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HealthLinks randomized controlled trial: Design and baseline results

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ABSTRACT

Small employers, especially those in low-wage industries, frequently lack the capacity and resources to implement evidence-based health promotion interventions without support and assistance. The purpose of this paper is to (a) describe the intervention design and study protocol of the *HealthLinks* Trial and (b) report baseline findings. This study is a three-arm randomized controlled trial testing the impact of the *HealthLinks* intervention on worksites' adoption and implementation of evidence-based interventions. Group 1 will receive *HealthLinks*, Group 2 will receive *HealthLinks* plus wellness committees, and Group 3 will be a delayed control group. Seventy-eight employers are participating in the study; and 3302 employees across the worksites participated in the baseline data collection. Employers and employees will participate in follow-up surveys at one and two years after baseline to measure implementation (one year) and maintenance (two years) of *HealthLinks* interventions. Study outcomes will determine whether *HealthLinks* is an effective approach to increasing evidence-based health promotion in small, low-wage worksites and whether wellness committees are a capacity-building tool that increases *HealthLinks*' effectiveness.

1. Introduction

Cancer and other chronic diseases are leading causes of death in the United States [1,2]. Several preventable risk behaviors, including inadequate physical activity, poor eating habits, missed cancer screenings, and tobacco use, increase disease risk [3–5]. Evidence-based interventions (EBIs) significantly improve each of these risk behaviors [6]. The challenge is to implement these interventions successfully in community settings, especially settings that reach people with low income and/or less education, who are at greatest risk.

Worksites can implement EBIs to support employees' cancer screening, healthy eating, physical activity, and tobacco cessation; they can also promote evidence-based services, such as state-sponsored tobacco quit lines. However, most worksites do not offer health promotion programs that address all of these behaviors (evidence-based or otherwise) [7]. Many employers cite lack of capacity (staff expertise and time) as a key barrier to implementing EBIs [8,9], and employers who have dedicated staff time to health promotion are more likely to have EBIs in place [7,10]. However, research addressing these implementation issues for worksites wishing to offer EBIs has not kept pace with research developing new worksite interventions [11]. The present study addresses both of these gaps. We will test the effectiveness of a worksite health promotion program and we will also advance implementation research by testing the impact of adding a capacity-building component to the worksite health promotion program. We are doing this study with small worksites (20–200 employees) in low-wage industries, which are generally least likely to have health promotion programs and most likely to need implementation assistance [12,13].

We partnered with the American Cancer Society (ACS) to create and test *HealthLinks*, a program to disseminate EBIs to small worksites and provide implementation support. The EBIs are from the *Guide to Community Preventive Services* and include using small media to promote cancer screening, increasing access to and awareness of healthy food options, increasing access to physical activity facilities, using point-of-decision prompts to promote physical activity, sponsoring physical activity programs that offer individual choice of activity and increased social support, and telephone-based support for tobacco cessation (see Table 1) [6]. The *HealthLinks* approach is based on Greenhalgh's diffusion of innovations framework [14], as well as Rogers' diffusion of innovations theory [15]. We pilot-tested *HealthLinks* with 23 small worksites; it significantly increased their implementation of EBIs [16]. A second pilot-test with 47 small worksites also showed a significant

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Table 1
Evidence-based interventions promoted in *HealthLinks* and *HealthLinks*+.

Behavior	*Community Guide*-recommended EBIs compatible with worksites	Interventions promoted in *HealthLinks* and *HealthLinks*+
Breast, cervical, and colon cancer screening	• Use small media, such as posters and brochures	• Distribute brochures and post posters to educate workers about cancer screening guidelines
	• Provide group education	• Provide brief education sessions at the worksite, including benefits of screening and information about costs/insurance coverage
	• Reduce out-of-pocket costs of screening	• Promote the Washington Breast, Cervical, and Colon Health Program to uninsured workers; include information about local providers, screening free of charge, and treatment coverage for those diagnosed with cancer
		• Promote benefits coverage at those worksites with insurance benefits
Healthy eating	• Increase access to and awareness of healthy food options	• For worksites that sell food, create policies to offer healthy options, label them, and price them competitively
	• Increase access to healthy food options	• For all worksites, create policies to support offering healthy foods at meetings and events
Physical activity	• Increase access to facilities	• Negotiate discounts at local gyms for workers
	• Use point-of-decision prompts	• Post "Use the Stairs" signs
	• Offer programs with individual choice of activity	• Offer ACS *Active for Life* program [25], an evidence-based program that offers individual choice of activity and builds social support
	• Increase social support	
Tobacco cessation	• Offer telephone-based support	• Promote the Washington State Tobacco Quit Line via brochures and other small media; include information about quit line services
	• Reduce out-of-pocket costs for medications and counseling	
	• Reduce out-of-pocket costs for medications and counseling	• Promote benefits coverage at those worksites with insurance coverage for tobacco cessation

increase in EBI implementation; [17] both studies showed absolute increases >20% (worksites are scored 0–100% on their implementation of a set of EBIs).

In this study, we will formally test a) *HealthLinks* and b) the effect of adding worksite wellness committees (to build internal capacity [14,15,18]), on worksites' adoption, implementation, and maintenance of EBIs. We will also measure the effect of *HealthLinks* on employees' health behaviors, perception of EBIs at their worksites, and productivity and job satisfaction. Our study design was guided by the HPRC Dissemination and Implementation Framework (see Fig. 1), a practical framework for studying and promoting the dissemination and implementation of EBIs to organizational settings such as worksites [19]. The purpose of this paper is to describe the study protocol and the baseline characteristics of participating employers and employees.

2. Methods

Below, we use three terms in specific ways. *Worksite* refers to both the physical location and the organization for which employees work. *Employer* refers to the decision-maker(s) at the worksite who decide whether to participate in the study, complete worksite-level measures, and decide which EBIs to adopt and implement. *Employees* refer to individuals employed at the worksite. In addition, we refer to the EBIs as *best practices* in all intervention materials and communications with employers.

