UPSKILL Health – Technical Report on worker and business outcomes

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SRDC✦SRSA

The Social Research and Demonstration Corporation (SRDC) is a non-profit research organization, created specifically to develop, field test, and rigorously evaluate new programs. SRDC's two-part mission is to help policy-makers and practitioners identify policies and programs that improve the well-being of all Canadians, with a special concern for the effects on the disadvantaged, and to raise the standards of evidence that are used in assessing these policies.

Since its establishment in December 1991, SRDC has completed over 250 projects and studies for various federal and provincial departments, municipalities, as well as other public and non-profit organizations. SRDC has offices located in Ottawa, Toronto, and Vancouver, and satellite offices in Calgary and Winnipeg.

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Executive summary

Background

This document is the third deliverable for the UPSKILL Health and Mental Health Outcomes Study (UPSKILL Health), whose purpose is to explore the relationship of literacy and essential skills (LES) with health and mental health, using data from the original UPSKILL trial. As described in the Background section of this document, the UPSKILL trial was a large demonstration project that tested the effectiveness of workplace-based literacy and essential skills training for employees in the tourism accommodations sector. The Social Research and Demonstration Corporation (SRDC) is the Canadian non-profit research organization that developed and managed UPSKILL, which ran from 2010 until 2014.

The Public Health Agency of Canada (PHAC) contracted with SRDC in January 2014 to undertake a two-phased sub-study that analyzes the health implications of the UPSKILL trial. Since the UPSKILL trial results were somewhat ambiguous with respect to health impacts (i.e., a negative impact on bodily pain; mixed results for mental health), the first phase involved a more in-depth and comprehensive analysis of health-related data already collected through UPSKILL; the results of these analyses are presented here. The second phase – currently underway – is a qualitative inquiry involving key informant interviews and focus groups with a sample of UPSKILL participants. More detailed information on Phase Two will be provided in a separate report to the Public Health Agency in June 2015. The final report for UPSKILL Health will synthesize the results of the quantitative and qualitative analyses and explore implications for policy and practice, and will be delivered in September 2015.

Objectives

This report pertains to the first phase of this project - the in-depth exploration of quantitative, health-related data on worker and workplace characteristics, psycho-social variables and health-related practices (e.g., health literacy), job performance, and business outcomes. The report presents background information about the UPSKILL trial and UPSKILL Health projects, and the basis for considering the potential health impacts of literacy and essential skills (LES) training. Results from each of four lines of inquiry – corresponding to the four research questions – are provided, and implications for the remaining work on the project are discussed.

Methods

Phase one began with an extensive review of the literature on learning and health, particularly in the workplace context. On this basis SRDC developed a comprehensive conceptual model that describes the relationships among LES, health, mental health, and mediating and moderating factors, for both workers and firms.

We then set out to test this model empirically to assess health in relation to worker-level outcomes, job performance, and business outcomes, using data from the UPSKILL trial. SRDC took a four-step approach to the analysis. The first stage of testing consisted of first establishing bivariate associations

among a variety of relevant variables and health outcomes, and with other outcomes defined in the conceptual model. Then, we examined the strength of the relationships among variables to refine this model and guide the multivariate analysis. We identified three sets of relationships that warranted further investigation:

- Health literacy and mental health

- Workplace characteristics and mental health

- Essential skills (document use and numeracy), safety at work and physical health.

Regressions were conducted to provide more information on these three areas of investigation.

Having tested these main relationships between LES, health and mental health, workplace characteristics and job performance in Part 1, Part 2 involved analyzing the differential impacts of the LES training on workers' health and mental health, as well as other variables such as self-efficacy, work stress, and job performance. Part 3 evaluated the effects of workers' health and mental health on business outcomes. Finally, Part 4 looked at the implications of the UPSKILL Health analyses for other possible non-health interventions in the workplace, in terms of potential beneficial impacts on health and mental health.

Results

Overall, our first round of empirical testing confirmed much of what we found in the research literature and supported our conceptual model. Certain worker psychosocial variables (i.e., self-esteem, self-efficacy) and workplace characteristics (i.e., work control, work-home satisfaction) were closely related to *mental* health, while workers' literacy skills and education, resilience, and social networks were mostly related to *physical* health. In particular, we found that health literacy played an important role in workers' mental health, both directly and in relation to self-efficacy and self-esteem. Work stress was also a key factor in workers' mental health.

On the other hand, firm-level characteristics (i.e., work force size, union and collective agreement and training expenses per employee) had few links with health, with the exception of work-home satisfaction and the quality of staff relations. The expected relationships among essential skills, safe work practices and physical health did not emerge in our analyses.

Better self-reported mental health among UPSKILL participant was associated with a higher likelihood of passing the teamwork and communication performance assessments, which were related to business outcomes such as productivity and customer satisfaction. Both physical and mental health had substantial and statistically significant relationships with absenteeism, and work stress had an even larger impact. We also found a relationship between low and declining work stress and a number of positive business outcomes; self-esteem (which is strongly correlated with mental health) at follow-up was also associated with positive changes in performance and business outcomes.

Our UPSKILL Health sub-group analysis did not find any evidence of gender differences in training effects on health, mental health, or work stress, nor was there evidence of differences in health-related impacts by immigration status, despite the fact that the UPSKILL trial found that immigrants generally benefitted more from the training intervention than their Canadian-born counterparts. However, we

did find that individuals who reported a high level of stress at baseline had greater job performance gains from UPSKILL than those with low stress, and there was also a significant treatment effect for individuals with low self-efficacy.

Conclusions and next steps

At a very high level, the results of our analyses highlight the importance of workers' health literacy for their mental health, and the role of mental health in achieving both job performance and business outcomes. The LES training intervention achieved these effects primarily by reducing work stress and facilitating gains in communication and teamwork.

The breadth of UPSKILL Health results means there are many areas with potential implications for policy and practice, whether in terms of LES training, other workplace interventions, organizational development and management, or health promotion. Investment in programs that reduce work stress, for example, or increase self-esteem and mental health among workers could yield numerous benefits, especially for those at risk of diminished well-being at work. It would be premature, however, to go too far in this direction without considering the results of our qualitative inquiry, which is currently underway.

We will synthesize the results of the quantitative and qualitative analyses and explore their policy and practice implications with PHAC representatives to ensure our final report has the greatest potential relevance and potential reach.

Application

We expect that this study's findings of this study will be of interest to policy makers, researchers, literacy practitioners, providers of health programs, as well as the business community (e.g., sector councils, employers).

1. Introduction

There is a large and growing academic literature that identifies education and literacy as important social determinants of health, and the potential for non-health interventions such as training and adult learning to have substantial impacts on individual and population health. While several theories exist as to the mechanisms by which education and health are related (e.g., income, health literacy, access to health resources, learned health behaviours, etc.), these theories are rarely examined empirically in a comprehensive manner.

Building on the original UPSKILL Literacy and Essential Skills in the Workplace project (UPSKILL trial), the UPSKILL Health and Mental Health Outcomes Study (UPSKILL Health) presents a rare opportunity to interrogate a comprehensive dataset on workplaces and their workers to identify how various personal and workplace factors – including workplace literacy and essential skills (LES) training – influence workers' physical health and mental health (for a full list of measures, see Appendix B).

This opportunity was important in part because the results of analyses on health impacts from the original UPSKILL trial were somewhat ambiguous; specifically, there were no impacts on perceived health or physical health overall, but there was a slight negative impact in terms of bodily pain. Similarly, there were no impacts on overall mental health, a very slight negative impact on vitality. However, training participants reported a significant reduction in work stress compared to the control group.

UPSKILL Health, therefore, provided an opportunity to investigate these results in a more in-depth manner, and explore the mechanisms by which LES might influence physical and mental health, taking into account other sources of influence (e.g., psychosocial variables). UPSKILL trial data also provided an opportunity to learn how worker health can influence job performance and business outcomes, and which sub-groups of workers may benefit most from workplace interventions, such as literacy and essential skills training.

This report is the third major deliverable for the UPSKILL Health study, following successful applications for Research Ethics Board (REB) approval and a report on the proposed conceptual model of the relationships between literacy and essential skills and health in the workplace. The present document summarizes the results of SRDC's extensive empirical testing of different elements of that model, including worker and workplace characteristics, health-related practices, and health and performance outcomes, in relation to and independent of the LES training intervention.

The second section of this report provides background information on the original UPSKILL trial and the UPSKILL Health study, while the third section summarizes the reasons why UPSKILL – admittedly a non-health intervention – nevertheless has considerable potential to influence health, based on both relevant theory and empirical research.

The fourth section describes the data sources and measures used for the UPSKILL Health exploratory analysis, and our analytical approach. The results of these analyses comprise the fifth, sixth, seventh and eight sections of the report. Each of these sections corresponds to the lines of inquiry taken to address the four main research questions: 1) personal and business factors affecting workers' health and job performance; 2) differential effects of UPSKILL's LES training for specific sub-groups;

3) impacts of workers' physical and mental health on business outcomes; and 4) the potential impact of other non-health interventions on health and performance.

Despite certain data limitations – generally stemming from the fact that health effects were secondary to UPSKILL's primary goal of improving workers' skill gains and job performance, and business outcomes – the results of our analyses did find significant health outcomes, and generally supported the conceptual model. The report concludes by demonstrating the extent to which the results of the quantitative analyses addressed initial research questions, and how the concurrent qualitative inquiry is likely to deepen our understanding of these issues. These opportunities will be taken up in the forthcoming qualitative technical report and the knowledge synthesis, due in June and September 2015, respectively.

2. Background

Summary:

- The purpose of the UPSKILL trial was to rigorously evaluate the effectiveness of workplace Literacy and Essential Skills (LES) training for workers and firms.

- UPSKILL Health explores UPSKILL'S comprehensive dataset to identify how different personal and workplace factors – including LES training – influence workers' physical and mental health, their job performance, and business outcomes.

2.1. The UPSKILL trial

Objectives

With support from the Office of Literacy and Essential Skills (OLES) at Employment and Social Development Canada (ESDC), SRDC designed and implemented the Literacy and Essential Skills in the Workplace project, known as UPSKILL. This large-scale demonstration project began in February 2010 and ran until February 2014, and operated in eight provinces (all except Quebec and Prince Edward Island). The purpose of the UPSKILL trial was to evaluate workplace Literacy and Essential Skills (LES) training using the most rigorous evaluation methods. Its research strategy included three main components: 1) an experimental evaluation of impacts; 2) implementation research to explore delivery lessons and best practices; and 3) a cost-benefit analysis to estimate the returns from investments in LES training by firms and government.

The objectives of the UPSKILL trial were to:

- measure the impacts of LES training on workers and workplaces;

- understand the pattern of impacts on different types of workers and firms;

- establish a clear business case for LES training by measuring the returns to workers and firms; and

- describe the conditions in which LES training can be most successfully and strategically implemented.

The UPSKILL trial focused on the tourism accommodations sector, since this was found to have the required conditions for successful implementation of the study (e.g., partnership with a strong national sector council, existing standards and certification) and for generalizing results to other service and retail sectors. Within this sector, the project focused on a range of occupations, from those such as housekeeping that require lower levels of LES, to those requiring higher LES levels, such as front-desk agents. The LES training intervention was based on industry certification and occupational standards for these positions, and was customized to the skills and business needs of participating employers using organizational needs assessments.

Partnerships and recruitment

To design and implement the project, SRDC worked closely with a number of partner organizations, including the Canadian Tourism Human Resource Council (CTHRC), and several provincial tourism human resource organizations. Several provincial government training departments were also closely involved, along with non-profit organizations (e.g., the Training Group at Douglas College) and a private training developer (SkillPlan).

Recruitment of firms was the responsibility of local partners, who usually began with their established hotel contacts but went farther afield with referrals or "cold calls" as necessary to meet their recruitment targets. Hotels that responded positively to the UPSKILL offer and were interested in joining the study signed an UPSKILL employer agreement to officially begin their participation. In total, 110 firms (hotels) with 1,438 workers were recruited from the eight provinces in which UPSKILL operated. Nearly one third of the recruited firms were from BC, 18 per cent were from Ontario, and approximately 25 per cent were from of the prairies and another quarter from the Atlantic region. Of the 110 recruited hotels, 22 withdrew during the initial baseline research and needs assessment phase, mostly because they determined the program wasn't a good fit for their needs, or they were undergoing management changes. This resulted in 88 hotels being eligible for random assignment.

UPSKILL's large sample size provided sufficient statistical power to detect even fairly modest impacts of five to seven percentage points, equal to about a 10-point change on the scale corresponding to the International Adult Literacy and Skills Survey (IALS),[1] or a 5 per cent increase on a performance measure.

Once the employer-level baseline research was completed at a given hotel, employees were invited to attend an on-site information session to learn more about the UPSKILL trial. In some hotels these sessions were a hotel-wide initiative with management ensuring all staff knew about the project and had the opportunity to sign up, though in all cases sign-up was voluntary. In other hotels UPSKILL was more of a "niche" project with only a small percentage of staff invited to attend an information session. Employees were provided with the opportunity to ask questions, review the informed consent form one-on-one with an UPSKILL representative, and sign the form if they wished to participate (or take the forms away to reflect on). All employees received assurances that their participation was voluntary and not tied to any condition of their employment, and that their personal information would be kept confidential.

Random assignment of firms

In order to isolate the effects of the UPSKILL LES training from all other factors, a counterfactual was needed – a measure of what would have occurred in the absence of training. Comparing participants' performance after the training with this counterfactual would give a true measure of its incremental impact. It is widely accepted that the best way to construct a counterfactual and measure program

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[1]   IALS scores range on a scale from 0 to 500 points for each domain of literacy, numeracy and document use. Each of the scales are split into five different levels from level 1 for the lowest literacy proficiency to level 5 for the strongest level of literacy proficiency. After level 1 (2-225 points), each level has a 50-point range, so the ability to detect a 10-point change represents a fairly high degree of precision.

impacts is through the use of a randomized control trial (RCT). In an RCT, individuals who volunteer for an intervention are randomly assigned to either a program group that receives the intervention or to a control group that does not receive it. This ensures the two groups are equivalent in terms of their pre-intervention characteristics, even those that are unobserved or not measured. As a result, any differences in outcomes between the two groups after the intervention can be attributed with confidence to the effect of the program.

For the UPSKILL trial, random assignment occurred immediately following recruitment of firms and workers. A cluster random assignment design was used, whereby firms were randomly assigned rather than individual workers; each firm therefore had a 50-50 chance of receiving the LES training intervention. All participating workers within each firm were assigned to the same group, whether the program group eligible for UPSKILL training, or the control group. Random assignment was conducted in cohorts of matched pairs of firms, based on their approximate size and location, to ensure equivalent distribution of firms within program and control groups. For instance, if four firms were recruited within a two-week window, they would be matched to similar firms within that cohort based on their size (i.e., revenues, employees, number of participants) and their location, then randomly assigned to either the program or control group. The control group had 43 firms with 651 workers while the program group had 43 firms with 787 workers.

As an extra precaution, SRDC investigated the possibility of differences between the two groups introduced by possible confounding factors, such as the pattern of non-response to surveys. Results showed there no systematic differences between the groups at baseline, nor that differential nonresponse between the groups introduced bias. A summary of these findings is found in Appendix A.

Distribution of training received, given available release time

UPSKILL training activities were recorded in a project management information database, along with the progress of both program and control group participants through various measurements, described below.

Employees' uptake of the intervention was high: n=562 workers in total received the training. Although participants could receive as many as 40 hours of training through UPSKILL, the average number of training hours received was 17.7; this comprised the core modules plus self-directed activities. The difference between hours offered and received is 1.4 hours on average, or about eight per cent of the hours offered. This indicates that once participants began the training, there was very high attendance, with participants missing only a small fraction of what was offered.

