



## *Comparative Effectiveness Review Disposition of Comments Report*

### **Research Review Title:** *Total Worker Health<sup>®</sup>*

Draft review available for public comment from September 15, 2015 to October 13, 2015.

**Research Review Citation:** Feltner C, Peterson K, Palmieri Weber R, Cluff L, Coker-Schwimmer E, Viswanathan M, Lohr KN. Total Worker Health<sup>®</sup>. Comparative Effectiveness Review No. 175. (Prepared by the RTI International–University of North Carolina Evidence-based Practice Center under Contract No. 290-2012-00008-I.) AHRQ Publication No. 16-EHC016-EF. Rockville, MD: Agency for Healthcare Research and Quality; May 2016. [www.effectivehealthcare.ahrq.gov/reports/final.cfm](http://www.effectivehealthcare.ahrq.gov/reports/final.cfm).

### **Comments to Research Review**

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Comments on draft reviews and the authors' responses to the comments are posted for public viewing on the EHC Program Web site approximately 3 months after the final research review is published. Comments are not edited for spelling, grammar, or other content errors. Each comment is listed with the name and affiliation of the commentator, if this information is provided. Commentators are not required to provide their names or affiliations in order to submit suggestions or comments.

The tables below include the responses by the authors of the review to each comment that was submitted for this draft review. The responses to comments in this disposition report are those of the authors, who are responsible for its contents, and do not necessarily represent the views of the Agency for Healthcare Research and Quality.



Commentator and Affiliation	Section	Comment	Response
Peer Reviewer #1	Quality of the Report	Good	Thank you.
Peer Reviewer #2	Quality of the Report	Superior	Thank you.
TEP Reviewer #1	Quality of the Report	Good	Thank you.
TEP Reviewer #2	Quality of the Report	Superior	Thank you.
Peer Reviewer #3	Quality of the Report	Good	Thank you.
Peer Reviewer #4	Quality of the Report	Good	Thank you.
TEP Reviewer #3	Quality of the Report	Good	Thank you.
Peer Reviewer #5	Quality of the Report	Superior	Thank you.
TEP Reviewer #4	Quality of the Report	Superior	Thank you.
Peer Reviewer #2	Executive Summary	Page 19 Line 34: <del>ne</del> only	Done.
Peer Reviewer #2	Executive Summary	Page 21 Line 49: <del>had</del> on randomization	Done.
Peer Reviewer #2	Executive Summary	Page 24 Line 58: 104- Weeks	Done.
Peer Reviewer #2	Executive Summary	Page 26 Line 13: consideration to workers	Done.
Peer Reviewer #2	Executive Summary	Page 27 Line 19: <del>drew</del> drew	Done.

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Commentator and Affiliation	Section	Comment	Response
TEP Reviewer #1	Executive Summary	ES-11, line 34. delete the word "not"	Done
Peer Reviewer #1	Introduction	The introduction and abstract clearly states the purpose of the review.	Thank you.
Peer Reviewer #2	Introduction	The target population was well defined and the key questions stated explicitly. I would suggest adding a decrease in physical inactivity as an intermediate outcome, independent of increased physical activity.	We list included outcomes in Table 1 of the Methods section. We note that "frequency of physical activity" is an included outcome and consider this to include any change in physical activity regardless of the direction of effect (i.e., increase or decrease in physical activity).
TEP Reviewer #1	Introduction	I think a paragraph summary of the state of the art of health promotion science, and a separate paragraph on the state of the art understanding of occ. safety & health programs alone would be helpful. Both have incredibly extensive literature. Although most readers of this document will be familiar with both, I would be worried that the media and less sophisticated readers would get the wrong impression from this, by thinking that there is almost no science behind it.	We have edited the Introduction to make it clear that our scope is focused only on integrated interventions. We did not add a detailed summary of the evidence supporting health promotion and health protection programs; this is beyond the scope of what we addressed in this report.
TEP Reviewer #1	Introduction	I did not get enough of an impression that the reader will understand exactly what you mean by "integrated interventions." it is a little too loose.	The text has been edited to clarify the range of meanings of "integration." However, there is variation in terms of what is meant by "integrated"; we note this as a limitation of the review.
TEP Reviewer #1	Introduction	ON first pass, it was not clear that key question #6 was needed, because it seems that identifying the gaps in #5 would cause one to automatically assume that we need to do more research in those areas to fill in the gaps.	The future research needs provide more specific guidance on what populations, interventions, outcomes and methods should be prioritized to fill the research gaps outlined in Key Question (KQ) 5.

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TEP Reviewer #1	Introduction	Page 2, line 5: pure health promotion programs are moving to outcomes-based ones, as promoted by the ACA. Many employers are stopping participation based incentives and self-reported behaviors.	We recognize that some of the studies were conducted in policy and programmatic contexts that may not be applicable to current employers. We note this in the Discussion under the Applicability section.
TEP Reviewer #2	Introduction	The introduction adequately addresses the intent of the review. Additional content could identify that the topic of this systematic review is very narrow in regards to the broad spectrum of worksite health promotion and OSH. The IE findings of this review should not be interpreted to mean that evidence on worksite interventions overall is insufficient.	We have edited the Introduction to make it clear that our scope is focused only on integrated interventions. The inclusion/exclusion criteria is also outlined in more detail in the Methods section.
Peer Reviewer #3	Introduction	The introduction is nicely written and covers the topic of TWH interventions well.	Thank you.
Peer Reviewer #4	Introduction	The introduction section is clearly written and updated with all background information on TWH initiative.	We appreciate this feedback.
TEP Reviewer #3	Introduction	Clear and explicit.	Thank you.

