanding the

time commitment at the beginning of the program and the difficulty in finding healthy food at the workplace.

The survey also asked employees what factors motivated them to enroll in the NDPP. Responses were dichotomized into “strongly agree/agree” and “strongly disagree/disagree”. The two biggest factors that motivated employees to enroll in the NDPP were that they were ready to change their lifestyle (83.3%) and that they could find healthy food at their workplace (83.3%). Readiness to change was included because it is an important component in behavior change theory (e.g., social cognitive theory, stages of change, health belief model). Other important factors included their doctor telling them that they were at risk for developing type 2 diabetes (66.7%), getting support from their family (66.7%), and being able to find the time to exercise on workdays (66.7%).

For the six individuals who completed the program, the survey asked what factors helped them to do so. The responses were dichotomized into “quite a bit/somewhat” and “very little/not at all”. All six respondents said that convenient class times, an understanding of the overall time commitment involved in the NDPP, the ability to find healthy food at their workplace, and a readiness for change helped them to complete the program.

Enrollment barriers (NDPP non-participants). The majority of employees who completed the survey had not enrolled or participated in the NDPP (*n* = 93; 87.1%). Most (65.8%) were not aware of the program, and 34% did not know if it was offered at their workplace or within their community. Over 40% did not believe that they were at risk for developing type 2 diabetes, but it is not known why. These at-risk employees do not lack readiness to change nor do social supports pose a barrier. Rather, they were concerned about the ability to find healthy food at their workplace (54.5%) and to get enough exercise on work days (67.1%) Interestingly, they reported that lack of support from their manager (68%), or family (76.6%) was not a barrier to their participation. More than four-fifths (80.8%) also suggested that they were willing to make lifestyle changes (Table 30: NDPP Enrollment Barriers (NDPP non-participants).

Table 30: NDPP Enrollment Barriers (NDPP non-participants)

	Strongly agree/ agree % (*n*)	Strongly disagree/ disagree % (*n*)	Don't know % (*n*)
It is hard to get enough physical activity on work days.	67.1% (51)	32.9% (25)	0% (0)
Employee not aware of NDPP.	65.8% (52)	22.7% (18)	11.4% (9)
It is hard to find healthy food at the workplace.	54.5% (42)	41.6% (32)	3.9% (3)
Employee does not feel they are at risk for developing type 2 diabetes.	41.3% (33)	53.8% (43)	5% (4)
There are not enough incentives (money/prizes) to enroll.	31.6% (24)	42.1% (32)	26.3% (20)
NDPP not offered at workplace.	24.7% (19)	26% (20)	49.4% (38)
Work schedule conflicts with NDPP classes.	24.7% (19)	23.4% (18)	51.9% (40)
Family responsibilities conflict with NDPP.	22.4% (17)	40.8% (31)	36.8% (28)
Employee cannot afford to attend.	20.5% (16)	44.9% (35)	34.6% (27)
NDPP not offered in community.	16.7% (13)	38.5% (30)	44.9% (35)
Employee not ready to make changes to lifestyle.	14.1% (11)	80.8% (63)	5.1% (4)
Employee needs more support from manager.	14.1% (11)	68% (51)	17.3% (13)
Employee needs more support from family.	9.1% (7)	76.6% (59)	14.3% (11)
Employee needs more support from coworkers.	7.8% (6)	76.3% (58)	15.8% (12)

Enrollment motivators (NDPP non-participants). The survey asked the group of employees who had never enrolled or participated in NDPP to indicate what factors they thought would motivate them to do so. Responses were dichotomized into "quite a bit/somewhat" and "very little/not at all". The majority of respondents indicated that they would be motivated to enroll in the NDPP if they were ready to make a change in their lifestyle (90.7%), if the classes were scheduled at a convenient time (89.3%), if their doctor told them that they were at risk for developing type 2 diabetes (86.8%), if they could find time to get physical activity on workdays (84%), and if there were incentives to complete NDPP (70.7%) (Table 31: Factors that Employees Say Would Motivate Them to Enroll in NDPP).

Table 31: Factors that Employees Say Would Motivate Them to Enroll in NDPP

	Quite a bit/somewhat % (*n*)	Very little/not at all % (*n*)
If I were ready to make changes in my lifestyle.	90.1% (68)	9.3% (7)
If the classes were scheduled at a convenient time.	89.3% (67)	10.7% (8)
If my doctor told me that I was at risk for developing type 2 diabetes.	86.8% (66)	13.2% (10)
If I could find time to get enough physical activity on days that I work.	84% (63)	16% (12)
If I could find healthy food at my workplace.	76% (57)	24% (18)
If there were incentives to complete the program (money or prizes).	70.7% (53)	29.3% (22)
If I received support from my family.	65.3% (49)	34.7% (26)
If I received support from my manager.	54.1% (40)	45.9% (34)
If I received support from my coworkers.	51.4% (38)	48.6% (36)

Table 32 provides cross tabulations on factors that employees say would motivate them to enroll in the NDPP by income, age, sex and BMI. Note that the income category of <$29,000 was omitted because it contained fewer than five cases. Bivariate associations were explored between workplace observations and income, age, sex, and BMI. Pearson's chi-square and Fisher's exact tests were run, and because the results were similar, only the Pearson's chi-square results were reported. The motivational factor variables were dichotomized with "quite a bit/somewhat" being reported in the table. There was a statistically significant correlation between the statement, "If [NDPP] classes were scheduled at a convenient time" and income,

with people in the highest income bracket more likely to respond positively. There was also a statistically significant difference between men and women with the statement, “If I received support from my family.” Women were more likely to say that having family support would motivate them to participate in the NDPP.

Table 32: Cross Tabulation of Factors that Employees Say Would Motivate Them to Enroll in NDPP

	Income % (*n*)			Age % (*n*)			Sex % (*n*)		BMI % (*n*)			
	$30-49K	**$50-69K**	**>$70K**	**28-44**	**45-54**	**55-65**	**Male**	**Female**	**Normal (BMI 18.5-25)**	**Overweight (BMI >25 and <30)**	**Obese (BMI >30)**	**Total % (*n*)**
Total	20.5% (15)	19.2% (14)	60.3% (73)	8.8% (6)	26.5 % (18)	64.7 % (44)	24.7 % (18)	75.3% (55)	13.6% (9)	33.3% (22)	53% (35)	81
If my doctor told me that I was at risk for developing type 2 diabetes.												
Quite a bit/somewhat motivated to enroll in NDPP	76.9% (10)	92.9% (13)	89.5% (34)	100% (6)	75% (12)	89.5 % (34)	88.9 % (16)	87.2% (41)	88.9% (8)	81.0% (17)	93.1% (27)	86.8% (66)
Total	13	14	38	6	16	38	18	47	9	21	29	76
Chi-sq p	0.076			0.335			0.820		0.225			
If the classes were scheduled at a convenient time.												
Quite a bit/somewhat motivated to enroll in NDPP	100% (12)	71.4% (10)	89.5% (34)	100% (6)	87.5 % (14)	86.5 % (32)	94.1 % (16)	85.1% (40)	100% (9)	80% (16)	89.7% (26)	89.3% (67)
Total	12	14	38	6	16	37	17	47	9	20	29	75
Chi-sq p	0.017*			0.598			0.313		0.674			
If I received support from my family.												
Quite a bit/somewhat motivated to enroll in NDPP	50% (6)	50% (7)	71.1% (27)	83.3 % (5)	68.8 % (11)	56.8 % (21)	88.2 % (15)	53.2% (25)	77.8% (7)	60.0% (12)	69.0% (20)	65.3% (49)
Total	12	14	38	6	16	37	17	47	9	20	29	75
Chi-sq p	0.700			0.246			0.039*		0.281			
If I received support from my coworkers.												
Quite a bit/somewhat motivated to enroll in NDPP	33.3% (4)	46.2% (6)	52.6% (20)	66.7 % (4)	50% (8)	41.7 % (15)	62.5 % (10)	52.6% (20)	55.6% (5)	47.4% (9)	51.7% (15)	51.4% (38)
Total	12	13	38	6	16	36	16	47	9	19	29	74
Chi-sq p	0.301			0.413			0.566		0.137			

Continued

Table 32: Cross Tabulation of Factors that Employees Say Would Motivate Them to Enroll in NDPP

	Income % (*n*)			Age % (*n*)			Sex % (*n*)		BMI % (*n*)			
	$30-49K	**$50-69K**	**>$70K**	**28-44**	**45-54**	**55-65**	**Male**	**Female**	**Normal (BMI 18.5-25)**	**Overweight (BMI >25 and <30)**	**Obese (BMI >30)**	**Total % (*n*)**
If I received support from my manager.												
Quite a bit/somewhat motivated to enroll in NDPP	41.7% (5)	42.9% (6)	54.1% (20)	50% (3)	56.3% (9)	48.6% (18)	64.7% (11)	45.7% (21)	55.6% (5)	55% (11)	50% (14)	54.1% (40)
Total	12	14	37	6	16	37	17	46	9	20	28	74
Chi-sq p	0.183			0.726					0.255			
If I could find healthy food at my workplace.												
Quite a bit/somewhat motivated to enroll in NDPP	58.3% (7)	78.6% (11)	78.9% (30)	66.7% (4)	81.3% (13)	75.7% (28)	82.4% (14)	72.3% (34)	77.8% (7)	80% (16)	79.3% (23)	76% (57)
Total	12	14	38	6	16	37	17	47	9	20	29	75
Chi-sq p	0.734			0.228			0.617		0.237			
If I could find time to get enough physical activity on days that I work.												
Quite a bit/somewhat motivated to enroll in NDPP	83.3% (10)	78.6% (11)	84.2% (32)	83.3% (5)	81.3% (13)	83.8% (31)	88.2% (15)	80.9% (38)	77.8% (7)	80% (16)	86.2% (25)	84% (63)
Total	12	14	38	6	16	37	17	47	9	20	29	75
Chi-sq p	0.451			0.055			0.565		0.423			
If there were incentives to complete the program (money or prizes).												
Quite a bit/somewhat motivated to enroll in NDPP	75% (9)	71.4% (10)	63.2% (24)	100% (6)	56.3% (9)	67.6% (25)	70.6% (12)	66.0% (31)	66.7% (6)	70.0% (14)	69.0% (20)	70.1% (53)
Total	12	14	38	6	16	37	17	47	9	20	29	75
Chi-sq p	0.145			0.459			0.416		0.553			
If I were ready to make changes in my lifestyle.												
Quite a bit/somewhat motivated to enroll in NDPP	91.7% (11)	85.7% (12)	89.5% (34)	83.3% (5)	87.5% (14)	91.9% (34)	100% (17)	85.1% (40)	100% (9)	85% (17)	86.2% (25)	90.1% (68)
Total	12	14	38	6	16	37	17	47	9	20	29	75
Chi-sq p	0.314			0.155			0.397		0.164			

I conducted an analysis on employees who had never participated in the NDPP to find out if environmental or policy practices were more motivating to people based on their occupation (Table 33). If differences were found, they could potentially inform marketing and communications strategies when employers recruit for the NDPP. There were differences, but none were found to be statistically significant based on Pearson's chi-square and Fisher's exact tests. For example, 88% of employees in information services, 90% of professional-clinical roles, and 100% of and professional-nonclinical roles said they would be motivated to enroll in the NDPP if their doctors told them that they were at risk for developing type 2 diabetes. Meanwhile, 94% of clerical/administrative support personnel and 88% of information services employees said they would be motivated if they could find time to get physical activity on work days. Employees from four occupations said they would be motivated to enroll in the NDPP if they were ready to make a change in their lifestyle, including clerical/administrative support (94%), information services (88%), nursing (87%), and professional-clinical (90%) positions. There were fewer than five employees in the categories of management/leadership, clinical support, physician, and service/maintenance, so they were excluded.

Table 33: Motivation to Enroll in NDPP by Occupation

	If my doctor told me that I was at risk for developing type 2 diabetes (social) % (*n*)	If I received support from my manager (social) % (*n*)	If I received support from my coworkers (social) % (*n*)	If I received support from my family (social) % (*n*)	If I could find time to get physical activity on days that I work (physical/ policy) % (*n*)	If I could find healthy food at my workplace (physical/ policy) % (*n*)	If there were incentives to complete the program (policy) % (*n*)	If I were ready to make changes to my lifestyle (other) % (*n*)
Clerical/administrative Support	83% (15)	56% (10)	50% (9)	67% (12)	94% (17)	89% (16)	78% (14)	94% (17)
Information services	88% (7)	50% (4)	50% (4)	50% (4)	88% (7)	63% (5)	75% (6)	88% (7)
Nursing	81% (13)	53% (8)	47% (7)	47% (7)	67% (10)	80% (12)	60% (9)	87% (13)
Professional- clinical	90% (9)	40% (4)	40% (4)	60% (6)	80% (8)	60% (6)	60% (6)	90% (9)
Professional-non-clinical	100% (13)	75% (9)	67% (8)	77% (10)	85% (11)	69% (9)	77% (10)	85% (11)
Management/leadership	100% (2)	50% (1)	50% (1)	100% (2)	100% (2)	100% (2)	100% (2)	100% (2)
Clinical support	100% (1)	100% (1)	100% (1)	100% (1)	100% (1)	100% (2)	100% (1)	100% (1)
Physician	100% (4)	50% (2)	50% (2)	100% (4)	100% (4)	100% (4)	50% (2)	100% (4)
Service/maintenance support	50% (1)	0% (0)	50% (1)	100% (2)	50% (1)	50% (1)	50% (1)	100% (2)

CHAPTER 5: DISCUSSION

The NDPP is an evidence-based program shown to reduce the risk of developing type 2 diabetes by 58% (Knowler et al., 2002). Worksite wellness programs have traditionally focused on changing behavior directly. Recently, more attention has been placed on how the social ecology of worksites can affect behavior indirectly. By understanding how specific environmental and policy practices affect the motivation of employees with prediabetes to participate in these kinds of programs, worksites will have the opportunity to implement practices that support employees who are attempting lifestyle behavior changes. Using knowledge of the barriers and facilitators that affect enrollment in NDPP and the implementation of environmental and policy practices, employers who do not currently offer NDPP, but want to, will be able to develop approaches that take advantage of the lessons learned by others.

This study determined what environmental and policy practices employers in Maine have been using to promote enrollment and support employees participating in the NDPP. It also explored barriers and facilitators related to the implementation of these practices. Understanding the level of employee awareness of these practices and whether they find them supportive of healthy behavior provides valuable information to employers who strive for efficiency and effectiveness in their health and wellness activities.

Worksites in Maine that offer the NDPP are using a variety of physical/social environmental and policy practices to promote healthy lifestyle behaviors. These include the promotion of gyms/fitness facilities, making changes to the cafeteria, such as smaller portions or

healthy options, and providing financial incentives to employees to adopt and practice healthy behaviors. Generally, small organizations in this study implemented fewer environmental and policy practices related to healthy behavior change than large organizations, but that was not always the case. The organization with the fewest environmental and policy practices was also a large organization that notably lacked leadership support, a positive health culture, and health champions. Low- or no-cost changes (e.g., leadership support) were absent from organizations of all sizes.

In phase one of the study, key informants reported a number of barriers within the environment and policy realm that hindered healthy behavior. These included the use of food as a reward, which was prevalent at nearly every site and reported as a barrier by five sites. Other barriers included having sugar sweetened beverages and unhealthy food in the cafeteria or vending machines and a lack of financial incentives to enroll and/or complete the NDPP. Interestingly, in phase two of the study (the employee survey), financial incentives did not rise to the top of the factors that employees said would motivate them to enroll in the NDPP. Rather, it was elements such as a readiness for change, having NDPP classes held at convenient times, having their doctors tell them that they were at risk for developing type 2 diabetes, and being able to find time to exercise on work days.

The worksites that participated in the study struggled to identify and communicate directly with employees who had prediabetes. At these worksites, NDPP recruitment tended to occur through broad communication channels, such as organization-wide emails and general employee newsletters, while some organizations did not promote the program to employees at all, instead focusing their NDPP marketing and communications efforts on the surrounding communities. Those who did promote the NDPP to employees often listed the program on a

menu of wellness options that employees could choose from, as opposed to using more direct recruitment attempts for people who were at risk of developing type 2 diabetes. As a result, the NDPP had to compete with other programs, which were potentially less time intensive and lower impact in terms of outcomes. Only one organization offered a higher financial incentive for NDPP completion compared to other wellness program offerings, for example meeting with a health coach or attending a stress reduction program. Other organizations that offered financial incentives gave the same incentive to employees whether they completed the NDPP or any other approved wellness activity. As a result, employees who were motivated by financial incentives could opt for programs that do not have the same effect on weight loss as the NDPP does.

Some of the worksites that participated in phase one of the study were connecting with primary care providers to ensure that doctors were diagnosing prediabetes and referring to lifestyle change programs, but most were not. Most of the worksites in the study that have a CDC-recognized NDPP curriculum are hospitals or healthcare systems, and these systems often own primary care practices. Given these existing relationships, such worksites could look to partner with primary care providers on efforts aimed at reducing prediabetes incidence and prevalence among the practice's patient population. There may also be potential in including prediabetes goals (e.g., prediabetes screening, BMI documentation, NDPP referral) in practice quality metrics or payer contracts as a strategy to increase awareness about prediabetes and increase referrals to NDPP.