Figure 1   Distribution of training hours received, given release time
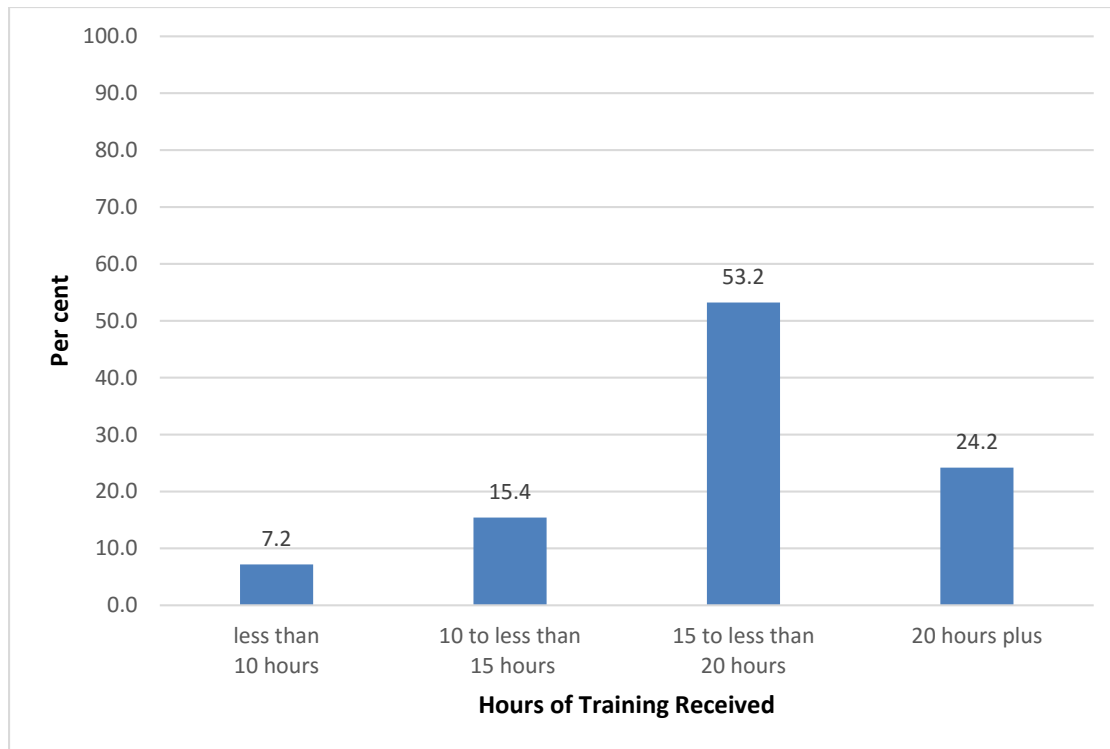
Source: Calculations by SRDC based on project management information system (PMIS); see Gyarmati, Leckie, Dowie, and Palameta (2014).

Data collection

SRDC developed a variety of employee- and employer-level data collection instruments for the UPSKILL trial. There were three main components to the employee-related data collection:

▪ a survey to obtain data on topics such as demographics, psychosocial variables, literacy practices (i.e., the frequency with which participants engaged in reading, writing, and using documents and numbers) and health variables;

▪ a literacy and essential skills assessment; and

▪ a job performance assessment.

These instruments were administered at least twice during the project to obtain pre- and post-intervention assessments. Together, these measurement activities generated repeated measurements of literacy, skills, performance, health, workplace factors and various psychosocial measurements of participants for impact evaluation.

Likewise, the employer data collection had three primary components:

- a baseline survey of key workplace characteristics;

- baseline organizational needs assessment; and

- an employer follow-up survey to measure changes in employee performance and key business outcomes during the study period.

Results

Results of UPSKILL analyses have shown that even modest investments in workplace LES training can translate into substantial gains in skills and job performance of workers with accompanying increases in employment and earnings. Training also produced a wide range of improvements in business outcomes including increased job retention, productivity gains, and costs savings from reduced errors and waste, with firms ultimately realizing an average return on their training investments of 23 per cent within the first year alone.

It is important to note that the benefits and costs of training varied greatly across firms, depending on the firms' context and their characteristics, the depth of their needs, and the process of training implementation – all of which have important policy implications for the design of workplace training interventions. UPSKILL offers crucial insights on the design and delivery of effective workplace training programs that can help maximize their return on investment – and which ultimately provide a solid business case that can motivate employer investments in workplace training.

More detail on selected results of the UPSKILL trial is provided in the section on UPSKILL's potential to improve health, below. Full results are available in the final report of the UPSKILL trial (Gyarmati, Leckie, Dowie, & Palameta, 2014) and on the SRDC website at www.srdc.org/news/new-study-shows-net-benefits-of-essential-skills-training-in-the-workplace.aspx.

2.2. UPSKILL Health

Rationale

The UPSKILL Health and Mental Health Outcomes study – known as UPSKILL Health – took full advantage of the comprehensive data set and rigorous research design of the UPSKILL trial. Whereas physical and mental health were included in the conceptual model for the UPSKILL trial – particularly in terms of occupational health and safety – they were of interest as one of many potential business outcomes arising from the LES training intervention. Exploring physical and mental health outcomes at the worker level, the relationship of these variables with LES levels, and the mechanisms by which improvements in one area might affect the others, were not the primary focus of the original UPSKILL study.

However, there is a large and growing academic literature that identifies education and literacy as social determinants of health and the potential for non-health interventions such as training and adult learning to have substantial impacts on individual and population health. While several theories exist as to the mechanisms by which education and health are related (e.g., income, health literacy, access to

health resources, learned health behaviours, etc.), these are rarely examined empirically in a comprehensive manner in the literature.

Fortunately, data collection for the UPSKILL trial included a robust set of health measures, including employees' perceived physical and mental health status, well-being, and worker health behaviours, as well as workplace-level measures such as occupational health and safety. SRDC also developed questions about health literacy and coping behaviours that supplemented questions on perceived stress and other aspects of quality of work life.[2] For the UPSKILL Health study, this comprehensive data enabled SRDC to build a model of worker health, and to assess the potential of LES (and possibly other interventions) to improve worker and workplace health.

Objectives

The objectives of UPSKILL Health were:

- to enhance conceptual understanding of how literacy skills and other factors can influence workers' physical and mental health;

- to measure the effect of workplace literacy and essential skills (LES) training, personal traits of workers, and characteristics of the workplace on worker health;

- to measure the influence of worker health on job and organizational performance; and

- to examine differences/inequities in health and performance outcomes experienced by selected subgroups of workers such as those with low literacy, low income earners, immigrants, etc. (data permitting).

Phases

The empirical work for UPSKILL Health was divided into two phases: (1) a secondary analysis of UPSKILL trial data, focusing specifically on health; and (2) gathering new qualitative data from selected individuals to explore their own perspectives. In Phase One, SRDC examined the relationships among worker and workplace factors, health literacy, health, and mental health, in terms of both individual and business outcomes. Specifically, this included:

- developing a conceptual and empirical model that describes the relationships among health, mental health, and other mediating and moderating factors;

- applying the model to the workplace to assess worker-level outcomes; and

- analyzing workers' health and mental health in relation to job performance and business outcomes.

Phase Two explored the experiences of a sub-group of UPSKILL trial participants to identify how they coped with low levels of LES, how this may have affected their mental health, and whether/how their experiences may have changed to the extent their literacy may have improved. This second phase involved thematic analysis of new data derived from interviews with experts in literacy and health, as

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[2] A matrix presenting the various LES, psychosocial and health measures used in the UPSKILL trial is provided in Appendix B.

well as focus groups with workers from the UPSKILL program group. Results from this second phase will be presented in an upcoming report.

Research questions

The specific research questions for the UPSKILL Health project were as follows:

- **Research question #1**: What personal and business factors affect workers' physical and mental health, and how?

  This question explored the baseline personal and business characteristics that can affect workers' health, including physical health, mental health, job stress, work-home satisfaction, overall well-being and workplace health and safety. It also looked at the contribution of these factors to worker health, and the pathways by which these effects occur.

- **Research question #2**: What effect does physical and mental health have on job performance and business outcomes?

  To answer this question, analyses explored to what degree workers' health (physical health, mental health, job stress, and overall well-being) directly affected their job performance, as well as possible mediating effects of psycho-social and other variables. This question also concerned the extent and ways in which workers' physical and mental health affected business outcomes such as occupational health and safety and overall firm performance), although results are somewhat limited by the number of firms participating in UPSKILL.

- **Research question #3:** What is the impact of LES training on physical and mental health and job performance?

  This question concerned the mechanisms by which literacy and essential skills training affected workers' health and performance through improved health. Since the UPSKILL trial already provided many answers to this question, the UPSKILL Health project focused on differential impacts for specific sub-groups related to sociodemographic variables, as well other possible moderators of the program for job performance (e.g., working conditions).

- **Research question #4**: How might other workplace interventions influence physical and mental health and job performance?

  This question explored the ways in which other workplace interventions focused on workplace conditions or practices (such as reducing work stress or increasing job control or recognition) may potentially affect workers' health and performance.

Analyses related to Research questions #1 and #2 tested the validity of the conceptual model developed for UPSKILL Health. Research questions #3 and #4 assessed the impact of the LES training intervention on health and performance, and what this may tell us about the potential impacts of other workplace interventions.

Focus and methods

UPSKILL Health extended the analysis undertaken in the UPSKILL trial by examining the mechanisms by which literacy and essential skills affected workers health, by looking at a variety of personal and workplace factors and their relationship to health and mental health, and by measuring the contribution of worker health to performance. More specifically, UPSKILL Health:

- unpacked the role LES training plays in worker health, via changes in healthy behaviours, health literacy, and psychosocial capital (in the UPSKILL trial, the impact of LES training on health was measured, but not the intermediate mechanisms by which this occurred);

- identified the contribution of, and the paths by which, various personal and workplace characteristics influenced health for workers and workplaces, as measured by perceived health status, health and safety, job-related stress and satisfaction, and other measures (in the UPSKILL trial, many of these variables were controlled for in the training impact estimates, but their contribution to health at baseline and to the impact of the training were not identified); and

- measured the contribution of worker health and workplace health to job and organizational performance (in the UPSKILL trial, this was not considered at all).

Figure 2 below illustrates the ways in which UPSKILL Health extends and builds upon the impact analyses of the original UPSKILL trial.

Figure 2   Links between the UPSKILL Trial and UPSKILL Health
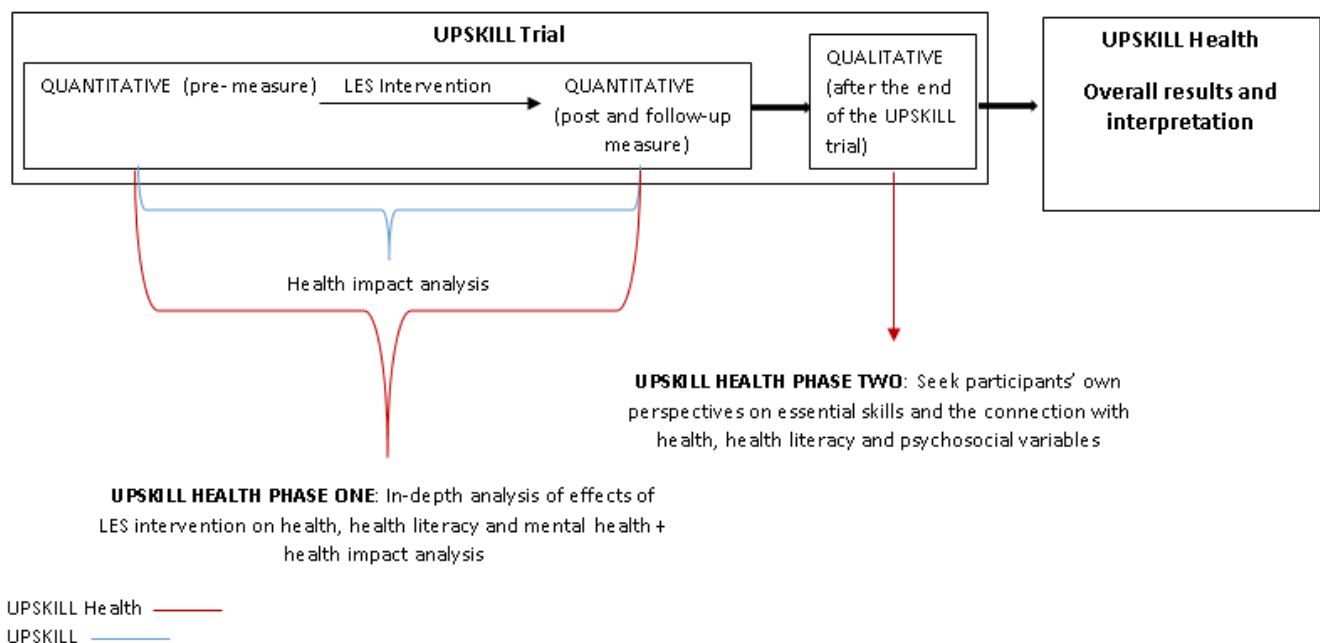
Overall, UPSKILL Health considerably expanded upon work already conducted in the area of health and learning by exploring the potential design of, and business case for, interventions that can contribute to worker and workplace health. While literacy training is one possible intervention (as explored in the original UPSKILL trial), the current study considered a number of other factors that could be modified at the workplace level as a means to improving worker health. The results of this study will thus prove useful for policy makers, literacy and health practitioners, and employers interested in improving worker health through LES training and other interventions, by demonstrating what workplace factors and practices can be modified to contribute to greater worker health and improved job and business performance.

3. UPSKILL's potential to improve health

Summary:

- UPSKILL was designed to help address the problem that 49 per cent of Canadians function below the level of literacy and essential skills required to function adequately in many jobs.

- Like education, Literacy and Essential Skills (LES) are considered social determinants of health. Some studies have shown that workplace LES training can have positive effects on workers' health, although how this works is unclear.

- UPSKILL's LES training intervention had few or ambiguous impacts on physical and mental health, though it did affect a number of health-related variables.

- The conceptual model developed for UPSKILL Health included a wide range of variables thought to influence workers' physical and mental health and in turn, their job performance and business outcomes.

3.1. Defining and assessing literacy and essential skills

While adult literacy used to be defined in binomial terms, with a basic threshold of literate or illiterate, it is more appropriately conceived of as a *range* of ability. In Canadian society, most people are able to read (Statistics Canada, 2013). The question therefore becomes *how well* can they read, *what can they do* with the information they read, and in *what contexts*.

Moreover, literacy is now understood to encompass a broader range of processes and skills; rather than just the ability to read, literacy is the "ability to find, use, and process information in prose, document, and quantitative terms" (TOWES, 2015). Literacy and essential skills (LES), then, refers to a set of foundational skills, upon which further learning – including development of technical skills – is based. Through extensive research in Canada and internationally, nine of these essential skills have been identified and validated:

- **Reading**: reading material in the form of sentences or paragraphs;

- **Writing**: writing text and writing in documents (e.g., filling in forms);

- **Document Use**: reading/interpreting and writing/completing/producing documents, which derive their meaning from a variety of sources, including text, numbers, icons, visual characteristics (e.g., line, colour, shape), and spatial arrangement;

- **Numeracy**: workers' use of numbers and their capability to think in quantitative terms;

- **Computer Use**: the variety and complexity of computer use within the occupational group;

- **Thinking**: interconnected cognitive functions, including problem solving, decision making, critical thinking, job task planning and organizing, significant use of memory, and finding information;

- **Oral Communication**: the use of speech to given and exchange thoughts and information;

- **Working with Others**: the extent to which employees work with others to carry out their tasks; and

- **Continuous Learning**: the requirement for workers in an occupational group to participate in an ongoing process of acquiring skills and knowledge (ESDC, 2014).

Measurement of these skills varies. Reading, numeracy, and document use, for instance, are often measured using the International Adult Literacy Scale (IALS), presented below in Box 1.

Box 1   International Adult Literacy Survey (IALS)

The IALS measures literacy capability on a 500-point scale (Ontario Literacy Coalition, 2010), split into five categories.

Level 1 (0 - 225)	Level 2 (226 - 275)	Level 3 (276 - 325)	Level 4 (326 - 375)	Level 5 (376 - 500)

Level 1 – *Very poor literacy skills:* An individual at this level may, for example, be unable to determine from a package label the correct amount of medicine to give a child.

Level 2 – *A capacity to deal only with simple, clear material involving uncomplicated tasks:* People at this level may develop everyday coping skills, but their poor literacy skills make it hard to conquer challenges such as learning new job skills.

Level 3 – *Adequate to cope with the demands of everyday life and work in an advanced society:* This roughly denotes the skill level required for successful high school completion and college entry. Level 3 is generally considered to be the minimum required literacy level to cope in modern society.

Levels 4 and 5 – *Strong skills:* Individuals at these levels can process information of a complex and demanding nature (Canadian Council on Learning, 2015).

According to the latest round of international adult literacy assessments, Canada's literacy score ranking is about average (Statistics Canada, 2013). However, higher than average proportions of the Canadian population have high and low levels of literacy: 14 per cent of Canadian adults, for example, function at Level 4 or above, and 49 per cent function at Level 2 or lower. For occupations included in UPSKILL, Level 3 was considered the minimum industry standard for job performance in the tourism accommodations sector, based on the essential skills profiles of the selected professions (housekeeping, food and beverage service, kitchen services, and guest services). The essential skills profile for each

occupation or each occupational groups can be found in the ESDC website
(http://www.esdc.gc.ca/eng/jobs/les/profiles/index.shtml).

It is important to note that low literacy skills are not confined to those who are unemployed. More than 75 per cent of Canadians with low LES are employed at some point during the year (Canadian Council on Learning, 2008). This underscores the importance of the growing body of anecdotal and empirical evidence that workplaces can be an effective venue for LES training. UPSKILL was designed to contribute to this body of evidence by using the most rigorous methods to evaluate the effectiveness of workplace LES training for lower-skilled, working age Canadians that was specifically designed to meet business needs.