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Commentator and Affiliation	Section	Comment	Response
Peer Reviewer #5	Introduction	<p>The full-length commentary is provided as a footnote to this table.<sup>a</sup></p> <p>The issue is whether the use of a TWH program accompanied by some currently undefined level of enhanced collaboration between health and safety will actually produce different results from the programs without this enhanced level of collaboration between the health and safety departments. To assess this requires a comparison of organizations operating under the TWH with the organization operating health and safety programs that do not meet the definition of the TWH model. It is not enough to compare a TWH program to no program. For example to determine the added value of the TWH approach for a specific outcome, such as smoking cessation, injury reduction, or both, it would be necessary to compare the results for an organization that ran similar programs with and without the TWH umbrella. The authors address this issue only in the section of the report on Future Research Needs under the Comparators heading. This issue should be brought forward and also identified earlier in the report.</p>	<p>We agree that the lack of studies comparing an integrated program with a program that is not integrated (but which has similar OSH and HP services available to employees) is a limitation of this body of literature. We note this in KQ 5 (focused on evidence gaps), in KQ 6 (future research needs) and the Discussion. We have also edited the report to highlight this limitation in the abstract.</p>
Peer Reviewer #5	Introduction	<p>The full-length commentary is provided as a footnote to this table.<sup>a</sup></p> <p>There is also a need to define what level and form of collaboration transforms a program into a TWH program. This issue should be addressed in the report and is also an area that requires further research. Is TWH an over-riding philosophical approach to health and safety or can it be applied to a single or group of programs? Are there organizational or cultural factors that enhance or hinder success? Are results enhanced by a shared reporting structure or is it better if health and safety report separately, or does it matter?</p>	<p>We agree that this is an important area of future research and consideration by NIOSH's Total Worker Health (TWH) program. Defining what programs fall under the larger umbrella of TWH is not within the scope of our systematic review. However, we do note that there is variation in terms of what types of studies are considered to be TWH interventions in the Discussion; we acknowledge this as a limitation of the body of literature as well as a limitation of our review process.</p>

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Commentator and Affiliation	Section	Comment	Response
Peer Reviewer #5	Introduction	<p>The full-length commentary is provided as a footnote to this table.<sup>a</sup></p> <p>The Key Questions are explicitly stated and address most of the important issues. Key Question 1 does not include the need to assess what is meant by integration nor the issues discussed above. For Key Question 2, other outcomes that could have been assessed are healthcare costs and total health spending. Other harms to consider include additional cost of operating a TWH program (or if an organization could show that this approach lowered the cost of operating the program, this could be an added benefit). Another possible harm includes worker concerns, such as loss of privacy.</p>	<p>Defining integration and developing a detailed taxonomy for various types of integration is beyond the scope of this review. We note that the lack of a standardized definition of integration is a limitation of our review process.</p> <p>The scope of our review focused on outcomes that could be considered measures of worker health and safety; we did not assess healthcare costs and total health spending or other outcomes.</p> <p>For harms, we did not exclude outcomes that might reflect concerns about privacy of personal health information; no included studies measured this outcome. We clarified in the inclusion/exclusion criteria (Methods chapter) that concerns about privacy are a potential harm.</p>
TEP Reviewer #4	Introduction	<p>The Introduction provides a clear, brief historical summary of the development of the NIOSH TWH concept and rationale, as well as of the Institute's program guidelines to employers. (The report does not comment per se on these guidelines, nor does the literature review address the elements of those guidelines one at a time. In fact it would not be feasible to do so, as the extant literature has not evaluated these elements separately; as noted in the Introduction, typically a TWH program is multi-level with multiple elements combined so they cannot be distinguished with regard to attributable effectiveness. So I am not criticizing the literature review on this point; nonetheless, it might have been appropriate to acknowledge it in the report.)</p>	<p>We have edited the introduction to make the point that TWH programs are often multi-level and often combine various elements of integration (as well as specific content); we also note that studies have not isolated various attributes of integration sufficiently for us to be able to attribute effectiveness to any one element independently.</p>

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TEP Reviewer #4	Introduction	In general, the Introduction gives an excellent overview of the challenges in summarizing a disparate body of evidence, with different interventions and outcome metrics in a variety of settings. The authors also correctly point out that literature reviews may come to different conclusions because of how they choose from and manage these factors. The Analytic Framework provides a useful schematic for understanding the relationships among the outcome categories as well as the Key Questions.	Thank you.
Peer Reviewer #1	Methods	Methods and outcome measures are appropriate.	Thank you.
Peer Reviewer #2	Methods	The inclusion and exclusion criteria were justified and the methods used appropriate.	Thank you
Peer Reviewer #2	Methods	Page 42 Line 55: peer reviewed. We	Done.
TEP Reviewer #1	Methods	Given the paucity of research on integrated interventions, I think the methods were appropriately broad.	Thank you.
TEP Reviewer #1	Methods	Figure B is very clear on disposition, but very depressing that so few met criteria. The lack of rigor in this field should be stressed, and hopefully addressed by the right funding sources in a call to action as a result of this document.	This report will be used by a NIH Pathways to Prevention workshop panel charged with making recommendations about research gaps and future research needs on TWH. We stress methodological deficiencies in this literature in Key Question 5 and 6
TEP Reviewer #1	Methods	You note that baseline surveys among eligible workers were low or not reported. Could that indicate that many workers don't care about this stuff, or don't trust their employer to do it? Or that the wrong interventions are being crafted? Or something else?	This is uncertain. There are many reasons for low survey participation rates in general, but none of the included studies assessed reasons for non-participation in the baseline survey.