2.1. Study aims and overview

The *HealthLinks* Trial is a three-arm randomized controlled trial with the overall goals of testing *HealthLinks*' effectiveness in small, low-wage worksites and testing whether incorporating wellness committees into *HealthLinks* increases its effectiveness. The three arms are (a) *HealthLinks*, (b) *HealthLinks* plus wellness committees (*HealthLinks*+), and (c) delayed control (worksites in this arm will have the opportunity to participate in *HealthLinks* after completing their final follow-up data). The primary aim of the study is to improve worksite adoption of best practices. We hypothesize that worksites receiving *HealthLinks* will implement more EBIs than worksites in the delayed control group. The primary outcome is the proportion of the best practices *HealthLinks* promotes that participating worksites implement. The secondary aim of the study is to improve employees' awareness of health promotion activities at their worksites and their health behaviors and risk factors. We hypothesize that each of these secondary outcome measures will improve among employees of worksites receiving the *HealthLinks* intervention compared with employees in the delayed control group. Worksites and their employees will be enrolled in the study for 2 years and will be assessed at baseline, one year (following delivery of *HealthLinks*) and two years (the year between the first and second year follow-ups is intended to measure maintenance). Fig. 2 shows the overall study design.

2.2. Ethical approval

The University of Washington Institutional Review Board reviewed all study materials and procedures. Following their approval, we registered the study at Clinicaltrials.gov (NCT02005497).

2.3. Setting and recruitment

The study is being conducted in King County, Washington, which includes the Seattle metropolitan area. We recruited worksites through two primary methods. First, we purchased a list of companies meeting our size and industry eligibility criteria from Survey Sampling International (Shelton, CT). We randomly sequenced the list and called the companies. Companies were contacted up to 15 times before being retired from the list. Second, we used new and existing partnerships with local health insurers and brokers to identify companies. Two insurers, three brokers, and one employer association identified companies that they believed met our eligibility criteria and made either introductory calls or emails to refer them to our study. We then contacted these companies to screen them for interest and eligibility (screening procedures described in detail below). In addition, a few companies heard about the study through word of mouth or an article published in the employer association's newsletter and contacted us; these companies followed the same eligibility screening and enrollment procedures described below. Recruitment procedures are described in more detail in a separate paper (Hammerback et al., forthcoming).

2.4. Eligibility criteria and screening procedures

Our eligibility criteria include worksite size (20–200 employees) and industry based on NAICS code (accommodation and food services; arts, entertainment, and recreation; education; health care and social assistance; other services excluding public administration; and retail trade). As many *HealthLinks* best practices occur at the worksite

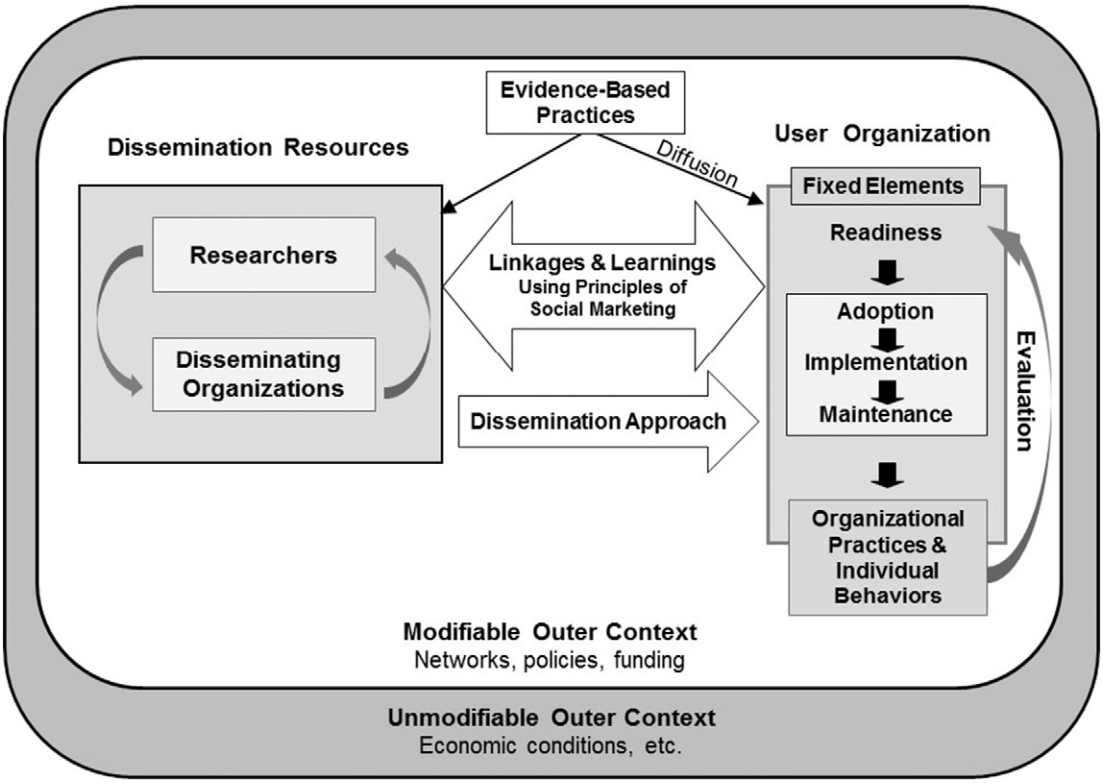

Fig. 1. HPRC dissemination framework.

location, we required that at least 20% of employees report to a physical worksite at least once per week. About half of new small businesses fail in their first 5 years; [20] to minimize loss of enrolled companies to business failure, we required the worksite to have been in business for at least 3 years. Finally, worksites were ineligible if they already had a wellness committee (as we intended to randomize worksites to form wellness committees or not, we needed to ensure that none already had a wellness committee).

Once we established contact with a prospective employer, we briefly described the *HealthLinks* Trial. If the employer was interested in learning more about the study, we screened them for the eligibility criteria described above. In order to participate, eligible employers had to be willing to a) be randomized to treatment or comparison groups, b) allow their employees to complete brief surveys at the worksite at baseline, 12 months, and 24 months follow-up, and c) complete all study activities, including going through the *HealthLinks* or *HealthLinks+* protocol if assigned to one of the treatment groups and completing worksite measures at baseline, 12 months, and 24 months follow-up. We attempted to contact 851 employers, and screened 452 for eligibility. Of these, 265 were ineligible and 60 were not interested in learning more about the study. One hundred twenty-seven employers were both eligible and interested in learning about the study; we scheduled visits to these employers to describe the *HealthLinks* Trial fully. Forty-nine of those who were visited then declined participation, for a total of 109 eligible employers declining participation (see Fig. 3).

2.5. Enrollment

One or two members of the research team visited each prospective employer to describe the *HealthLinks* Trial and answer employers' questions about participating in the study. Employers who wanted to participate completed three steps prior to being randomized to one of the study arms: 1) they signed a memorandum of understanding (MOU), which outlines the basic study procedures and expectations for data collection; 2) they completed the worksite profile and baseline *Implementation survey*, which measures the worksites' current implementation of EBIs; and 3) they collaborated with research staff to administer the employee survey to their employees. Research staff administered the employee survey at the worksite to all eligible employees willing to participate. Seventy-eight employers completed all of these procedures and were randomized to one of the three study arms using stratified randomization as described below (see Fig. 3).