The UPSKILL trial included a number of indicators related to LES, including document use, numeracy, oral communication, thinking, working with others, and continuous learning. Reading, writing and computer use were not assessed in the UPSKILL trial, due to their lack of direct relevance to participants' job demands and training needs. For a full description of the indicators used to measure LES and the rationale for their selection, please refer to section 4.2.

3.2. Essential skills are a social determinant of health

Beginning with the publication of the Lalonde report in 1974 (Lalonde, 1974), Canada has been a leader in the population health movement, which recognizes that health outcomes can be affected by factors "*not normally associated with health, but whose activities may have an impact on health or the factors known to influence it*" (Public Health Agency of Canada, 2002). The PHAC website currently lists twelve social determinants of health, among them education and literacy, employment and working conditions, income and social status, social support networks, personal health practices and coping skills.

As described in detail in our Conceptual Model Report (SRDC, 2014), several organizations and groups have produced overview studies on the factors contributing to worker health, including the National Institute for Occupational Safety and Health (1999), the Canadian Centre for Occupational Safety and Health (2012), Jackson (2009), Smith and Polanyi (2009), Burton (2010), Marchand and Durand (2011), and Marmot, Siegrist, and Theorell (2006). However, while there has been a fair amount of research into the effects of literacy training in the workplace on individual health, the evidence is more limited as to the *mechanisms* by which this occurs. This section provides a high-level summary of the research literature that does exist in this area.

Health behaviours

In many cases, the impacts of adult learning on health are theorized to have occurred, implicitly or explicitly, via changes in health behaviours. In their investigation of the relationship between participation in adult learning and health and wellbeing, Feinstein and Hammond (2004) examined 12 indicators of health and social cohesion: smoking, drinking, exercise, life satisfaction, entering depression, leaving depression; racial tolerance, political cynicism, support for authority, political interest, number of group memberships, and voting. The authors found that participating in adult learning was associated with improved outcomes for nine of the twelve indicators.

Participation in adult learning was also found by Feinstein, Hammond, Woods, Preston, and Bynner (2003) to contribute towards giving up smoking and exercising more. Sabates and Feinstein (2004) associated adult learning with an uptake of cervical screening. De Coulon, Meschi, and Yates (2010) showed that basic skills and education affect the probability of being a heavy/binge drinker, a smoker and obese.

Health literacy

Another way in which learning has been thought to affect health is via improved health literacy. Zarcadoolas, Pleasant, and Greer (2006) define health literacy as the ability to understand, evaluate, and act on health information in spoken, written, and visual formats. Baker (2006) and Campbell (2010) contend that high levels of health literacy lead to healthy behaviours and good physical health via two main channels: (1) reading/document use – strengthened ability to interpret and apply workplace health and safety regulations; and (2) greater awareness of and advocacy for workplace safety rights and/or communication with health and safety officials. Literacy training can also enable individuals to better read and comprehend instructions for taking medicine, understand the inclusions and exclusions of a health plan, and decide on a course of action when public health warnings and emergency bulletins are issued (Zarcadoolas, Pleasant, & Greer, 2006).

There is considerable evidence of health literacy being associated with better health outcomes. For example, an Agency for Healthcare Research and Quality (AHRQ) systematic literature review of studies of literacy and health by Berkman, Dewalt, Pignone, Sheridan, Lohr, Lux, Sutton, Swinson, and Bonito (2004) found an association between higher literacy levels and knowledge of matters relating to health services use and physical health issues. In a review of three Canadian random control trials involving literacy training focused on health, Rootman and Ronson (2005) found that the training positively affected health indicators. Lefebvre, Belding, Brehaut, Dermer, Kaskens, Lord, McKay, and Sookermany (2006) interviewed adult literacy learners who reported health literacy outcomes such as a better understanding of health issues and more effective interactions with the health system, as well as healthier lifestyle choices and reduced stress.

More recently, an updated AHRQ systematic review of health literacy interventions and outcomes found that lower health literacy levels were consistently associated with negative health behaviours such as lower use of mammography, lower receipt of influenza vaccine, and poorer ability to demonstrate taking medications appropriately. Lower heath literacy was also associated with sub-optimal health outcomes such as increased hospitalizations, greater emergency care use, and poorer overall health status, including mortality among seniors.

Psycho-social factors

Literacy has also been found to affect health through a variety of psychosocial factors, both in the workplace (demand, control and reward/recognitions, social supports), and individually (resilience, motivation, trust, strong social networks). Perrin (1998) noted that people with low levels of LES typically have limited self-confidence and are vulnerable to changes in their circumstances, such as changes in job requirements or employment situations. This is consistent with earlier research by the Ontario Public Health Association, which found that trying to cope with the literacy demands of the

workplace and society causes stress for low literacy workers, which is a major factor in mental health problems such as depression and anxiety (Perrin 1990).

A key workplace psychological factor found to affect worker health is job fit, defined as alignment between a) employees' interpersonal/emotional competencies and job skills and b) the expectations and responsibilities of their position (CCOSH, 2012). According to Marchand and Durand (2011), industrial relations/climate, risk tolerance, organizational learning and changes are also important psychological factors. These are closely related to workplace social capital factors that are also important to worker health, such as organizational culture, social inclusiveness, positive interactions, and social support available from colleagues and managers (CCOSH, 2012).

Job and business performance

Less research has been done with respect to the contribution of worker health to job and organizational performance, which, if demonstrated in a more robust manner, could make the business case for intervening to improve worker health. NIOSH's (1999) review of the research found that stressful working conditions were linked to increased absenteeism, tardiness, and intention to quit, all of which had a negative effect on the company's bottom line in terms reduced productivity and higher costs. Lowe (2006), in a study of Canadian workers, also found that about half of respondents said stress had caused health problems and at least half of workers reported that stress had led to lower quality of work, lower quantity of work, and a greater tendency to leave a workplace.

Park's (2007) research using Canadian data sources showed that high job strain (demand-control imbalance) and active jobs (high demands and control) were associated with reduced work activities and taking disability days. Gilmour and Patten (2007) also used Canadian data to demonstrate an association among depression, work impairment and absences, and lost productivity.

Burton (2010), in her review of research on worker health for the World Health Organization, found that poor mental health cost firms in the form of lost productivity due to fatigue, lost interest in work, withdrawal from colleagues, and difficulty concentrating, making decisions, managing daily tasks and coming to work, all of which contribute to poor job performance. CCOSH (2012) similarly identified the outcomes of a mentally unhealthy workplace as increased conflict and strain, headaches, burnout and anxiety, and a higher incidence of accidents, errors, incidents, injuries and absenteeism/presenteeism,[3] all of which led to increased withdrawal behaviours and turnover, reduced productivity and increased costs.

Burton (2010) also cited evidence to indicate that mental health problems cost Canadian businesses $33 billion Canadian dollars per year in 2002 (The Scientific Advisory Committee to The Global Business and Economic Roundtable on Addiction and Mental Health, 2002). More recently, the Mental Health Commission of Canada (2013) indicated that the potential impact of mental illness on productivity in the workplace in terms of absenteeism, presenteeism and exits amounted to about $6.4 billion in 2011.

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[3]   Defined as being present at work while unwell, but not necessarily productive.

These results summarize a growing body of evidence linking essential skills to health outcomes, and health outcomes in turn to job and organizational performance. As seen in the Results and Discussion sections, UPSKILL Health is now in a position to add to this research literature, situating LES and similar non-health interventions as having potential to deliver health outcomes, for the betterment of both individuals and firms.

3.3. The UPSKILL trial's impacts on health and related variables

As the foundation for the UPSKILL Health analyses, this section summarizes some of the key impacts of UPSKILL's workplace LES training intervention, starting with those linked to the central objectives of the study: participants' skills, job performance, and key business outcomes. Impacts on participants' physical and mental health and well-being are also reviewed, as well as those on certain key psychosocial outcomes and indicators of quality of working-life factors. These average impacts in the full sample were the starting point for the UPSKILL Health study, which delved deeper into the mediating variables, underlying relationships, and patterns of the impacts across subgroups. For more detail on UPSKILL impacts, see the final report of that project (Gyarmati, Leckie, Dowie, & Palameta, 2014), available at http://www.srdc.org/publications/UPSKILL-A-Credible-Test-of-Workplace-Literacy-and-Essential-Skills-Training-details.aspx

Impacts on essential skills, job performance, and job retention

The primary objective of workplace LES training interventions is to raise Essential Skills levels in an effort to improve workers' job performance and, ultimately, key business outcomes. While the end goal is to improve outcomes such as job retention and productivity, the initial aim of training is to raise Essential Skills levels, which are transferable and can improve performance across a wide range of areas of business interest.

A skills snapshot was completed for firms participating in the UPSKILL trial to assess workers' document use and numeracy skills, two elements of the Test of Workplace Essential Skills (TOWES). This assessment concluded that 85 per cent of the UPSKILL trial sample scored below Level 3 on the IALS, with the largest proportion (40 per cent) at upper Level 1. The average document use score at baseline was low level 2 (a score of approximately 226). The average numeracy score was slightly higher in the middle-level 2, at approximately 245. Industry performance assessments also measured oral communication, problem-solving, and ability to work with others. These results showed that only three in five participants met or exceeded industry standards for performance in their jobs, meaning that 40 per cent failed to meet the minimum threshold.

Following the UPSKILL trial training intervention, results demonstrated that workplace LES training did improve workers' scores on several standardized literacy skill measures. For instance, participants' document use scores increased by 11 points immediately after training and by up to 18 points six months later, compared to the changes experienced by workers in the control group. Among those assessed more than a year after enrolment, a 23-point impact was observed, which is equivalent to about half a level on the internationally-recognized literacy scale. This provided evidence that improvements in literacy skills can occur fairly quickly after training, and increase subsequent to training, as individuals utilize their skills.

Significant gains in job performance were also observed among UPSKILL participants including a greater breadth of service quality, improved relations with customers, and increased task efficiency. At the same time, Essential Skills training led to an increase of over 12 percentage points in the number of employees achieving industry certification standards of job performance, compared to the changes observed among the control group. This not only improves the quality of work, it can support future training success and career paths among workers.

Importantly, skills and performance gains were accompanied by significantly higher rates of job retention among participants. Fully 91 per cent of participants worked with the same employer up to a year after enrolment, compared to 83 per cent of those in the control group, representing an impact of 8.5 percentage points (statistically significant at 5 per cent). Participants were also less likely to be unemployed a year after enrolment: only three per cent had an unemployment spell compared to nine per cent in the control group. On average, participants worked nearly four weeks more over the year compared to the control group.

Impacts on health and well-being

Beyond labour market outcomes, the UPSKILL trial assessed the impacts of LES training on a number of key indicators of health and wellbeing.

One of the most powerful findings of UPSKILL related to the benefits of essential skills training in reducing work-related stress of participants. **Program group members were nearly 25 percentage points more likely than the control group to have reported a reduction in their level of stress** experienced in the workplace since enrolling in the UPSKILL training program (this finding of reduced stress was further explored in the UPSKILL Health study in relation to other workplace outcomes, as this was theorized to support staff morale, job performance, and job retention). Curiously, however, UPSKILL found little or no significant differences between program and control group members with regard to other aspects of mental health, as measured by either subscales of the SF-12 or the mental health composite score (MCS) from the same measure . [4]

There were also **no apparent differences in overall perceived health** (a subscale of the SF-12) between program and control group members. However, there were **negative impacts for the bodily pain sub-scale** of the SF-12, which in turn resulted in negative impacts for the physical component summary score (PSC). Program participants reported an increase in bodily pain between baseline and follow-up, whereas control group members reported a slight improvement on this aspect of health. This finding might be accounted for by the fact that program participants also experienced increased employment rates and longer hours worked.

UPSKILL training also led to **higher levels of confidence utilizing health information.** This was accompanied by an increased willingness among program group members to ask for help reading medical materials, along with higher levels of confidence completing medical forms, and higher comfort in utilizing social supports to understand and use health information when needed. These improvements may also contribute to the observed impacts on bodily pain, as awareness of one's own

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[4] MCS refers to the Mental health Composite Score of the SF-12, and is comprised of four subscales (see the section 4.2 for a full description of the SF-12 and its subscales).

physical health and a willingness to report on such issues may rise with improved health literacy and practice.

While there was a significant increase in absenteeism reported among program group members compared to control group members, this was offset by a reduction in the incidence of working while unwell. Although the net impact on absenteeism was an average of 0.6 more work days missed among program group members, when days missed and days worked while unwell were combined, the difference between program and control group members was no longer significant.

In terms of overall well-being, an indicator of **life satisfaction showed a rising trend among program group members** and a falling one among control group members. Nonetheless, the difference between the two groups just failed to attain statistical significance.

Impacts on psychosocial outcomes

In addition to the central impacts on essential skills and job performance, UPSKILL led to a number of improvements in the attitudes of participants that are indicative of gains in their psychological capital, which can support job performance and further learning. The improvements include increases in receptivity to continuous learning, future orientation, trust, and self-efficacy. In a composite measure of psychological capital, UPSKILL participants were significantly more likely to have experienced gains than were control group members.

UPSKILL also led to substantial gains in several behavioural indicators of workplace motivation and engagement, literacy practices (such as reading, writing letters, and filling out forms), and broader social inclusion. These indicators included engagement in learning, workplace practices (e.g., better use of time, arranging the work area to optimize working conditions) and volunteering for groups and organizations. Furthermore, UPSKILL training produced improvements in the social capital of female participants, including less dense and more diverse networks, with greater use of social supports.

Critically, it is these types of outcomes that represent improved channels for further learning, which can propagate skills gains and provide the long-term benefits of essential skills interventions. These mediating variables were explored further in the UPSKILL Health study to understand the underlying mechanisms for these types of sustained improvements in the lives of participants.

Impacts on business outcomes

UPSKILL training produced a wide array of improvements in business outcomes in most areas of interest to employers, as identified at the outset of the project. These included gains in both sides of the profitability equation in terms of the underlying drivers of both revenues and costs. For instance, UPSKILL led to significant improvements in the fundamental driver of business revenue – customer satisfaction with service quality. Over 70 per cent of program group firms reported significant increases in satisfaction of hotel guests compared to less than 40 per cent of the control group.

UPSKILL training also led to significant reductions in customer complaints. Only about one in four control group firms reported changes in guest complaints, most of which were small reductions. In contrast, over three quarters of firms in the program group reported reductions in the incidence of customer complaints after LES training for an impact of over 53 percentage points. Program group

firms also reported larger increases in customer loyalty and in revenue compared to the control group. Program group firms were more than 20 percentage points more likely to report an increase in the likelihood that guests would return to their hotel.

Improving productivity in terms of worker efficiency and the extent of waste and errors in service provision are two critical avenues for businesses to reduce costs and increase profitability. LES training produced positive impacts on both – reducing error rates and increasing the efficiency of workers within several departments, leading to significant cost savings for firms. Employers reported significant reductions in wastage and errors experienced in both core job tasks as well as administrative (non-service) activities. Nearly half of program group firms reported significant reductions in error rates, compared to only one in five firms in the control group.

Accompanying increased efficiency and accuracy of staff performance, are gains in productivity of supervisors. Significant increases in the confidence that supervisors have in their staff were observed among program group firms compared to their control group counterparts. At the same time, reductions in the amount of time supervisors spend monitoring and correcting work of their staff were also reported.

A fairly consistent percentage of program group firms also reported positive changes in staff morale, receptivity to new challenges, and a desire for further training and certification among their staff.

4. Methods

Summary:

- Data sources on workers' characteristics and outcomes included the baseline and follow-up surveys, the Test of Workplace Essential Skills (TOWES), and the emerit© job performance assessment. Data on business outcomes came from a survey of hotel managers at follow-up.

- Key measures for the UPSKILL Health analysis included the Short Form Health Survey (SF-12), Quality of Work Life (QWL), a health literacy scale developed by SRDC, and other scales measuring psychosocial variables such as self-esteem, self-efficacy, etc.

- The analytical approach involved four main steps:

    1. Correlations to test what variables were related to each other, and regressions to test the most promising relationships of factors influencing workers' health and job performance;

    2. Difference-in-Difference (DID) regression analysis to identify differences in impacts among sub-groups;

    3. Correlational analysis of the effects of workers' health on business outcomes;

    4. Review of other similar interventions and research to begin to analyze the implications of our results.

4.1. Data sources

This section outlines data sources used for the analyses described in this report. To address Research questions #1 and #2, employee information was derived from the baseline employee survey (n=1,438), the literacy and essential skills assessment (document use and numeracy) as measured by the Test of Workplace Essential Skills (TOWES) instrument (n=1,438), and the job performance measurements by the Canadian Tourism Human Resource Council (CTHRC) (n=984).[5] Communication and Working with Others are two important dimensions of essential skills as defined by OLES without a standardized measurement, but for UPSKILL, these were assessed by items on CTHRC's emerit© job performance assessment.