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TEP Reviewer #1	Methods	Unfortunately, the old age of the HP studies that made your cut are seriously outdated and no longer what companies actually do for HP, because they had no ROI	We recognize that some of the studies were conducted in policy and programmatic contexts that no longer apply. This issue is addressed in the Discussion section of the report under the Applicability section.
TEP Reviewer #1	Methods	Page 58, line 20. Unfortunately, companies don't care about studies of less than one year. They only care about sustainability and long term behavior change.	We agree that the duration of included studies is a limitation; very few studies measured outcomes beyond one year.
TEP Reviewer #1	Methods	Because the methods focused on integration rather than the intervention, we were left with few low quality studies. Perhaps a separate, later qualitative paper on the actual integrations would help the readership.	The distinction between integration and intervention here is not clear; for this review, we only included studies assessing an intervention that met our criteria for being an integrated intervention. In KQ 1, we describe the interventions in detail (including the strategy of integration) regardless of the risk of bias rating. However, our methods do limit our SOE conclusions to studies that had a concurrent control group. We agree that a descriptive paper focused on the pre-post interventions (including a description of the results) may be helpful.
TEP Reviewer #2	Methods	I have no substantial issues with the systematic review methods, and the reporting is clear and logical.	Thank you.
Peer Reviewer #3	Methods	The study inclusion and exclusion criteria are appropriate, recognizing the limitations of not reviewing a larger body of nondomestic literature that may have some applicability to the review.	We agree.

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Peer Reviewer #4	Methods	Inclusion and exclusion criteria are justifiable although an explanation should be provided on the limitation to study conducted in developed country. Workplace Health promotion is increasingly being conducted in developing countries and the rationale to exclude these studies is not clear.	We agree that workplace health promotion is increasingly being conducted in developing countries. However, we identified no studies considered to be integrated interventions (by other reviews and NIOSH background documents) conducted in developing countries during the scoping of this review. This report will be used to help inform future research funded primarily by NIOSH and other; findings from studies set in developing countries may not be applicable to U.S. workers. We have noted this in the Methods section.
Peer Reviewer #4	Methods	Search strategies and outcomes definition are all appropriate	Thank you.
TEP Reviewer #3	Methods	I'm not trained in methods but seemed reasonable and clear.	Thank you.
Peer Reviewer #5	Methods	<p>The criteria, search strategies, and statistical methods are appropriate, with the exception of excluding studies conducted outside the US. It is unclear why these needed to be excluded. Many of the studies are published in US journals and some are conducted by USA multinationals.</p> <p>It may be useful to also look at unpublished data for winners of the Koop Award and Corporate Health Achievement Award. It is possible that some award winners would share their applications for inclusion in the database.</p>	We did not exclude studies conducted outside of the United States; however, we did exclude studies not published in English. Our inclusion and exclusion criteria are summarized in the Methods. Approximately half of the included studies were conducted in European countries; we describe work setting (including geographic setting) KQ 1.
TEP Reviewer #4	Methods	The overall attention to methodologic considerations in this review has produced a document of high quality. The search strategies are explicitly stated and appropriate. The categories of outcome measures are clearly indicated and highly appropriate to the types of goals that the TWH program seeks to achieve.	Thank you.

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TEP Reviewer #4	Methods	The inclusion and exclusion criteria are clearly stated and mostly well justified. These decisions represent by far the most challenging aspect of this entire endeavor. I agree that the minimum criterion, arising from the essential definition of TWH, is that a program contain both explicit OSH content and HP content, and some degree of explicit coordination between OSH and HP programs [top of p ES-19]. However, this definition is still a bit fuzzy, because “improving OSH” is stated to refer to reducing exposures (independent variables), whereas “improving HP” refers to a mix of risk factors (exposures), intermediate variables, and outcomes (“overall health”) [p ES-4].	We have edited this definition in the Executive Summary and Methods to clarify the inclusion criteria for interventions. Our categorization of outcomes as “intermediate” and “health outcome” also addresses this issue; in KQ2, we only consider studies that had a concurrent control group, and so the “exposure” is the intervention and outcomes are those reported by eligible studies.
TEP Reviewer #4	Methods	Also, while certainly it would have been very difficult to judge degree of integration, it should be considered that some programs which claimed “coordination” might not have been very different from programs where both OSH and HP co-existed in parallel. This is a possible source of omission of relevant evidence that probably should have been acknowledged. While parallel programs would not, in theory, fit the TWH construct, their evaluation might still contribute relevant information if the comparator were OSH alone or HP alone (rather than no program at all). For example, what if an OSH program already exists, and then a new WHP program is created that interfaces in an intentional manner with the first program? (Or vice-versa, of course.) This certainly might in practice result in a reasonable amount of “integration,” at least as much as programs that have the TWH label applied to them but do not demonstrate any notable interaction between the two domains.	We did include the type of studies described here as parallel- e.g., worksites that had existing OSH (or HP) programs and the intervention under study interfaced in an intentional manner with the first program. We have clarified this in the Methods section.

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TEP Reviewer #4	Methods	Among the other decisions that I endorse is that the Peer Reviewers did NOT exclude studies based on the outcomes selected (different from a previously published review which required both a “work related” and a “non-work-related” outcome in the same study.) The reason this should NOT be an inclusion criterion is that multifactorial diseases by definition cannot be slotted into one domain vs another; the etiologic literature shows that many of them result from both “work-related” and “non-work-related” EXPOSURES. For example, there is an increasing body of evidence on the effect of job stress on health behaviors (smoking, lack of exercise) and obesity – precisely the “personal” (putatively non-occupational) factors that most wellness programs target.	We agree with these points.
TEP Reviewer #4	Methods	I strongly endorse the authors’ the inclusion of worksite/cluster randomized trials as well as observational studies. Organizational changes cannot be studied with randomization of individual subjects [p 60]. It is more useful that they have tabulated all relevant studies and extracted the available information from each study for the Key Questions to which it can apply.	Thank you.
TEP Reviewer #4	Methods	Also I agree that it would have been inappropriate to perform any meta-analyses because of the tremendous heterogeneity across studies; instead they produced tabulated summaries of study features with reference to the 6 Key Questions, to elucidate the basis for their conclusions to each question. Also I commend the Peer Reviewers for extracting contextual factors from both the Results and Discussion sections of each article reviewed.	Thank you.
Peer Reviewer #1	Results	Sufficient detail is provided in the results. Figures, tables and appendices are adequate. The number of studies considered seem sufficient for the review conducted.	Thank you.