2.6. Power calculation

The study is powered for the primary outcome of total best practice score. Initial power calculations for this study estimated that a final sample size of 75 companies (25 in each arm) would be needed to have 80% power to identify a 10 percentage point difference in total best practice score between the *HealthLinks* group and the delayed control group and a 15 percentage point difference between the *HealthLinks+* group and the delayed control group at the 5% significance level. The calculation was based on an assumption that the proportion of best practices for the delayed control group has mean 0.3 with standard deviation 0.2 (based on our previous studies with similar interventions [21–23]). A post-hoc power calculation was performed based on the baseline data as shown in Table 3, which reveals that the study has 80% power to detect a smaller difference of 4 percentage points between the *HealthLinks* group and the delayed control group and a 8 percentage point difference between the *HealthLinks+* group and the delayed control group.

2.7. Randomization

Randomization procedures were completed by research staff who did not have contact with employers during the recruitment and enrollment processes. We blocked randomization on three characteristics: worksite size (20–49 v. 50–200), interventionist (Interventionist 1 v. Interventionist 2), and industry (arts, entertainment, and recreation/

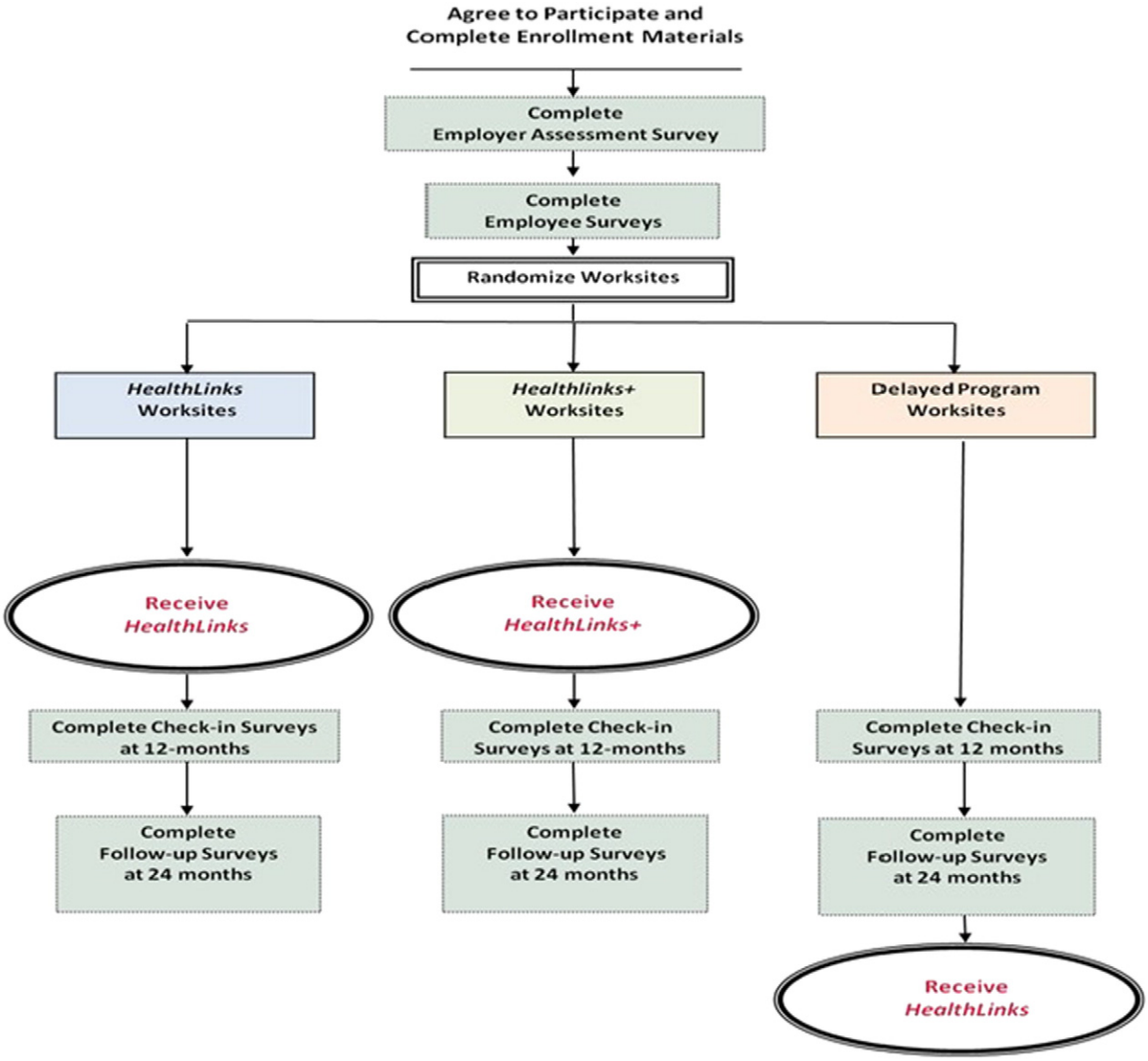

Fig. 2. Study design.

education/health care and social assistance v. accommodation and food services/other services excluding public administration/retail trade). Industry groups were categorized based on our past studies' findings showing that some industries are more likely to participate in health promotion studies than others [12,24]; we wanted to ensure that industries likely to be underrepresented (the second group) were evenly distributed across the three study arms. The statistician developed a random numbers table based on these blocking criteria. Study staff alerted the data manager when an employer completed all of the data requirements for enrollment; the data manager assigned the employer to study arm based on the random numbers table. Research staff then telephoned or emailed the employer to inform them of their assignment.

2.8. HealthLinks and HealthLinks + interventions

The *HealthLinks* intervention was developed in partnership with the American Cancer Society, which serves as the disseminating organization for our workplace interventions. The *interventionist* is usually staffed by ACS (the current study includes both ACS and the University of Washington staff as interventionists, due to the large number of employers). When we test the interventions we co-develop, the *research staff* (who coordinate the study, design measures, and collect and analyze data) are based at the University of Washington.