Even though the baseline data from the employee survey and TOWES assessment were fairly complete, a certain level of missing data was unavoidable, since not all participants were assessed on every measure, nor did everyone complete every item on both the baseline and follow-up surveys. As a result, the sample used in the various UPSKILL Health analyses is sometimes smaller than the baseline sample of 1,438. Sample sizes and descriptive statistics for each of the main outcome measures have been provided in Appendix B.

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[5]   For the sample used in this report however, the correct number is n=856.

For the analysis related to Research questions #3 and #4, data sources included the follow-up employee survey (n=790), CTHRC's emerit© assessments of job performance following the intervention (n=641), the TOWES assessment at follow-up (n=796),[6] and surveys of hotel managers at follow-up, asking about recent and anticipated changes in the workplace. The smaller sample size at follow-up for workers' essential skills and other measurements in the employee performance measurements did somewhat affect our capacity to detect smaller effects of variables in upcoming analyses.

The above-mentioned employee data were linked to employer data based on anonymous employee identification codes. It should be noted that, to ensure confidentiality, all personal, identifying information previously collected through UPSKILL was removed from the analysis dataset, prior to any secondary analyses being conducted for the UPSKILL Health project.

4.2. Measures

This section describes the measures used to assess document use and numeracy, health, mental health, and psychosocial variables. We also present job performance and business measures and our hypotheses regarding their effects on health and mental health. Appendix A presents a summary of the health and well-being related variables as well as other relevant variables used for the analyses in this report.

Measures of Literacy and Essential Skills (LES)

TOWES

In order to measure document use and numeracy skills, the UPSKILL project used a TOWES-based Essential Skills assessment. TOWES is a nationally recognized leader in the field of literacy and essential skills tools and resources, and uses authentic work and life content linked directly to occupational roles (TOWES, 2015a).

Document use refers to an individual's ability to understand and interpret visual displays of information, particularly information that generates meaning on the basis of its spatial arrangement. It can involve interpreting or reading graphs, lists, tables, blueprints, schematics, drawings, signs and labels (TOWES, 2015b). Numeracy refers to a worker's ability to use numbers and to think in qualitative terms, including numerical estimating, money math, scheduling or budgeting, or analyzing measurements or data (TOWES, 2015b). TOWES results were measured on the International Adult Literacy Scale (IALS).[7]

While TOWES assessments are also able to measure reading, this component was not included in the UPSKILL trial. This decision was made for several reasons, not least in order to minimize the response

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[6] A portion of the sample had two follow-up TOWES assessments.

[7] As noted in section 3, IALS scores range on a scale from 0 to 500 points for each domain of literacy, numeracy and document use. Each of the scales are split into five different levels from level 1 for the lowest literacy proficiency to level 5 for the strongest level of literacy proficiency. After level 1 (2-225 points), each level has a 50-point range.

burden on participants by shortening the assessment where possible. Secondly, the focus of UPSKILL's LES training was on skills that would have the greatest potential effect on job performance and in turn, business outcomes in the tourism accommodations sector; for the job demands of the four selected occupations, reading was not a priority skill. Last but not least, research has shown reading to be highly correlated with document use, so assessing one was considered sufficient for the purposes of UPSKILL.

Job Performance

In the UPSKILL trial, impacts on oral communication, thinking skills/problem solving, and working with others (teamwork) were derived from job performance indicators assessed through pre- and post-training observations by independent industry-trained assessors certified through the Canadian Tourism Human Resource Council (CTHRC). The specific indicators are part of the emerit© industry-certification program for each occupation, built on the National Occupational Standards and aligned with each of the six core business objectives identified by employers in UPSKILL (Gyarmati et al., 2014). For a full description of the job performance measure, please refer to the section on job performance, below.

Continuous learning skills, while not measured directly, were addressed indirectly through psychosocial variable measuring participants' attitudes to learning before and after the intervention. A full description of this variable is available below.

Measures of health and well-being

Short Form Health Survey (SF-12)

Information on self-reported physical and mental health status was obtained using a 12-item version of the 36-item Short Form Health Survey (SF-36) developed and validated by the RAND Corporation for the Medical Outcomes Study (Ware, Kosinski, & Keller, 1996). Both measures are used to provide a "glimpse into the mental and physical functioning and overall health-related quality of life" (Wen, Shi, Li, Yuan, & Wang, 2012, p. 2). Both versions have good psychometric properties and have been validated with many different populations, though mostly in the U.S. Versions of the SF-36 with 20 or eight items are also available.

Items of the SF-12 are summarized into two weighted scales: the Physical Component Summary scale (PCS) and the Mental Component Summary scale (MCS), designed to assess physical and mental health status and degree of impairment. Each sub-scale has a mean of 50 and a standard deviation of 10; a lower score indicates a higher level of impairment (Mond, Mitchison, Latner, Hay, Owen, & Rodgers, 2013). The eight subscales are scored on US norms.

Table 1 outlines the items and subscales of the SF-12:

Table 1   Items and subscales of the SF-12

Scale items	Subscales
Physical Health Component Summary (PCS)	
In general, would you say your health is *[Excellent; Very good; Good; Fair; Poor]*.	General health (GH)
The following questions are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much? *[Yes, limited a lot; Yes, limited a little; No, not limited at all]* a. Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf b. Climbing several flights of stairs	Physical functioning (PH)
During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of your physical health? *[All of the time; Most of the time; Some of the time; A little of the time; None of the time]* a. Accomplished less than you would like b. Were limited in the kind of work or other activities	Role functioning-physical (RP)
During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)? *[Not at all; A little bit; Moderately; Quite a bit; Extremely]*	Bodily Pain (BP)
Mental Health Component Summary (MCS)	
During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)? *[All of the time; Most of the time; Some of the time; A little of the time; None of the time]* a. Accomplished less than you would like b. Did work or activities less carefully than usual	Role functioning - Emotional (RE)
How much of the time during the past 4 weeks... *[All of the time; Most of the time; Some of the time; A little of the time; None of the time]* a. Have you felt calm and peaceful? b. Have you felt downhearted and depressed?	Mental health (MH)
How much of the time during the past 4 weeks... *[All of the time; Most of the time; Some of the time; A little of the time; None of the time]* Did you have a lot of energy?	Vitality (VT)
During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting friends, relatives, etc.)? *[All of the time; Most of the time; Some of the time; A little of the time; None of the time]*	Social Functioning (SF)

For this study, each of the eight subscales were analyzed separately in addition to the summary component scales (PCS and MCS), since each subscale relates to somewhat different constructs. Given

the exploratory nature of the UPSKILL Health study, we felt it was important to explore each of these constructs separately.[8]

Work Stress

Work stress was measured in two different ways in the UPSKILL Health study. The first was the two-item subscale of the Quality of Work Life (QWL), which asked to what extent participants feel under pressure at work, and feel excessive levels of stress at work.

The QWL scale measures employee's feelings about, and evaluation of, their satisfaction or contentment with their job and career, and the training they receive to do it, as well as other areas of their life (i.e., general wellbeing; see Edwards, Van Laar, Easton, & Kinman, 2009). Six factors comprise the core scale: job and career satisfaction; general well-being; home-work interface; *stress at work*; control at work; and working conditions. This scale was selected due to its simplicity and succinctness, ease of implementation, and good reliability, for both the entire scale, and the six sub-scales (Van Laar, Edwards, & Easton, 2007).

Table 2   QWL items used to determine work stress

Items
▪   I often feel under pressure at work [Strongly disagree; Disagree; Neutral; Agree; Strongly Agree]
▪   I often feel excessive levels of stress at work [Strongly disagree; Disagree; Neutral; Agree; Strongly Agree]

The second measure was a single-item included in the follow-up survey, which asked participants to what extent they had noticed a reduction in the amount of stress they experienced at work since participating in UPSKILL. Response options ranged from *not at all,* to *very little, some,* and *a lot.* For the purposes of analysis, these responses were transformed into a dichotomous measure that indicated whether participants had experienced any or no reduction in work stress.

Health Literacy

Two measures of health literacy were considered for the UPSKILL trial – the *Short Test of Functional Health Literacy in Adults (S-TOFHLA)* and the *Rapid Estimate of Adult Literacy in Medicine (REALM-R)* (Baker, Williams, Parker, Gazmararian, & Nurse, 1999; Davis, Long, Jackson, Mayeaus, George, Murphy, & Crouch, 1993). After consultation with several Canadian health literacy experts,[9] however, both were rejected as being inappropriate for the UPSKILL trial, on the grounds that they were considered to be more tests of reading comprehension of health-related content, and less tests of health literacy per se. Given that the development of health literacy assessment measures is still in its infancy (the concept

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[8]   In most cases, however, subscale results were not significantly different from the component scores, so are not generally reported in the Results section.

[9]   We consulted with Dr. I. Rootman, Dr. L Hoffman-Goetz, and Dr. S. Murray in the planning stages of the UPSKILL study.

itself still being fairly new), it was recommended that SRDC develop our own measure of health literacy.

Accordingly, SRDC used health literacy screening questions developed by Chew, Bradley, and Boyko (2004), and created a few other items to try to unpack the perceived impacts of limited and marginal health literacy, and the coping strategies participants use. Together, these items created a health literacy composite or index; higher scores on the health literacy index were interpreted to indicate a higher level of health literacy. See Appendix E for an explanation of how the scale was scored.

Table 3   Items used to determine health literacy

Items
▪ A lot of health information is confusing and unclear – including pamphlets, medical forms, advertisements, and instructions from the doctor or pharmacist. How confident do you feel filling out medical forms by yourself? *[Extremely; Quite a bit; Somewhat; A little bit; Not at all]* From Chew et al., 2004 (see also Wallace, Rogers, Roskos, Holiday, and Weiss, 2006); included as a screening questions to identify limited and marginal health literacy, to correlate with other health literacy items.
▪ How often do you have someone help you read medical materials? *[Always; Often; Sometimes; Occasionally; Never]* From Chew et al 2004 (see also Wallace et al., 2006); screening question used to identify limited and marginal health literacy, as well as coping strategies.
If participants chose any response *other than* Never: ▪ Some people find it stressful to depend on others for help to understand and use health information, such as figuring out how much medication to take, or if you should get a flu shot. How stressful do you find it to rely on others to understand and use health information? *[Not at all stressful; Not very stressful; A bit stressful; Quite a bit stressful; Extremely stressful]* Included to identify potential perceived effects on mental health of low health literacy.
▪ If you had difficulty understanding and using health information (such as figuring out how much medication to take, or if you should get a flu shot) which of the following best describes what you would do? *[Do nothing; Ask a friend or family member for advice; Ask advice from someone in my community; Try to find the information out on my own; Ask my doctor or another health professional to clarify; Make a guess; Other]* Included to identify coping strategies associated with low health literacy.
▪ In the past 12 months, which of the following happened to you because health information was not clear? (Check all that apply) [Missed an appointment; Too the wrong medication, or too much/too little; Couldn't locate or access needed services/ Had difficulty managing a medical condition (e.g., diabetes); Had an accident or injury at work; Had difficulty deciding if a treatment would be good for you; Weren't able to participate in decisions about your health; Didn't get the health care you needed; Had difficulty making changes to improve your health (e.g., quitting smoking); None of the above] Included to show potential impacts on health/health practices because of low health literacy and lack of clearly-communicated health information.

Life satisfaction

A single survey question included in the baseline and follow-up surveys measured the extent to which participants reported satisfaction with life. Participants were asked to rate the statement, *I am satisfied with my life*; response options included *Strongly disagree, Disagree, Neutral, Agree,* and *Strongly Agree.*

The life satisfaction question was an item within the Quality of Work Life (QWL) scale. The QWL scale measures employee's feelings about, and evaluation of, their satisfaction or contentment with their job and career, and the training they receive to do it, as well as other areas of their life (i.e., general well-being; see Edwards, Van Laar, Easton, & Kinman, 2009). Six factors comprise the core scale: job and career satisfaction; *general well-being*; home-work interface; stress at work; control at work; and working conditions. This scale was selected due to its simplicity and succinctness, ease of implementation, and good reliability, for both the entire scale, and the six sub-scales (Van Laar, Edwards, & Easton, 2007).

Psychosocial variables

All variables included in the conceptual model testing were also kept for this report, including self-efficacy, motivation and engagement, self-esteem, and attitudes to learning. Table 4 provides detail on how each of these constructs were measured.

Table 4   **Psychosocial variables used in UPSKILL Health**

Variables	Construct	Items
Self-efficacy **(Schwarzer & Jerusalem, 1995)**	Belief in one's own competence and ability to solve problems and attain goals	▪ I can always manage to solve difficult problems if I try hard enough. ▪ If someone opposes me, I can find the means and ways to get what I want. ▪ It is easy for me to stick to my aims and accomplish my goals. ▪ I am confident that I could deal efficiently with unexpected events. ▪ Thanks to my resourcefulness, I know how to handle unforeseen situation. ▪ I can solve most problems if I invest the necessary effort. ▪ I can remain calm when facing difficulties because I can rely on my coping abilities. ▪ If I am in trouble, I can usually think of a solution. ▪ I can usually handle whatever comes my way.
Motivation and Engagement **(Martin, 2009)**	Participant has goals and works towards those goals	▪ On the whole, I believe I do a good job. ▪ In my job I am focused on learning and improving more than I am on competing and being the best. ▪ I believe that what I do at work is important and useful. ▪ I try to plan out the things I have to do in my job. ▪ In my job, I use my time well and arrange my work area so that I can work under the best conditions. ▪ I persist in my job even when it is challenging or difficult.

Variables	Construct	Items
		▪ I get quite anxious in my job. ▪ If I work hard in my job it is usually to avoid failing or disapproval from my boss or colleague(R). ▪ I don't think I have much control over how well I do my job (R).[10] ▪ I find I sometimes reduce my chances of doing well in my job (R).
Self-esteem **(Robins, Hendin, & Trzesniewski, 2001)**	Participants' evaluation of their self-worth	▪ I see myself as someone who has a high self-esteem.
Attitudes to Learning **(Department for Business Innovation & Skills, 2012)**	The extent to which participants may be open to and interested in future learning, education, or skills upgrading	▪ I am more likely to get a better job if I do some learning. ▪ Learning new things makes me more confident. ▪ Getting qualifications takes too much effort (R).
Future orientation **(Zimbardo & Boyd, 1999)**	The importance of planning for future goals rather than focusing on immediate pleasure, as well as belief in one's own ability to control their own futures	▪ I make decisions on the spur of the moment (i.e., with little thought) (R). ▪ Meeting tomorrow's deadlines and doing other necessary work comes before tonight's play (e.g., before recreation or relaxation). ▪ Generally, I am more focused on what is going on now than on what will happen in the future (R). ▪ Since whatever will be, will be, it doesn't really matter what I do (i.e., I can't affect the future) (R). ▪ You can't really plan for the future because things change so much (R).

Job performance

The Canadian Tourism Human Resources Council (CTHRC) emerit© job performance assessments are occupation-specific and were conducted by CTHRC-certified assessors at each workplace participating in the UPSKILL trial. The assessments were administered prior to training and again roughly nine months post-training to participants within four occupational groups: custodial positions (housekeeping room attendants and maintenance) administrative and sales positions (front desk agents and reservation sales agents), serving occupations (food and beverage servers and banquet servers), and culinary occupations (line cooks).

Some occupations were excluded from the UPSKILL Health analysis of job performance due to small sample sizes. In addition only those who were working shifts while the assessors were on site were assessed, meaning that not every participant received a job performance assessment. There was no evidence of systematic selection of this convenience sample of participants.

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[10] R indicates a reverse-coded item.

The following variables were created for the UPSKILL Health analysis, based on elements of the job performance assessment:

- *Teamwork*: Effective collaboration among coworkers, both within and among departments

- *Organizational skills*: Tasks are performed efficiently through better task organization at the occupation-level and through improved organizational skills of workers

- *Productivity*: A combination of teamwork and organizational skills

- *Functional/basic oral communication*: Closely related to essential skills of oral communication. Staff are able to routinely communicate with guests

- *Emergency procedures*: Following safety procedures and being prepared for emergencies

- *Working safely*: Protecting oneself and others from injuries

- *Health and safety*: A combination of following emergency procedures and working safely

- *Absenteeism*: At least one day in the past 4 weeks; self-reported.

Business Outcomes

Business outcomes were determined through a survey conducted with hotel management at each workplace participating in the UPSKILL trial, in both program and control groups. Surveys of hotel managers were administered following the intervention period. Survey respondents were asked to reflect on recent changes they had observed in their workplace, and to anticipate potential future changes. The survey questions asked respondents to rate each category on a seven-point scale, where a score of 1-3 indicated a negative change, 4 indicated no change, and 5-7 indicated a positive change.