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Peer Reviewer #2	Results	The amount of detail used was appropriate although there are some repetitions that contribute to the length of the document but may serve to buttress the point.	We have condensed sections of the report in order to avoid repetition when possible- primarily in the executive summary, KQ 1 and the Discussion section.
Peer Reviewer #2	Results	Page 59 Line 19: involved <del>and</del> an	Done.
TEP Reviewer #1	Results	page 46, line 49. change "out" to "of"	Done.
TEP Reviewer #1	Results	page 50, line 40. change "chose" to "choose"	Done.
TEP Reviewer #1	Results	<p>Key Question 5 turns out to be the most important section, due to the huge number of gaps in the literature.</p> <p>Stress that the various industries that have not been studied could have very different outcomes than those that have been analyzed.</p> <p>I think you could expand on the idea that "women are underrepresented" so as not to confuse the readers nor to imply that either the organizations studied or the researchers who did them had any negative intent. It could also be important to point out that, in the pure health promotions literature, the vast majority of people who participate and engage in HP programs are female. Males are underrepresented there. Does that impact your ability to have a strong conclusion, present as a huge research gap, or suggest that OSH focused interventions were in the more dangerous male-dominated industries?</p>	We can only speak to the representation across included studies; we have edited this section to make it clear that we are not referring to women and their participation in health promotion in general (outside of the body of evidence eligible for this review). Unfortunately, the scope of this review did not extend to a review of the HP-only or OSH-only studies. We agree that direct comparisons of integrated and non-integrated HP and OSH interventions would be useful. However, only one of the included studies made this comparison.
TEP Reviewer #2	Results	I have no concerns with the limited results provided in the executive summary and provided in the full review.	Thank you.

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TEP Reviewer #2	Results	The research gaps and suggestions for future studies could be useful to the field. The guidance sets a high bar for future studies, so I have doubts that this report will be translated easily (or frequently) into new research without some effort by future funders to formally require the findings of this report to be considered or incorporated into future intervention research funding.	Thank you.
Peer Reviewer #3	Results	The detail presented in the results section is appropriate, as are the characteristics of the studies. The figures, tables and appendices are appropriate.	Thank you.
Peer Reviewer #4	Results	The amount if results is appropriate and somewhat redundant as the same results are repeated in different sessions.	We have edited sections of this report to reduce redundancy, particularly in the executive summary and Key Question 1.
Peer Reviewer #4	Results	No relevant studies seem to be missing from the review	Thank you.
TEP Reviewer #3	Results	I found this section to be the most helpful, with an appropriate level of detail. Too bad that NHLBI's RI trials on obesity prevention in the worksite had anything to contribute. Perhaps because reducing obesity was the primary endpoint, not cardiovascular events or impact on WC or disability. Seems like a missed opportunity for those 5-year trials.	Our database searches did identify the NHLBI funded trials focused on obesity prevention in the worksite. These did not meet our inclusion criteria for interventions.
Peer Reviewer #5	Results	The results section is well done.	Thank you.

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Peer Reviewer #5	Results	<p>ADDENDUM(10/13)15): Since submitting the review, I have come across the following article that should be included in the report:</p> <p>Williams JA, Nelson CC, Cabán-Martinez AJ, Katz JN, Wagner GR, Pronk NP, Sorensen G, McLellan DL. Validation of a New Metric for Assessing the Integration of Health Protection and Health Promotion in a Sample of Small- and Medium-Sized Employer Groups. J Occup Environ Med. 2015 Sep; 57(9):1017-21. doi: 10.1097/JOM.0000000000000521.</p> <p>This article (and some others) begin to address the issue raised in my comments on the Introduction regarding the need to assess the level of integration. As new instruments are developed to assess program integration, these instruments will need to be used as a component of studies that assess TWH programs. This is also an area for future research.</p>	Thank you. We have reviewed this article and incorporated suggestions in the section on future research needs that relates to measuring integration.
TEP Reviewer #4	Results	<p>The material in this section is very clearly presented. The characteristics of the studies are clearly described, including the “comparators” (basis of comparison for each intervention). The Key Points are clearly stated and provide a useful summary of the literature, including its diversity. I applaud the attention to the intervention program characteristics of organizational integration and worker participation, intervention complexity and content. For reasons explained above (“Methods”), I disagree with categorizing “Health Promotion Outcomes” vs “OSH Outcomes” (Table 6); I think it would have been much more appropriate to categorize the outcomes according to the four categories of outcomes listed in KQ 2.</p>	We have edited Table 6 to be consistent with the four categories of outcomes listed in KQ 2.
TEP Reviewer #4	Results	<p>My criticism above about classifying study outcomes as “OSH” and “HP” is applicable in this section, as well.</p>	We have edited this section as noted above.

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TEP Reviewer #4	Results	I strongly agree about the importance of monitoring unintended harmful consequences. I would add to the points cited the concern -frequently cited by workers themselves, their union representatives, and occupational medicine practitioners – about confidentiality of health information in the workplace	We have added this example to the potential harms/ unintended consequences that should be considered in future studies.
TEP Reviewer #4	Results	In addition to noting possible selection bias at the level of the individual worker [p 47], it would also have been appropriate to note that there is a question about the effect of self-selection by organizations, which has potential implications for generalizability of this entire literature, as many workplaces still do not fully comply with basic OSH protections (nor offer any HP services).	Text about study limitations (in the Discussion section) has been edited to note the concerns about possible selection bias at the worksite (organizational) level.
TEP Reviewer #4	Results	The recommendations for future research (KQ 6) are very thoughtful and should greatly inform design of future interventions and their evaluations. I particularly value the suggestion [top of p 49] to compare the same intervention across a variety of settings, to shed light more directly on the influence of different organizational characteristics on program success and benefits. The recommendations to define clearly the paradigm of “integration” used in each study, to examine different forms of employee participation, and to modify work environment constraints on health behaviors are also highly salient.	Thank you.
TEP Reviewer #4	Results	I am not personally aware of any articles that should have been included according to the stated criteria but were overlooked.	We appreciate this feedback.
Peer Reviewer #1	Discussion	Major findings are clearly stated. Would like to see more discussion in the future research section on how new studies might be considered which will measure impact of new interventions implemented and what the important outcome measures might be.	We have edited the future research needs section to indicate how future studies might assess the effectiveness of TWH interventions including what types of outcomes might be appropriate. The specific outcome measures would likely vary based on the occupational group (or setting) under study.