2.8.1. HealthLinks

Worksites receiving *HealthLinks* go through the following procedures. In the Assessment phase (which occurs during study enrollment), research staff measure current worksite implementation of cancer screening, nutrition, physical activity, and tobacco cessation best practices (with the baseline worksite *Implementation survey*). In the Recommendations phase (months 1–2), the interventionist creates a tailored *Recommendations Report* based on the baseline *Implementation survey* responses and delivers the report in a face-to-face meeting with the employer. The *Recommendations Report* summarizes the worksite's current implementation of best practices and makes recommendations for improvements.

When the interventionist meets with the employer to deliver the *Recommendations Report*, she delivers *Implementation Toolkits* for each of the recommended best practices. The *Implementation Toolkits* include checklists outlining the steps to implement each best practice, as well as appropriate supporting materials. For example, the policy-oriented toolkits include relevant sample policies, a checklist for creating a new policy, and a timeline. The toolkits promoting state resources include ready-to-post (or distribute) posters, brochures, and email text describing the resources and eligibility criteria and how to access the resources. The Recommendations phase concludes with the interventionist and the employer creating an implementation plan focused on 3–5 best

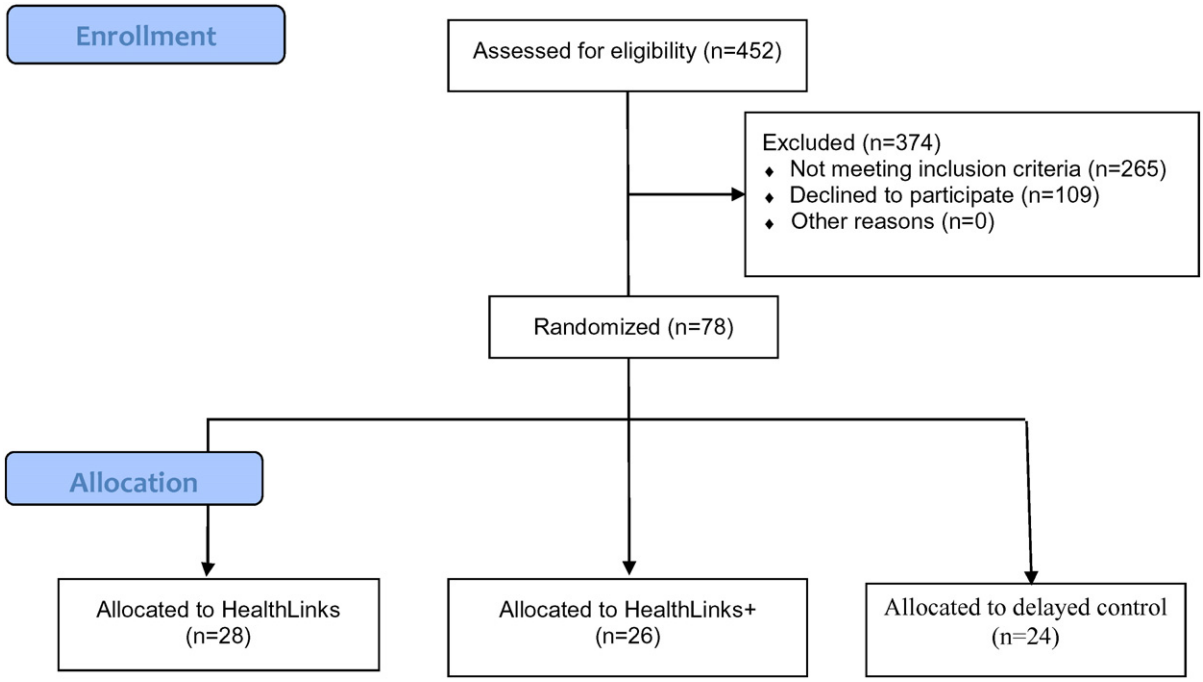

Fig. 3. CONSORT recruitment diagram.

practices chosen by the employer. The implementation plan includes a schedule of future visits or contacts with the interventionist, and how to promote the newly adopted best practices to employees.

During the implementation phase (months 3–12), the employer begins implementing the recommended best practices and promoting them to employees. The interventionist may offer brief education sessions at the worksite to employees to help present or start newly implemented best practices. For example, if a worksite implements *Active for Life* [25] (a physical activity program), the interventionist delivers a presentation to employees introducing them to the program, summarizing the program steps, and giving information about recommended physical activity levels and creative ways to fit more physical activity into the workday. Worksites with Spanish-speaking employees also receive Spanish-language versions of any materials for direct distribution to employees; one of the interventionists speaks Spanish and is able to deliver these presentations in Spanish if needed. The interventionist contacts employers once per month by email or telephone during this period to offer implementation assistance; employers may contact the interventionist at will.

After the implementation phase, worksites enter the maintenance phase (months 13–24). They will be able to contact the interventionist for technical assistance. The interventionist will not proactively contact worksites during this period.

2.8.2. HealthLinks +

The *HealthLinks* + protocol is the same as described above, with one addition. First, the interventionist recommends that the employer form a wellness committee during the *Recommendations Report* meeting. She provides an *Implementation Toolkit* for wellness committees and offers to help form the committee, structure kick-off meetings, etc. The role of the wellness committee is to lead implementation of the worksite's selected best practices. The interventionist attends the initial wellness committee meetings, with the goal of helping the wellness committee develop a regular meeting schedule and a best practice implementation plan. Although there is still a single person at the worksite tasked with being the main point of contact for the *HealthLinks* Trial, the interventionist works with the wellness committee to implement best practices (whereas in the standard *HealthLinks* condition, the interventionist is usually working with the main contact person).

2.8.3. Delayed control group

Worksites in the delayed control group will not receive either version of the *HealthLinks* intervention for 2 years. After they provide their 2-year follow-up data, we will offer them the opportunity to participate in *HealthLinks*.

2.9. Measures & data collection procedures

We collect measures at both the worksite and employee levels. Below, we describe main outcome measures as well as descriptive and process measures we will collect from worksites and employees.

2.9.1. Worksite descriptive and outcome measures

Once an employer agreed to participate, we collected information about the characteristics of the worksite with the *Worksite Profile* survey. This survey measures *antecedents* in our dissemination and implementation framework: worksite industry, size, average annual salary, annual employee turnover, and percentage of workforce employed full-time, insured by the employer, and belonging to a union. It also captures whether the worksite is the company's headquarters and workforce demographic characteristics (race/ethnicity, age, and gender). The *Worksite Profile* survey was administered at the same time as the baseline *Implementation survey* (after the worksite agreed to participate and prior to randomization).