For the purpose of analysis, these variables were then transformed in order to indicate whether any positive change was experienced for each category. It should be noted that in instances where a positive change was not reported, this can indicate either no change or a negative change on that outcome.

Business outcomes explored included:

- *Guest satisfaction*: Change in ratings of departmental services, service recovery for guest complaints, likelihood of guests recommending the hotel, and likelihood of guests returning to the hotel

- *Revenue:* change in occupancy rates, food and beverage revenue, and ancillary revenue

- *Productivity:* Change in efficiency and error rates in core job tasks and administration, by occupation

- *Human resources:* Change in participants job satisfaction, staff morale, receptivity to new challenges, desire for further training and certification, and staying on with the firm

- *Health and safety:* Change in sick days, number of injuries, number of safety violations, reports of pain and working unwell, and worker's compensation board (WCB) claims, by occupation

- *Future health and safety:* Anticipated change in future injuries, reports of pain and working unwell, sick days, WCB claims, and safety violations, by occupation

- *Staff outcomes:* Change in staff retention, tenure, desire for further training, desire for further certification, promotional costs, hiring and recruitment costs, and other human resources issues

- *Future staff outcomes:* Anticipated change in future staff retention, tenure, desire for further training, desire for further certification, promotional costs, hiring and recruitment costs, and other human resources issues

- *Human resources plans:* Plans to deliver Essential Skills training, deliver industry training, deliver in-house training, support further mentorship, use merit pay, include additional feedback systems, and other plans for improving human resources

- *Upselling*: Change in upselling confidence, needs identification, technique, pulling the trigger, and other upselling performance, by occupation

- *Sales:* Change in sales of promotional items, specials, upsell items, departmental sales, and other sales, by occupation

- *Future sales:* Anticipated change in future sales of promotional items, specials, upsell items, departmental sales, and other sales, by occupation.

4.3. Analytical Approach

SRDC took a four-step approach to the analysis for UPSKILL Health, as summarized in Table 5.

- Part 1 concerns results from the conceptual model testing, where main relationships between LES, health and mental health, workplace characteristics and job performance were tested.

- Part 2 looked at the differential impacts of the LES training on workers' health and mental health, as well as other variables such as self-efficacy, work stress, and job performance.

- Part 3 evaluated the effects of workers' health and mental health on business outcomes.

- Part 4 looked at the implications of the UPSKILL Health analyses for other possible non-health interventions in the workplace, in terms of potential beneficial impacts on health and mental health.

The methods used for each of these lines of inquiry are presented in the following sub-sections, and significant results are reported in the Results section.[11] Full results are available on request.[12]

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[11] Results from the conceptual model testing are summarized here, since they were reported in detail in Deliverable 2.

[12] Requests for full results can be addressed to the first author of this report.

Table 5   UPSKILL Health: Lines of inquiry, research questions, and Analytical approach

Line of Inquiry	Research question	Approach
Part 1: **Conceptual model testing**: unpacking the role of LES in physical health, workplace characteristics, mental health and job performance	**Research question #1**: What personal and business factors affect workers' physical and mental health, and how?* * Complete results available in Deliverable #2	▪ Relationships between personal (including LES and health literacy) and firm-level factors, and physical and mental health were explored; ▪ Explored potential mediating effects of psychosocial and workplace variables and practices with LES, health literacy and physical health and mental health; ▪ Used workers' baseline data survey.
	Research question #2: What effect does physical and mental health have on _job performance_ and business outcomes?	▪ Estimated direct effects of physical health/mental health on job performance; ▪ Explored potential mediating effects of psychosocial variables and work stress between physical health/mental health and job performance; ▪ Used workers' baseline data survey.
Part 2: Differential impacts of LES training on physical health/mental health, and other variables	**Research question #3**: What is the impact of LES training on physical and mental health and job performance?	▪ Differential impacts of the LES training for specific sub-groups related to immigration and gender were assessed as well as other possible moderators of the program for job performance (work stress, self-efficacy); ▪ Used workers' baseline and follow-up data survey.
Part 3: Impacts of physical health and mental health on business outcomes	**Research question #2**: What effect does physical and mental health have on job performance and _business outcomes_?[13]	▪ Data did not permit direct estimation of physical health/ mental health effects on business outcomes due to small number of firms (n=88); ▪ Correlations were performed between health-related measures at the worker–level and business outcomes, but given the number of firms, we took a qualitative approach to interpreting these associations; ▪ Used workers' baseline and follow-up survey data and employers' surveys conducted post-intervention.
Part 4: Potential impacts of other non-health interventions	**Research question #4**: How might other health-related workplace interventions influence physical and mental health and job performance?	▪ Exploration of the quantitative findings regarding work stress and work conditions (results from part 1, 2, and 3), in conjunction with qualitative findings and discussions with PHAC about policy implications.

[13] Note that the impact of health on business outcomes was addressed in Part 3 due to the fact that we needed to use different methodology and data sources from those used in Part 1. While the analyses of the effects of health on job performance are at the worker level, business outcomes had to be assessed at the firm level.

Part 1: Conceptual Model Testing

The first step for the UPSKILL Health project team was to develop a conceptual model of literacy and essential skills, physical and mental health, and job performance. Fortunately, the UPSKILL trial dataset included virtually all of the variables considered in the literature as contributors to worker health, as well as measures of workers' health practices, health outcomes, job and organizational performance.

In Figure 3 below, the LES training intervention (the arrow at the top of the diagram) is understood to achieve its impacts primarily by enhancing human capital (i.e., literacy and essential skills, including health literacy), but also by building psychological and social capital (e.g., confidence and trust).

The far left hand side of the model includes worker and workplace factors identified in the literature as potentially affecting worker physical or mental health. These health determinants include socio-demographic, lifecycle, human capital (including LES), psychosocial, contextual and employment characteristics of the individual, along with characteristics of the firm such as its size and working conditions.

The middle part of the model specifies the main channels by which changes in workplace health and workplace mental health are thought to occur, particularly through the influence of health literacy and behaviours related to safety at work. The right hand side of the model illustrates how worker and workplace health can enhance job performance and the performance of the organization, that is, its business outcomes.

UPSKILL trial data on the LES intervention, and the repeated measurements of the conditions, determinants, and outcomes before and after training delivery, provided a valuable opportunity to test pathways of relationships identified in the conceptual model. The first step was to assess the strength of association among all relevant variables. Our preliminary data analysis showed that many expected variable relationships were found, particularly among health, mental health, psychosocial variables, and workplace characteristics.

However, some of the estimated correlations were weak or statistically insignificant. In some cases, the absence of correlations was expected due to a lack of prior theory about their relationship. In other cases, the lack of significant correlation was likely due to an insufficient degree of variation in the UPSKILL sample data (i.e., ceiling effects, where most participants rated themselves highly on a given variable) or to missing data (e.g., measures toward the end of the survey were not completed to the same extent as those at the beginning).

For the first Research question, "*What personal and business factors affect workers' physical and mental health, and how*?" we were guided by the correlation matrix produced in the Conceptual Model Report (Deliverable #2) to remove variables with very weak correlations from our model specification. This helped us to focus on the most promising areas of investigation which are identified by the numbers in Figure 3 below.

Figure 3   Updated conceptual model of LES and health
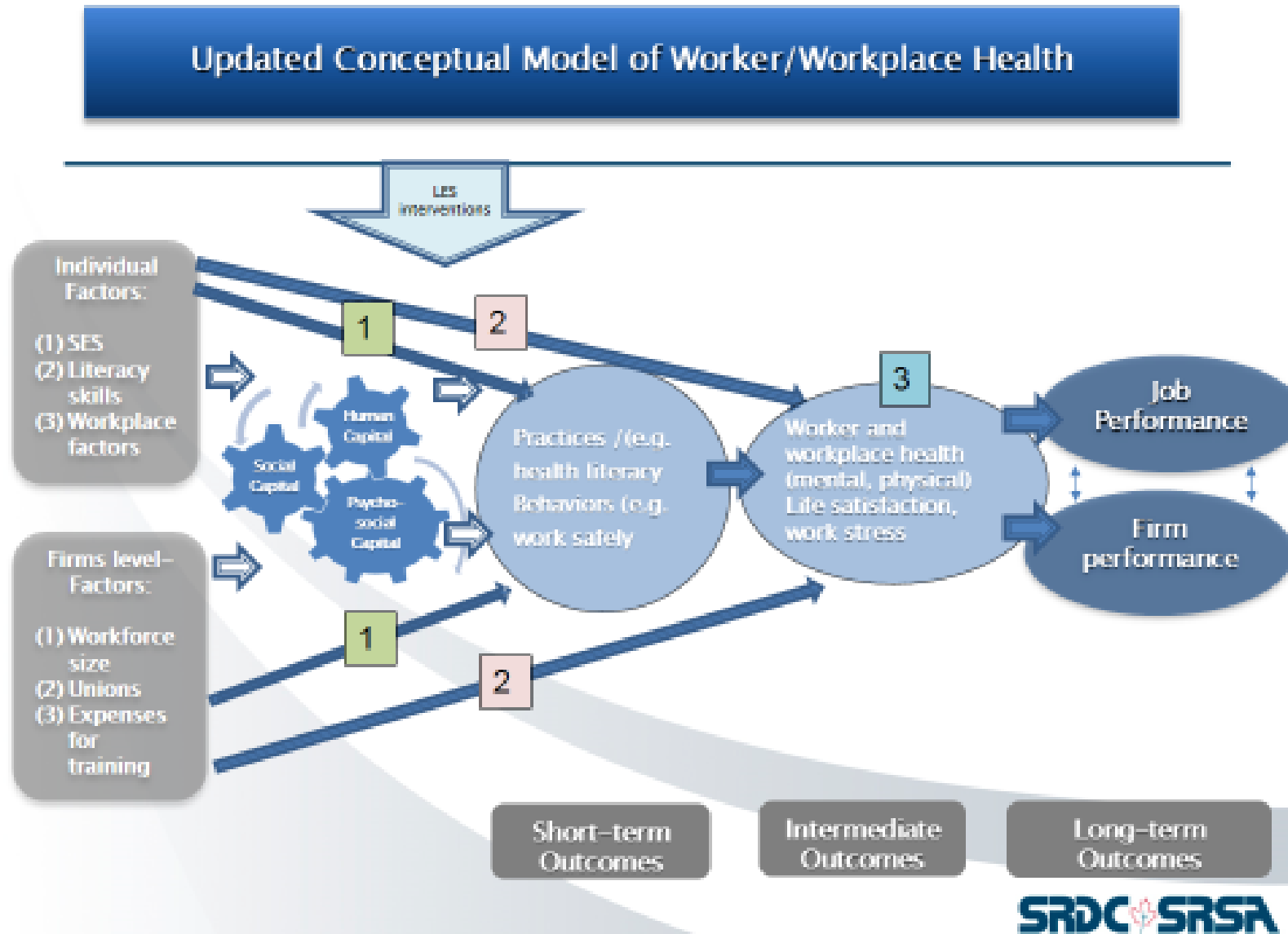
We then explored potential mediating effects of psychosocial and workplace variables and practices with LES, health literacy, physical health and mental health using data from the baseline survey data. In other words, we applied a path analysis to individual-level outcome data on a broad range of variables, focusing particularly on mental and physical health, as well as health literacy. For each area of investigation, we considered the effects of these variables in terms of their potential mediating roles in the main relationships being examined.[14]

Box 2   Path Analysis

Our statistical path analysis relied on the results of a series of linear regressions. For example, in simple path analysis of outcome Y, factor X, and mediating factor M, we first examine the gross effect of X on outcome Y by regressing Y on X directly. In order to examine the direct and indirect effects of factor X on outcome Y, we regress Y on X and M. The coefficient of X is the estimated direct (partial) effect of X, while the coefficient of M is the estimated direct (partial) effect of M. Then we also regress M on X to identify the effect of X on the potential mediating factor M. Comparing the relative sizes of the direct and indirect effects through these estimates of coefficient will complete the path analysis. Continuous variables were standardized before the regressions such that the estimated coefficients are either effect sizes (for a binary factor) or partial correlation coefficient (for a continuous factor).

We then applied regression analyses to baseline UPSKILL trial data to explore the relationships among variables and their specific roles in the conceptual model (i.e., does variable "x" appear to be a potential mediator in the relationship of interest?). Covariates identified in the research literature on determinants of health (i.e., marital status, age, immigration status and gender) were included in all models. For a more detailed discussion of the methods used to address this first research question, see Deliverable #2 for UPSKILL Health, the Conceptual Model Report (SRDC, 2014).

The three areas of investigation we explored for worker and workplace characteristics were as follows:

1. **Health literacy and its influence on mental health**: Does health literacy directly affect mental health, or does its effect pass through channels such as psychosocial variables (e.g., motivation and engagement, self-efficacy, attitudes to learning, resilience and self-esteem)? In other words, does health literacy have a direct effect on mental health or are there are potential mediators in that relationship?

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[14] A mediator variable specifies how or why a particular effect or relation occurs. A moderator variable affects the direction or the strength of the relation between a predictor and an outcome. Thus, a moderator variable indicates under what particular condition an effect can be expected.

Figure 4   Relationship of health literacy to mental health
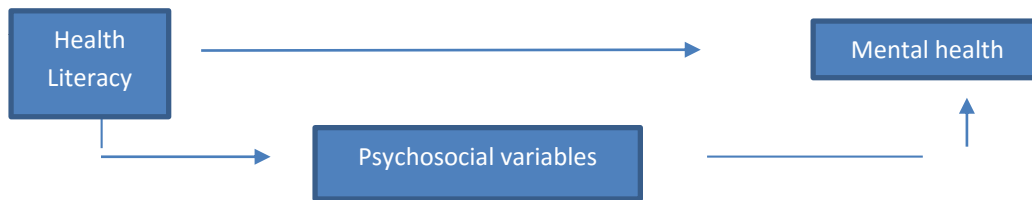
2. **The relative effects of different workplace characteristics and conditions on mental health**: What are the relative influences of workplace characteristics, work stress, and work satisfaction on mental health? To what extent do work stress and work satisfaction act as potential mediators in the relationship between workplace characteristics and mental health?

Figure 5   Relationship of workplace characteristics to mental health
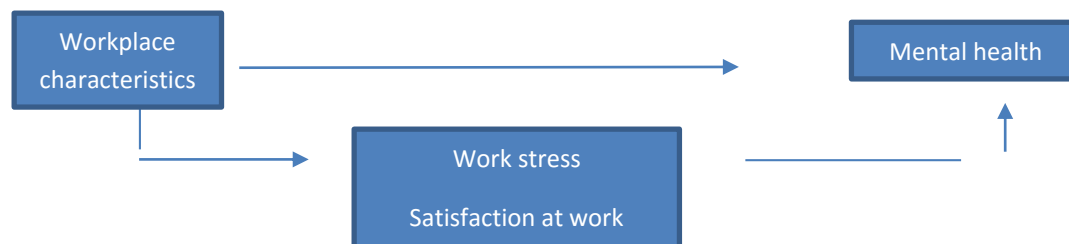
3. **The links among essential skills, safe work practices and physical health**: The UPSKILL trial showed that LES training improved job performance in terms of working safely – participants were about 12 percentage points more likely to surpass industry standards after training compared to the control group. Given this, do numeracy/literacy/health literacy skills help job performance in terms of working safely? Does working safely have an effect on physical health?

Figure 6   Relationship of LES, safe work practices, and physical health
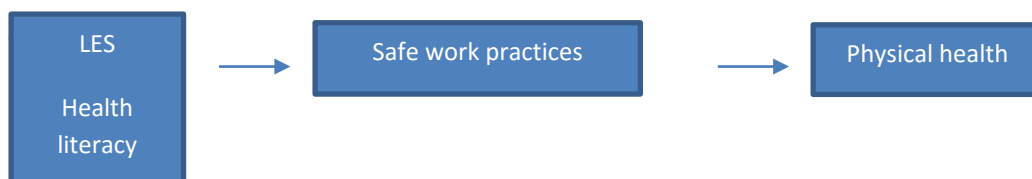
To evaluate the first part of Research question #2 "What effect does physical and mental health have on *job performance*?" (i.e., the right-hand part of the conceptual model), we took a similar approach to empirical model specification as for the analyses described above.

Using relevant literature and running bivariate associations, the research team first identified which aspects of job performance were most likely to be influenced by physical and mental health. These

included teamwork, task efficiency, productivity, functional communication, safety and emergency procedures, working safely, health and safety, as well as absenteeism. The earlier findings regarding the first part of the conceptual model (i.e., the role of psychosocial variables between health literacy and mental health and the importance of work stress for mental health) also informed the analytical strategy for the second part of the conceptual model testing.