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Commentator and Affiliation	Section	Comment	Response
Peer Reviewer #2	Discussion	The implications were clearly stated. I would add a recommendation for research examining whether an integrated approach improves safety outcomes.	Agreed. We note in the Discussion (and Executive Summary) that future studies of TWH interventions should evaluate the effect of integration on safety outcomes.
TEP Reviewer #1	Discussion	Page 55, line 34. delete the word "not"	Done.
TEP Reviewer #1	Discussion	Both smoking cessation and fruit/vegetable consumption are really pure health promotion outcomes. It may be worth calling that out, and that either no studies adequately evaluated occ safety outcomes, the data is too hard to aggregate to study, or events are rare enough that you can't find statistical variation by the interventions.	We agree that smoking cessation and fruit and vegetable consumption are commonly measured health promotion outcomes. We note in the discussion (as well as KQ 5) that few studies measured occupational safety outcomes.
TEP Reviewer #1	Discussion	Page 62, lines 3 & 4. For relativity and comparison, it would be great if you would include the specific smoking cessation rate and veg. consumption improvement magnitudes, and also include some good comparison numbers from the pure HP literature for readers to have context.	We agree that this would be helpful for readers. However, included studies do not provide sufficient detail for us to calculate an effect size.
TEP Reviewer #2	Discussion	The findings, implications, and gaps identified are worthwhile contributions to the field, and should help future research.	Thank you.
Peer Reviewer #3	Discussion	The major finding as clearly stated with limitations adequately described. While the future research section is clear it could benefit from specific recommendations on study design and methodology.	In KQ 6 (future research needs) under we outline recommendations on study design and methodology. Text has been added to the conclusion to highlight the need for future studies to compare integrated interventions with a non-integrated approach (where workers have similar HP and OSH services available).

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Commentator and Affiliation	Section	Comment	Response
Peer Reviewer #4	Discussion	The discussion is again a bit repetitive of the result section and could have developed more some consideration about the quality of the studies, their pertinence to the TWH concept. The timing of the studies should have been discussed in relation to the development of the TWH definition. Studies before 2004 were included, which is a much earlier period to the creation of TWH in 2011. There may be some inherent difference in comparing analysis of integrated approached before and after the creation of TWH that clearly defined integrated OSH and HP approach.	We have edited text in the Discussion and Executive Summary to reduce repetition.  We identified very few studies conducted after 2011; of those that we did identify, few had a concurrent control group. Although we agree that older studies may have limited applicability to current workplace settings, many of these studies (e.g., Wellworks-2) are considered to be examples of TWH interventions.
TEP Reviewer #3	Discussion	Yes, implications are clear. Limitations well described. I am not aware of missing studies. I think the future research should focus more on the key research questions and methods and less on the diversity of the populations to be studied. It is more important to figure out if integrated interventions actually improve safety (in a robust study with large sample sizes) than it is to worry about incorporating geographic diversity and worker type - all of which can come later.	We have edited the Discussion to note that future research should focus on reducing methodological limitations and also address occupational safety outcomes.
Peer Reviewer #5	Discussion	The limitations are well described. The authors should add a discussion of limitations discussed in the response to question 1 of this review.	We have added addressed this comment above and added text to the conclusion and limitations section about the lack of studies that compare an integrated intervention with a non-integrated approach (with no added HP or OSH content).
Peer Reviewer #5	Discussion	An additional limitation of workplace studies is publication bias. Unlike clinical trials where publication is required, corporations are likely to develop and submit only positive studies. And some corporations that conduct publication quality research may also chose not to publish even positive results for a variety of reasons.	We have edited the discussion to note that publication bias is a potential limitation.

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Commentator and Affiliation	Section	Comment	Response
Peer Reviewer #5	Discussion	In the few programs that are reported in the summary, evidence that decreased smoking and increased fruit and vegetable consumption was increased in a TWH program was not compared with how this would have changed with a health promotion program alone. The attribution of these results to the TWH approach may be overstated and this should be clearly stated. Similar (and sometimes better) results have been described for health promotion programs that were not necessarily conducted under a TWH umbrella.	We note this as a limitation of the body of evidence and a future research need; we have made this point more clearly under in the Discussion section.
TEP Reviewer #4	Discussion	Overall, the findings and their implications are clearly stated, as are the limitations of the studies. The authors carefully assessed the strength of evidence for each specific outcome, which is highly valuable. This includes identification of populations and sectors that have not yet been studied at all, but more importantly consideration of the comparators, specification of what services were in place before the integrated program began, and the distinction between integration of existing programs versus the effect of starting new, integrated programs. These are all very important insights that should be echoed by others as the field progresses.	Thank you.
TEP Reviewer #4	Discussion	The bottom line of this review is that TWH evaluation findings are very sparse to date and with substantial gaps in the evidence. While the report appears to be directed primarily toward the research community, it is greatly to be hoped that these limitations are also noted by practitioners and by NIOSH itself, which could certainly continue to promote the TWH concept in principle while being appropriately cautious about the evidence of benefits.	The primary audience for the review is the Pathways to Prevention panel charged with making recommendations related to future research needs related to TWH interventions. However, the report will be publicly available and intended to be directed at a wide audience with interest in this topic (e.g., researchers, employers and policy makers).