The *Implementation survey* measures best practice *adoption* and *implementation* in our model, and includes items that characterize worksite implementation of best practices promoting cancer screening, healthy eating, physical activity, and tobacco cessation. The primary outcomes for this study are assessed with this survey. For each of the best practices, the survey includes 5–10 items assessing level of implementation. For example, for the physical activity best practice of offering programs with individual choice of activity, items include: 1) does the worksite offer a physical activity program (the remaining questions are asked of employers who do offer a program), 2) how many months does the program run, 3) what percent of employees have access to the program, 4) does the program allow participants to choose their own types of activities, 5) does the program allow participants to set their own physical activity goals, 6) does the company promote the physical

activity program to employees, 7) what communication channels are used, and 8) how frequently are these communications sent. Items are combined using a weighted algorithm to form an implementation score from 0 to 1.00 for each best practice, with 0 indicating no implementation and 1.00 indicating full implementation. The *Implementation survey* was administered at baseline to our main contact at each worksite either in-person or by telephone (prior to randomization), and will be administered again at 12 months, and 24 months follow-up (the 24 months follow-up will measure *maintenance* of the adopted best practices).

2.9.2. Employee surveys

We will collect measures from employees at all participating worksites at baseline, 12 months, and 24 months follow-up. Our primary goal with the *Employee* survey is to learn whether the worksite's implementation of best practices has any effect on employees' health behaviors (*individual behaviors* in our model). We will measure employees' demographic characteristics, overall health status, awareness of best practices at their worksite, and current health behaviors regarding cancer screening, nutrition, physical activity, and tobacco cessation. Most of these items were adapted from the Behavioral Risk Factor Surveillance System survey questionnaire (http://www.cdc.gov/brfss/questionnaires/index.htm); we also used Godin's leisure time physical activity measure [26]. We include validated measures of employees' depression risk [27], perceived stress [28], health-related productivity [29], and job satisfaction [30], as these are risk factors and outcomes of interest to employers. We offer the employee surveys in four languages, English, Spanish, traditional Chinese, and Vietnamese; these are the most common languages spoken in King County [31].

We work with each employer to identify an appropriate date and time for administering employee surveys at the worksite. We promote the survey to employees in advance using the communication channels the employer believes will reach the most employees. We also offer employees a small cash incentive ($5) to complete the survey. The survey is administered to all employees who are willing to participate and who meet the eligibility criteria (able to read one of the four survey languages, age > 20). The survey packets contain the survey, a brief cover letter about the project and the employer's support for the survey, and the $5 incentive. Employees who do not wish to complete the survey are not required to participate.

2.9.3. Process measures

In addition to the outcome measures described above, we collect process measures at both the worksite and employee levels. These measures should provide insights into why the *HealthLinks* and *HealthLinks* + interventions are or are not effective. The interventionists collect the following process measures at worksites in the *HealthLinks* and *HealthLinks* + arms of the study. For each meeting with the employer, the interventionist logs the meeting date, duration, attendees, engagement of attendees in the meeting, and implementation barriers anticipated or reported by employers. The interventionist logs the date and number of attendees at the education sessions for employees; she also logs which *HealthLinks* communications materials are distributed at the worksites. The interventionist tracks physical activity program kick-off date, number of participating employees, and type of support materials provided. In addition, the interventionist logs every employer-initiated contact (date and what was requested). For worksites receiving *HealthLinks* +, the interventionist tracks the wellness committee meetings (dates, attendance, and topics covered). These process measures document a) that *HealthLinks* was delivered as intended, b) worksites' requests for implementation support, and c) the implementation barriers worksites encountered.

At the employee level, we include items in the *Employee* survey that measure employees' awareness of worksite best practices. We will measure employees' participation in best practices, (awareness of best practice policies, awareness and perceived usefulness of worksite communications and educational presentations, and awareness of and participation in programs). These process measures will enable us to test whether employees' awareness and perception of worksite implementation changed over the 24-month study period, and whether change was in accordance with worksites' reported best practice implementation.

2.10. Statistical analysis

Descriptive statistical analyses were performed, where the general characteristics of the participants were summarized using percentages for categorical variables and means (standard deviations) for continuous variables. Tests for equality of distributions were performed using one-way ANOVAs and chi-squared tests. For both the primary and the secondary outcomes, we propose to study the longitudinal trajectories of outcomes over three time points. Since the data from the same worksite are correlated at those three time points, we propose to analyze the data using a generalized estimating equation with an autoregressive correlation structure. A robust standard error will also be used to ensure proper inference should the working correlation structure be mis-specified.

3. Results

3.1. Baseline worksite characteristics and best practice implementation.

Seventy-eight worksites were enrolled in the study and randomized between December 2013 and November 2014; this represents 42% of the eligible worksites we screened and 61% of eligible worksites who completed recruitment visits (see Fig. 3). Table 2 shows worksite characteristics and employer-reported employee demographic characteristics by study arm. Worksite characteristics were generally very similar across the three study arms in terms of average size (73–79 employees), annual salary ($38,086–$43,038/year), and proportion of employees enrolled in the worksite's health insurance plan (81–84%). Less than 5% of the worksites were self-insured. Worksites reported similar proportions of racial/ethnic minority employees (31–35% non-white employees; 9–14% Latino employees), and that the vast majority of employees speak English (92–97%). The majority of employees were female, though the proportion of female employees by study arm approached significance (58–71%, $p < .09$).

Table 3 shows worksite implementation of *HealthLinks* best practices at baseline. Worksites reported highest implementation for policy best practices, particularly related to limiting tobacco use and healthy foods and beverages. Implementation of policies to support physical activity was much lower (<.20). Implementation of physical activity programs was even lower (<.10), as was implementation of all communication best practices. Total best practices scores ranged from .17–.21 implementation, with no significant differences by study arm ($p = 0.31$).

3.2. Baseline employee survey results: demographic characteristics, perceptions of best practice implementation, and health behaviors

Across 78 worksites, 3302 employees completed surveys. This represents 56% of all employees at the worksites, and 77% of employees who are at the worksite at least 20 h per week. Table 4 shows demographic characteristics of the employees who completed surveys. Employees were 40 years old on average, and 65% were female. 44% reported racial/ethnic minority status (38% non-white, 9% Latino). Most employees reported at least some college education (83% some college or technical school, or college graduate), and nearly half (44%) reported household incomes less than $50,000 (substantially lower than King County's median household income of $71,811 in 2009–2013, http://quickfacts.census.gov/qfd/states/53/53033.html).