Next, the pathways by which physical and mental health and other psychosocial variables might have an effect on job performance were defined. Since the performance of different jobs calls upon very different skills or capabilities, we tested these relationships in two ways (see Appendix C for details). For teamwork and communication (Figure 7), we looked at mental health, stress and psychosocial variables as possible mediators between LES and job performance. Although the primary goal was to evaluate the impact of health on job performance, we wanted to ensure we also captured the role of LES to increase our understanding of the *mechanisms* by which they affect job performance. For example, while essential skills are likely to improve teamwork, channels of improvement are still unknown (see ABC Life Literacy, 2010; Kuji-Shikatani & Zori, 2007).

Figure 7   Relationship between LES, mental health, and job performance
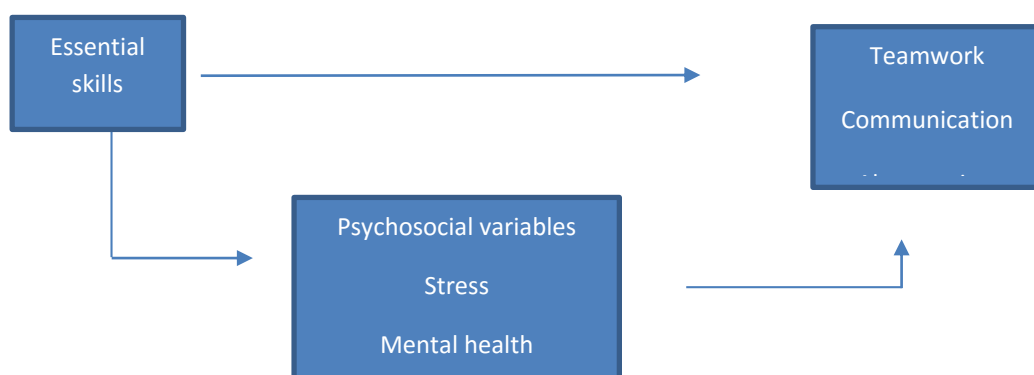
For productivity, task efficiency, health and safety, and absenteeism, we hypothesized that health would have a direct effect (see Figure 8).

Figure 8   Relationship of health to job performance
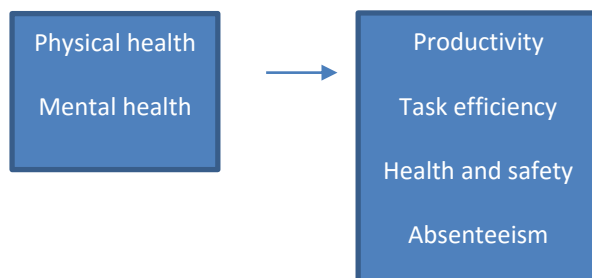
Note that in Figure 7, mental health, stress, and psychosocial variables are possible mediators between essential skills and job performance (teamwork, functional communication and absenteeism). Conversely, physical health, mental health and stress are theorized to have a direct effect on other job performance measures (e.g., productivity, health and safety), as depicted in Figure 8.

The first analyses on the impact of physical and mental health showed that using follow-up data did not improve model identification, due to missing data on job performance[15] and health scores (see Appendix B). Focusing on baseline data was a better choice to ensure reliability of estimations. We then used similar regressions as for the first research question, as well as the same covariates, to obtain more precise estimations.

Part 2: Differential impacts of LES training on health/mental health, and other variables

Research question #3 asks, "What is the impact of LES training on physical and mental health and job performance?" As indicated in Section 2 of this report, the UPSKILL trial already assessed the impact of LES training on a series of health-related and psychosocial variables, both in terms of average effects and differential effects for specific sub-groups. UPSKILL Health explores this question in more depth, addressing a particularly important question for policymakers: "Whom does the intervention help? Do all participants benefit equally or are there differential effects for individuals with specific characteristics?" Although overall program effects may be robust, these might be larger for some people and smaller or even nil for other (Weiss, Bloom, & Brock, 2014).

Using the same Difference-in-Difference (DID) estimations of impacts used in UPSKILL, our goal was to look at differential health-related impacts of the LES training for specific sub-groups in order to provide insight about possible targeting or modifications to the intervention and/or future implementation. The subgroups were defined in terms of client characteristics at baseline (see Table 4), since these can moderate the size of intervention effects. For UPSKILL Health, we used two types of program moderators: sociodemographic characteristics (immigration status and gender) and non-cognitive skills (self-efficacy and work stress levels). The former are considered of greatest policy interest, and the latter were among the variables most highly correlated with physical and/or mental health.

Box 3　　Non-cognitive skills – Definition

Non-cognitive skills are "*relatively enduring patterns of thoughts, feelings and behaviors that reflect the tendency to respond in certain ways under certain contexts*" (Roberts, 2009, p. 140). Weiss, Bloom & Brock (2014) specify that "*they include the ability of an individual to (1) avoid distractions while working on long-term goals (e.g., learning a new skill, quitting smoking, advancing in a career); (2) deal productively with stressors, including setbacks and failures; and (3) interact well with others.*"

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[15] As noted earlier, job performance assessments were conducted by observation and interview, so scheduling conflicts meant it was not possible to evaluate all participants.

The first subgroup for the differential impacts analyses was defined by immigration status. Immigrants comprised a large proportion of the UPSKILL sample (42 per cent) and are well-represented in the tourism accommodations sector. The UPSKILL trial generally showed more important gains for this subgroup in terms of essential skills and job performance. Accordingly, we hypothesized this group may also have experienced other positive effects on health-related outcomes.

The second subgroup was defined by gender. Female participants tended to experience greater and more sustained effects in the UPSKILL trial (likely owing to the fact that they were disproportionately represented in the UPSKILL sample). Again, we hypothesized that they may have experienced greater health-related effects, such as with regard to work stress and work control (for example, see Campos-Serna, Ronda-Pérez, Artazcoz, Moen, & Benavides, 2013).

The other two subgroups were defined as having either a high or low level of perceived self-efficacy, or a high or low level of work-stress, on the assumption that these factors might have enhanced or diminished program effects. The median of both scales was used as a cut-off to define low/high level of self-efficacy (median=31 on a possible score of 40) and work stress (median=3 on a possible score of 5).

Table 6   Sub-groups for analysis of differential impacts

Subgroups (program moderators)	Outcomes
Immigrants	- Work Stress - Physical Component Score (PCS) - Mental Component Score (MCS) - Self-efficacy - Social capital - Health literacy - Work control - Work satisfaction
Gender	- Work Stress - PCS - MCS - Self-efficacy - Work control - Work satisfaction
Low/high Self-efficacy at baseline	- Job performance (all) - MCS - Work Stress
Work stress at baseline	- Job performance (all) - Functional communication - MCS

The difference in treatment effects between sub-groups should be based on tests for interaction between subgroups, as opposed to results within subgroups (Assmann, Pocock, Enos, & Kasten, 2000). No other covariates were included in the estimations with the exception of those for immigration status. In this case, we controlled for hours of training received, since we knew that immigrant UPSKILL participants received on average, about three hours more training than other participants, likely due to language needs.

Part 3: Impacts of health and mental health on business outcomes

To evaluate the relationship between health and business outcomes, we calculated the average scores for workers at each firm on a number of key variables, including the physical and mental health (PCS and MCS), health literacy, work stress, self-efficacy and self-esteem scales. We then examined the correlations of these firm-level characteristics with various measurements of business outcomes.

Although simple correlations were used to assess the direction and strength of association between variables, the small number of observations (n=88 firms) limits our confidence with the robustness of the statistical estimates. Our discussion of the results therefore focuses on general implications (e.g., the nature or type of association) rather than effect sizes of the estimated correlations.

Part 4: Potential impacts of other non-health interventions on health

Given that the most significant health-related impact of the LES training intervention in the UPSKILL trial was on self-reported work stress, we focused our exploration of the potential impacts of other non-health interventions on stress and other mental health outcomes. This focus is also motivated by policy and practical considerations. According to Leigh and Schnall (2000), occupational stress is becoming the greatest cause of occupational disease, having consequences both for workers and firms. Occupational stress has been linked with a range of negative mental and physical health outcomes, including depression, anxiety, emotional exhaustion, immune deficiency disorders, and cardiovascular diseases (Noblet & LaMontagne, 2006).

For this analysis, we focused on workplace interventions – including but not limited to LES training – that could potentially improve mental health outcomes of employees (including work stress). Using results from UPSKILL Health analyses from Parts 1, 2, and 3, we discuss how workplace interventions could address work stress, mental health, and satisfaction at work. We also provide a brief description of the findings of other studies of workplace LES interventions in Canada.

The analyses for Part 4 will be expanded upon in the final synthesis report of the UPSKILL Health study, based on upcoming discussions with PHAC representatives on the policy and practice implications of the qualitative and quantitative findings.

5. Results (Part 1): Unpacking the role of LES in health and job performance

Summary:

▪ **Health literacy appeared to have a direct effect on workers' mental health,** although self-esteem and self-efficacy were also important mediating variables.

▪ **Workplace characteristics did not appear to affect overall mental health, but did have impacts on work stress**, which in turn affects mental health.

▪ There was no conclusive evidence of links among Essential Skills, working safely, and physical health, which was unexpected. However, there were some associations (e.g., between numeracy and knowledge of safety procedures and emergency preparedness, and between document use and working safely) that warrant further study.

▪ **Mental health was associated with three dimensions of job performance: teamwork, communication and especially, absenteeism**, such that a higher score on the mental health sub-scale of the SF-12 decreased the probability of absenteeism. Physical health had a similar strong relationship with absenteeism.

▪ **Less work stress was associated with better functional communication and decreased absenteeism**.

▪ In the same way, we found that **life satisfaction was positively associated with teamwork**, as well as with mental health and certain workplace characteristics (working conditions, control over work, and work-home satisfaction).

▪ **Attitudes to learning was an important variable for job performance** (teamwork, task efficiency, and working safely).

Sections 5.1 and 5.2 present a summary of results from the first stage of UPSKILL Health analysis that explored the extent and nature of relationships among a number of worker-level variables related to health, LES, and psycho-social variables. For more detail on these analyses and tabular results, see Deliverable #2, the Conceptual Model report (SRDC, 2014). Section 5.3 presents new analyses conducted to assess the relationship between health, mental health and job performance.

5.1. Association of variables at the worker-level

Findings from conceptual model testing conducted in the first stage of analysis are the result of correlational analyses amongst a variety of worker-level variables, using baseline UPSKILL data. As

such, they present a picture of association or relationship between variables and the strength of that relationship, but do not illuminate the direction of the association.

LES and Heath Literacy

▪ The health literacy scale (created by SRDC) was associated with a number of sociodemographic variables, essential skills, psychological capital, social capital and workplace factors. Specifically, health literacy was strongly associated with self-efficacy (0.25), resilience (0.29 motivation and engagement (0.24), and attitudes to learning (0.21).

▪ Health literacy was also associated with self-esteem (0.15), literacy-confidence (0.30), reading or using information (0.21), network size (0.14), reading as a favourite activity (0.19), and work control (0.11).

▪ Numeracy and document use were also both associated with health literacy (0.28 and 0.14 respectively).

Mental health

▪ Mental health, life satisfaction, work stress and quality of work life presented important associations (>0.20), particularly with workplace characteristics such as control over one's work, working conditions and work-home satisfaction.

▪ Mental health was associated with health literacy (0.23), although mechanisms to explain this association are unclear at this point. Attitudes to learning, motivation and engagement and self-efficacy are pathways that could be explored. Of those, mental health was associated with motivation and engagement (0.15) and self-efficacy (0.25).

▪ Mental health was also highly associated with a number of other psychosocial variables, including resilience (0.20) and self-esteem (0.27).

▪ Mental health was highly associated with work stress (0.40) and quality of work life (0.28) but negatively associated with physical health (-0.19). This finding is unclear, although it could be related to measurement issues concerning the SF-12 subscales (see Study limitations).

▪ Mental health was also negatively associated with both document use and numeracy (-0.12 and -0.11 respectively).

Physical health

▪ Physical health was associated with health literacy (0.12), literacy (0.10) and confidence in one's literacy (0.13). One possible pathway for this relationship is the influence of health literacy and literacy on occupational health. The association between safe work practices and physical health was small (0.09) but significant.

▪ Numeracy was also associated with physical health (0.19).

- Physical health was not strongly associated with workplace factors (e.g., working conditions) but also presented some correlation with the size of workers' social networks (0.17), their motivation and engagement (0.10), and age (-0.14).

- Physical health was also associated, although not strongly, with a number of psychosocial variables, including self-efficacy (0.11), resilience (0.14), and self-esteem (0.07).

Together, these results confer a potentially important role for essential skills training to improve mental and physical health. They also confirm health literacy as an important component of the model, whose precise role was explored further in later analyses.

5.2. Potential mediating effects of psychosocial and workplace variables between LES and health

Health literacy, psychosocial variables, and mental health

The first series of regression models investigating the relationship between health literacy, mental health and possible mediators (Figure 4 above) showed that health literacy appeared to have a direct effect on mental health. One implication of this finding may be that interventions that could enhance health literacy could potentially improve mental health. However, we also observed that many psychosocial variables appeared to be significant intermediary variables in the relationship between health literacy and mental health, of which self-efficacy and self-esteem were the most important.

Workplace characteristics and mental health

The second series of regression models (Figure 5 above) showed that workplace characteristics such as control over work, satisfaction with home-work balance, firm size, and presence of a union, did not appear to have any substantial impacts on mental health but did appear to have some impacts on work stress, which in turn, affects mental health. Work satisfaction did not appear to be a mediator between workplace characteristics and mental health.

Safe work practices and physical health

The third series of regression models (Figure 6 above) showed inconclusive evidence of links among essential skills, safety at work and physical health. While numeracy seemed to be related to working safely (conferring a potential role for essential skills training to improve job performance), working safely was not related to any dimension of physical health.

This finding may be related to the smaller sample size available for these models due to sparser data on job performance. It may also be due to the lack of health–related variables at the individual level, or to work-related injuries. For example, data on work injuries and workers' chronic health conditions could have more easily described the link between safety practices at work and work injuries. Even in the absence of such data, however, we can conclude that overall, the data fit the conceptual model quite well. The connection between working safely and physical health, however, requires further investigation.

5.3. Association between physical and mental health and job performance

For each area of the performance assessment, we tested specific models as stated in the previous section on Methods – Analytical Approach. Here, we present the results by job performance assessment area or variable in order to emphasize the role of physical and mental health in each of these concepts. We have opted to portray only statistically significant results in detail; complete results are available on request.

All results presented in this section are based on baseline data, so it is not possible to attribute causality or a particular direction to the relationship. The independent variables of mental health and physical health (and all other variables of interests, such as work stress and psychosocial variables) were standardized in the regression estimations. Each estimated coefficient (given by "β") is the decrease or increase in the likelihood of passing the performance assessment per standard deviation change of the scale.

Teamwork

The main hypothesis tested for the role of health on teamwork was that better mental health would be associated with greater aptitude for teamwork. Moreover, since the research literature shows that Essential Skills are likely to improve teamwork, we hypothesized that psychosocial variables and mental health could act as mediators between these two variables.

The main results from these analyses are as follows:

▪ In the UPSKILL final report, it was shown that significant gains (i.e., changes from baseline to follow-up) in productivity were observed through more effective teamwork. Our analysis of baseline data, however, did not show any significant associations between teamwork and numeracy and document use, especially once educational attainment was taken into account. Indeed, document use proficiency was negatively associated with teamwork performance at baseline, perhaps as a result of measurement error;

▪ Our analysis also failed to identify any psycho-social variables (e.g., self-efficacy, self-esteem, attitudes to learning, trust, and motivation) that were significant potential mediating factors in the relationship between LES and teamwork.

Other pathways (besides psychosocial variables) should be investigated in the future to explain how the improvement in teamwork occurred following the training. Our analyses showed that attitudes to learning ($\beta=0.028$, $p<.0381$; Table 7) and life satisfaction ($\beta=0.0251$, $p<.0497$; Table 8) were positively associated with teamwork; one standard deviation (SD) in each of these scales increased the probability of passing the teamwork assessment by about two percentage points. If workplace essential skills training had an impact on these two variables, it might offer a possible explanation of why teamwork improved.