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Commentator and Affiliation	Section	Comment	Response
Peer Reviewer #1	General	The report is clinically meaningful and addresses the importance of investing in prevention when considering occupational safety and health and health promotion. Target populations are specifically defined and key questions appropriately stated. Many Employee Health Clinics are assuming larger roles in occupational safety and health prevention activities and findings of this report support this concept. It is also important that Organizational Safety Functions work closely with Employee Health functions for a more comprehensive effort.	We agree with this statement.
Peer Reviewer #1	General	The report is well structured and organized. Would like to see a short section with recommended best practices as to how to best implement new and innovative programs for specific high occupational risk industry sectors.	Given the limited evidence, we are not able to say much about the best practices for implementing new and innovative programs for specific high occupational risk industry sectors. We do note that our conclusions related to smoking outcomes are applicable to blue-collar manufacturing and construction workers.
Peer Reviewer #2	General	This is a well-researched and thorough report. It is clinically meaningful and serves to highlight challenges with research in this area.	Thank you.
Peer Reviewer #2	General	The report is well structured and does highlight the research gaps that exist.	Thank you.
TEP Reviewer #1	General	Several included studies (about half!) were Danish or other non-American. They are probably applicable for the pure health promotion outcome, but given our different employment laws, ADA, ACA, work comp, cultural norms, views of authority, health care system, and corporate governance, it may be loosely applicable to American companies.	Applicability of these studies is limited; we note this in the Discussion. However, the majority of studies contributing to our Strength of Evidence Grades were conducted in the United States.

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Commentator and Affiliation	Section	Comment	Response
TEP Reviewer #1	General	You mentioned that the intended audiences include health plans and employers. It is not entirely clear from the conclusions that it could help either one, that these programs would be worth pursuing, or some specific things for them to consider when weighing their investments, or not, in these types of programs.	The primary goal of the review was to inform future research agendas. However, we hope the review is accessible to any reader who is interested in this topic, including employers and health plans. We agree that the evidence supporting integrated interventions is limited and may not be sufficient to allow employers or health plans to make decisions about whether or not to implement an integrated program. We've edited the discussion and executive summary to remove the short section title "implications for employers and policy-makers" for this reason.
TEP Reviewer #1	General	Sorry for the seemingly random order these comments may appear.  Does the organizational psychology or org. development literature have any good evidence that integration is useful and works in other areas of company life?	There is a broad area of focus on various integrated company management strategies and how these might lead to better outcomes for workers and employers. However, we are not aware of any prior review that supports the effectiveness of integration on other areas of company life and this was not part of the scope of our review. We focused on outcomes that relate to worker health and safety.

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TEP Reviewer #1	General	For most companies, the health plan or one of the literally thousands of health promotion vendors now do the wellness/HP work, so there may be less relevance to the idea of integration in the future. Also, the emergence of private exchanges defined contribution health plans, and market withdrawal may decrease the relevance of HP in companies.	We agree the ACA changes the context for these interventions and note this in the Applicability section of the Discussion; we expanded this text to include the point that workers may have increased availability of HP services via their health plan in the future. However, employers are not precluded from employing HP vendors and/or additional onsite HP services as part of an integrated intervention. We note that future studies should describe the range of HP and OSH programs available to workers outside of the intervention under study.
TEP Reviewer #1	General	The paper could make a stronger case for why we should care about integration, and what it means. I know that is a NIOSH failure, not this paper's, but it could be called out more clearly. It is not clear what integration means: is HR now in charge of safety, is safety leading the wellness program, or is there a committee? Does data have to be shared, same communication platform with employees, or some other? Is it more of a cultural aspect? I'm afraid that it seems that if you have seen one integration, you have seen one integration. That may make the case that research is less helpful and each organization must organically build its best idea based on cultural factors.	We agree that more work is needed to clarify what is meant by integration (and how this might differ by occupational setting). We have clarified text in the Methods regarding the criteria we used to determine whether interventions were integrated. We also added additional text in KQ 6 (future research needs) describing how future studies could more clearly define and describe the various approaches used to integrate HP and OSH.

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Commentator and Affiliation	Section	Comment	Response
TEP Reviewer #1	General	Why would integration matter, versus two Independent but highly effective HP and OSH programs at a company? efficiency? lower budget? allay privacy fears of the employees? improved productivity? combined budgets? shared accountability? reporting metrics to senior management to incent improvement and include in bonus structures? Does integration add unnecessary complexity that hurts the simple cost/benefit analysis of a company?	These are all potential benefits of integration; for this review, we limited our scope to outcomes related to worker health and safety. Few studies assessed the benefit of integration alone (independent of a new or added HP or OSH component). We have edited the text in the Introduction to give a fuller picture of the potential benefits of integration.
TEP Reviewer #1	General	Smoking cessation is now an ACA mandate for non-grandfathered plans. Because the data suggests that cessations rates are way better with Rx drugs and NRT, this should probably be done by an employee's doctor and his/her health plan, and not by the employer. Except for the environmental policy of no smoking on campus, higher premiums for smokers and some companies not hiring smokers.  ACO's, attributed membership, and value-based health care arrangements will pull more employees out of company-sponsored wellness plans into their health plan and physicians' programs.	We agree that these factors limit the applicability of older studies and we note this in the Discussion section.
TEP Reviewer #1	General	Company onsite clinics were traditionally occ health nurses doing work comp and OSHA mandated stuff. Now many do primary care, acute care, and chronic condition management onsite. That is probably a better example of integrated safety and health promotion than any in the studies included.	We did not include studies assessing the effectiveness of worksite-based primary care services. No study that met inclusion criteria evaluated an intervention aimed at integrating care for work-related injuries with the management of chronic conditions.
TEP Reviewer #1	General	Why would an integrated program that results in more vegetable consumption be better than a targeted HP-only intervention?	We note in KQ 6 that future studies need to evaluate the effectiveness of integration itself (separate from an added health promotion or occupational safety component).