In general, employees reported low implementation of *HealthLinks* best practices at their worksites (see Table 5), expressing either neutral responses or disagreement with statements such as “My worksite offers

Table 2
Worksite characteristics by study arm (employer assessment, n = 78).

	Intervention arm					
	Control (n = 24)		Standard *HealthLinks* (n = 28)		*HealthLinks* with wellness committee (n = 26)	
	Mean (SD)	Percent	Mean (SD)	Percent	Mean (SD)	Percent	p value
Company characteristics							
Total employees	73.08 (46.78)		79.32 (49.57)		74.38 (51.35)		0.92
Annual salary	38,086 (11,135)		38,866 (12,127)		43,038 (14,225)		0.41
Percent full-time employees	74.16 (24.17)		77.30 (22.11)		75.58 (26.01)		0.90
Percent union membership	0.70 (3.34)		5.96 (20.69)		2.38 (11.76)		0.41
Company tax status							0.82
Nonprofit		62.50%		53.57%		57.69%	
For profit		37.50%		46.43%		42.31%	
Company offers health insurance to employees		91.67%		100.00%		96.15%	0.31
Company is self-insured		0.00%		3.57%		4.00%	
Employees eligible for health insurance		86.36%		84.04%		80.44%	
Employees enrolled in health insurance		84.14%		81.36%		81.88%	
Industry[a]							0.60
Accommodation and food services		12.50%		7.14%		7.69%	
Arts, entertainment, and recreation		0.00%		0.00%		11.54%	
Educational services		12.50%		7.14%		11.54%	
Health care and social assistance		37.50%		50.00%		42.31%	
Other services (except public administration)		33.33%		10.71%		15.38%	
Retail trade		4.17%		25.00%		11.54%	
Employee demographics							
Race							
White		66.83%		64.58%		69.18%	0.85
Black		10.44%		10.29%		9.09%	0.95
American Indian/Alaska Native		1.12%		1.52%		0.48%	0.70
Asian–Pacific Islander		12.17%		15.78%		10.77%	0.63
Multi-racial		4.06%		3.75%		4.48%	0.92
Other race		3.56%		4.74%		3.14%	0.83
Ethnicity							
Hispanic or Latino		9.25%		12.40%		14.08%	0.68
Language[b]							
English		97.26%		95.39%		92.32%	0.37
Spanish		5.88%		7.86%		21.00%	0.09
Chinese		3.50%		1.78%		2.17%	0.65
Vietnamese		1.00%		2.00%		2.00%	0.87
Other languages		4.60%		1.43%		5.67%	0.61
Age							
18–44		62.51%		64.75%		65.68%	0.87
45–64		34.55%		31.17%		29.92%	0.69
65+		2.93%		4.08%		4.40%	0.57
Sex							
Male		28.40%		42.20%		34.48%	0.09
Female		71.60%		57.76%		65.52%	0.09

[a] Industry as identified by NAICS code.
[b] Total exceeds 100% due to report of bilingual employees speaking both English and another language.

healthy foods at meetings or other company events" or "My worksite supports me in trying to live an active life." When asked yes/no questions about the presence of healthy foods and beverages, physical activity programs, a written tobacco policy, and communications about the tobacco quit line, the majority of employees said these were not present at their worksites or that they did not know. Employees were least likely to perceive communications and support related to cancer screening. Overall, they neither agreed nor disagreed with the statement that their worksites supported them in living a healthy life (mean 3.32, SD 0.96).

Employees' self-reported health behaviors are presented in Table 6, along with overall health status, BMI, depression risk, perceived stress, and job satisfaction. The majority of employees reported eating fewer than five servings of fruits and vegetables per day (72%). Fewer employees reported eating fast food one or more times per week (25%), eating while doing other tasks (35%), or current smoking (13%). Nearly half reported overweight (30%) or obesity (18%). Nearly half of employees (44%) reported inadequate leisure time physical activity. Among gender and age-eligible employees, 19% had missed or were late for one or more cancer screenings. Most employees reported being in good-to-excellent health; 12% reported fair or poor health. Ten percent of employees were at-risk for depression and 12% reported high stress. Employees were generally satisfied with their jobs (mean = 3.94, SD = 1.65) and reported low health-related absenteeism and presenteeism in the past week. In general, employees reported very similar behaviors across study arms.

4. Discussion

The *HealthLinks* Trial is the first study to test *HealthLinks* using a randomized design with a control group. Testing the incremental benefit of adding wellness committees to *HealthLinks* on both implementation of best practices and their maintenance after *HealthLinks* ends is another contribution of this study. We will capture both employers' and employees' experiences with *HealthLinks*, providing a multi-level perspective of the impact of the intervention with and without wellness committees. All of the employers in the delayed control group will have the opportunity to participate in *HealthLinks* at the close of the study.

Table 3
Worksite best practices implementation (employer assessment, n = 78).

	Intervention arm						
	Control (n = 24)		Standard *HealthLinks* (n = 28)		*HealthLinks* with wellness committee (n = 26)		
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	p value
Policy best practices[a]							
Tobacco	0.66	0.26	0.70	0.23	0.70	0.24	0.76
Food	0.41	0.16	0.23	0.22	0.35	0.22	0.00
Beverages	0.71	0.26	0.66	0.30	0.65	0.32	0.93
Physical activity	0.19	0.12	0.16	0.09	0.17	0.09	0.49
Total policy score	**0.49**	**0.10**	**0.43**	**0.13**	**0.47**	**0.13**	**0.26**
Program best practices							
Physical activity	0.09	0.26	0.02	0.12	0.05	0.17	0.39
Total program score	**0.09**	**0.26**	**0.02**	**0.12**	**0.05**	**0.17**	**0.39**
Communication best practices							
Quit line	0.03	0.17	0.09	0.27	0.02	0.12	0.43
Tobacco	0.03	0.14	0.05	0.18	0.02	0.12	0.81
Beverages	0.03	0.17	0.03	0.15	0.06	0.21	0.82
Healthy eating	0.09	0.24	0.06	0.21	0.08	0.22	0.88
Physical activity	0.03	0.10	0.06	0.16	0.02	0.09	0.47
Breast, colon, and cervical programs	0.00	0.00	0.00	0.00	0.00	0.00	–
Cancer screening	0.03	0.13	0.02	0.13	0.09	0.25	0.37
Total communication score	**0.04**	**0.10**	**0.05**	**0.13**	**0.05**	**0.10**	**0.94**
Total best practice score[b]	**0.21**	**0.11**	**0.17**	**0.08**	**0.19**	**0.08**	**0.31**

Bold entries in Table 3 are summative scores for the best practices within each category.
[a] Individual best practices and best practice category totals are scored on a scale from 0 to 1.
[b] Total best practice score is the average of Total policy score, Total program score and Total communication score, also on a scale from 0 to 1.