Table 7 Association between of attitudes to learning and teamwork (standardized results at baseline)

	Estimate (β)	Standard Error	Pr > |Z|
Intercept	**0.8924**	**0.1004**	**<.0001**
Attitudes to Learning	**0.028**	**0.0135**	**0.0381**
Numeracy Score	0.0167	-0.0237	0.4173
Document Use Score	**-0.0292**	**-0.0611**	**0.0726**
Age	0.0007	0.0016	0.6763
Gender			
Male	**-0.0995**	**0.0538**	**0.0645**
Female	0	0	.
Education			
Bachelor's Degree or Greater	-0.0331	0.0468	0.4795
College Diploma/Certificate	-0.0237	0.0371	0.5235
Trade/Vocational Diploma/Certificate	**-0.1290**	**0.0553**	**0.0196**
High School Diploma/Certificate	-0.0688	0.0513	0.1802
Less Than High School Diploma	0	0	.
Marital Status			
Married or Common Law	0.0134	0.0488	0.7838
Single, Never Married	0.0113	0.0568	0.8418
Separated/Divorced/Widowed	0	0	.
Immigration Status			
Canadian-born	0.0337	0.0428	0.4316
Immigrant	0	0	.
Network Size	0.0137	0.0137	0.3873
Number of observations = 520			

Table 8   Association between life satisfaction and teamwork (standardized results at baseline)

	Estimate (β)	Standard Error	Pr > |Z|
Intercept	**0.8608**	**0.0966**	**<.0001**
Life Satisfaction	**0.0251**	**0.0128**	**0.0497**
Numeracy Score	0.0218	0.0205	0.2875
Document Use Score	**-0.0266**	**0.0158**	**0.0916**
Age	0.0007	0.0016	0.6747
Gender			
Male	**-0.0985**	**0.0536**	**0.0662**
Female	0	0	.
Education			
Bachelor's Degree or Greater	-0.0016	0.05	0.9749
College Diploma/Certificate	0.0077	0.0421	0.8544
Trade/Vocational Diploma/Certificate	**-0.0969**	**0.0556**	**0.0813**
High School Diploma/Certificate	-0.0414	0.0497	0.4054
Less Than High School Diploma	0	0	.
Marital Status			
Married or Common Law	0.0141	0.0476	0.7674
Single, Never Married	0.0164	0.0545	0.7632
Separated/Divorced/Widowed	0	0	.
Immigration Status			
Canadian-born	0.0386	0.0398	0.333
Immigrant	0	0	.
Network Size	0.0097	0.0138	0.4848
Number of observations = 537			

- Mental health (MCS) was also positively associated with teamwork (β=0.0024, p<.07; see Table 9), particularly on one of its subscales, Role functioning-Emotional (β=0.0378, p<.0718). Vitality was negatively associated with teamwork (β=-0.0504, p<.0076), but we suspect this sub-scale may have problems with internal consistency, since it also produced counter-intuitive results in the UPSKILL impact analysis.

- While MCS was modestly related to teamwork we observed a relatively large gender difference in teamwork productivity: being a man was associated with a reduced probability of passing the teamwork assessment by 9.2% (p<.0811; see Table 9).

These results are notable since they reinforce the potential importance of mental health promotion in order to improve teamwork, an important component of productivity.

Table 9   Association between of mental health and teamwork (standardized results at baseline)

	Estimate (β)	Standard Error	Pr > |Z|
Intercept	**0.7426**	**0.1097**	**<.0001**
MCS	**0.0024**	**0.0014**	**0.07**
Numeracy Score	0.0315	0.0219	0.1506
Document Use Score	-0.0273	0.0175	0.1177
Age	0	0.0018	0.989
Gender			
Male	**-0.0916**	**0.0525**	**0.0811**
Female	0	0	.
Education			
Bachelor's Degree or Greater	-0.0046	0.0553	0.9337
College Diploma/Certificate	0.0051	0.0444	0.9084
Trade/Vocational Diploma/Certificate	**-0.0951**	**0.055**	**0.0838**
High School Diploma/Certificate	-0.0420	0.0561	0.4546
Less Than High School Diploma	0	0	.
Marital Status			
Married or Common Law	0.027	0.0523	0.6053
Single, Never Married	0.0185	0.0589	0.7538
Separated/Divorced/Widowed	0	0	.
Immigration Status			
Canadian-born	0.0439	0.0421	0.2979
Immigrant	0	0	.
Network Size	0.0098	0.0147	0.5045
Number of observations = 488			

Task efficiency

This performance assessment related to how tasks were performed efficiently through better organization and improved organizational skills of workers. Therefore, one important hypothesis is that stress (namely, work stress) and mental health could decrease productivity, by workers being less focused at work and more disorganized. Physical health (PCS) and each of its subscales were also expected to negatively affect task efficiency.

While these hypotheses were supported by literature, our data analyses did not show any significant associations between physical or mental health and task efficiency. We explore possible explanations for this in the Discussion section.

Productivity

Productivity was a derived variable created from a combination of teamwork and task efficiency. Therefore, we had a similar hypothesis to the above on task efficiency: stress and poor mental health would decrease productivity (see Lowe, 2006), as would poor general physical health or injuries.

However, no effects of mental health (MCS), physical health (PCS), work stress, or stress were found on this variable. The only significant variable related to productivity was attitude to learning ($\beta=0.0353$, $p<.0604$). This lack of impact is not surprising in light of the similar result for Task Efficiency (above), which likely diluted links previously made, such as for the influence of mental health on teamwork.

Functional Communication

Functional communication was measured by how well a hotel staff member was able to routinely communicate with guests, including listening effectively. Existing literature suggests that LES are likely to improve functional communication, and that mental health, stress and psychosocial variables can also influence the degree and way we communicate with each other (Lowe, 2006). Accordingly, one of the hypotheses tested in this study is that psychosocial variables would have a direct impact on functional communication, or might act as mediators between LES and communication.

Our results showed that:

- Numeracy at baseline was positively associated with communication ($\beta=0.0505$, $p<.0307$; see Table 10), but document use was not. Given that numeracy and document use skills are usually highly correlated, we suspect the numeracy score may have captured all the relevant strength of association between LES and effective communication.

Table 10   Association between LES and functional communication (standardized results of base model at baseline)

	Estimate (β)	Standard Error	Pr > |Z|
Intercept	**0.7776**	**0.1130**	**<.0001**
Numeracy Score	**0.0505**	**0.0234**	**0.0307**
Document Use Score	0.0076	0.0165	0.6475
Age	-0.0001	0.0019	0.9402
Gender			
Male	0.0234	0.0405	0.5627
Female	0	0	.
Education			
Bachelor's Degree or Greater	0.0209	0.073	0.7745
College Diploma/Certificate	0.044	0.069	0.5242
Trade/Vocational Diploma/Certificate	0.015	0.0728	0.8365
High School Diploma/Certificate	0.0211	0.0634	0.7396
Less Than High School Diploma	0	0	.
Marital Status			
Married or Common Law	-0.0419	0.0494	0.3969
Single, Never Married	0.0016	0.0567	0.9777
Separated/Divorced/Widowed	0	0	.
Immigration Status			
Canadian-born	**0.0704**	**0.04**	**0.0788**
Immigrant	0	0	.
Network Size	0.0182	0.0148	0.2197
Number of observations = 580			

- We also found that less work stress was significantly associated with communication (β=0.0327, p<.0286; see Table 11), but this was not the case for overall stress or life satisfaction. However, our results are clear that effective workplace communication and perceived work stress were closely linked, as opposed to workers' general level of stress.

Table 11   Association between of work stress and communication (standardized results at baseline)

	Estimate (β)	Standard Error	Pr > |Z|
Intercept	**0.7516**	**0.1134**	**<.0001**
Work Stress	**0.0327**	**0.0149**	**0.0286**
Numeracy Score	**0.0525**	**0.0235**	**0.0252**
Document Use Score	0.0066	0.0162	0.6832
Age	0	0.0019	0.9977
Gender			
Male	0.0253	0.0417	0.5433
Female	0	0	.
Education			
Bachelor's Degree or Greater	0.0307	0.0737	0.6773
College Diploma/Certificate	0.0542	0.0731	0.4581
Trade/Vocational Diploma/Certificate	0.0273	0.0731	0.7087
High School Diploma/Certificate	0.0174	0.0647	0.7875
Less Than High School Diploma	0	0	.
Marital Status			
Married or Common Law	-0.0381	0.0494	0.4407
Single, Never Married	0.0087	0.0557	0.8758
Separated/Divorced/Widowed	0	0	.
Immigration Status			
Canadian-born	**0.0793**	**0.0415**	**0.0559**
Immigrant	0	0	.
Network Size	0.0158	0.0154	0.3059
Number of observations = 572			

- Mental health (MCS) was modestly related to functional communication and just passed the threshold of statistical significance (β=0.0025, p<.0961; see Table 12). Since our conceptual model shows a high correlation between work stress and mental health, the fact that both have effects on communication is not surprising.

Table 12   Association between mental health and communication (standardized results at baseline)

	Estimate (β)	Standard Error	Pr > |Z|
Intercept	**0.7022**	**0.1148**	**<.0001**
MCS	**0.0025**	**0.0015**	**0.0961**
Numeracy Score	**0.0444**	**0.0239**	**0.0634**
Document Use Score	0.0074	0.0155	0.6319
Age	-0.001	0.0019	0.6194
Gender			
Male	0.0131	0.0406	0.7478
Female	0	0	.
Education			
Bachelor's Degree or Greater	0.008	0.0796	0.9202
College Diploma/Certificate	0.0216	0.0791	0.7854
Trade/Vocational Diploma/Certificate	0.023	0.0789	0.7704
High School Diploma/Certificate	0.0164	0.0702	0.8151
Less Than High School Diploma	0	0	.
Marital Status			
Married or Common Law	-0.0183	0.0528	0.7287
Single, Never Married	0.0006	0.0577	0.9922
Separated/Divorced/Widowed	0	0	.
Immigration Status			
Canadian-born	0.0543	0.0419	0.1945
Immigrant	0	0	.
Network Size	0.0107	0.0155	0.4911
Number of observations = 519			

Finally, we found trust to be negatively associated with effective communication (β=-0.0526, p<.0079; see Table 13). While this may seem counter-intuitive, one can hypothesize that in these particular workplaces – and in the context of communication with hotel guests – effective communication depends less on trust and more on other factors such as effective listening.

Table 13   Association between trust and communication (standardized results at baseline)

	Estimate (β)	Standard Error	Pr > |Z|
Intercept	**0.7842**	**0.107**	**<.0001**
Trust	**-0.0526**	**0.0198**	**0.0079**
Numeracy Score	**0.0536**	**0.0235**	**0.0228**
Document Use Score	0.0072	0.0162	0.6561
Age	0.0002	0.0018	0.9093
Gender			
Male	0.02	0.0415	0.6297
Female	0	0	.
Education			
Bachelor's Degree or Greater	0.0079	0.0746	0.9161
College Diploma/Certificate	0.0238	0.0716	0.7395
Trade/Vocational Diploma/Certificate	0.0205	0.0722	0.7767
High School Diploma/Certificate	-0.0017	0.0642	0.9786
Less Than High School Diploma	0	0	.
Marital Status			
Married or Common Law	-0.0556	0.0474	0.2404
Single, Never Married	-0.0137	0.0543	0.8002
Separated/Divorced/Widowed	0	0	.
Immigration Status			
Canadian-born	**0.0709**	**0.0397**	**0.0742**
Immigrant	0	0	.
Network Size	**0.0287**	**0.0165**	**0.0821**
Number of observations = 553			

In summary, when we compared the estimates of correlation between Essential Skills and communication, with and without introduction of psychosocial variables in the regressions, we found that their variations did not explain away any of the effects of Essential Skill on communication. In other words, psychosocial variables did not appear to act as mediators between Essential Skills and Functional Communication.

Safety and emergency preparedness

This element of job performance mainly concerned knowledge and actions that employees take in order to follow safety procedures and be prepared for emergencies. Since some of the items of the assessment involve knowledge of written guidelines, our hypothesis was that Essential Skills would play a central role, as opposed to health or mental health.

Our results were consistent with this hypothesis. Indeed, while numeracy was significantly associated with safety and emergency preparedness (β=0.1032, p<.0013; see Table 14), mental health (MCS) and physical health (PCS) were not.

Table 14   Association between Essential Skills and safety and emergency (standardized base model results at baseline)

	Estimate	Empirical Standard	Pr > |Z|
Intercept	0.2239	0.1566	0.1528
Numeracy Score	**0.1032**	**0.0320**	**0.0013**
Document Use Score	0.0292	0.0269	0.2773
Age	**0.0043**	**0.0024**	**0.076**
Gender			
Male	-0.0267	0.0606	0.6589
Female	0	0	.
Education			
Bachelor's Degree or Greater	0.1532	0.1114	0.1690
College Diploma/Certificate	**0.2007**	**0.1007**	**0.0463**
Trade/Vocational Diploma/Certificate	**0.1681**	**0.1019**	**0.099**
High School Diploma/Certificate	0.1227	0.09	0.1728
Less Than High School Diploma	0	0	.
Marital Status			
Married or Common Law	0.0136	0.0717	0.8493
Single, Never Married	0.0711	0.0876	0.417
Separated/Divorced/Widowed	0	0	.
Immigration Status			
Canadian-born	0.0689	0.0645	0.2853
Immigrant	0	0	.
Network Size	0.0092	0.0271	0.7336
Number of observations = 436			

Working Safely

Working safely refers to how employees protect themselves from injuries, whether in terms of how they use electrical appliances, or how they push housekeeping carts, or how they bend to lift a heavy object (e.g., furniture). This aspect of job performance can be influenced by Essential Skills by knowing how to use tools or appliances and handle chemicals. However, the links between health and mental health and working safely are much less clear. Without the benefit of much in the way of research literature, we can hypothesize that having diminished mental health could have an impact on how carefully we work. The opposite would likely hold for physical health. If we have a physical health limitation, for example, we might want to further protect ourselves from injuries.

In both cases, however, we would not expect the effects to be large, since there are many factors that could potentially affect how carefully we work, aside from health and mental health (e.g., management practices related to prevention of work injuries, short staffing resulting in the employee being in a hurry to accomplish tasks, etc.).

Our analyses indicated support for these hypotheses:

- Unlike safety and emergency procedures, we found document use to be associated with working safely (β=0.0659, p<.0282; see Table 15), though numeracy was not;

Table 15   Association between Essential Skills and working safely (standardized base model results at baseline)

	Estimate	Empirical Standard	Pr > |Z|
Intercept	**0.5674**	**0.1795**	**0.0016**
Numeracy Score	0.0157	0.0364	0.6655
Document Use Score	**0.0659**	**0.03**	**0.0282**
Age	0.0015	0.0024	0.519
Gender			
Male	0.043	0.0717	0.5482
Female	0	0	.
Education			
Bachelor's Degree or Greater	-0.0506	0.1158	0.6622
College Diploma/Certificate	-0.0305	0.0928	0.7425
Trade/Vocational Diploma/Certificate	-0.045	0.0808	0.577
High School Diploma/Certificate	0.0242	0.073	0.7402
Less Than High School Diploma	0	0	.
Marital Status			
Married or Common Law	0.0496	0.0769	0.5189
Single, Never Married	0.0743	0.0967	0.4421
Separated/Divorced/Widowed	0	0	.
Immigration Status			
Canadian-born	0.0357	0.0762	0.6392
Immigrant	0	0	.
Network Size	0.0221	0.0225	0.3252
Number of observations = 382			

- Mental health (MCS) and physical health (PCS) were not associated with working safely;

- Attitudes to learning were associated with working safely (β=0.0613, p<.0241; see Table 16). One explanation might be that the more open we are to learning, the more we might be inclined to use information about ways to avoid or diminish the risk of work injuries. As a result, an intervention

such as UPSKILL (which improved these attitudes) could be a useful tool in the workplace for injury prevention.

Table 16   Association between attitudes to learning and working safely (standardized results at baseline)

	Estimate	Empirical Standard	Pr > |Z|
Intercept	**0.6597**	**0.1834**	**0.0003**
Attitudes to Learning	**0.0613**	**0.0272**	**0.0241**
Numeracy Score	0.0124	0.0388	0.7483
Document Use Score	**0.0556**	**0.0328**	**0.09**
Age	0.0006	0.0024	0.7851
Gender			
Male	0.0488	0.0721	0.4982
Female	0	0	.
Education			
Bachelor's Degree or Greater	-0.1039	0.1181	0.3789
College Diploma/Certificate	-0.0946	0.0953	0.3208
Trade/Vocational Diploma/Certificate	-0.1	0.0888	0.26
High School Diploma/Certificate	-0.0195	0.0795	0.8058
Less Than High School Diploma	0	0	.
Marital Status			
Married or Common Law	0.0488	0.0776	0.5289
Single, Never Married	0.0616	0.0959	0.5207
Separated/Divorced/Widowed	0	0	.
Immigration Status			
Canadian-born	0.0145	0.0745	0.8453
Immigrant	0	0	.
Network Size	0.0209	0.0227	0.3583
Number of observations = 363			

Safe Work Practices

The safe work practices variable was a derived measure created as a combination of the two measures above, each of which has different theoretical links with health. So our hypothesis around the role of health and mental health in safe work practices is unclear.