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Commentator and Affiliation	Section	Comment	Response
TEP Reviewer #2	General	Clarity and Usability: The report is well structured and organized.	Thank you.
TEP Reviewer #2	General	This review is a high quality systematic assessment of the best available evidence on a new intervention approach to improve worker health.	Thank you.
TEP Reviewer #2	General	The key questions are appropriate, explicitly stated, and addressed in logical and thorough order	Thank you.
TEP Reviewer #2	General	I have no substantial suggests for modification of this review as is, and few minor comments for consideration	Thank you.
Peer Reviewer #3	General	Clarity and Usability: The report is well structured and organized with main points clearly presented. Given that it offers a small and diverse body of evidence, as the authors point out, there is limited usefulness in terms of policy and practice decisions. A section focused on specific parameters of future study design should be included in the report. Evidence looking at the persistence of improved rates of smoking cessation and fruit and vegetable consumption would have been particularly important. Outcomes measuring persistence should be included in the recommendations for future study design.	In KQ 6 (future research needs) we outline issues related to methodology (including study designs) that should be considered in future research. We also note that future studies should evaluate outcomes over a sufficient period of time.
Peer Reviewer #3	General	The report is significant in identifying the need to conduct research that effectively demonstrates the impact of TWH interventions on a broad range of workers looking at the combined impact of HP and OSH interventions.	We agree.
Peer Reviewer #4	General	Clarity and Usability: The report is well structured and organized although somewhat repetitive in results and discussion. The main points are reported very clearly and the conclusions are definitely relevant to policy decisions as they indicate the current gap of knowledge in terms of job sector, methodology and outcomes that deserve further assessment. In this respect the report is a valuable contribution for new infarction and understanding on the TWH approach.	We have edited the report to reduce repetition across various chapters.

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Peer Reviewer #4	General	This report is clinically meaningful. The key questions are all pertinent, and define well the most important elements of the analysis. The literature search strategy was straightforward and the inclusion/exclusion criteria set correctly according to the PICOTS guidelines. Since this review is on integrated TWH approach only studies approaching integrated OSH and TWH intervention were rightly considered. Study selection, abstraction, and SOE assessment were conducted in a systematic manner.	Thank you.
Peer Reviewer #4	General	The final results appear to reflect the existence body of evidence and the discussion is well written, with important indications on future research needed on a variety of aspects. Although somewhat repetitive, the overall quality of this report is very good.	We have edited the report to reduce the redundancy across various sections.
TEP Reviewer #3	General	Clarity and Usability: It's a very well written paper with relatively little to report. However, practitioners would do well to note the importance of worker participation in designing and implementing interventions, the need to consider social and cultural characteristics of the workforce, and the evidence for multicomponent interventions that reinforce behaviors.	These factors are characteristics of the studies that showed benefit for smoking cessation and fruit and vegetable consumption; however, future studies are needed to clarify the importance of these individual components.
TEP Reviewer #3	General	The report's limited findings are disappointing from a TWH implementation perspective for reasons stated by the authors - heterogeneity of study populations, outcomes and comparators; small number of qualifying studies; and likelihood of bias.	This is an accurate summary of the findings.
Peer Reviewer #5	General	The authors are commended for their extensive and thoughtful analysis.	Thank you.

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Peer Reviewer #5	General	<p>The report is organized clearly.</p> <p>It would be helpful to reorganize the Structured Abstract Result and Conclusion sections to place greater emphasis on the limitations as opposed to the positive findings, since these findings come with significant caveats. I suggest altering the organization of the Results and Conclusion sections to focus first on the limitations.</p>	We have edited the abstract to emphasize the limitations of the body of evidence supporting TWH interventions. In the results (KQ 2) we emphasize the study limitations throughout and also return to this in subsequent chapters of the report.
TEP Reviewer #4	General	Clarity and Usability: The report is indeed very well-structured and organized. The main points are clearly presented (although the Discussion section is, to a large extent, a re-cap of the Results section) with insightful commentary.	We have edited the Discussion some to condense the re-cap of the results (to avoid redundancy).
TEP Reviewer #4	General	The audience for this report is not defined explicitly but I think it is fairly obvious (albeit implicit) that the report is directed to future researchers and research funders. In that light, "clinically meaningful" is unclear, because the report does not pretend to make specific practice recommendations. (There is a short and conservatively worded section, "Implications for Employer and Policy Decision making," [p. ES-19] which notes a few specific features of the few studies that reported behavioral benefits of integrated programs; and another brief section on Applicability of the study findings which notes several important unanswered questions.)	This report is directed more towards future researchers and funders; evidence was not sufficient to make detailed practice recommendations. We have deleted the paragraph in the ES and discussion labeled as "implications for employer and policy decision-making" to avoid confusion.
TEP Reviewer #4	General	The Key Questions are explicitly stated and are highly appropriate, as they facilitate not only a clear summary of research findings but also research gaps, both with regard to integrated programs themselves and also an important range of contextual factors. In addition, the four categories of outcomes listed in KQ 2 are clearly organized to distinguish leading and lagging indicators, as well as unintended negative consequences.	Thank you.