It is understandable that employers may be reluctant to directly engage employees in a conversation about their risk for developing type 2 diabetes. They may be concerned about causing employee relations issues or raising questions about the privacy and security of employee personal health information. By partnering with the primary care community to

support diabetes prevention, these employers have the opportunity to share the goal of having a healthy workforce without having to be the one who tells an employee that they are at risk. Also, employers have an opportunity to examine their health risk assessment tools and reports. If they are able to customize the content, they could consider placing more emphasis on diabetes prevention or drawing attention to risk factors, much like the CDC's simple prediabetes screening test does. Employees who participate in a health risk assessment receive some kind of report that provides them with information on their risk. These reports should be examined to ensure that opportunities to direct people who may be at risk for developing type 2 diabetes are connected to additional education and information about risk reduction programs. Lastly, employers could think about direct messaging (through their third party vendor to ensure privacy and security) that encourages employees to assess their risks and directs them to appropriate interventions, like the NDPP.

None of the worksites that participated in phase one of the study, including those that were self-insured, had created partnerships with insurance carriers around value-based designs for prediabetes, and only some key informants reported that their organizations were contemplating it. Value-based insurance designs aim to remove financial barriers to evidence-based and high-value treatments. Self-insured organizations have the opportunity and flexibility to implement strategies such as including the NDPP as a covered health benefit and removing other barriers (e.g., out of pocket costs for prediabetes screening or rescreening) to effective prevention of type 2 diabetes. Even organizations that are commercially insured may find insurance carriers willing to provide coverage (many of them do now), especially since the Department of Health and Human Services announced that Medicare will cover the NDPP beginning in 2018 (Centers for Medicare & Medicaid Services, 2016). It is possible for

employers who are also providers to offset some of their costs for delivering NDPP through insurance reimbursements.

Very few organizations are making the connection for employees about how changes the site has made to workplace policies and the physical/social environment can support employees who are trying to make lifestyle behavior changes. This may seem inconsequential, but given the challenges related to behavior change and how self-efficacy and change readiness are key ingredients to success, it would behoove organizations to be more explicit about these efforts. If I am an employee who has been told by my physician (or my wellness program) that I am at risk for developing type 2 diabetes, and I am ready to make a change, but I am not confident that I can find healthy food at work or time to exercise, it may be helpful for me to know that my employer has taken very specific steps to support me in my efforts.

Key informants noted the importance of social support for employees in the NDPP, particularly at the beginning of the program and at the time when classes transitioned from weekly to monthly or bimonthly. Many sites have found ways to offer support on a walk-in basis or through virtual channels, such as Facebook. Lastly, key informants noted the importance that both leadership and middle managers played in the overall organizational culture and the physical and social environments.

Even though there was not much overlap between the worksites that participated in the key informant interviews and the organizations whose employees were surveyed, employees have noticed workplace environmental and policy changes related to health behaviors. Over half of employees who took the worksite survey indicated that they were getting encouragement from their employer to participate in fitness-related events, and about half receive encouragement to join fitness/wellness centers. That said, the majority have not seen information at their workplace

that encourages them to walk, take the stairs, walk/bike to work, or participate in organized physical activities. Most employees observe their co-workers eating fruits and vegetables, and most also reported seeing their co-workers being physically active during work breaks. There was a statistically significant correlation between the observation, "I see information at my worksite that encourages me to participate in fitness related events such as road races, charity walks, triathlons, and bike rides" and income with more people in the highest income bracket more likely to respond positively.

The survey asked about key characteristics in the workplace that were shown in the literature review to facilitate or hinder health behaviors. Employees reported that their organizations offered financial incentives that helped them improve their health behavior. They also reported factors that may hinder health behavior, such as jobs that require all day sitting or those without access to a gym or shower. The key is for worksites to increase the number of environmental and policy practices that facilitate healthy behavior and to reduce the number of practices that hinder healthy behavior to the extent possible.

Very few employees who completed the survey had participated or completed the NDPP. Of those who had participated, the factors that motivated them to enroll included a readiness to make a lifestyle change and their ability to find healthy food at their workplace. Other important factors included having their doctors tell them that they were at risk for developing type 2 diabetes, receiving support from their families, and being able to find time to exercise on work days.

For those employees who have not participated in the NDPP, many were not aware of the program or its location or class times. In addition to the lack of awareness, employees said that the top barriers that prevented them from enrolling in the NDPP included finding time to

exercise on work days and having a hard time finding healthy food at their workplace. Factors that would motivate this group to enroll included a readiness to change, having the NDPP classes at convenient times, if their doctor told them that they were at risk for developing type 2 diabetes, if they could find healthy food at work, if there were incentives to participate and, particularly for women, if they received support from their families.

A major limitation of this study is that the employee survey reached a relatively small group of people. The findings need to be interpreted cautiously, and more research is needed to better understand employee perceptions of their work environments, particularly among males with prediabetes. Too few employees had enrolled or completed the NDPP to provide meaningful conclusions about what motivated them. More research should be targeted toward NDPP enrollees and completers. Future research should also test for associations between environment and policy practices and actual participation in the NDPP. These data were not available to me, but would provide better evidence of connections between environmental/policy practices and their effects on NDPP enrollment and participation.

CHAPTER 6: PLAN FOR CHANGE

The plan for change is divided into three sections. The first provides recommendations to employers based on findings from the literature review and the original research. The second section lays out a process for implementing the changes based on diffusion of innovation theory. This is the process that I intend to use at my home organization. The last section outlines what I will do to disseminate the findings of this research beyond my own organization and contribute to improvements in the health of people with prediabetes. Limitations of the plan are included in each section.

Recommendations Based on Literature and Research Findings

Recommendation 1: Employers should adopt a social ecological approach to support health behavior. The literature review in Chapter 2 helped us to understand how workplace environments and policy support or hinder employee behavior related to diabetes prevention (i.e., physical activity, healthy eating, and weight status). Overall, the evidence supports an association between worksite physical, social, and policy practices with lifestyle behaviors. However, when these strategies were examined on their own, they often had a limited effect or no effect on clinical outcomes such as BMI. The most promising method takes a social ecological approach by combining practices in the environmental and policy realms. That said, the literature had limitations, including a lack of studies assessing the long-term sustainability of behavior change or clinical outcomes**.**

Employers should adopt a social ecological approach that combines evidence-based lifestyle change programs with physical and social environmental and policy practices that

support health behavior. They should also seek to minimize or avoid policies or practices that have been shown in the literature to hinder healthy lifestyles. Employers should aim for a comprehensive approach, touching on the physical environment, social environment, and policy in addition to other health and wellness opportunities aimed at promoting lifestyle change. Organizations may not be able to overcome all of the barriers (particularly those in the physical environment or policies that are too costly to implement), but they should be aware of how they can capitalize on assets that they already have and minimize existing barriers. For instance, it may not be feasible for an organization to build a gym for employees, but they could encourage physical activity by offering discounts to local gyms, using signage to promote stair-use, distributing maps to local walking trails or assets on the organization's campus, promoting walking meetings, encouraging employees to park far away, etc. There are many low and no-cost practices that can support employees in their efforts to make healthy lifestyle choices. A list of items found in the literature to support or hinder health behavior can be found in Tables 3 and 4.

Recommendation 2: Target communications and programming to employees with prediabetes. Many organizations in this study struggled to identify and communicate directly with employees who had an elevated risk for developing type 2 diabetes. Given that many organizations collect both biometric screening and health risk assessment data, they should be using this information to proactively reach out to this population. Goals of these communications should include: (a) increasing employee awareness of their risk status; (b) referring them to the NDPP; (c) encouraging employees to talk with their primary care provider about prediabetes; (d) explicitly highlighting ways that the worksite environment and policies can support them in adopting and sustaining lifestyle behavior changes; and (e) offering support.

Employers may want to consider offering wellness opportunities to employees based on their risk status. Most of the organizations in this study offered a menu of health and wellness program options that wound up competing with each other. In many organizations, an employee with prediabetes can earn a financial incentive by meeting with a health coach a couple of times a year, or they can get the same incentive by completing an intensive year-long lifestyle change program. The incentive costs the organization the same amount for both wellness program options, but the outcomes will likely differ dramatically. By using employee health data to stratify employees into risk categories, organizations can tailor communications to employees and promote specific opportunities to them based on their risk profile. This would result in a more efficient and effective use of wellness resources and would provide a better match between the employee's need (based on their risk) and the program "dose" or length and intensity of the health behavior intervention.

Employers should partner with primary care providers in their area to ensure that patients (who may also be employees) are being screened for prediabetes and referred to NDPP. In Maine, many of the worksites that are providing NDPP to employees and the community are healthcare organizations that have existing relationships with primary care (e.g., ownership or referral relationships). Both would be served well to collaborate on approaches to engage people with prediabetes, especially since the employees surveyed said that they would be more likely to enroll in NDPP if their doctors told them that they were at risk for developing type 2 diabetes.

Both the employer and the provider need to comply with privacy and confidentiality policies and procedures therefore, the partnership should not include an exchange of personal health information. Rather, it should focus on the identification of shared goals for diabetes prevention and on assuring that systems are put into place for the providers to refer people with

prediabetes to diabetes prevention programs. One workplace in the qualitative study (a healthcare employer) worked with primary care practices to embed a referral to NDPP into the electronic health record. They also created brochures with NDPP class schedules and locations that could be distributed by the practice. In this example, the employer found a way to inform and educate employees through the primary care provider and not take on the role of informing people directly of their risk status, which may feel uncomfortable or invasive to some employees.

Recommendation 3: Provide clear communication and ample social support to employees who enroll in the NDPP. We know from social cognitive theory that the social environment plays a role in health behavior. During the interview phase of the study, key informants shared lessons that they learned about the need to provide ongoing support, mentoring, and coaching to employees who participated in the NDPP. This support begins with being clear about the time commitment required to be successful in the program. One site used a written "contract" to solicit employee commitment to actively participate in the NDPP. While the numbers were small, all of the surveyed employees who completed the NDPP said that their understanding of the time commitment at the beginning of the program was a factor in their success. More research is needed to assess whether sites that are explicit about the program's time commitment using contracts or other tools observe less attrition than those who do not.

Out of the 10 key informants, nine of them reported that they struggled with retaining employees in the NDPP when the weekly core classes transitioned to a monthly schedule. The combination of reduced social support and personal accountability led many to drop out. Organizations that offer the NDPP to employees should anticipate this and develop strategies to mitigate attrition. Many sites in the study implemented creative strategies, including partnering with employee health so that employees could drop in to the employee health office for a weigh

in, offering open hours with a lifestyle coach, creating a social media page/site to provide ongoing support to employees in the NDPP, and offering additional structured classes more frequently than once per month. Future studies should evaluate the impact of these strategies on overall outcomes, such as blood glucose levels and BMI.

Recommendation 4: Leaders should take an active role in creating a positive health culture. The role of leaders in shaping and reinforcing the health culture of an organization was emphasized in the key informant interviews, and the survey also demonstrated that employees take notice of their leader's words and actions. Many of the worksites attributed their success in implementing environmental and policy practices to supportive leaders. This research demonstrated many ways that leaders get involved in health culture, from the CEO who requested that only whole grain bread be available in the cafeteria to the organization that wrote health into its core values. It is apparent that leaders also make decisions and create policies that have an impact on health behavior. For example, the qualitative study also elucidated the significant impact of leaders' decisions on the physical environment (e.g., the CEO who decided to eliminate the fast food restaurant that was inside the hospital, or the one who championed the creation of a fitness facility for employees and then created a policy to allow their spouses to use it as well).

The employees who responded to the survey came from organizations that appeared to be doing a good job conveying how they value healthy workers and lifestyles. The majority of respondents reported positively to the statements "my organization values healthy workers" and "my organization values healthy lifestyles." However, there appears to be room for improvement as fewer than 20% strongly agreed with these statements. Leaders need to consider the impact of the messages they are sending to employees through words and actions. For example, a leader

may say that he or she values healthy workers, but then subsequently host an ice cream social or a cheesecake party for employee appreciation week. Leaders need to be aware of conflicting messages and should examine alternatives that align their actions with their stated values. In addition, leaders play a key role in supporting an overall social ecological approach that supports employee health behavior. According to the diffusion of innovations theory, which is discussed in greater detail in Chapter 6, decisions made by individuals with authority generally achieve the fastest rates of adoption (Rogers, 2003). An example of this can be seen from the qualitative study when the CEO who wanted whole grain bread to be served in the cafeteria resulted in that change being implemented immediately.

Recommendation 5: Engage middle managers in support of a positive (and consistent) health culture. The qualitative study found that middle managers play a role in shaping the social environment as it relates to employee participation in the NDPP and in other health behaviors more broadly. None of the organizations in the study had explicit guidelines, expectations, or policies for managers in terms of their role in health behavior, and only one reported thinking about the role of middle managers in this regard. As a result, all of the organizations reported significant variation from department to department, meaning that employees had very different experiences when it came to finding support (or barriers) to lifestyle behaviors. The interviews provided examples of managers who proactively had conversations with their teams about not eating lunch at their desks or making sure they took time out for relaxation or a walk. There were also examples of organizations that required employees to receive permission from their managers in order to participate in the NDPP, as well as managers who created other barriers to healthy lifestyles. Employers need to be aware of the tone that managers set, which can affect the social environment and health culture of an

organization. Not all managers will be health champions, but there may be ways for organizations to use policies or other mechanisms to create a more consistent experience for employees. Examples of this included the organization that built health into its core values and other worksites that provided release time for employees to participate in the NDPP or did not require a manager's approval for participation in the program.

Over a third of employees who were surveyed disagreed with the statements "my manager values healthy workers" and "my manager values healthy lifestyles." While the lack of support from a manager did not appear to be a barrier to those employees who completed the NDPP, support from managers was a motivator for some to enroll in the program. For those employees who have not participated in the NDPP, over half of them said that support from their manager would motivate them to do so. The point is that social support is an important component in behavior change, and organizations need to have deliberate strategies in place to promote consistency and to avoid creating unintentional barriers for employees who are ready to make lifestyle behavior changes. Future studies should be conducted on the role of middle managers in facilitating or hindering health behavior at the worksite.

Recommendation 6: Offer multiple options for NDPP participation. Finding NDPP class times that appealed to a variety of workers emerged as a general barrier to NDPP participation in both studies. All of the interviewed/surveyed organizations had a workforce that operated for 24 hours a day through multiple shifts. It was apparent that no single day or time would work for every employee who was ready to participate in a lifestyle change program. Therefore, employers should offer as much variety as they can and, if feasible, they should consider different methods for NDPP delivery. There are many programs that now offer online-only programs or programs that combine in-person and online options (Centers for Disease

Control and Prevention, 2016a). By offering a variety of choices, employers can reduce barriers to NDPP enrollment and participation.

Recommendation 7: Offer NDPP as a covered benefit. The worksites in the study mostly paid for NDPP on their own or with some grant support. Several worksites noted that a significant barrier for them was the lack of financial support for running the program. While most worksites offer NDPP for no charge to employees, some charge fees offset their costs, creating financial barriers for participants. Without sustainable support, these programs could be at risk for cuts if the organization is in a tenuous financial situation.

One strategy to offset some of these costs is to secure reimbursement from insurance companies. None of the organizations that participated in the qualitative study currently offer the NDPP as a covered health insurance benefit. However, many insurance companies now cover the NDPP. Employers should work with their insurance companies to pursue NDPP coverage as a way of increasing both access and affordability to the program. A study by the UnitedHealth Group and YMCA in 2013 found that participants who received coverage through their health insurance had slightly better outcomes than those who paid for it themselves, or if it was paid through a grant (Vojta, Koehler, Longjohn, Lever, & Caputo, 2013).

Recommendation 8: Consider financial incentives as one of many strategies to encourage NDPP recruitment and retention. Financial incentives are not a panacea for accelerating or achieving lifestyle behavior change. A systematic review on the use of financial incentives found them to be "promising," but other studies have not found them to be as successful (Abraham et al., 2011). In addition, few studies have looked at whether employees who began a program because of a financial incentive sustained the behavior change or outcome over time (e.g., weight loss). Key informants in the qualitative study either offered or wanted to

offer financial incentives for employees to enroll and complete the NDPP. The worksites that did offer financial incentives for the program (between $50 and $250) wanted more incentives. However, nearly a third of employees who participated in the survey said that an incentive would not motivate them to enroll. Other factors were deemed more important, including readiness to make lifestyle behavior changes, conveniently scheduled classes (discussed in Recommendation 6), having their doctors tell them that they were at risk for developing type 2 diabetes (discussed in Recommendation 2), and finding time to exercise on work days. Keep in mind that survey participants tended to be in higher income brackets. More research is needed on lower income cohorts to determine the influence of financial incentives on employee motivation to enroll in the NDPP.

Employers should consider financial incentives as one tool in the toolbox to promote healthy behavior among employees. They should also consider strategies based on behavior change theory to help employees move along the change readiness continuum. Wellness programs can also communicate messages and provide social support for helping employees to build exercise into their workdays. Examples from the qualitative study include stairwell prompts, step competitions, and signs encouraging people to park far away. Employers can also encourage their employees who have prediabetes to talk about it with their primary care provider as a way of reinforcing the messages and the importance of lifestyle behavior change.