Table 4
Employee characteristics by study arm (employee survey, n = 3302).

	Intervention arm						
	Control (n = 925)		Standard *HealthLinks* (n = 1234)		*HealthLinks* w/ Wellness committee (n = 1143)		
	Percent	Mean (SD)	Percent	Mean (SD)	Percent	Mean (SD)	p values
Race							0.12
White	67.24%		52.67%		55.91%		
Black	6.05%		10.62%		6.39%		
American Indian/Alaska Native	0.22%		0.49%		0.44%		
Asian	9.62%		16.37%		17.41%		
Native Hawaiian/Pacific Islander	0.86%		1.62%		1.92%		
Multi-race	7.78%		9.40%		9.45%		
Other	3.14%		4.38%		3.59%		
Prefer not to answer	5.08%		4.46%		4.90%		
Ethnicity							0.19
Not Hispanic or Latino	90.32%		85.51%		85.93%		
Hispanic or Latino	6.12%		10.49%		10.60%		
Prefer not to answer	3.56%		4.00%		3.47%		
Language of survey							0.13
English	97.62%		93.03%		98.08%		
Spanish	1.19%		4.38%		1.92%		
Chinese	0.32%		1.78%		0.00%		
Vietnamese	0.86%		0.81%		0.00%		
Age		40.49 (13.09)		40.48 (13.08)		39.85 (12.47)	0.84
Sex							0.35
Male	31.06%		38.04%		32.63%		
Female	68.94%		61.96%		67.37%		
Education							0.01
Elementary	1.10%		1.65%		0.80%		
Some high school	1.10%		3.87%		1.43%		
High school graduate or GED	6.17%		16.23%		10.97%		
Some college or technical school	19.82%		28.91%		23.37%		
College graduate	71.81%		49.34%		63.43%		
Annual household income							0.21
Less than $15,000	3.06%		7.14%		4.04%		
$15,000–$24,999	10.54%		13.44%		11.85%		
$25,000–$49,999	28.34%		30.53%		29.57%		
$50,000–$74,999	17.46%		18.11%		19.65%		
$75,000 or more	40.59%		30.78%		34.80%		

Table 5
Employee perceptions of best practices by study arm (employee survey, n = 3302).

	Intervention arm									
	Control (n = 925)			Standard *HealthLinks* (n = 1234)			*HealthLinks* w/ wellness committee (n = 1143)			
	Mean	Standard deviation	Percent	Mean	Standard deviation	Percent	Mean	Standard deviation	Percent	p values
Healthy eating										
"My worksite provides information about nutritious foods and healthy eating"[a]	2.09	1.16		2.25	1.23		2.15	1.22		0.58
"My worksite offers healthy foods at meetings or other company events."[a]	3.25	1.03		2.88	1.12		3.20	1.13		0.01
"My worksite sells healthy food items such as fruits, salads, or low-calorie snacks or meals."										0.90
No			63.65%			63.61%			66.67%	
Yes			27.29%			22.79%			22.22%	
Don't know			9.06%			13.61%			11.11%	
Health beverages										
"My worksite sells healthy beverages such as water, milk, or unsweetened teas."										0.81
No			51.10%			47.71%			47.27%	
Yes			41.85%			40.20%			43.34%	
Don't know			7.05%			12.09%			9.38%	
My worksite supports me in trying to eat healthy foods and drink healthy beverages."[b]	3.20	0.94		3.12	1.02		3.22	0.96		0.56
Physical activity										
"Is there a physical activity program at your worksite?"										0.39
No			79.08%			73.11%			73.70%	
Yes			7.45%			13.40%			13.81%	
Don't know			13.47%			13.49%			12.49%	
"At my worksite, taking a break for physical activity during work hours is:"[c]	3.20	1.27		3.29	1.26		3.08	1.30		0.11
"My worksite provides information about physical activity recommendations and how to meet them."[a]	1.74	0.96		1.85	1.05		1.84	1.02		0.60
"My worksite provides information about nearby gyms, parks, walking trails, or other places for physical activity."[a]	1.73	0.98		1.76	1.04		1.91	1.09		0.34
"My worksite supports me in trying to live an active life."[b]	3.16	0.89		3.14	1.02		3.16	0.97		0.96
Tobacco cessation										
"Have you ever seen information about a Tobacco Quit Line at your worksite?"										0.37
No			85.38%			78.53%			78.41%	
Yes			14.62%			21.47%			21.59%	
"My worksite provides information about quitting using tobacco."[a]	1.41	0.92		1.63	1.08		1.73	1.27		0.25
"My worksite supports me in trying to quit using tobacco."[b,d]	3.53	1.28		3.52	1.36		3.37	1.32		0.14
"My worksite has a (written) policy restricting tobacco use."										0.00
No			20.73%			25.88%			19.66%	
Yes			23.17%			34.03%			34.11%	
Don't know			56.10%			40.08%			46.23%	
Cancer screening										
"My worksite provides information about when men and women should be screened for cancer"[a]	1.32	0.80		1.49	0.95		1.59	1.44		0.01
"My worksite supports me in trying to obtain the recommended cancer screenings."[b]	2.74	0.96		2.69	1.06		2.80	0.99		0.38
Overall health										
"Overall, my worksite supports me in living a healthier life."[b]	3.32	0.88		3.30	1.02		3.33	0.95		0.93

[a] Likert-type scale, 1 = Never to 5 = Always.
[b] Likert-type scale, 1 = Strongly disagree to 5 = Strongly agree.
[c] 1 = Encouraged, 2 = Allowed, 3 = Allowed only during lunch or unpaid breaks, 4 = Not allowed, 5 = Don't know.
[d] Support for quitting tobacco is reported for current tobacco users only (n = 454).

4.1. Limitations and strengths

This study has several limitations, the most important of which is the low participation rate. The majority of the employers we attempted to recruit were unreachable or did not meet our eligibility criteria. Regardless of recruitment method, employers in some industries were more likely to participate than others, and more than half of the participating worksites have nonprofit tax status. Nearly two-thirds of employees in participating worksites are female (65%). All of these facts will limit our ability to generalize to the broad population of worksites meeting our size and industry eligibility criteria.