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Commentator and Affiliation	Section	Comment	Response
Public Peer Reviewer (Emily Stiehl)	General	Hello Thank you for sending this out. One thing that I found to be missing possibly from the report was a rich discussion of context despite Key Question 4 being about it. I think the studies selected did look at individuals in various occupations but did not look at how those particular occupations might have inhibited or enhanced the effectiveness of these programs. They mention work stress but do not include other ideas including the organizations safety climate the employees perceived level of supervisor or coworker support or other workplace factors such as staffing or access to proper equipment although they do mention work schedules and union membership as two variables they considered.	All of the contextual factors mentioned by the authors were abstracted and considered in this review. For KQ 4, we did not review literature beyond the studies that met eligibility criteria for KQ 1. No study compared the same intervention in separate populations (that differ in terms of occupation); when studies reported on subgroups of workers by occupation or job, we reported the results in KQ 2. However, we did not comment on any factors not highlighted by authors of included studies.
Public Peer Reviewer (Emily Stiehl)	General	There is also no or little examination of the persons home life. Someone who lives in a dangerous or poorly maintained neighborhood may have fewer opportunities to exercise than someone from a better maintained neighborhood.	We agree that this is an important issue. However, None of the included studies commented on the home life of workers and how this influenced worker health and safety.
Public Peer Reviewer (Emily Stiehl)	General	There is some work in the organizational literature about these health outcomes and factors in the work environment that could affect them including stressor supervisor support. For example Manning Jackson Fusilier 1996 look at the effects of personal and external sources of stress e.g. from physical or job factors on potential outcomes e.g. physical or psychological through their effects of experienced stress. They also examine the role of social support in moderating this relationship. Toker Biron 2012 look at physical activity and job burnout not exactly a health promotion program but a look at the potential benefits of physical activity among workers. I think some of this work even looks generally at health promotion. I guess I wonder whether there is any way that we can mention this idea of being situated in a context occupation organization and/or home and to think about what that might do to health protection and/or promotion programs at work Thanks Emily Stiehl	These factors were not addressed in the included studies. During our update literature search, we identified one study that assesses an intervention focused on supervisor training aimed at improving work-life stress. This study has been incorporated into the results. We did not review the literature to identify contextual factors noted in other studies as potential modifiers of intervention effectiveness. We only comment on contextual factors noted in the included studies.

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<sup>a</sup> TWH is an important topic that is relevant for workplace programs. Most organizations of sufficient size operate health promotion and workplace safety programs somewhat independently with varying levels of collaboration. Integration of these programs for the specific purpose of improved outcomes has been encouraged recently, without sufficient evidence that the costs of integration will produce better results. It is therefore important to ascertain whether organizations should be encouraged to pursue integration and if so, what integration should look like.

The main issue in evaluating TWH programs is whether the whole is greater than the sum of the parts – does the synergy of combining A with B produce results that are greater than the sum of A and B alone (after subtracting the additional costs of the integration).

Specifically, the issue is whether the use of a TWH program accompanied by some currently undefined level of enhanced collaboration between health and safety will actually produce different results from the programs without this enhanced level of collaboration between the health and safety departments. To assess this requires a comparison of organizations operating under the TWH with the organization operating health and safety programs that do not meet the definition of the TWH model. It is not enough to compare a TWH program to no program. For example to determine the added value of the TWH approach for a specific outcome, such as smoking cessation, injury reduction, or both, it would be necessary to compare the results for an organization that ran similar programs with and without the TWH umbrella. The authors address this issue only in the section of the report on Future Research Needs under the Comparators heading. This issue should be brought forward and also identified earlier in the report.

There is also a need to define what level and form of collaboration transforms a program into a TWH program. This issue should be addressed in the report and is also an area that requires further research. Is TWH an over-riding philosophical approach to health and safety or can it be applied to a single or group of programs? Are there organizational or cultural factors that enhance or hinder success? Are results enhanced by a shared reporting structure or is it better if health and safety report separately, or does it matter?

Even for organizations with well-developed strategic plans, there is a need to continually refresh programs for workers to maintain interest and focus. Using the TWH label may make a program seem “new and different”, without actually making significant underlying changes. Distinguishing between these possibilities from a program description in the literature may be challenging.

TWH requires collaboration between the health and safety functions of an organization. It is extremely difficult to evaluate the effect of “integrating” health and safety programs and compare this integration across organizations. As the authors discuss, organizations are heterogeneous in their work environments, culture, processes, and benefits. However, they are also heterogeneous in the structure, function, and activities of their health programs and safety efforts. This makes comparisons of the complex organizational factor of “integration” highly problematic. There is no currently available scale that can be used to assess the state of a health or safety program or define the level of integration.

There is also a need to calibrate the level of integration of programs with the strength and success/outcomes of an organization’s prior (and ongoing) efforts in health promotion and safety. Further, there is a need to understand how this integration translates into action. Many organizations have policies and strategic plans that were developed jointly by the health and safety functions. However, these planning documents do not demonstrate how programs are actually put into practice. Some organizations may routinely operate at high levels of collaboration, while others organizations or even individual sites of a larger organization may have similar written policies, but may operate very differently.

Another challenge in using the literature to evaluate the evidence supporting TWH is that many articles describing successful corporate programs may discuss programs that operated in a TWH environment, but the authors did not include the TWH terminology nor discuss the organizational environment. Sometimes this may have occurred before the terms were in common use, as the authors point out. In other cases, the terms were not used because the authors simply considered their program as a whole and did not chose to incorporate the key words used as search terms.

TWH may also be beneficial when an organization does not have a program to address an issue, such as musculoskeletal injuries. It might be possible to generate enthusiasm for a new program under the TWH umbrella. However, even in this setting, there would need to be evidence for the benefit of this approach when compared with alternate approaches, not just compared with no program.

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None of these comments are intended to disparage the concept of TWH. Many corporations that have received the ACOEM Corporate Health Achievement Award (see [chaa.org](http://chaa.org)) by demonstrating continuous improvement in health and safety metrics likely operate in a TWH environment, although they probably did not use the term to describe their programs. However, this does not prove cause and effect. TWH may well have value, but for the reasons stated above and many more discussed by the authors, there is currently insufficient evidence to support TWH as an evidence-based practice (even though it is considered by many to be a "best practice").

The Key Questions are explicitly stated and address most of the important issues. Key Question 1 does not include the need to assess what is meant by integration nor the issues discussed above. For Key Question 2, other outcomes that could have been assessed are healthcare costs and total health spending. Other harms to consider include additional cost of operating a TWH program (or if an organization could show that this approach lowered the cost of operating the program, this could be an added benefit). Another possible harm includes worker concerns, such as loss of privacy.

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