Limitations

The recommendations presented are subject to limitations. Some of them are based on findings in the literature, and specific research study limitations are listed in the literature review (Chapter 2) and in the summary of studies, which can be found in Appendix A. Other

recommendations are based on findings from the qualitative and quantitative studies described in this dissertation. These limitations are outlined in Chapter 3.

A Process for Implementing Recommendations Based on Change Theory

This section will outline a process that I will use to implement the recommendations that emerged from the research within my organization. I will also share this plan with other organizations to spread the change more widely. The plan utilizes the diffusion of innovations theory as a framework. *Diffusion* is "the process in which an innovation is communicated through certain channels over time among the members of a social system" (Rogers, 2003). In his book, Rogers talks about how diffusion is a type of communication that is used to spread information about new ideas. The spread of these ideas follows an "S" shaped curve whereby adoption takes place first by innovators, then by early adopters, until eventually a majority has adopted the change (Figure 10).

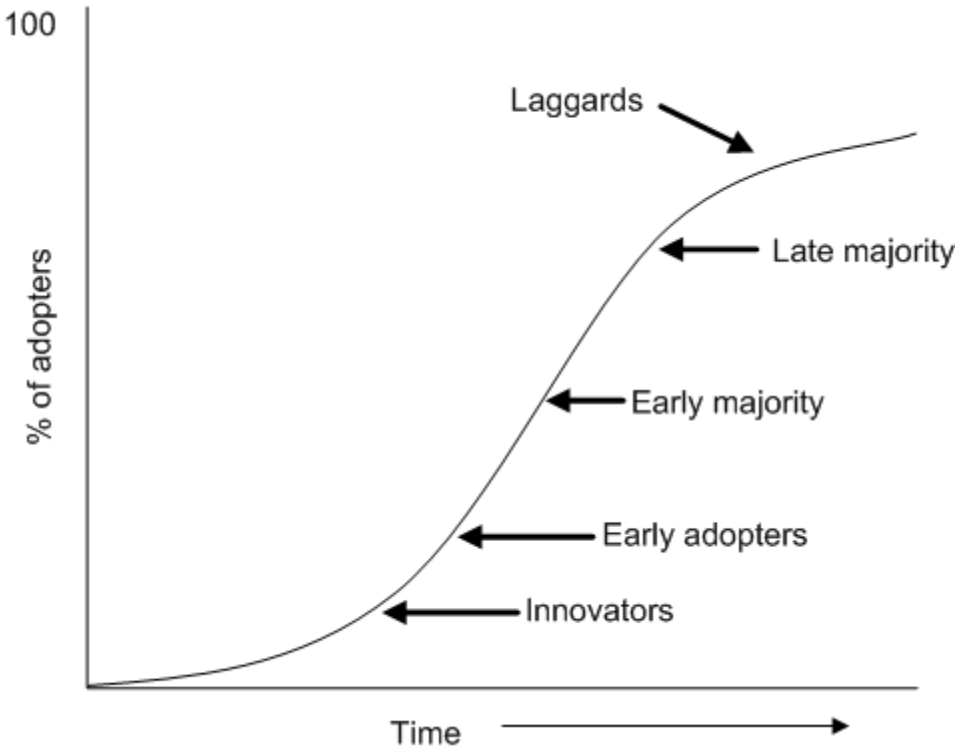


Figure 10. The diffusion process of communication. Adapted from "The Prevention Paradox: Principles and Practice of Health Promotion, Health Promotion Models and Theories," by Health Knowledge, 2016 (http://www.healthknowledge.org.uk/public-health-textbook/disease-causation-diagnostic/2h-principles-health-promotion/prevention-paradox). Copyright 2011 by Public Health Action Support Team.

Briefly, diffusion research can be traced back to Europe in the early 1900s and is approximately contemporary with the establishment of social science as a field. The purpose of diffusion research was to discover why some innovations are adopted and others are not. For example, scurvy killed more sailors in the British Navy than warfare. Even after physicians discovered how to cure it with vitamin C from citrus fruits, it still took hundreds of years before there was widespread adoption of life-saving scurvy prevention policies. Diffusion research examines why some innovations, like scurvy-prevention, take so long to become mainstream, while others catch on much more rapidly. Research on the diffusion of innovations continued in the 1940s and 1950s, and Roger's contribution stemmed from his work with farmers in Iowa

concerning their adoption of a weed spray. Today, diffusion of innovations theory is used by a wide variety of industries and disciplines (Rogers, 2003).

The good news for worksites in Maine is that it has not taken hundreds of years to implement environmental and policy practices to support health behavior. All of the organizations that participated in the qualitative study had done some work in this area. However, there are many opportunities for these organizations and others to speed the adoption of more practices and eliminate those that hinder health behavior.

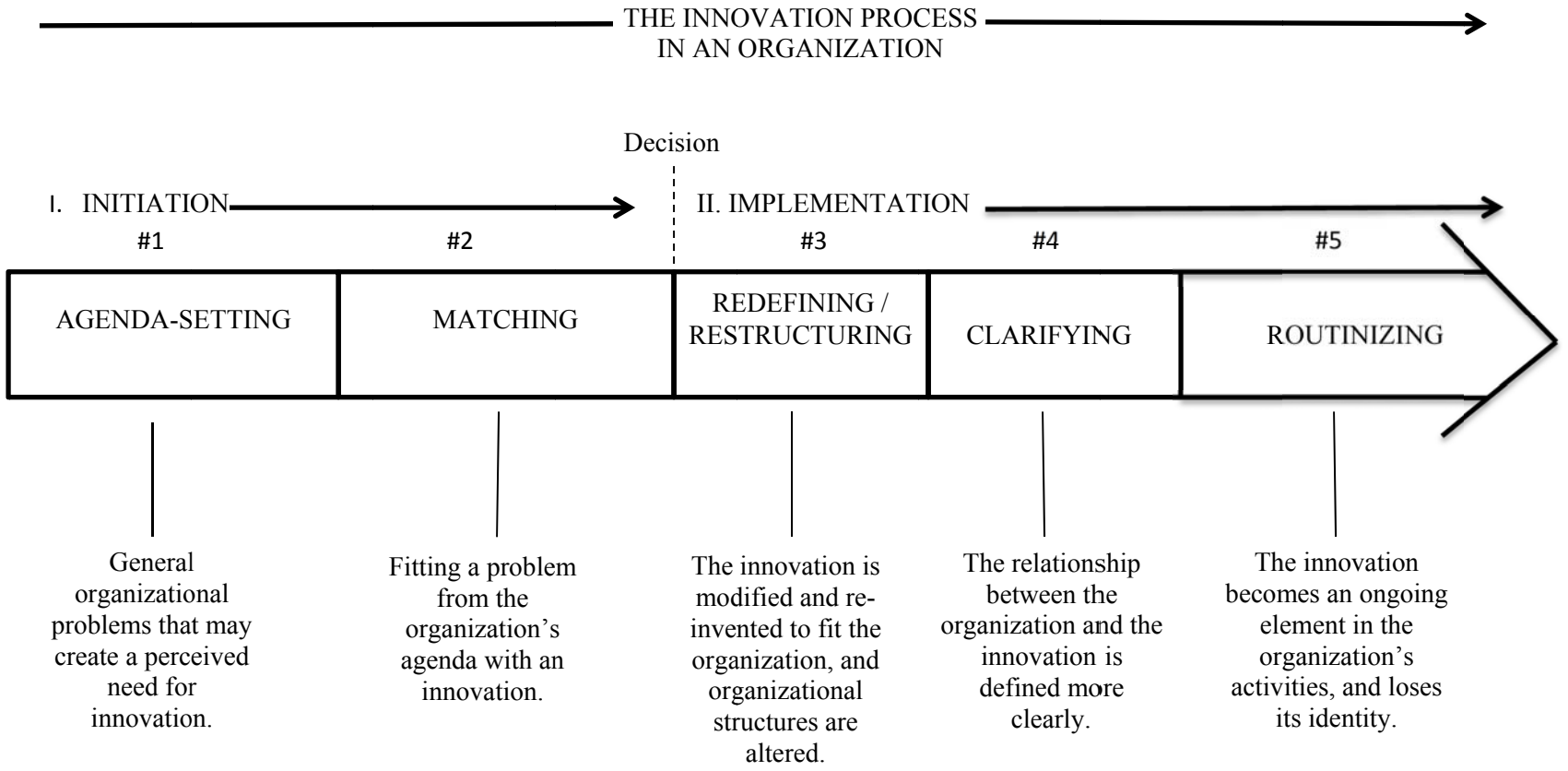
According to Rogers (2003), there are five states in the innovation process for organizations (Figure 11). They include:

1. Agenda-setting: an organizational problem is identified and creates the need for innovation. These problems must be prioritized and solutions must be explored. Performance gaps within organizations can trigger the innovation process.
2. Matching: "The state in the innovation process at which a problem from the organization's agenda is fit with an innovation, and this match is planned and designed (Rogers, 2003, p. 423)." An effective match will determine whether the innovation is sustained over time.
3. Redefining/restructuring: the process of re-inventing the innovation to meet the needs of the local organization. Here, the innovation may be adapted to meet the structure and culture of the organization. Internally generated innovations are more likely to be implemented successfully because they are developed with organizational fit in mind.
4. Clarifying: the process by which the innovation becomes more widespread and clearer to the organization's members. Care must be taken not to implement the innovation too rapidly at the clarifying stage or else risk failure of adoption. If people

do not understand an innovation, they may make incorrect assumptions or frame it in a negative way. Innovation champions play a critical role in this stage.

5. Routinizing: the point at which the innovation becomes incorporated into the regular activities of the organization.

Steps one and two are part of what is called *initiation*. Data are gathered and conceptualized, ideas are explored, and plans are made that lead up to a decision to adopt or reject an innovation. Steps three through five are called *implementation*. Adaptations occur to fit the local environment, and as the innovation is spread people have a chance to understand it as it becomes part of the everyday processes.



The innovation process in an organization consists of two broad activities: (1) *initiation,* consisting of all of the information gathering, conceptualization, and planning for the adoption of an innovation, leading up to the decision to adopt, and (2) *implementation,* consisting of all of the events, actions, and decisions involved in putting the innovation into use. The decision to adopt, shown as a dotted line, divides the two stages of initiation from the three stages of implementation.

Figure 11. Five stages in the innovation process within an organization. From DIFFUSION OF INNOVATIONS, 5E by Everett M. Rogers. Copyright © 1995, 2003 by Everett M. Rogers. Copyright © 1962, 1971, 1983, by Free Press, a Division of Simon & Schuster, Inc. Reprinted with the permission of Free Press, a Division of Simon & Schuster, Inc. All rights reserved.

Champions are an important ingredient in achieving organizational change. These people help the organization overcome resistance to change by supporting the alteration and coordinating the actions of others. Champions do not need to be top leaders, unless the change is particularly radical or disruptive, in which case middle managers are often a better choice (Rogers, 2003). Rogers describes three qualities of champions:

1. They have a key "linking" position in the organization;
2. They have analytical and intuitive skills in understanding people and their aspirations;
3. They work well with others and have good interpersonal and negotiation skills.

What follows is the process that I will use within my own organization and that I recommend for other workplaces to spread environmental and policy practices to support health behaviors and participation in NDPP using Rogers's innovation process in organizations. The process is summarized in Table 37.

Step 1: Agenda setting. The appropriate organizational leaders should come together to document the problem, which is they have too many employees who have prediabetes. The leaders can document the problem by collecting and reporting data on the number and percent of employees with prediabetes if the organization collects blood glucose levels. If they do not collect such information, they can use national data from the CDC, which states that one in three U.S. adults over the age of 20 has prediabetes. Organizational leaders may also want to consider adding prediabetes screening questions to a health risk assessment, if they do not do so already. If resources and systems allow, they should compare medical utilization and productivity costs of employees who are healthy, have risk factors for diabetes, and who have one or more chronic diseases to produce a cost profile based on risk stratification. A business case can help secure support from senior leaders in the organization. If organization-specific data are not available,

they can use published literature to provide estimates. Any performance gaps that exist should also be highlighted. For example, health and wellness staff may find performance gaps within the organization's health risk assessment (e.g., employees reporting low fruit/vegetable consumption and physical activity or high levels of stress). These data should be compared to historical data or benchmarks, if they are available. It is important to demonstrate the health risk gaps that can be closed by implementing environmental and policy practices at the workplace (e.g., physical activity, fruit/vegetable consumption). Lastly, a gap analysis should be conducted to identify specific opportunities for implementing environmental and policy practices to support healthy lifestyles among employees or identify practices that may hinder health behavior. There are a number of instruments that can be used by the organization to assist with this task, including, but not limited to:

- The CDC Worksite Health ScoreCard (Centers for Disease Control and Prevention, 2014)
- Check for Health: Workplace Environmental Assessment (California Department of Public Health, 2008)
- Checklist for Health Promotion Environments at Worksites (Oldenburg, Sallis, Harris, & Owen, 2002)
- Environmental Assessment Tool (David M DeJoy et al., 2008)
- The Worksite Supportive Environments for Active Living Survey (Blunt & Hallam, 2010)
- Worksite and Energy Balance Survey (Hoehner et al., 2013)

Step 2: Matching. In this step, it is critical for the organization's decision makers to agree that implementing a comprehensive social ecological strategy will lead to increased health behavior among employees and increased enrollment and participation in NDPP. Evidence from

the literature should be used to demonstrate this connection. In addition, the team seeking support (for beginning or continuing implementation of environmental and policy practices) should anticipate both the benefits and problems that could arise as a result of implementation. It may be helpful to consult with other organizations that have done this work with success in the past. It was clear from the qualitative study that one organization in Maine stood out from the others in terms of the number and comprehensive nature of the environmental and policy practices it has implemented to support health behavior. It is likely that this organization has learned from the experience and has both opportunities and challenges to share with others.

Step 3: Redefining/restructuring. Once health and wellness leaders have the support and approvals required to proceed to implementation of environmental and policy practices, it is important to ensure that leaders assess the practices for appropriate fit within the organization and its culture. An omission of this step could lead to failure. The team should be open to looking critically at the practices and re-inventing them, if necessary.

That said, the changes in the adaptation phase are not intended to alter program fidelity. NDPP is a structured program with a specific curriculum that has been shown to reduce the risk of developing type 2 diabetes. Redefining or restructuring the curriculum, for instance, would not be appropriate. However, in terms of the environmental or policy practices that are being implemented to support the health culture, it is appropriate for those practices to be altered to fit the worksite and its culture. For example, one of the key informants who participated in the qualitative study told me about what they learned about the use of stairwell prompts, which are signs that encourage employees to take the stairs instead of the elevator. They were intrigued by the idea of visually prompting people to take advantage of aspects of the physical environment to encourage physical activity, but they worked in a one-level building. They re-invented this idea

by creating signs that prompted people to do measured laps inside the building, and it worked for them. This kind of adaptation meets the intent of the practice – using signage in the physical environment to support and encourage physical activity – and it is more appropriate for the setting (i.e., a one-level building without stairs).

Step 4: Clarifying. During the clarifying step, environmental and policy practices encouraging health behavior become more evident to employees. As these practices are implemented, it is important for leaders to talk about why these changes are happening and what they mean for the organization. If appropriate, organizations can link these changes to their mission, vision, or values. For example, an organization described in the qualitative study had a corporate value centered on health. When new policies or environmental practices were implemented, leaders had the opportunity to make the connection to that core value for their employees. If leaders do not take care to communicate and clarify intentions, they may be faced with unintended consequences (e.g., employees coming up with their own stories about the changes, which may be incorrect).

The role of health champions, people who will support the environmental and policy practices, is essential in this stage. Champions should be utilized throughout the organization and during the implementation stages and beyond. They should be visible and express support and encouragement for the changes. They should actively recognize and reinforce employee attempts to adopt healthy eating and physical activity behaviors. Practices should be promoted through a variety of communication channels in order to give employees a chance to understand why the changes are being made. Leaders should not just say, "Try a walking meeting," for example. Instead, they should say, "We value your health, and we understand how hard it is to

find time to exercise on work days. That is why we are encouraging you to try a walking meeting. Try it and tell us what you think."

Step 5: Routinizing. When environmental and policy practices that support health behavior become embedded in the organizational culture and norms, routinizing has occurred. Sustainability may be at risk if the decision to implement environment and policy practices was solely made through an authority figure (e.g., the CEO). Decisions made through a collective decision-making process, whereby consensus is reached among members of a system, are more likely to be sustained. Innovations that are re-invented or otherwise adapted to the local environment are also more likely to be upheld.

During the routinizing step, care must be taken to continue positive reinforcement of the chosen environmental and policy practices through the use of champions and frequent messaging by leaders. In addition, a system to facilitate monitoring should be put into place to ensure the environmental and policy practices are yielding the expected results. Environmental and policy practices are observable and therefore measurable. Members of the health and wellness team should have a plan for monitoring and evaluating the impact of the changes. The existing literature highlights the fact that organizations will not be able to prove causation, which is to say that it is difficult to determine whether one particular environmental or policy practice has led to improved health behaviors. However, organizers can measure health behavior over time through existing health risk assessments and biometric screening. They may also be able to measure how many employees with prediabetes enroll and complete the NDPP. If the organization used a survey at the outset to collect data on worksite characteristics or employee observations, the survey can be repeated at a later time to assess how environmental or policy changes at the workplace have affected such factors. In addition, organizers can qualitatively assess changes in

the overall health culture. A key informant from one of the organizations in the qualitative study talked about how she had seen a real difference in the overall health culture at her worksite over time. She had been working at the organization long enough to be able to cite specific examples of changes that contributed to an overall culture that supported health behavior.