We also experienced some challenges gathering surveys from employees. Our original goal was that every employer had to achieve a 70% response rate for the employee surveys (using the total number of employees as the denominator), or they would not be enrolled in the study. However, employees were not to be pressured or coerced to take the survey if they did not wish to participate. Furthermore, many more worksites than anticipated had significant numbers of employees that were on-site only rarely. Given this, we revised our goal to 70% of all employees that are on-site at least 20 h per week. Employers were able to meet this goal. More than half of all employees completed surveys even with this revised goal, but there is a possibility that employee data will be less representative than if we were able to meet or exceed the original target response rate of 70% of all employees.

This study also has several strengths, including a robust research design, 2 years of follow-up data that will allow us to go beyond implementation to studying maintenance, and data from multiple sources. The employee measures include several measures of importance to employers when considering health promotion programs, including absenteeism, presenteeism, and job satisfaction. If *HealthLinks* implementation

Table 6
Employee health behaviors, depression/stress, productivity and job satisfaction by study arm (employee survey, n = 3302).

	Intervention arm						
	Control (n = 925)		Standard *HealthLinks* (n = 1234)		*HealthLinks* w/ wellness committee (n = 1143)		
	Percent	Mean (SD)	Percent	Mean (SD)	Percent	Mean (SD)	P values
Healthy eating							
Fruits and vegetables per day							0.36
Fewer than five servings	69.95%		73.85%		73.23%		
Five or more servings	30.05%		26.15%		26.77%		
Fast food per month							0.01
Fewer than 4/mo	74.27%		61.51%		69.64%		
4 or more times/mo	19.89%		28.53%		24.67%		
Missing	5.84%		9.97%		5.69%		
Soda per day							0.87
Fewer than 2	95.28%		94.84%		94.57%		
2 or more	4.72%		5.16%		5.43%		
Secondary eating							0.45
Sometimes/seldom/ never	63.51%		66.50%		63.70%		
Always/most of the time	36.49%		33.50%		36.30%		
Physical activity							
Leisure time activity (mean sessions per week)							
Strenuous		2.05 (2.17)		2.08 (2.58)		2.03 (2.99)	0.95
Moderate		3.06 (3.36)		3.00 (2.86)		2.96 (3.46)	0.94
Mild		3.85 (4.02)		3.57 (3.53)		3.73 (4.99)	0.52
Leisure time activity (sufficient for health benefits)[a]							
Minimal activity — low benefits	17.20%		18.77%		19.29%		
Moderate activity — some benefits	24.83%		24.59%		27.12%		
High activity — substantial benefits	57.97%		56.65%		53.59%		
Tobacco use							
Currently uses any tobacco product							0.08
Does not use	88.75%		82.12%		87.25%		
Current user	11.25%		17.88%		12.75%		
Cancer screening							
Cancer screening status							0.89
Missing one or more screenings	20.10%		23.57%		20.50%		
Current on all screenings	55.98%		46.13%		53.77%		
N/A	23.92%		30.29%		25.73%		
Depression and stress							
Depression risk							0.13
Not at risk	87.03%		81.52%		83.55%		
At risk	8.65%		11.35%		10.76%		
Missing	4.32%		7.13%		5.69%		
Perceived stress[b]		5.17 (2.89)	5.37 (3.02)	5.39 (2.95)	0.39		
Categorical stress[c]							0.08
Low stress	89.10%		86.90%		86.40%		
High stress	10.90%		13.10%		13.60%		
Work experience							
Productivity							
Absenteeism		0.02 (0.07)	0.03 (0.11)	0.03 (0.10)	0.01		
Presenteeism		0.12 (0.19)	0.13 (0.24)	0.13 (0.20)	0.90		
Job satisfaction[d]		3.90 (1.33)	4.01 (1.92)	3.89 (1.57)	0.33		
Categorical weight status[e]							0.92
Underweight	1.17%		1.85%		2.26%		
Normal	47.72%		44.68%		46.80%		
Overweight	32.16%		34.30%		30.36%		
Obese	18.95%		19.17%		20.58%		
Self-rated health[f]		2.45 (0.89)	2.53 (0.90)	2.51 (0.90)	0.45		
Excellent	14.41%		12.99%		12.99%		
Very good	37.49%		34.72%		36.66%		
Good	37.81%		40.20%		38.34%		
Fair	9.21%		10.54%		10.42%		
Poor	1.08%		1.55%		1.59%		

[a] Calculated based on some of strenuous and moderate physical activity, Godin and Shephard [26] and Godin [32].
[b] Perceived Stress Scale, scores range from 0 to 16.
[c] Perceived Stress Scale, dichotomized, Low stress <=8, High Stress > = 9.
[d] Likert-type scale, 1 = Completely dissatisfied to 5 = Completely Satisfied.
[e] Underweight BMI < 25, Normal weight BMI 25-29, Overweight BMI 30-34, Obese BMI > = 35.
[f] Likert-type scale, 1 = Excellent, 5 = Poor.

is associated with positive changes in these measures, employers will have a solid business case for choosing *HealthLinks*. In addition to the data provided by employers and employees presented in this paper, the interventionists are collecting process evaluation measures that will allow us to see whether and how intervention "dose" varies across employers and whether this is associated with implementation and maintenance success.

4.2. Contribution of the HealthLinks Trial

Much workplace health promotion research and practice is still focused on large employers. The *HealthLinks* Trial is reaching small employers and employees in six low-wage industries that employ 63 million people in the U.S. (www.bls.gov/oes/2012/may/oessrci.htm). This is an underserved audience with significant health risks, unlikely to be reached by current workplace health promotion vendors. Our past research suggests that relatively few employers in this group have the capacity to adopt and implement best practices using only self-directed tools [12,21,24]. *HealthLinks* gives employers tools and resources they can use on their own, but also provides on-site and free technical assistance. The *HealthLinks* + intervention adds tools and technical assistance in building a worksite's wellness committee, with the aim of increasing worksite capacity for health promotion and creating champions for health promotion.

The *HealthLinks* trial tests intervention impact at both the employer and employee levels, both immediately following *HealthLinks* implementation and maintenance one year later. We will examine employers' implementation of *HealthLinks* best practices and (in the *HealthLinks* + arm) wellness committees, as well as their satisfaction with the intervention. We will also examine employees' awareness, use of, and participation in *HealthLinks* best practices implemented by the employer, as well as their health behaviors and measures important to employers — productivity, job satisfaction, stress, and perception that their work environment supports their health. At the end of this study, we will know whether *HealthLinks* works as intended for employers, improves employee health, and has positive impact on productivity and morale.

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