Using diffusion of innovations theory, organizational leaders can impact health behavior through the implementation of a comprehensive social ecological approach. All of the worksites in the qualitative study have already done some of this work, and there are many opportunities for implementing more environmental and policy practices in most organizations. The five step process ensures a systematic approach that contains all of the ingredients for success.

Of course, this plan for change has limitations. Diffusion research itself suffers from what is called *pro-innovation bias*, which is "the implication in diffusion research that an innovation should be diffused and adopted by all members of a social system" (Rogers, 2003). A lot of research in diffusion theory is funded by agencies that support change (i.e., pro-innovation bias). It is difficult to study unsuccessful diffusion efforts and therefore, more is known about rapid diffusion versus slow diffusion, adoption of innovation versus rejection, and sustained change versus discontinued implementation.

Organizations may be limited by the resources required to follow this systematic process. Aspects of the plan may not be feasible for all organizations, particularly when it comes to data collection/reporting and monitoring/evaluation. There is no good way to predict the outcome if steps in the process are skipped. Additionally, the entire plan is predicated on having senior leaders who are willing to support the changes after learning about the problem. If an organization has other pressing priorities, this work may not get past the initiation phase.

Change involving health behavior and organizational culture can take a very long time. Leaders must practice patience and diligence as they work their way through the steps. Together, organizational leaders have a tremendous opportunity to create workplace environments that help all employees, not only those who are at risk for developing type 2 diabetes.

Table 34: Process to Implement Worksite Environmental and Policy Practices

	Step	Responsible party	Activities
Initiation	Agenda setting	Leaders responsible for organization health/wellness	Document the problem (baseline): • Find the number/percent of employees with prediabetes. • Determine average costs for healthy employees, employees with prediabetes, employees with type 2 diabetes. • Highlight any performance gaps using existing health risk assessment data or other benchmarks. • Perform a gap analysis showing opportunities to implement environmental and policy practices that support or remove barriers to health behavior.
	Matching	Leaders responsible for organization health/wellness and senior leaders	Demonstrate the connection between environment and policy practices and health behavior. • Evidence in literature Anticipate benefits and problems • Consult with other organizations that have had success
	Decision point: Obtain senior leader support for implementation.		
Implementation	Redefining/ restructuring	Leaders responsible for organization health/wellness.	Evaluate environmental and policy practices of interest and assess whether or not they will fit within the organizational structure and culture. Redefine, reinvent, and restructure as necessary to ensure adoption and sustainability.
	Clarifying	Senior leaders Leaders responsible for organization health/wellness. Champions	Make connections between the implementation of environmental and policy practices and the organization's health goals, mission, vision, and values. Ensure high visibility of champions to reinforce positive messages and to encourage health behavior.
	Routinizing	Senior leaders Leaders responsible for organization health/wellness. Champions	Ensure sustained efforts by leaders and champions. Create a plan for measuring and monitoring change. • Use health risk assessments/biometric screening. • NDPP participation data (if available). • Evaluate using quantitative or qualitative methods.

Plans for Communication/Dissemination of Findings and Recommendations

I will implement the aforementioned process at my own organization, beginning with meeting with senior leaders to obtain support. In addition, I will provide support and assistance for implementing environmental and policy practices that facilitate healthy behaviors. In addition, I will share findings and offer support and technical assistance to the worksites that participated in the study that are not part of the integrated healthcare delivery system.

In addition, the findings and recommendations presented in this dissertation will be shared at the national, statewide, and local levels. I will seek to publish the systematic review of literature, which was created using the 27-item checklist included in the PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions (Liberati et al., 2009). I will also explore publishing the qualitative study. While the number of sites in the study was relatively low, it does represent the majority of CDC-recognized diabetes prevention programs in the state of Maine. The studies provide valuable information about what worksites in Maine are doing in terms of using physical and social environmental and policy practices to affect the health behavior of employees.

There are also a number of opportunities to present the findings and recommendations at conferences and meetings. I will submit abstracts for presentations (oral and poster) to the following national meetings:

- Employer Healthcare & Benefits Congress (EHBC): The EHBC is a large healthcare and benefits conference in the United States and draws up to 1,500 attendees annually. This conference has a track dedicated to corporate wellness, and it serves as the official conference for the Corporate Health and Wellness

Association. In this conference, there is a focus on health behavior and improving employee health outcomes (Employer Healthcare & Benefits Congress, 2016).

- Welcoa Annual Summit: The Wellness Council of America is a national organization focused on healthy workplaces. They have over 5,000 corporate members and have been in existence for over thirty years. Each year Welcoa offers an annual summit where health promotion managers come together to learn and network (Wellness Council of America, 2016).
- Association for Community Health Improvement (ACHI): ACHI is a national association for community health, community benefit, and health communities professionals. It is part of the American Hospital Association. Each year, ACHI hosts a national conference focused on learning and networking. In the spring of 2016, I submitted an abstract for a presentation for the conference taking place in March, 2017.

Opportunities for statewide presentations include:

- Maine Public Health Association (MPHA): MPHA is a statewide membership organization focused on improving the public's health. A diverse membership gathers each year for an annual conference. As a former MPHA president, I am confident that my dissertation findings and recommendations will be of interest to this group of professionals.
- Maine Quality Counts: This organization's mission is to transform health and healthcare in Maine by leading, collaborating, and aligning improvement efforts (Maine Quality Counts, 2016). This organization hosts an annual conference for healthcare leaders.

- Maine Health Management Coalition (MHMC): MHMC is a non-profit membership organization with over 70 members representing public and private purchasers, hospitals, health plans, and healthcare providers. MHMC measures and reports on healthcare value and assists employers and employees in making informed decisions (Maine Health Management Coalition, 2016).
- Maine CDC, Diabetes Prevention & Control Program: The findings and recommendations of this dissertation will be shared with the Maine CDC. I have been in communication with the Maine CDC's Diabetes Prevention & Control Program since the outset of this work.

Opportunities for local presentations include:

- Maine Health System Wellness Councils: Given that a significant number of NDPP programs are run out of hospitals in Maine, I will present at hospital or health-system-level wellness councils/groups. For example, the largest health system in Maine has a system-level wellness council that disseminates information to connected local wellness councils. I will facilitate discussion with this council and will assist them in developing local implementation plans following the process that is based on diffusion of innovation theory. These plans will be incorporated into the overall worksite wellness workplans and evaluated on an annual basis.
- Research Participants: Findings and recommendations will be shared with all of the organizations that participated in the qualitative study.

The plan for communication and dissemination has several limitations. First, external parties have control over whether or not to approve publications or provide time during conference and

meeting agendas to discuss this work. The number of professionals reached with this information is limited by how many people attend a conference/meeting or read a publication and subsequently go back to their organization to act on the information. My own organization supports this work and has already implemented a number of supportive practices, but could be limited by resources to monitor and evaluate change over time if there are changes in leadership or priorities. Monitoring and evaluation functions can be resource intensive and require diligence and ongoing support from leadership.

APPENDIX A: LIST OF STUDIES INCLUDED IN LITERATURE REVIEW

Article Title	Journal	Authors	Year	Contextual Factor(s) Studied	Results: Association between environment/ policy and behavior	Study Design	Population	Study Limitations
Premium-Based Financial Incentives Did Not Promote Workplace Weight Loss in A 2013-2015 Study	Health Affairs	Patel, Mitesh Asch, David Troxel, Andrea Fletcher, Michele Osman-Koss, Rosemary Brady, Jennifer Wesby, Lisa Hilbert, Victoria Zhu, Jingsan Wang, Wenli Volpp, Kevin	2016	Policy	Negative	Randomized Controlled Trial	196 Employees of University Pennsylvania Health System	Single organization with mostly well-educated female participants studied. Only 2 data points (weight at 6 and 12 months)
Workout at work: Laboratory test of psychological and performance outcomes of active workstations	Journal of Occupational Health Psychology	Sliter, Michael Yuan, Zhenyu	2015	Environment (physical)	Positive	Experimental study using 4 randomly assigned conditions: seated, standing, cycling, and walking workstations	180 undergraduate students (66% women, 73% white, avg age 21) from a large urban University in the Midwest.	Experimental design-results more internally valid than externally. Selection bias: homogeneous student sample. Short duration of study.

Article Title	Journal	Authors	Year	Contextual Factor(s) Studied	Results: Association between environment/ policy and behavior	Study Design	Population	Study Limitations
Workplace social and organizational environments and health-weight behaviors	PLoS ONE	Tabak, Rachel G Hipp, J. Aaron Marx, Christine M. Brownson, Ross C.	2015	Social Environment	Positive	Exploratory Cross Sectional	2015 residents from 4 metro areas in Missouri	Cross sectional design- cannot determine causality. Use of self-reported data.
"They should stay at their desks until the work's done": a qualitative study examining perceptions of sedentary behavior in a desk-based occupational setting	BMC Research Notes	Cole, Judith A. Tully, Mark A. Cupples, Margaret E	2015	Social Environment	Descriptive Only	Qualitative	14 office employees	Small sample size limits generalizability
Relationship between employment characteristics and obesity among employed U.S. adults	American Journal of Health Promotion	Park, Sohyun Pan, Liping Lankford, Tina	2014	Policy implications (employment characteristics)	Descriptive only	Quantitative, cross-sectional study	15,121 employed adults in the U.S.	Cross-sectional study does not allow for causal conclusions. Reliance on self-reported data. Missing data.

Article Title	Journal	Authors	Year	Contextual Factor(s) Studied	Results: Association between environment/ policy and behavior	Study Design	Population	Study Limitations
Prevalence of obesity among U.S. workers and associations with occupational factors	Am J Prev Med	Luckhaupt, S. E. Cohen, M. A. Li, J. Calvert, G. M	2014	Environment (social), occupation	Positive	multistage clustered sample cross sectional design	Participants in National Center for Health Statistics in-person household survey	Cross-sectional study does not allow for causal conclusions. Reliance on self-reported data. Limitations with measures used to assess health behaviors.
An Evaluation of the Peer Helper Component of Go !: A Multimessage, Multi-“step” Obesity Prevention Intervention	American Journal of Health Education	de Souza, Rebecca Dauner, Kim Nichols Goei, Ryan LaCaille, Lara Kotowski, Michael R. Schultz, Jennifer Feenstra LaCaille, Rick Versnik Nowak, Amy L.	2014	Environment (social)	Positive	Qualitative evaluation of a 12-month multicomponent obesity prevention program at a hospital worksite	407 hospital employees in intervention group; 92 clinic employees in comparison group	Independent effect of peer helper cannot be separated from larger intervention. Small number of participants - limited external validity.
Nurses' lifestyle behaviours, health priorities and barriers to living a healthy lifestyle: a qualitative descriptive study	BMC Nurs	Phiri, L. P. Draper, C. E. Lambert, E. V. Kolbe-Alexander, T. L.	2014	Environment (physical, social)	Positive	Qualitative descriptive study	103 management, night shift and day shift nurses Western Cape Metropole, South Africa	Challenge for some participants (night shift workers) to attend focus groups. Included only public hospitals and excluded primary care. Group interview format may have suppressed some opinions.

Article Title	Journal	Authors	Year	Contextual Factor(s) Studied	Results: Association between environment/ policy and behavior	Study Design	Population	Study Limitations
Physical activity and body mass index: the contribution of age and workplace characteristics	American Journal of Preventive Medicine	Nelson, Candace C. Wagner, Gregory R. Caban-Martinez, Alberto J. Buxton, Orfeu M. Kenwood, Christopher T. Sabbath, Erika L. Hashimoto, Dean M. Hopcia, Karen Allen, Jennifer Sorensen, Glorian	2014	Environment (physical, social)	Positive	Cross-sectional survey	1572 Patient care workers in 2 large academic hospitals in Boston (2009)	Cross-sectional study does not allow for causal conclusions. Reliance on self-reported data.

Article Title	Journal	Authors	Year	Contextual Factor(s) Studied	Results: Association between environment/ policy and behavior	Study Design	Population	Study Limitations
Evaluation of a Workplace Treadmill Desk Intervention A Randomized Controlled Trial	Journal of Occupational & Environmental Medicine	Schuna Jr, John M. Swift, Damon L. Hendrick, Chelsea A. Duet, Megan T. Johnson, William D. Martin, Corby K. Church, Timothy S. Tudor-Locke, Catrine	2014	Environment (physical)	Positive	Randomized Controlled Trial	41 office workers overweight or with obesity at a private workplace	Potential limitation in equipment (accelerometer) may have skewed results. Small number of study participants (n=41).
The association between worksite physical environment and employee nutrition, and physical activity behavior and weight status	J Occup Environ Med	Almeida, F. A. Wall, S. S. You, W. Harden, S. M. Hill, J. L. Krippendorf, B. E. Estabrooks, P. A.	2014	Environment (physical)	Positive	Two-group, cluster randomized control trial using cross-sectional employee survey data and baseline worksite audits using the Checklist of Health Promotion Environments at Worksites (CHEW)	28 small and medium-sized worksites in Virginia (n=27) and Colorado (n=1) with 8,680 employees	Cross-sectional study does not allow for causal conclusions. Reliance on self-reported measures for individual variables.

Article Title	Journal	Authors	Year	Contextual Factor(s) Studied	Results: Association between environment/ policy and behavior	Study Design	Population	Study Limitations
Associations between building design, point-of-decision stair prompts, and stair use in urban worksites	Preventive Medicine	Ruff, R. R. Rosenblum, R. Fischer, S. Meghani, H. Adamic, J. Lee, K. K.	2014	Environment (physical)	Mixed	Mixed method	Convenience sample- city agency workers in 14 NYC buildings	Cross-sectional study does not allow for causal conclusions. Reliance on self-reported data. Lack of standardized and validated measurement tools to assess building and stair characteristics.
Home and workplace built environment supports for physical activity	Am J Prev Med	Adlakha, D. Hipp, A. J. Marx, C. Yang, L. Tabak, R. Dodson, E. A. Brownson, R. C.	2014	Environment (physical)	Mixed	Cross-sectional study	Employed adults residing in 4 Missouri metro areas (n=2,015)	Cross-sectional study does not allow for causal conclusions. Lack of consensus in literature on measuring workplace physical activity.
Weight gain prevention in the school worksite setting: Results of a multi-level cluster randomized trial	Preventive Medicine	Lemon, Stephenie C. Wang, Monica L. Wedick, Nicole M. Estabrook, Barbara Druker, Susan Schneider, Kristin L. Li, Wenjun Pbert, Lori	2014	Environment & policy	Positive	Cluster randomized trial	782 employees in 12 central Mass public high schools from 2009-2012	2-year follow up not enough to infer long-term impact.

Article Title	Journal	Authors	Year	Contextual Factor(s) Studied	Results: Association between environment/ policy and behavior	Study Design	Population	Study Limitations
What factors influence participation in an exercise-focused, employer-based wellness program?	Inquiry	Abraham, J. M., Feldman, R., Nyman, J.A., Barleen, N.	2013	Policy (worksite incentive for gym membership)	Mixed	Mixed method	University of Minnesota employees enrolled in Uplan and eligible for wellness program	Low survey response rate (17% of eligible population). Reliance on self-reported data. Some measures only available for survey population, not entire population. Missing data.
Individual- versus group-based financial incentives for weight loss: a randomized, controlled trial	Annals of Internal Medicine	Kullgren, Jeffrey T. Troxel, Andrea B. Loewenstein, George Asch, David A. Norton, Laurie A. Wesby, Lisa Tao, Yuanyuan Zhu, Jingsan Volpp, Kevin G.	2013	Policy (financial incentives for weight loss)	Positive	Randomized controlled trial	105 employees at Children's Hospital Philadelphia with BMI between 30-40 kg/m^2	Small sample size questions external validity. Short duration of study. Missing data.

Article Title	Journal	Authors	Year	Contextual Factor(s) Studied	Results: Association between environment/ policy and behavior	Study Design	Population	Study Limitations
Promoting health and wellness in the workplace: a unique opportunity to establish primary and extended secondary cardiovascular risk reduction programs	Mayo Clin Proc	Arena, R. Guazzi, M. Briggs, P. D. Cahalin, L. P. Myers, J. Kaminsky, L. A. Forman, D. E. Cipriano, G., Jr. Borghi-Silva, A. Babu, A. S. Lavie, C. J.	2013	Environment & policy	Positive	Literature Review	Variable	Only one database searched. Inclusion/exclusion criteria not specified.
Office-based physical activity and nutrition intervention: barriers, enablers, and preferred strategies for workplace obesity prevention, Perth, Western Australia, 2012	Prev Chronic Dis	Blackford, K. Jancey, J. Howat, P. Ledger, M. Lee, A. H.	2013	Environment & policy	N/A	Cross sectional; Online survey of 111 employees from 55 organizations	Employees aged 18-45 in Perth Australia	Selection bias based on recruitment process. Low sample size.

Article Title	Journal	Authors	Year	Contextual Factor(s) Studied	Results: Association between environment/ policy and behavior	Study Design	Population	Study Limitations
Perceived stress, behavior, and body mass index among adults participating in a worksite obesity prevention program, Seattle, 2005-2007	Prev Chronic Dis	Barrington, W. E. Ceballos, R. M. Bishop, S. K. McGregor, B. A. Beresford, S. A.	2012	Environment (social)	Mixed	Group-randomized worksite intervention	Healthy working adults in Seattle Metro area (2005-2007) n=621 participants at n=33 worksites	Cross-sectional study does not allow for causal conclusions. Potential confounding variables. Reliance on self-reported data.
HealthWorks: results of a multi-component group-randomized worksite environmental intervention trial for weight gain prevention	Int J Behav Nutr Phys Act	Linde, J. A. Nygaard, K. E. MacLehose, R. F. Mitchell, N. R. Harnack, L. J. Cousins, J. M. Graham, D. J. Jeffery, R. W.	2012	Environment (physical)	Negative	Multi-component group-randomized trial	6 worksites in Twin Cities Metro area, Minnesota (intervention n=611; control n=795)	Small sample size (n=6 sites) created limitations in group-randomized design.
Process evaluation results from an environmentally focused worksite weight management study	Health Educ Behav	DeJoy, D. M. Wilson, M. G. Padilla, H. M. Goetzel, R. Z. Parker, K. B. Della, L. J. Roemer, E. C.	2012	Environment (physical)	Limited	Process Evaluation	10,281 employees at 12 Dow Chemical sites (intervention n=8013; control n=2268)	Reliance of self-reported data. Limited access to study sites led to reliance on questionnaires. Potential confounding between intervention and evaluation.

Article Title	Journal	Authors	Year	Contextual Factor(s) Studied	Results: Association between environment/ policy and behavior	Study Design	Population	Study Limitations
Promising practices for the prevention and control of obesity in the worksite	American Journal of Health Promotion	Archer, W. R. Batan, M. C. Buchanan, L. R. Soler, R. E. Ramsey, D. C. Kirchhofer, A. Reyes, M.	2011	Policy (incentives, educational practices along with interventions); worksite environment	Positive	Systematic Review of Literature	Variable	Heterogeneity between studies creates challenges in identifying strength of evidence of effectiveness for one practice over another.
Associations between social ecological factors and self-reported short physical activity breaks during work hours among desk-based employees	Preventive Medicine: An International Journal Devoted to Practice and Theory	Bennie, Jason A. Timperio, Anna F. Crawford, David A. Dunstan, David W. Salmon, Jo L.	2011	Policy	Positive	Survey- unclear design	801 employed adults aged 18-70 years in metro Melbourne, Australia	Lack of consistency in the definition of short physical activity break.
The association between worksite social support, diet, physical activity and body mass index	Preventive Medicine	Tamers, S. L. Beresford, S. A. Cheadle, A. D. Zheng, Y. Bishop, S. K. Thompson, B.	2011	Environment (social)	Mixed	Group-randomized weight reduction intervention	2878 employees from 34 worksites in Greater Seattle	Cross-sectional study does not allow for causal conclusions. Reliance of self-reported data. Limited external validity due to worksite geographic location and participant demographics.
Workplace Interventions to Reduce Obesity and Cardiometabolic Risk	Curr Cardiovasc Risk Rep	Thorndike, A. N.	2011	Environment (physical, social)	Mixed	Literature Review	Varies	Methods were not described.

Article Title	Journal	Authors	Year	Contextual Factor(s) Studied	Results: Association between environment/ policy and behavior	Study Design	Population	Study Limitations
Productivity of transcriptionists using a treadmill desk	Work	Thompson, Warren G. Levine, James A	2011	Environment (physical)	Positive, with consequences	Observational	12 transcriptionists with obesity in Minnesota	Small number of subjects (n=12). Short duration of study.
Combining Environmental and Individual Weight Management Interventions in a Work Setting: Results From the Dow Chemical Study	Journal of Occupational & Environmental Medicine	DeJoy, David M. Parker, Kristin M. Padilla, Heather M. Wilson, Mark G. Roemer, Enid C. Goetzel, Ron Z.	2011	Environment (physical)	Limited	Comparative effectiveness study using a quasi-experimental design	10,281 employees at 12 Dow Chemical sites (intervention n=8013; control n=2268)	Quasi-experimental design. Study cohort differed from group that provided baseline data. Lack of complete data from both HRA and biometric screening. Results not comparable to other weight loss literature because participants did not have to be overweight or have obesity.
Environmental changes to control obesity: a randomized controlled trial in manufacturing companies	Am J Health Promot	Brehm, B. J. Gates, D. M. Singler, M. Succop, P. A. D'Alessio, D. A.	2011	Environment (physical)	Limited	Randomized controlled community trial	8 manufacturing companies in Kentucky with 150-350 employees each	Small sample size (n=8 sites). Selection bias (more than 40% declined to participate). Reliance of self-reported data.
Small portion sizes in worksite cafeterias: do they help consumers to reduce their food intake?	International Journal of Obesity	Vermeer, W. M. Steenhuis, I. H. Leeuwis, F. H. Heymans, M. W. Seidell, J. C.	2011	Environment (physical)	Limited	Longitudinal randomized controlled trial	308 consumers in 25 Dutch worksite cafeterias (50% women; mean age 39)	Reliance of self-reported data. Selection bias: may have had workers who do not usually use cafeteria come because of small portion choices. Attrition from consumer panel.

Article Title	Journal	Authors	Year	Contextual Factor(s) Studied	Results: Association between environment/ policy and behavior	Study Design	Population	Study Limitations
A qualitative examination of the role of small, rural worksites in obesity prevention	Preventing Chronic Disease	Escoffery, C. Kegler, M. C. Alcantara, I. Wilson, M. Glanz, K.	2011	Environment & policy	Positive	Qualitative; In-depth interviews	33 employed adults age 50+ in rural Georgia	Selection Bias. Study sample may not be representative of workers in other rural areas. No validation of respondent reported information (i.e. presence of cafeterias, vending, etc.).
Pricing and availability intervention in vending machines at four bus garages	Journal of Occupational & Environmental Medicine	French, S. A. Hannan, P. J. Harnack, L. J. Mitchell, N. R. Toomey, T. L. Gerlach, A	2010	Environment (physical)	Positive	comparison using randomized pairs	33 vending machines in 4 bus garages	Reliance on self-reported dietary recall. Inconsistencies between sales data (only aggregated data available) and self-reported behavior. Some selection bias (only measuring drivers who spend time at garage where vending machines located.

Article Title	Journal	Authors	Year	Contextual Factor(s) Studied	Results: Association between environment/ policy and behavior	Study Design	Population	Study Limitations
Are physical activity and nutrition indicators of the Checklist of Health Promotion Environments at Worksites (CHEW) associated with employee obesity among hotel workers?	Journal of Occupational & Environmental Medicine	Nigg, C. R. Albright, C. Williams, R. Nichols, C. Renda, G. Stevens, V. J. Vogt, T. M.	2010	Environment (physical)	Negative	Group-randomized clinical trial of a multi-component weight loss and obesity prevention program	30 hotel sites, 11,559 employees in Hawaii	Cross-sectional study does not allow for causal conclusions. Small sample size (n=30 hotels).
Worksite environment intervention to prevent obesity among metropolitan transit workers	Preventive Medicine	French, S. A. Harnack, L. J. Hannan, P. J. Mitchell, N. R. Gerlach, A. F. Toomey, T. L.	2010	Environment (physical)	Limited	cross-sectional cohort study	160 bus drivers in a major metropolitan area	Small sample size (n=4 sites). Limited exposure to garage environment. Short duration of study. Intervention-related reporting bias. Use of BMI as sole measure of body composition. Varying schedules or workers.
Perceptions of worksite support and employee obesity, activity, and diet	American Journal of Health Behavior	Lemon, S. C. Zapka, J. Li, W. Estabrook, B. Magner, R. Rosal, M. C.	2009	Environment (social)	Mixed	site-randomized trial	899 employees from 6 member hospitals of a healthcare system	Cross-sectional study does not allow for causal conclusions. Reliance on self-reported data.

Article Title	Journal	Authors	Year	Contextual Factor(s) Studied	Results: Association between environment/ policy and behavior	Study Design	Population	Study Limitations
Pausa para tu Salud: reduction of weight and waistlines by integrating exercise breaks into workplace organizational routine	Prev Chronic Dis	Lara, A. Yancey, A. K. Tapia-Conye, R. Flores, Y. Kuri-Morales, P. Mistry, R. Subirats, E. McCarthy, W. J.	2008	Environment (physical, social)	Positive	Uncontrolled pretest-post-test	335 Mexican Ministry of Health office workers	No control group. Selection bias toward healthier workers. Absence of information about exposure dose.
Worksite characteristics and environmental and policy supports for cardiovascular disease prevention in New York state	Prev Chronic Dis	Brissette, I. Fisher, B. Spicer, D. A. King, L.	2008	Environment & policy	Positive	cross sectional	832 worksites in New York State with 75 or more employees	Survey instrument led to missing data on workforce demographic characteristics. Survey included few questions related to secondary prevention of cardiovascular disease.
Worksite policies and environments supporting physical activity in Midwestern communities	American Journal of Health Promotion	Dodson, Elizabeth A. Lovegreen, Sarah L. Elliott, Michael B. Haire-Joshu, Debra Brownson, Ross C.	2008	Environment & Policy	Positive	cross sectional	977 adults from Missouri, Tennessee, Arkansas	Reliance on self-report data. No data about the number or types of jobs participants had. Could not objectively examine individual worksites to evaluate or measure policies and environments reported.

Article Title	Journal	Authors	Year	Contextual Factor(s) Studied	Results: Association between environment/ policy and behavior	Study Design	Population	Study Limitations
Design characteristics of worksite environmental interventions for obesity prevention	Obesity	Charlotte A. Pratt, Stephenie C. Lemon, Isabel Diana Fernandez, Ron Goetzel, Shirley A. Beresford, Simone A. French, Victor J. Stevens, Thomas M. Vogt and Larry S. Webber	2007	Environment (physical)	Positive (combination of individual and environmental strategies)	Review of design characteristics of NHLBI funded studies that are testing innovative environmental interventions for weight control and obesity prevention at worksites.	employees at hotels, hospitals, manufacturing facilities, business, school, bus garages in US	7 distinct studies. Multiple sites create challenges with data collection.
An office-place stepping device to promote workplace physical activity	British Journal of Sports Medicine	McAlpine, D. A. Manohar, C. U. McCrady, S. K. Hensrud, D. Levine, J. A.	2007	Environment (physical)	Positive	Observational	19 subjects (9 lean;10 people with obesity) in an experimental office facility	Small number of subjects (n=19). Short duration of study.
The energy expenditure of using a "walk-and-work" desk for office workers with obesity	British Journal of Sports Medicine	Levine, J. A. Miller, J. M.	2007	Environment (physical)	Positive	Observational	15 healthy, sedentary, volunteers with obesity	Small number of subjects (n=15).

Article Title	Journal	Authors	Year	Contextual Factor(s) Studied	Results: Association between environment/ policy and behavior	Study Design	Population	Study Limitations
Changing the work environment to promote wellness: a focus group study	AAOHN Journal	Gates, D. Brehm, B. Hutton, S. Singler, M. Poeppelman, A.	2006	Environment (physical, social)	N/A	community-based participatory research model	33 managers and 59 employees from 4 manufacturing companies located within 10 miles of each other	Small number of subjects (n=4 sites). Design of focus groups (managers/employees) may have led some participants to hold back opinions and may not be representative of larger groups.
A site-specific literature review of policy and environmental interventions that promote physical activity and nutrition for cardiovascular health: what works?	American Journal of Health Promotion	Matson-Koffman, D. M. Brownstein, J. N. Neiner, J. A. Greaney, M. L.	2005	Environment & Policy	Positive	Literature Review	Varies	Studies did not evaluate each component separately (e.g. policy/environment). Design and measurement limitations.
Environmental and policy factors associated with overweight among adults in Missouri	American Journal of Health Promotion	Catlin, T. K. Simoes, E. J. Brownson, R. C.	2003	Environment & policy	Positive	Cross-sectional data from Missouri Cardiovascular Disease survey	2821 adults in Missouri	Reliance on self-reported data from a one-time cross-sectional survey. Selection bias based on who participated in phone survey. Large number of missing data led to exclusions.

APPENDIX B: RECRUITMENT EMAIL FOR KEY INFORMANT INTERVIEW PARTICIPANTS

Dear [Name of NDPP Program Leader],

I would like to invite you to participate in a research study of how employers can optimize enrollment and support participation in worksite-based national diabetes prevention programs through environment and policy practices. I am conducting this study to meet dissertation requirements as a doctoral candidate at the University of North Carolina at Chapel Hill, Gilling School of Global Public Health.

The specific aims are to identify the (physical and social) environmental and policy practices being used by employers to, a) promote enrollment of employees with prediabetes in the diabetes prevention program; b) support employees who are participating in the program and attempting lifestyle behavior change; and in a subsequent study with employees c) understand how these practices affect their likelihood to enroll in the program.

Benefits of this research include:

- Determination of specific environment and policy practices employers are using to promote enrollment and support employees who are participating in the diabetes prevention program.
- An understanding of barriers and facilitators to implementing workplace environment and policy practices to promote enrollment and support participation in diabetes prevention programs.

If you agree to participate, I will schedule a 30-minute, in-person or telephone meeting with you. During this meeting, I will ask you some questions about your workplace and your National Diabetes Prevention Program.

Eligible sites allow employees of the organization to participate in the NDPP and they have pending or full CDC recognition status. Participation in this study is voluntary and confidential. Your name will not be used and this site will be blinded and only described in general terms. Though direct quotes may be used in the final dissertation, your name and other identifying information will remain anonymous.

Please let me know if you are willing to participate in this study.

Sincerely,

Julie Osgood

APPENDIX C: KEY INFORMANT INTERVIEW GUIDE

Date:_____

Worksite:_____

Key Informant:_____

Introduction

The purpose of this interview is to learn how this organization promotes enrollment in the National Diabetes Prevention Program for its employees and how it supports employees who are participating in the program. Specifically, I am interested in learning more about practices you use that are related to the physical environment, the social environment and policies that this organization uses to promote and support lifestyle behavior change.

This interview should take about 30 minutes. Again, it will be completely confidential and any information that you provide will be released as a summary or combined into general themes. Your name will not be connected to your answers in any way. Furthermore, this workplace will remain blinded and will not be listed by name but as a 'Workplace X that offers the DPP'. With your permission, I would like to record our interview. Digital audio files and transcripts will be confidentially destroyed at the end of the research study.

- **Are there any questions that you have about the research study or the interview?**
- **May I record the interview?**

I would like to start by explaining some of the terms I used. [Distribute the list of practices from literature review.] When I refer to the *physical* environment, I am referring to aspects of this worksite, such as stairs, sidewalks or walking trails, and a cafeteria. When I use

the term *social environment*, I mean the aspects of the environment that serve to influence behavior by shaping norms and how people behave at work. For example, some organizations use 'peer helpers' to encourage healthy eating or physical activity. Others have wellness coordinators who are responsible for promoting healthy behaviors. It can also refer to aspects of the culture of the organization- or the generally accepted behaviors. For instance, you may have leaders who are visibly supportive of health and wellness activities or those who express a commitment to the health of employees. It may be normal for people to eat lunch at their desks or to take a walk at lunch with their colleagues. Lastly, when I refer to *policies*, it can refer to healthcare benefits, incentives (financial or material rewards) used to promote physical activity or weight loss or an organization policy defined as written guidelines that affect all employees at the workplace. An example of a policy tied to an incentive is that employees are given release time to participate in the NDPP—they can do it on company time. An example of a written policy may be that you have guidance ensuring that healthy food is served as an option at meetings and events.

- **Do you have any questions about the definitions before we move on?**

I am going to start with some introductory questions to better understand your organization.

- **How many employees work here?_____**
- **Do you conduct health risk assessments with employees? Y N**
- **Do you conduct biometric screenings, including <u>BMI</u> and <u>fasting glucose</u>?**
- **How long have you been offering the NDPP to employees?_____**
- **Do you know approximately how many employees have enrolled in the program?_____**

- **Do you know approximately how many employees have completed the program?_____**

Now, I would like to talk specifically about the National Diabetes Prevention Program.

Environment and Policy Practices

- Do you promote employee enrollment in NDPP?
- How do you promote employee enrollment in the NDPP?

  Probes:

  - Can you describe how you use aspects of the physical or social environment in promoting enrollment in NDPP?
  - How would you describe the culture here as it relates to health and health behaviors?
  - Does the organization use policies to promote enrollment in NDPP?
  - Please tell me about the policies that this organization has established or uses to promote enrollment?
- Are you working with payers to receive value based payments for participation?
- Does the organization support employees who are participating in the NDPP or generally someone trying to create or practice healthy behaviors?
- How does the organization support employees who are participating in the NDPP and who are trying to create or practice healthy behaviors?

  Probes:

  - Do you highlight aspects of the physical environment?
  - Can you describe any use of social support (formal or informal) to support employees?

- Are there policies that support them? If so, what are they?

Barriers/Facilitators

- What else has the organization and its leaders done to facilitate employee enrollment and support participation in the NDPP?
- What obstacles or barriers have you encountered in trying to get employees to enroll or complete the NDPP?

  Probes:

  - Tell me about any barriers you have encountered in the physical environment that may make employees question whether they can be successful in to improve their lifestyle behaviors (e.g. vending machines with unhealthy food or sugar-sweetened beverages, no access to fitness facility/showers, jobs that require all day sitting, etc.)?
  - How about barriers in the social environment (e.g. stressful environment, people are expected to eat at their desks and may have low levels of eating awareness, employee attitudes about healthy eating and physical activity, etc.)?
  - Are there policy barriers (e.g. Lack of benefits or incentives, lack of job flexibility/decision latitude, lack of policies guiding food choices at meetings/events, etc.)?
- What do you do to retain employees in the program?
- Can you tell me about any obstacles that you have encountered specifically related to the use of environment or policy practices to promote enrollment in the NDPP?
  - What could the organization and its leaders do to encourage more people who are at risk for developing type 2 diabetes to enroll in the program?

- What could the organization and its leaders do to support employees who are at risk for developing type 2 diabetes to make lifestyle behavior changes such as losing weight and increasing physical activity?

❖ In your opinion, what is the most important thing that this organization could to do encourage employee enrollment in, and support participation in the NDPP?

Closing

❖ Do you have any additional comments that you would like to make about how this organization promotes enrollment and supports participation in the NDPP?

APPENDIX D: WRITTEN CONSENT FORM FOR QUALITATIVE RESEARCH

University of North Carolina at Chapel Hill
Consent to Participate in a Research Study
Adult Participants

Consent Form Version Date: November 5, 2015
IRB Study # 15-2571
Title of Study: POLICY AND ENVIRONMENT FACTORS THAT PROMOTE ENROLLMENT AND SUPPORT PARTICIPATION IN THE DIABETES PREVENTION PROGRAM: IMPLICATIONS FOR EMPLOYERS
Principal Investigator: Julie Osgood
Principal Investigator Department: Health Policy and Management Operations
Principal Investigator Phone number: 207-712-3696
Principal Investigator Email Address: osgooj1@live.unc.edu
Faculty Advisor: Jim Porto
Faculty Advisor Contact Information: (919) 966-7354

What are some general things you should know about research studies?
You are being asked to take part in a research study. To join the study is voluntary. You may refuse to join, or you may withdraw your consent to be in the study, for any reason, without penalty.

Research studies are designed to obtain new knowledge. This new information may help people in the future. You may not receive any direct benefit from being in the research study. There also may be risks to being in research studies.

Details about this study are discussed below. It is important that you understand this information so that you can make an informed choice about being in this research study.

You will be given a copy of this consent form. You should ask the researchers named above, or staff members who may assist them, any questions you have about this study at any time.

What is the purpose of this study?
The purpose of this research study is to learn how this organization promotes enrollment in the Diabetes Prevention Program for its employees and how it supports employees who are participating in the program. Specifically, I am interested in learning more about practices you use that are related to the physical environment, the social environment and policies that this organization uses to promote and support lifestyle behavior change.

You are being asked to be in the study because you oversee or run a CDC recognized diabetes prevention program that is offered to employees.

How many people will take part in this study?
Between 5 and 10 sites will be recruited to take part in the study and there will be 1-2 people from each worksite taking part in the study.

How long will your part in this study last?
This interview should take about 30 minutes. There is a chance that I will need to contact you for some follow up information but that would be brief and can be completed by telephone or email.

What will happen if you take part in the study?
If you agree to participate in the study, I will ask you some questions about the diabetes prevention program and how you recruit participants. I will ask you about some specific practices you use to support employees who are seeking to make lifestyle behavior changes.

It will be completely confidential and any information that you provide will be released as a summary or combined into general themes. Your name will not be connected to your answers in any way. Furthermore, this worksite will remain blinded and will not be listed by name but as a 'Worksite X that offers the DPP'. With your permission, I would like to record our interview. Digital audio files and transcripts will be confidentially destroyed at the end of the research study.

What are the possible benefits from being in this study?
Research is designed to benefit society by gaining new knowledge. This research will benefit employers who are seeking to increase enrollment in diabetes prevention programs. You will not benefit personally from being in this research study.

What are the possible risks or discomforts involved from being in this study?
There may be uncommon or previously unknown risks. You should report any problems to the researcher.

What if we learn about new findings or information during the study?
You will be given any new information gained during the course of the study that might affect your willingness to continue your participation.

How will information about you be protected?
I am taking multiple steps to ensure that your privacy and confidentiality will be protected.

- Your name will only appear on the consent form. All records will be kept in a locked location and electronic files will require a password.
- I am the only person who will have access to individually identifiable information. ID numbers will be used to identify the sites and the file that links them will require a password to access them.

Participants will not be identified in any report or publication about this study. Direct quotes will be used but not attributed to any person specifically. Although every effort will be made to keep research records private, there may be times when federal or state law requires the

disclosure of such records, including personal information. This is very unlikely, but if disclosure is ever required, UNC-Chapel Hill will take steps allowable by law to protect the privacy of personal information. In some cases, your information in this research study could be reviewed by representatives of the University, research sponsors, or government agencies (for example, the FDA) for purposes such as quality control or safety.

- As soon as the audio recordings are transcribed and checked for accuracy, the audio files will be destroyed. Transcripts will be kept in a folder requiring a password. Once the study has concluded and the dissertation has been accepted, the transcripts will be destroyed.

Check the line that best matches your choice:

_____ OK to record me during the study

_____ Not OK to record me during the study

What if you want to stop before your part in the study is complete?

You can withdraw from this study at any time, without penalty. The investigator also has the right to stop your participation at any time. This could be because the entire study has been stopped.

Will you receive anything for being in this study?

You will not receive any compensation for being part of this study.

Will it cost you anything to be in this study?

It will not cost you anything other than your time to be in this study.

What if you have questions about this study?

You have the right to ask, and have answered, any questions you may have about this research. If you have questions about the study, complaints, concerns, or if a research-related injury occurs, you should contact the researchers listed on the first page of this form.

What if you have questions about your rights as a research participant?

All research on human volunteers is reviewed by a committee that works to protect your rights and welfare. If you have questions or concerns about your rights as a research subject, or if you would like to obtain information or offer input, you may contact the Institutional Review Board at 919-966-3113 or by email to IRB_subjects@unc.edu.

Participant's Agreement:

I have read the information provided above. I have asked all the questions I have at this time. I voluntarily agree to participate in this research study.

_____ _____

Signature of Research Participant Date

_____

Printed Name of Research Participant

_____ _____

Signature of Research Team Member Obtaining Consent Date

_____

Printed Name of Research Team Member Obtaining Consent

APPENDIX E: RECRUITMENT EMAIL FOR SURVEY PARTICIPANTS

Initial email:

From: Julie Osgood, University of North Carolina Doctoral Candidate

Subject: Invitation to participate in a research study – respond by July 8

~~~~~~

My name is Julie Osgood and I am an employee of MaineHealth and a doctoral candidate at the University of North Carolina, Chapel Hill. I am conducting a study designed to help employers create healthy work environments.

You are part of a group selected to complete an anonymous and confidential survey that will take *less than ten minutes* to complete. Your responses will be combined with all other responses so that your personal information shared cannot be identified.

The information you share will be analyzed and assist me in developing community/worksite wellness programming. Please note, this survey is not affiliated with the MaineHealth Works on Wellness (WOW) program or rewards structure.

By clicking **Worksite and Health Research Study** you agree to participate in the study.

If the link above does not work, try copying the link below into your web browser:

https://collaborate.tuftsctsi.org/redcap/surveys/?s=Y5HW4RkbjE

Please complete the survey by July 8. Thank you in advance for your help. Your time and responses are incredibly valuable.

Sincerely,
Julie
P.S. If you have any questions regarding this survey, you may contact me via email at

osgooj1@live.unc.edu

All research on human volunteers is reviewed by a committee that works to protect your rights and welfare. If you have any questions or concerns regarding your rights as a research subject you may contact, anonymously if you wish, the Institutional Review Board at (919) 966-3113 or via email at
~~~~~~

IRB_subjects@unc.edu with study number 15-2571. Joining the study is voluntary. You may refuse to join, or you may withdraw your consent to be in the study, for any reason, without penalty. Research studies are designed to obtain new knowledge. This new information may help people in the future. You may not receive any direct benefit from being in the research study. There also may be risks to being in research studies.

Reminder email:

From: Julie Osgood, University of North Carolina Doctoral Candidate

Subject: Last chance- Make Your Voice Heard!

~~~~~~

I am halfway to my response goal so please make your voice heard and complete an anonymous and confidential survey that will take *less than ten minutes* to complete. Your responses will be combined with all other responses so that your personal information shared cannot be identified.

My name is Julie Osgood and I am an employee of MaineHealth and a doctoral candidate at the University of North Carolina, Chapel Hill. I am conducting a study designed to help employers create healthy work environments.

The information you share will be analyzed and assist me in developing community/worksite wellness programming. Please note, this survey is not affiliated with the MaineHealth Works on Wellness (WOW) program or rewards structure.

By clicking **Worksite and Health Research Study** you agree to participate in the study.

If the link above does not work, try copying the link below into your web browser:

https://collaborate.tuftsctsi.org/redcap/surveys/?s=Y5HW4RkbjE

Please complete the survey by July 8. Thank you in advance for your help. Your time and responses are incredibly valuable.

Sincerely,
Julie
P.S. If you have any questions regarding this survey, you may contact me via email at

osgooj1@live.unc.edu

All research on human volunteers is reviewed by a committee that works to protect your rights and welfare. If you have any questions or concerns regarding your rights as a research subject you may contact, anonymously if you wish, the Institutional Review Board at (919) 966-3113 or via email at IRB_subjects@unc.edu with study number 15-2571. Joining the study is voluntary. You may refuse to join, or you may withdraw your consent to be in the study, for any reason, without penalty. Research studies are designed to obtain new knowledge. This new information may help people in the future. You
~~~~~~

may not receive any direct benefit from being in the research study. There also may be risks to being in research studies.

Second reminder email:

From: Julie Osgood, University of North Carolina Doctoral Candidate

Subject: Help me reach my goal!

~~~~~~

My name is Julie Osgood and I am an employee of MaineHealth and a doctoral candidate at the University of North Carolina, Chapel Hill. I am conducting a study designed to help employers create healthy work environments. Thank you to those individuals that have already completed this survey. To reach my goal, **I need 300 more responses by July 22** to complete my school project.

Please help by completing an anonymous and confidential survey that will take *less than ten minutes* to complete. Your responses will be combined with all other responses so that your personal information shared cannot be identified.

The information you share will be analyzed and assist me in developing community/worksite wellness programming. Please note, this survey is not affiliated with the MaineHealth Works on Wellness (WOW) program or rewards structure.

By clicking **Worksite and Health Research Study** you agree to participate in the study.

If the link above does not work, try copying the link below into your web browser:

https://collaborate.tuftsctsi.org/redcap/surveys/?s=Y5HW4RkbjE

Please complete the survey by July 22. Thank you in advance for your help. Your time and responses are incredibly valuable.

Sincerely,
Julie

P.S. If you have any questions regarding this survey, you may contact me via email at osgooj1@live.unc.edu

All research on human volunteers is reviewed by a committee that works to protect your rights and welfare. If you have any questions or concerns regarding your rights as a research subject you may contact, anonymously if you wish, the Institutional Review Board at (919) 966-3113 or via email at IRB_subjects@unc.edu with study number 15-2571. Joining the study is voluntary. You may refuse to join, or you may withdraw your consent to be in the study, for any reason, without penalty. Research studies are designed to obtain new knowledge. This new information may help people in the future. You may not receive any direct benefit from being in the research study. There also may be risks to being in research studies.
~~~~~~

APPENDIX F: EMPLOYEE SURVEY INSTRUMENT

Confidential

Worksite and Health Research Study

Thank you for agreeing to participate in this study. The purpose is to learn about your perceptions of your worksite and how it affects health behaviors. We will start with some questions about your observations at your worksite.

Please try to complete the survey in one sitting. If you stop, you can come back to it but will have to use a special key to access the survey.

I see information at my worksite that...

	Often	Sometimes	Rarely	Never
Encourages me to take the stairs.	○	○	○	○
Encourages me to walk to places around my worksite.	○	○	○	○
Encourages me to walk or bike to work.	○	○	○	○
Encourages me to participate in fitness related events such as road races, charity walks, triathlons, and bike rides.	○	○	○	○
Encourages me to be physically active at wellness/fitness centers.	○	○	○	○
Encourages me to participate in physical activities such as exercise classes, dance lessons, and sports programs.	○	○	○	○

Please indicate how often you see your co-workers doing each of the following:

	Often	Sometimes	Rarely	Never
I see co-workers eating fruits and vegetables.	○	○	○	○
I see co-workers walking, biking, or taking public transportation to get to work.	○	○	○	○
I see co-workers being physically active during their work breaks.	○	○	○	○

Please indicate your level of agreement with the following statements:

	Strongly Agree	Agree	Disagree	Strongly Disagree
My organization values healthy workers.	○	○	○	○
My organization values healthy lifestyles.	○	○	○	○
My co-workers are good role models for making healthy food choices.	○	○	○	○
My co-workers are good role models for a physically active lifestyle.	○	○	○	○
My manager values healthy workers.	○	○	○	○
My manager values healthy lifestyles.	○	○	○	○

Please tell me more about your workplace.

	Yes	No	Not Sure/Don't Know
My workplace offers financial incentives to help me improve my health.	○	○	○
My workplace offers programs to help me improve my health at times that are convenient for me.	○	○	○
I have a job that requires sitting for a majority of my work day.	○	○	○
I am able to flex my work hours to meet my needs.	○	○	○
I have access to alternative workstations, such as standing or walking stations.	○	○	○
My workplace has a gym or exercise facility.	○	○	○
My workplace has showers.	○	○	○
My workplace has a cafeteria that serves food.	○	○	○

Have you ever participated in a diabetes prevention program at your worksite? This is a program that is designed to help you reduce your risk for developing type 2 diabetes.

The program uses lifestyle coaches who meet with groups for 16 weekly sessions followed by 6-10 monthly sessions?

◯ Yes
◯ No

To what extent did the following factors motivate you to enroll in a diabetes prevention program?

	Strongly Agree	Agree	Disagree	Strongly Disagree
My doctor told me that I was at risk for developing type 2 diabetes.	○	○	○	○
The classes were scheduled at a convenient time.	○	○	○	○
I received support from my family.	○	○	○	○
I received support from my coworkers.	○	○	○	○
I received support from my manager.	○	○	○	○
I could find healthy food at my workplace.	○	○	○	○
I could find time to get enough physical activity on days that I work.	○	○	○	○
There were incentives to complete the program (money or prizes).	○	○	○	○
I was ready to make changes to my lifestyle.	○	○	○	○

Why not?

	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't Know
I am not aware of the diabetes prevention program.	○	○	○	○	○
My organization does not offer a diabetes prevention program.	○	○	○	○	○
My community does not offer a diabetes prevention program.	○	○	○	○	○
I do not feel that I am at risk for developing type 2 diabetes.	○	○	○	○	○
I am not ready to make changes to my lifestyle.	○	○	○	○	○
My work schedule conflicts with the program.	○	○	○	○	○
I cannot afford to attend.	○	○	○	○	○
My family responsibilities conflict with the program.	○	○	○	○	○
I needed more support from my family.	○	○	○	○	○
I needed more support from my coworkers.	○	○	○	○	○
I needed more support from my manager.	○	○	○	○	○
It is hard to find healthy food at my workplace.	○	○	○	○	○
It is hard to get enough physical activity on work days.	○	○	○	○	○
There are not enough incentives for me to enroll in the program (money or prizes).	○	○	○	○	○

To what extent would the following factors motivate you to enroll in a diabetes prevention program?

	Quite a bit	Somewhat	Very little	Not at all
If my doctor told me that I was at risk for developing type 2 diabetes.	○	○	○	○
If the classes were scheduled at a convenient time.	○	○	○	○
If I received support from my family.	○	○	○	○
If I received support from my coworkers.	○	○	○	○
If I received support from my manager.	○	○	○	○
If I could find healthy food at my workplace.	○	○	○	○
If I could find time to get enough physical activity on days that I work.	○	○	○	○
If there were incentives to complete the program (money or prizes).	○	○	○	○
If I were ready to make changes to my lifestyle.	○	○	○	○

Did you complete the program?

○ Yes
○ No

What factors helped you complete the program?

	Quite a bit	Somewhat	Very little	Not at all
The classes were scheduled at a convenient time.	○	○	○	○
I understood the time commitment at the beginning of the program.	○	○	○	○
I received support from my family.	○	○	○	○
I received support from my coworkers.	○	○	○	○
I received support from my manager.	○	○	○	○
I received support from my lifestyle coach.	○	○	○	○
I could find healthy food at my workplace.	○	○	○	○
I could find time to get enough physical activity on work days.	○	○	○	○
There were incentives to complete the program (money or prizes).	○	○	○	○
I was ready to make changes in my lifestyle.	○	○	○	○

What factors prevented you from completing the program?

	Quite a bit	Somewhat	Very little	Not at all
The classes were not scheduled at a convenient time.	○	○	○	○
I did not understand the time commitment at the beginning of the program.	○	○	○	○
I did not receive support from my family.	○	○	○	○
I did not receive support from my coworkers.	○	○	○	○
I did not receive support from my manager.	○	○	○	○
It was hard to find healthy food at my workplace.	○	○	○	○
It was hard to get enough physical activity on work days.	○	○	○	○
There were not enough incentives to complete the program (money or prizes).	○	○	○	○
I was not ready to make changes to my lifestyle.	○	○	○	○

Lastly, I have a few questions about you. Your individual response will be kept confidential and only summary data will be reported. The researcher does not have any way to identify individual employees.

Where do you work?

- ◯ Franklin Memorial Hospital
- ◯ Home Health Visiting Nurses
- ◯ Lincoln County Healthcare-Miles Campus
- ◯ Lincoln County Healthcare-St. Andrews campus
- ◯ Maine Behavioral Healthcare
- ◯ MaineGeneral Health
- ◯ MaineHealth Accountable Care Organization
- ◯ MaineHealth Corporate
- ◯ Maine Medical Center
- ◯ Maine Medical Partners
- ◯ Memorial Hospital
- ◯ NorDx Labs
- ◯ Pen Bay Healthcare
- ◯ Southern Maine Healthcare-Biddeford Campus
- ◯ Southern Maine Healthcare-Sanford Campus
- ◯ Synernet
- ◯ Waldo County Healthcare
- ◯ Western Maine Healthcare

I work at another location (please specify)

_____

Which of the following best describes your occupation?

- ◯ Behavioral Health
- ◯ Clerical/Administrative Support
- ◯ Information Services
- ◯ Management/Leadership
- ◯ Nursing
- ◯ Clinical Support
- ◯ Physician
- ◯ Professional - Clinical
- ◯ Professional - Non-clinical
- ◯ Service/Maintenance Support

How many days per week do you typically work?

- ◯ 0-1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5
- ◯ 6-7

How many hours per week do you typically work?

- ◯ 1-20
- ◯ 21-35
- ◯ 36-40
- ◯ More than 40

What shift do you typically work?

- ◯ Day
- ◯ Night
- ◯ Both

What is your gender?

◯ Male
◯ Female
◯ Other

How old are you?

_____
(Years)

Do you consider yourself Hispanic/Latino?

- ◯ Yes
- ◯ No

Which one of the following would you say is your primary race?

- ◯ White
- ◯ Black or African American
- ◯ Asian
- ◯ Native Hawaiian or Other Pacific Islander
- ◯ American Indian or Alaska Native
- ◯ Other

What is your marital status?

- ◯ Married
- ◯ Divorced
- ◯ Widowed
- ◯ Separated
- ◯ Never Married
- ◯ A member of an unmarried couple

What is the highest grade or year of school you completed?

- ◯ Never attended school or only attended kindergarten
- ◯ Grades 1 through 8 (Elementary)
- ◯ Grades 9-11 (Some High School)
- ◯ Grade 12 or GED (High School Graduate)
- ◯ College 1 year to 3 years (Some college or technical school)
- ◯ College 4 years or more (College graduate)

How long have you worked at your current job?

- ◯ 1-3 years
- ◯ 4-7 years
- ◯ 8-11 years
- ◯ 12-15
- ◯ More than 15 years

How tall are you without shoes?

In Feet?

_____

In inches?

_____

About how much do you weigh without shoes?

_____
(pounds)

What is your annual household income from all sources?

- ◯ Less than $30,000
- ◯ $30,000-$49,000
- ◯ $50,000-$69,000
- ◯ $70,000 or more

How often do you smoke (cigarettes, pipe, cigars, e-cigarettes)?

- ◯ Everyday
- ◯ Some days
- ◯ Not at all

APPENDIX G: QUANTITATIVE SURVEY REMINDER EMAIL

From: Julie Osgood, University of North Carolina Doctoral Candidate

Subject: Last chance- Make Your Voice Heard!

~~~~~~

I am halfway to my response goal so please make your voice heard and complete an anonymous and confidential survey that will take *less than ten minutes* to complete. Your responses will be combined with all other responses so that your personal information shared cannot be identified.

My name is Julie Osgood and I am an employee of MaineHealth and a doctoral candidate at the University of North Carolina, Chapel Hill. I am conducting a study designed to help employers create healthy work environments.

The information you share will be analyzed and assist me in developing community/worksite wellness programming. Please note, this survey is not affiliated with the MaineHealth Works on Wellness (WOW) program or rewards structure.

By clicking **Worksite and Health Research Study** you agree to participate in the study.

If the link above does not work, try copying the link below into your web browser:

https://collaborate.tuftsctsi.org/redcap/surveys/?s=Y5HW4RkbjE

Please complete the survey by July 8. Thank you in advance for your help. Your time and responses are incredibly valuable.

Sincerely,
Julie
P.S. If you have any questions regarding this survey, you may contact me via email at

osgooj1@live.unc.edu

All research on human volunteers is reviewed by a committee that works to protect your rights and welfare. If you have any questions or concerns regarding your rights as a research subject you may contact, anonymously if you wish, the Institutional Review Board at (919) 966-3113 or via email at IRB_subjects@unc.edu with study number 15-2571. Joining the study is voluntary. You may refuse to
~~~~~~

join, or you may withdraw your consent to be in the study, for any reason, without penalty. Research studies are designed to obtain new knowledge. This new information may help people in the future. You may not receive any direct benefit from being in the research study. There also may be risks to being in research studies.

APPENDIX H: PERMISSIONS TO USE SURVEY QUESTIONS

From: Julie L. Osgood [mailto:OSGOOJ1@mainehealth.org]

Sent: Monday, October 05, 2015 1:42 PM

To: Tabak, Rachel

Subject: Doctoral student requests permission to use part of instrument

Dear Dr. Tabak,

I am a healthcare administrator in Maine and a doctoral student at the University of North Carolina, Chapel Hill in their DrPH program. I am working on my dissertation proposal, which will be focused on worksite environment and policy practices for supporting employee enrollment in diabetes prevention programs. I previously spoke with Aaron Hipp who helped me when I was trying to focus my research question.

Part of my research will involve surveying employees and I would like to use a question that you and colleagues wrote for the following article:

Tabak, R. G., Hipp, J. A., Marx, C. M., & Brownson, R. C. (2015). Workplace social and organizational environments and healthy-weight behaviors. *PLoS One*, *10*(4), e0125424. doi:10.1371/journal.pone.0125424

I would like to modify some of the items slightly so that I can meet literacy requirements from my organization. I would also slightly change the scale to be consistent with several other questions. If agreed to the following language, I would provide language that this was adapted or in original format from your work and would cite as such.

Proposed modified language:

I see co-workers eating fruits and vegetables. (I omitted the "Would you say" and kept the scale the same)

My organization values healthy workers. (I omitted “company or” to fit my setting)
My organization values a healthy lifestyle (I omitted “company or” to fit my setting)
I see coworkers being physically active during their work breaks. (no change)
My co-workers are good role models for making health food choices. (no change)
My co-workers are good role models for a physically active lifestyle. (no change)
Thank you in advance for considering this request.

Sincerely,
Julie
Julie Osgood
Senior Director, Clinical Integration
MaineHealth
110 Free Street
Portland, ME 04101
207-661-7515

On Mon, Oct 5, 2015 at 2:50 PM, Tabak, Rachel <rtabak@wustl.edu> wrote:

Hi Julie-This looks good to me. I’m copying Dr. Hipp as well to make sure this makes sense to him as well.

Good luck with your project!

~Rachel

--

Rachel Tabak, PhD, RD

Research Assistant Professor

Prevention Research Center in St. Louis

Washington University

(c) (919) 360-7734

rtabak@wustl.edu

From: Aaron Hipp [mailto:jahipp@ncsu.edu]

Sent: Monday, October 05, 2015 2:53 PM

To: Tabak, Rachel

Cc: Julie L. Osgood

Subject: Re: Doctoral student requests permission to use part of instrument

Agreed, looks good to me.

J. Aaron Hipp, PhD
Associate Professor of Community Health and Sustainability
Fellow, Center for Geospatial Analytics
Department of Parks, Recreation, and Tourism Management
College of Natural Resources
North Carolina State University
aaron_hipp@ncsu.edu
919.515.3433
@drhipp

Re: Doctoral Student requests permission to use survey question

Lindsay.della@louisville.edu

Sent: Wed 10/21/2015 12:23 PM

To: David M DeJoy; Julie Osgood

Cc: Lindsay Della

Julie,

I apologize. I saw the email from Dr. DeJoy but was out on fall break and dropped the ball in responding to you when I came back into the office. I second Dave's request to cite us if you use some or all of the LBE in your research, but otherwise we're excited to see the scale being put to good use. Good luck.

Lindsay

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Lindsay J. Della, Ph.D.
University of Louisville
Department of Communication

Re: Doctoral Student requests permission to use survey question
From: David M DeJoy dmdejoy@uga.edu
Sent: Wed 10/21/2015 9:46 AM
To: Julie L. Osgood
Cc: Lindsay Della
Julie - Sorry for our delay. Actually, I forwarded your request to Lindsay Della who was the lead author on that article. However, I am OK with your proceeding as planned and ask only that you acknowledge our paper as a source. Let me know if anything else is needed from us. Best wishes with your research.

Dave DeJoy
Professor Emeritus
Workplace Health Group
Department of Health Promotion & Behavior
College of Public Health
Health Sciences Campus
University of Georgia
Photography: http://dejoyimages.zenfolio.com

From: Julie L. Osgood <OSGOOJ1@mainehealth.org>

Sent: Wednesday, October 21, 2015 8:43 AM
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

To: David M DeJoy

Subject: RE: Doctoral Student requests permission to use survey question

Hello,

I am just following up on this request. I have not heard from Dr. Wilson. I'd be happy to reach out to him directly if you would be so kind as to share his contact information.

Sincerely,

Julie L. Osgood

From: David M DeJoy [mailto:dmdejoy@uga.edu]

Sent: Monday, October 05, 2015 4:23 PM

To: Julie L. Osgood

Subject: Re: Doctoral Student requests permission to use survey question

Great. Thanks for contacting me. I forwarded your message to Dr. Mark Wilson who is the current director of the Workplace Health Group. Very best wishes.

Dave DeJoy
Professor Emeritus
Workplace Health Group
Department of Health Promotion & Behavior
College of Public Health
Health Sciences Campus
University of Georgia
Photography: http://dejoyimages.zenfolio.com

From: Julie L. Osgood <OSGOOJ1@mainehealth.org>

Sent: Monday, October 5, 2015 2:32 PM

To: David M DeJoy

Cc: Julie L. Osgood

Subject: Doctoral Student requests permission to use survey question

Dear Dr. DeJoy,

I am a healthcare administrator in Maine and a doctoral student at the University of North Carolina, Chapel Hill in their DrPH program. I am working on my dissertation proposal, which will be focused on worksite environment and policy practices for supporting employee enrollment in diabetes prevention programs.

Part of my research will involve surveying employees and I would like to use a question that you and colleagues wrote for the following article:

Della, L. J., DeJoy, D. M., Goetzel, R. Z., Ozminkowski, R. J., & Wilson, M. G. (2008). Assessing management support for worksite health promotion: psychometric analysis of the leading by example (LBE) instrument. *Am J Health Promot, 22*(5), 359-367.

doi:10.4278/ajhp.22.5.359

I would like to modify the language slightly so that I can meet literacy requirements from my organization. I would also slightly change the scale to be consistent with several other questions. If agreed to the following language, I would provide language that this was adapted from your work and would cite as such.

Proposed modified language:

I see information at my worksite that:

a. Encourages me to take the stairs
b. Encourages me to walk to other places around my worksite
c. Encourages me to walk or bike to work
d. Encourages me to take part in physical activities such as exercise classes, dance lessons, and sports programs
e. Encourages me to be physically active at wellness/fitness centers
f. Encourages me to participate in fitness related events such as road races, charity walks, triathlons, and bike rides.

Scale: Never, Rarely, Sometimes, Often

Thank you in advance for considering this request.

Sincerely,

Julie
Julie Osgood
Senior Director, Clinical Integration
MaineHealth
110 Free Street
Portland, ME 04101
207-661-7515

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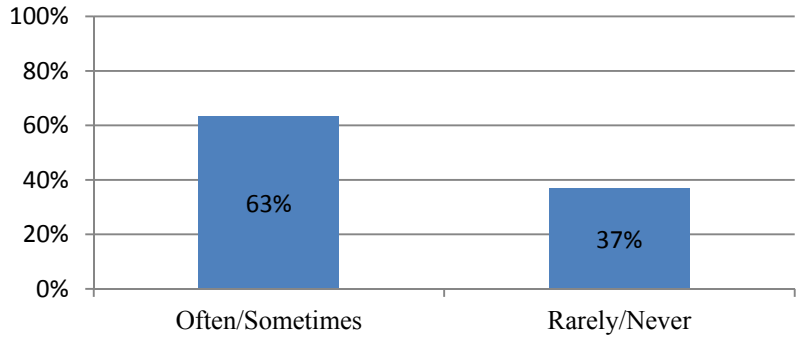
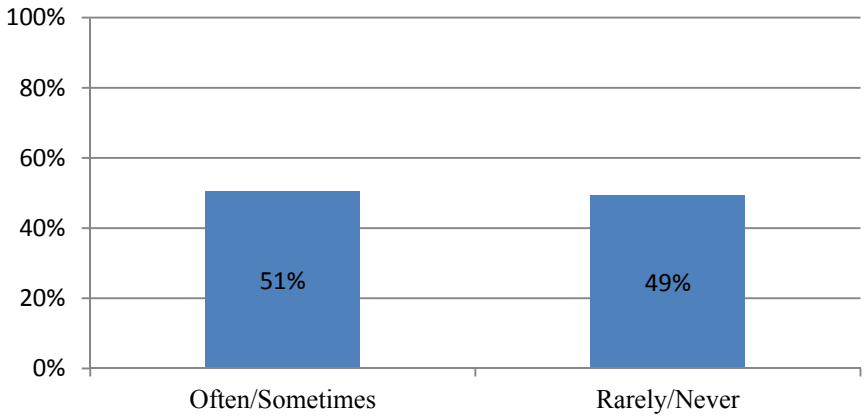
APPENDIX I: QUANTITATIVE SURVEY GRAPHS

I see information at my worksite that…

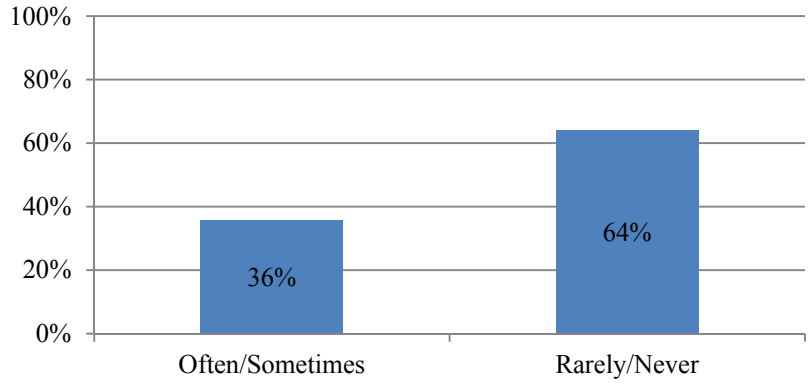
Encourages me to participate in fitness related events such as road races, charity walks, triathlons, and bike rides. (n=95)



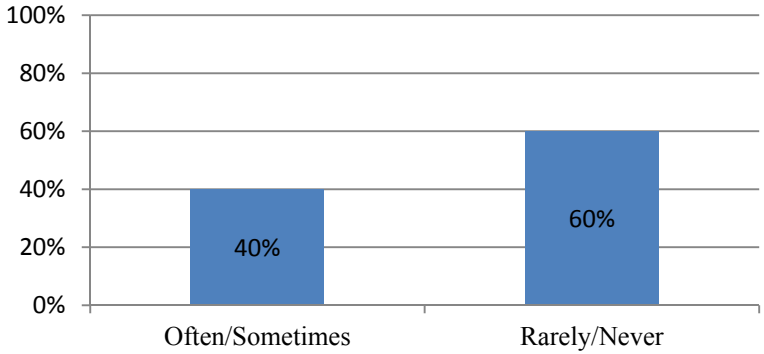
Encourages me to be physically active at wellness/fitness centers. (n=95)



Encourages me to take the stairs. (n=95)

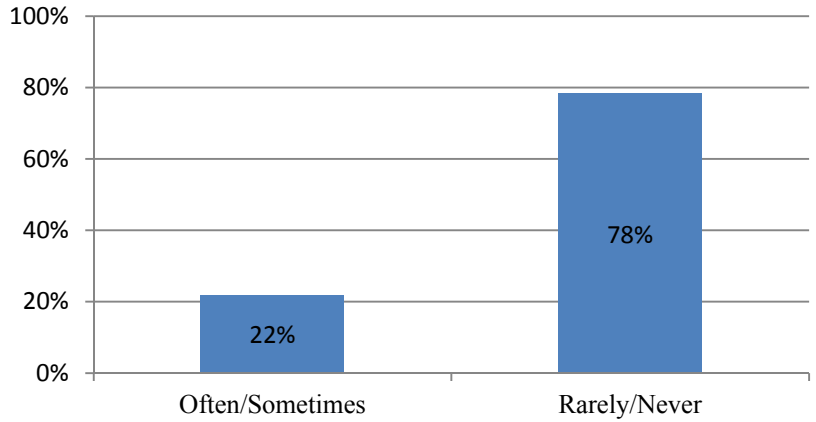


Encourages me to walk to places around my worksite (n=95).

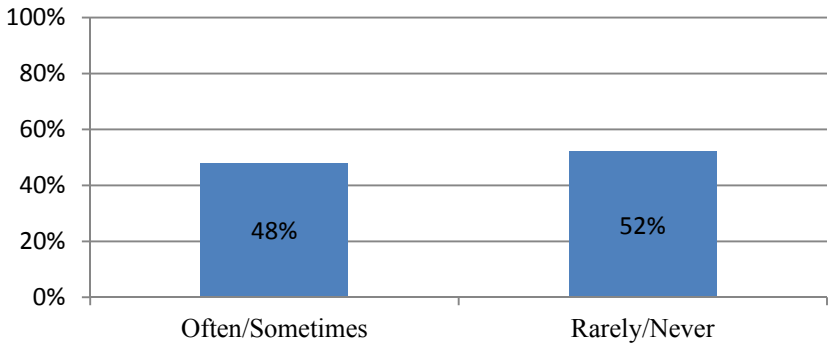


I see information at my worksite that…

Encourages me to walk or bike to work. (n=92)

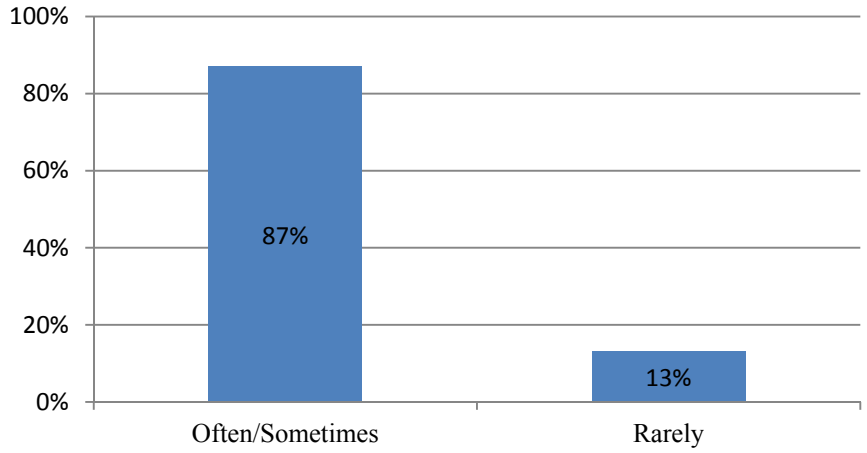


Encourages me to participate in physical activities such as exercise classes, dance lessons, and sports programs. (n=94)

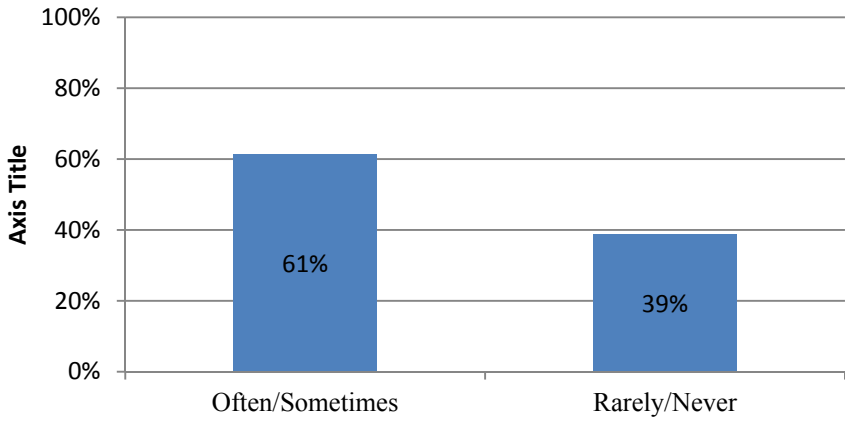


I see co-workers…

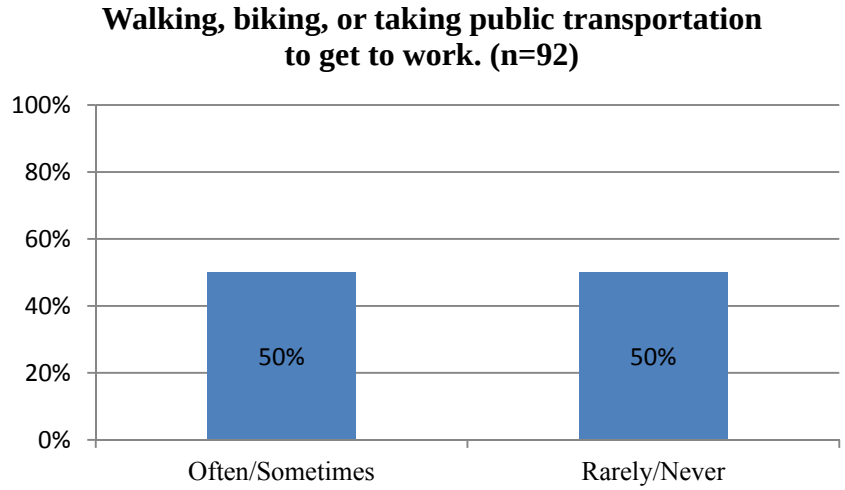
Eating fruits and vegetables. (n=92)

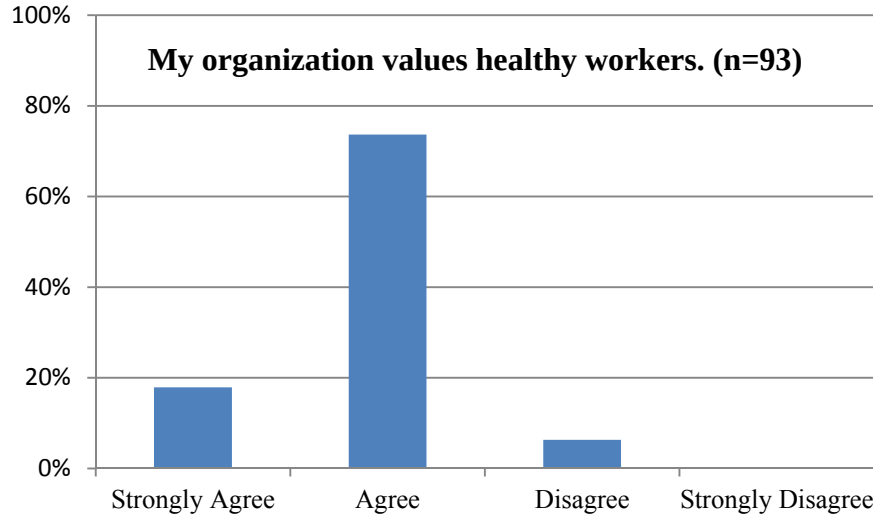


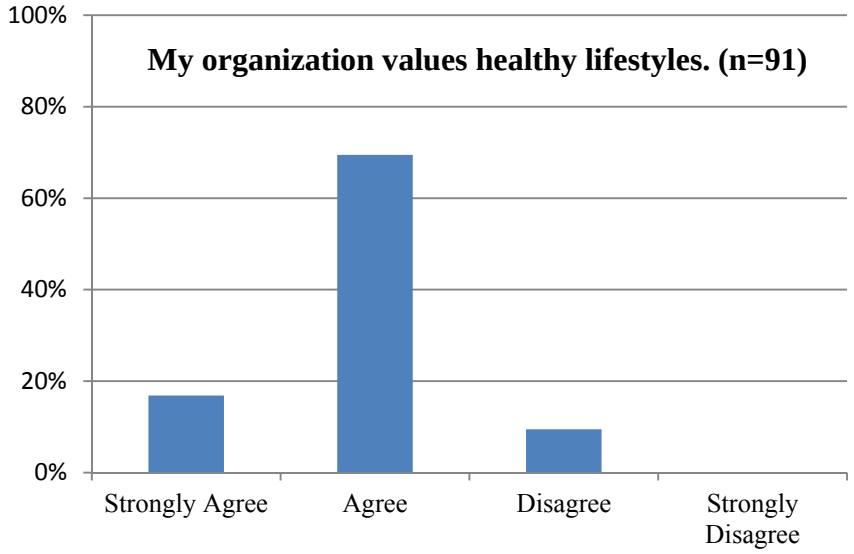
Being physically active during their work breaks. (n=93)



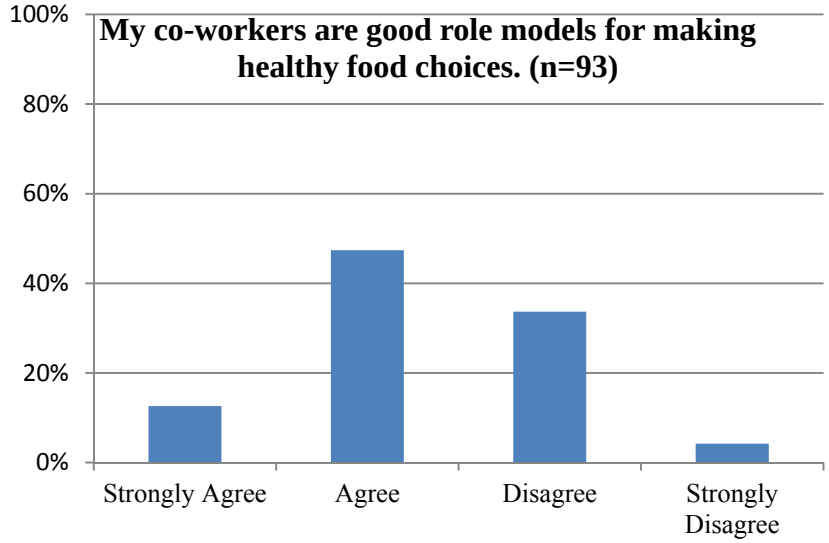
I see co-workers…

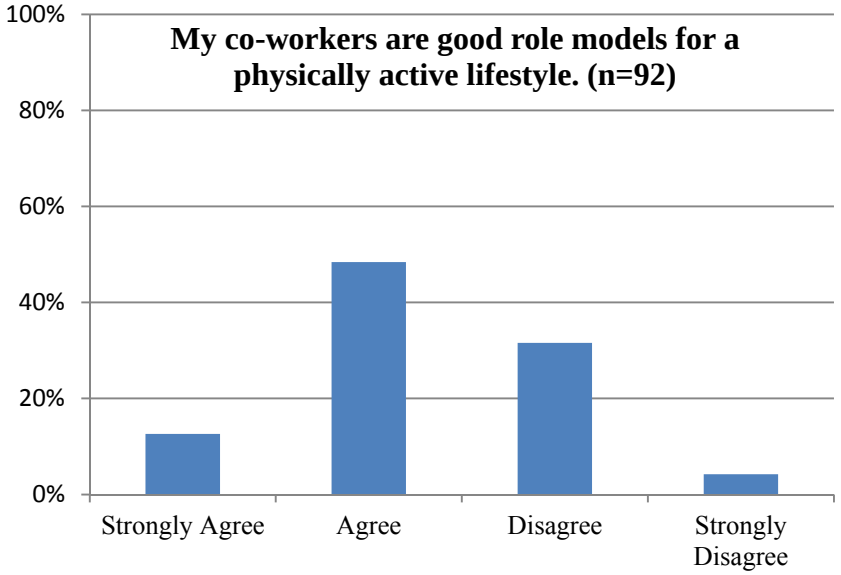




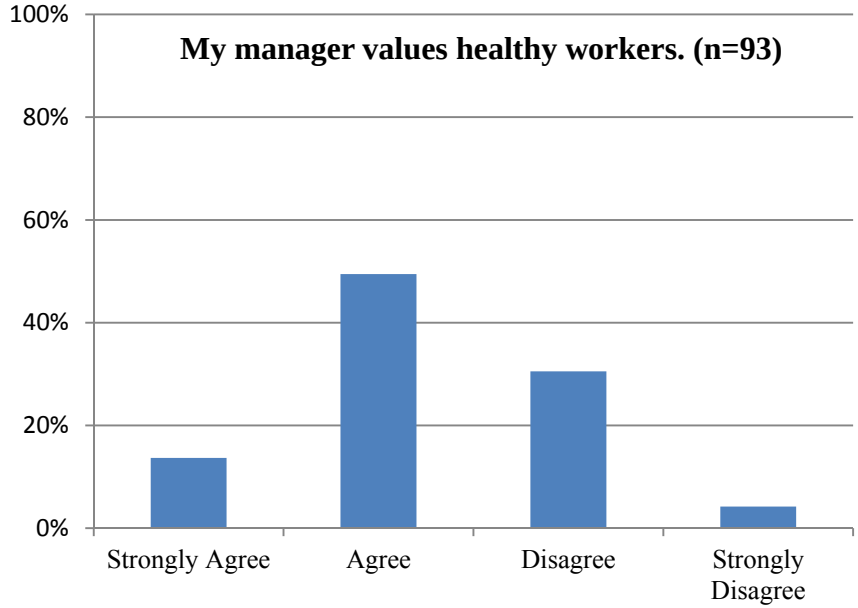


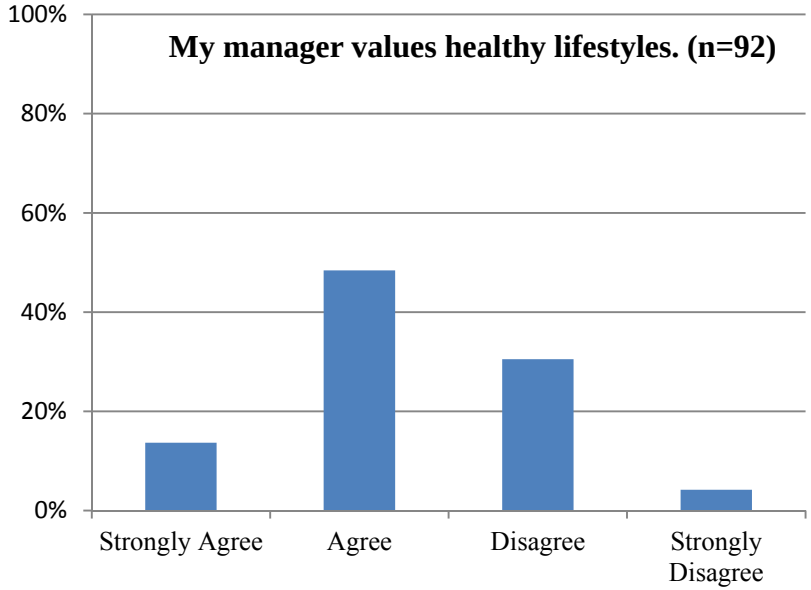
I see co-workers…





I see co-workers…





APPENDIX J: ENROLLMENT/COMPLETION BARRIERS AND MOTIVATORS (NDPP PARTICIPANTS)

Table 35: NDPP Completion Barriers

	Quite a bit/somewhat % (*n*)	Very little/not at all % (*n*)
It was hard to get enough physical activity on work days.	100% (4)	0% (0)
The classes were not scheduled at a convenient time.	75% (3)	25% (1)
I did not understand the time commitment at the beginning of the program.	50% (2)	50% (2)
It was hard to find healthy food at my workplace.	50% (2)	50% (2)
I was not ready to make changes to my lifestyle.	33% (1)	67% (2)
There were not enough incentives to complete the program (money or prizes).	25% (1)	75% (3)
I did not receive support from my family.	0% (0)	100% (4)
I did not receive support from my coworkers.	0% (0)	100% (4)
I did not receive support from my manager.	0% (0)	100% (4)

Table 36: Factors Motivating Employees to Enroll in NDPP

	Strongly agree/agree % (*n*)	Strongly disagree/disagree % (*n*)
I was ready to make changes to my lifestyle.	83.3% (10)	16.7% (2)
I could find healthy food at my workplace.	83.3% (10)	16.7% (2)
My doctor told me that I was at risk for developing type 2 diabetes.	66.7% (8)	33.3% (4)
I received support from my family.	66.7% (8)	33.3% (4)
I could find time to get enough physical activity on days that I work.	66.7% (8)	33.3% (4)
The classes were scheduled at a convenient time.	58.3% (7)	41.7% (5)
There were incentives to complete the program (money or prizes).	58.3% (7)	41.7 (5)
I received support from my coworkers.	50% (6)	50% (6)
I received support from my manager.	41.7% (5)	58.3% (7)

Table 37: Factors That Helped Employees Complete NDPP

	Quite a bit/somewhat % (*n*)	Very little/not at all % (*n*)
The classes were scheduled at a convenient time.	100% (6)	0% (0)
I understood the time commitment at the beginning of the program.	100% (6)	0% (0)
I could find healthy food at my workplace.	100% (6)	0% (0)
I was ready to make changes in my lifestyle.	100% (6)	0% (0)
I received support from my family.	66.7% (4)	33.3% (2)
I could find time to get enough physical activity on work days.	66.7% (4)	33.3% (2)
There were incentives to complete the program (money or prizes).	66.7% (4)	33.3% (2)
I received support from my lifestyle coach.	50% (3)	50% (3)
I received support from my coworkers.	50% (3)	50% (3)
I received support from my manager.	16.7% (1)	83.3% (5)

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Key Informant C. (2016, April 7, 2016) */Interviewer: J. Osgood*.

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