Perhaps not surprisingly, our analyses show mixed results:

▪ Self-efficacy was negatively associated with safe work practices (β=-0.0659, p<.0122; see Table 17). Since self-efficacy was related to confidence, a higher level of confidence may be involved in taking calculated risks related to safe work practices;

- Attitudes to learning was also associated with this measure, though positively this time (β=0.0336, p<.0654);

- Mental health (MCS) and physical health (PSC) were not associated with safe work practice.

Table 17   Association between psychosocial variables and safe work practices (standardized results at baseline)

	Estimate	Empirical Standard	Pr > |Z|
Intercept	**0.3974**	**0.1602**	**0.0131**
Future Orientation	0.0068	0.0207	0.7404
Motivation and Engagement	0.0269	0.026	0.3002
Attitudes to learning	**0.0336**	**0.0182**	**0.0654**
Self-efficacy	**-0.0659**	**0.0263**	**0.0122**
Numeracy Score	**0.0882**	**0.0311**	**0.0046**
Document Use Score	0.0149	0.0233	0.5211
Age	0.0025	0.0021	0.2542
Gender			
Male	0.0239	0.0535	0.6551
Female	0	0	.
Education			
Bachelor's Degree or Greater	0.1325	0.1118	0.2363
College Diploma/Certificate	**0.1808**	**0.1**	**0.0707**
Trade/Vocational Diploma/Certificate	**0.1932**	**0.1**	**0.0533**
High School Diploma/Certificate	0.1461	0.0908	0.1076
Less Than High School Diploma	0	0	.
Marital Status			
Married or Common Law	-0.0131	0.0725	0.8569
Single, Never Married	0.015	0.0877	0.8645
Separated/Divorced/Widowed	0	0	.
Immigration Status			
Canadian-born	0.0393	0.0547	0.4724
Immigrant	0	0	.
Network Size	0.0219	0.0214	0.3058
Number of observations = 520			

Absenteeism

Absenteeism was defined as missing a day of work or more in the past 4 weeks for any reason. Our hypothesis for this job performance measure was that good physical and mental health, lower stress and work-stress would decrease the likelihood of absenteeism. However, the role of Essential Skills is

unclear in this relationship. We could hypothesize that better Essential Skills would increase mental health, meaning that mental health could act as mediator between LES and reduced absenteeism.

In fact, our results were consistent with the literature and confirmed our hypotheses:

▪ High scores on physical health (PCS) (β=-0.058, p<.0024; see Table 18) and mental health (MCS) (β=-0.0055, p<.0004) both decreased the likelihood of absenteeism in the UPSKILL sample, indicating that both types of health have direct effects on absenteeism. While this may seem obvious (people who are unwell tend not to go to work), there are potentially important implications for employer practices and policy in terms both illness prevention and treatment.

Table 18   Association between mental and physical health and absenteeism (standardized results at baseline)

	Estimate	Empirical Standard	Pr > |Z|
Intercept	**0.7868**	**0.1312**	**<.0001**
MCS	**-0.0055**	**0.0016**	**0.0004**
PCS	**-0.058**	**0.0191**	**0.0024**
Numeracy Score	0.0089	0.0246	0.7177
Document Use Score	0.0165	0.0169	0.3299
Age	**-0.0038**	**0.0016**	**0.014**
Gender			
Male	-0.0457	0.0309	0.1393
Female	0	0	.
Education			
Bachelor's Degree or Greater	**-0.1108**	**0.0638**	**0.0823**
College Diploma/Certificate	-0.0975	0.0611	0.1106
Trade/Vocational Diploma/Certificate	-0.1101	0.0687	0.1089
Apprenticeship Diploma	**0.7372**	**0.1030**	**<.0001**
High School Diploma/Certificate	-0.0924	0.0611	0.1303
Less Than High School Diploma	0	0	.
Marital Status			
Married or Common Law	-0.0561	0.0542	0.3005
Single, Never Married	-0.0992	0.061	0.1038
Separated/Divorced/Widowed	0	0	.
Immigration Status			
Canadian-born	0.0539	0.0385	0.1613
Immigrant	0	0	.
Network Size	0.0117	0.0176	0.5072
Number of observations = 737			

- We also explored the relationship of subscale scores to absenteeism, and found none of the MCS subscales to be statistically significant. General health, Bodily pain and Role functioning-physical, on the other hand, were all significant PCS subscales in terms of absenteeism (β = -0.0430, p<.009, β=-0.0499, p<.0167 and β=-0.0342, p<.0653, respectively; see Table 19).

Table 19 Association between physical health subscales and absenteeism (standardized results at baseline)

	Estimate	Empirical Standard	Pr > |Z|
Intercept	**0.5653**	**0.1043**	**<.0001**
General Health	**-0.0430**	**0.0164**	**0.009**
Bodily Pain	**-0.0499**	**0.0209**	**0.0167**
Role-Physical	**-0.0342**	**0.0186**	**0.0653**
Physical Functioning	0.0257	0.0178	0.1495
Numeracy Score	0.0106	0.0226	0.6388
Document Use Score	0.0130	0.0161	0.4174
Age	**-0.0041**	**0.0016**	**0.0091**
Gender			
Male	**-0.0642**	**0.0304**	**0.0346**
Female	0	0	.
Education			
Bachelor's Degree or Greater	**-0.1309**	**0.0618**	**0.0344**
College Diploma/Certificate	**-0.0979**	**0.0585**	**0.0944**
Trade/Vocational Diploma/Certificate	**-0.1325**	**0.0672**	**0.0486**
Apprenticeship Diploma	**0.7406**	**0.0908**	**<.0001**
High School Diploma/Certificate	**-0.1138**	**0.0593**	**0.0547**
Less Than High School Diploma	0	0	.
Marital Status			
Married or Common Law	-0.0698	0.0516	0.1762
Single, Never Married	**-0.1126**	**0.0585**	**0.0545**
Separated/Divorced/Widowed	0	0	.
Immigration Status			
Canadian-born	0.0458	0.0383	0.2324
Immigrant	0	0	.
Network Size	0.0125	0.0174	0.4749
Number of observations = 766			

- Higher work stress increased the probability of absenteeism (β=-0.0254, p<.0373; see Table 20). This finding is an important one; while we know that both mental health (MCS) and work stress are related, the fact that employees who reported high work stress levels were more likely to miss a day at work shows that this variable *alone* is important.

Table 20   Association between work stress and absenteeism (standardized results at baseline)

	Estimate	Empirical Standard	Pr > |Z|
Intercept	**0.5285**	**0.1086**	**<.0001**
Work Stress	**-0.0254**	**0.0122**	**0.0373**
Numeracy Score	0.0065	0.023	0.7766
Document Use Score	0.0053	0.0173	0.7575
Age	**-0.0036**	**0.0015**	**0.0185**
Gender			
Male	**-0.0657**	**0.0314**	**0.0361**
Female	0	0	.
Education			
Bachelor's Degree or Greater	**-0.1384**	**0.0604**	**0.0219**
College Diploma/Certificate	**-0.1134**	**0.055**	**0.0393**
Trade/Vocational Diploma/Certificate	**-0.1436**	**0.0694**	**0.0385**
Apprenticeship Diploma	0.3396	0.2866	0.236
High School Diploma/Certificate	**-0.1212**	**0.0549**	**0.0273**
Less Than High School Diploma	0	0	.
Marital Status			
Married or Common Law	-0.071	0.0534	0.1833
Single, Never Married	-0.0917	0.0611	0.1335
Separated/Divorced/Widowed	0	0	.
Immigration Status			
Canadian-born	**0.0711**	**0.038**	**0.0613**
Immigrant	0	0	.
Network Size	0.0068	0.0162	0.6752
Number of observations = 808			

- However, it should be noted that the UPSKILL survey did not ask workers about the presence of a specific medical condition related to work stress that required absence from work, so the link between work stress and absenteeism must be interpreted with some caution.

- We found no substantial effect of LES on absenteeism, and the hypothesis that mental health could act as a mediator was not supported.

Conclusion

Overall, we found three areas in which job performance was significantly related to health and mental health: teamwork, communication and absenteeism. Figure 9 shows the results from the models for these variables.

Figure 9   Relationships between health and mental health and job performance (Standardized results from GLM, significant results only)
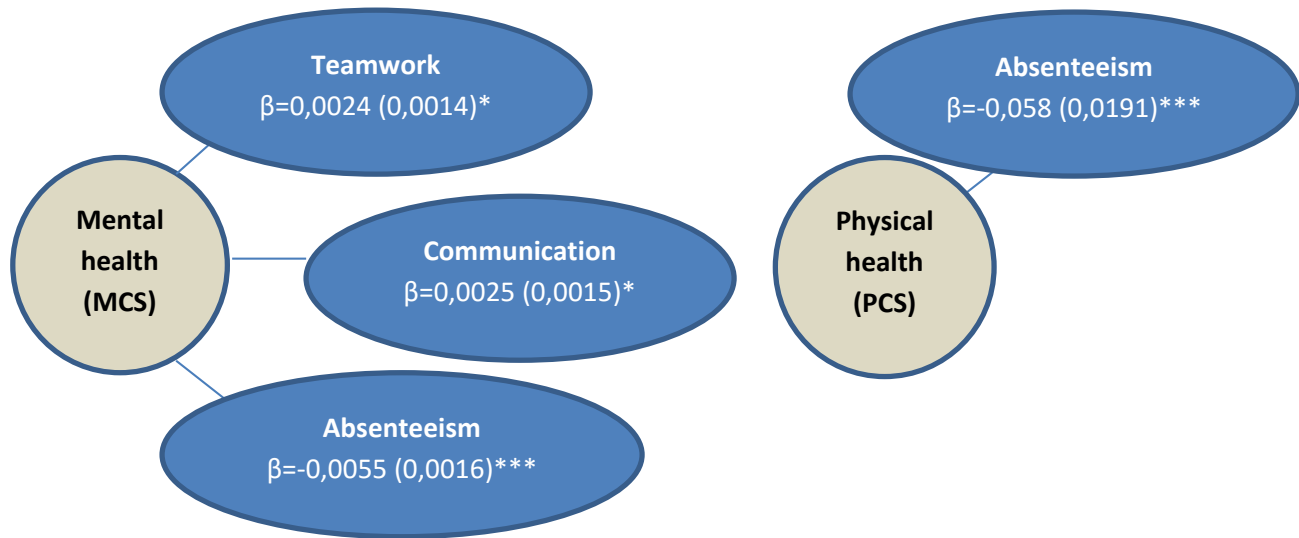
Both teamwork and communication were modestly related to mental health, although in comparison, the effect of both mental and physical health on absenteeism was strikingly significant. One standard deviation increase in the MCS score was associated with a 0.5 percentage point decrease in absenteeism within a four-week period, while one standard deviation increase in the PCS score was associated with a 5.8 percentage point decrease in absenteeism.

Overall, the modest effects of health and mental health on other elements of job performance might be explained by the healthy worker effect, in which people who are employed tend to have better health than those who are not (Shah, 2009). In this case, individuals who were evaluated for UPSKILL generally reported themselves to be in good health and would likely not be present for the job performance assessment if their health had any serious effects on their work.

6. Results (Part 2): Differential impacts of LES training on health, mental health, and other variables

Summary:

- Overall, findings suggest that **men and women benefitted equally** from the program in terms of job performance and health-related outcomes, such as work stress.

- **Although immigrants experienced larger skill and job performance improvements from LES training, they did not appear to benefit more** from the program than Canadian-born workers in terms of physical and mental health outcomes.

- Both **work stress and level of self-efficacy** significantly influenced job performance gains, though not health impacts. Those who reported higher stress at baseline had greater impacts on communication and teamwork than those who had lower stress.

- **Those who reported lower self-efficacy at baseline had significantly better job performance assessments** at follow-up than those with higher self-efficacy.

This section addresses the differential impacts of LES training on health and job performance for specific sub-groups (research question 3). It builds on and extends the initial UPSKILL Trial findings, by focusing on sub-groups that were not part of that analysis. For more information on UPSKILL results, see http://www.srdc.org/publications/UPSKILL-A-Credible-Test-of-Workplace-Literacy-and-Essential-Skills-Training-details.aspx

6.1. Differential impacts by sociodemographic subgroups

Gender

There is little direction in the literature to guide us in developing a clear hypothesis about the potentially differential effects of LES training for men and women in terms of job performance. However, one could assume that for other outcomes such as work stress, control at work, or mental health, we might observe gender differences, since the literature shows that *gender roles* are more important than biological factors in explaining sex differences in stress response (for example, see Messing, 1997; Spitzer, 2005). These stress responses can in turn affect mental and physical health.

Work stress

As discussed above, UPSKILL data includes two measure of work stress: a sub-scale of the Quality of Work Life (QWL), and a question about changes since participating in UPSKILL. These two variables provided different results in terms of gender and work stress:

- When work stress was measured by the QWL subscale, UPSKILL had no impact in reducing measured work stress, regardless of participants' gender;

- When using the alternative measure on participants' self-reported stress reduction experienced since participating in UPSKILL (in the follow-up survey only), we found that both men and women reported highly significant reductions in work stress, by 27 and 28 percentage points, respectively . (β=0.2706, p<.0001 for men; β=0.2864, p<.0001 for women; see Table 21). However, there was no significant difference between the sexes in the magnitude of this reported stress reduction.

Table 21   Impact and differences in impacts between men and women on reported work stress reduction (Difference-in-Differences)

	Control Group	Program Group	Impact (β) (Program – Control)
Male	0.2000	0.4706	0.2706 ***
Female	0.2294	0.5158	0.2864 ***
Difference in impacts			0.0158
Number of observations = 563			

Note: * p<.10, **p<.05, *** p<.01

While these results appear contradictory, this might be explained by measurement differences. The work stress QWL subscale makes reference to job pressure, which could be generalized and highly influenced by a workers' position in the firm and corresponding amount of responsibility. Housekeeping staff (who made up the largest proportion of the UPSKILL sample) may not perceive their work stress in this manner, so the questions may not have been considered as personally relevant.

The second measure (which is retrospective and makes explicit reference to UPSKILL) is much more focused on perceived reduction of stress at work, and makes an implicit link between the training as a potential mechanism for stress reduction. However, some caution should be used when interpreting the results of this (and any other) subjective measure, since there is always the possibility of a Hawthorne effect, whereby participants in an intervention score higher than those in a comparison group because they feel something good is happening for them (e.g., firms were viewed positively for investing in training for their workers, which in turn influenced their perception of work stress).

On the other hand, retrospective pretest assessment are increasing in use, having been demonstrated to be reliable measures of the success of various training programs and to correlate well with expert ratings of performance (D'Eon, Sadownik, Harrison, & Nation, 2008; Pratt, McGuigan, & Katzev, 2000).

Mental health

The average treatment effect of the LES training on mental health was positive for both men and women on the Mental Health Component score (MCS) of the SF-12, but not statistically significant. This result is not surprising since the UPSKILL Trial did not have any significant effect on MCS.

Physical health

The intervention appears to have had a slight negative impact on physical health for both men and women, as measured by the Physical Component Score of the SF-12 (see Table 22). This impact was statistically significant at the ten per cent level of probability for men, and at five per cent for women. This is consistent with the earlier UPSKILL finding of a modest negative health impact for the overall participant sample, and could be explained by the fact that both groups increased their productivity at work following UPSKILL, resulting in possible strain.

Table 22   Impact and differences in impacts between men and women on the physical health score (PCS) (Difference-in-Differences)

	Control Group	Program Group	Impact (β) (Program – Control)
Men	0.4439	-1.6961	-2.1400 *
Women	0.1355	-2.0279	-2.1634 **
Difference in impacts			-0.0234
Number of observations = 457			
Note: * p<.10, **p<.05, *** p<.01			

Quality of work life (QWL)

Two subscales of the QWL were used: work control and satisfaction at work. Again, our analyses found no overall impacts on either subscale, nor any gender differences.

Self-efficacy

Although UPSKILL analyses had found a slight positive impact on self-efficacy overall, our analyses found no gender differences in this area.

Immigration Status

UPSKILL's LES training demonstrated little or no overall impact on physical or mental health as measured by the SF-12. However, we can hypothesize that there may be potential benefits in both areas for immigrants, since this group benefitted from UPSKILL to a significantly greater extent than Canadian-born participants in terms of Essential Skills and job performance, and some of these outcomes have been shown to be associated with mental health (i.e., document use, communication and teamwork).

Immigrants did not experience disproportionate gains from UPSKILL in terms of psycho-social variables, however. In fact, the reverse was true; Canadian-born participants were much more likely to report benefits on three or more indicators of psychological capital (Gyarmati et al., 2014). Given our earlier findings that psycho-social variables such as self-esteem and self-efficacy may have some importance as mediating variables for mental health, it is possible this may result in immigrants

reporting poorer physical and mental health outcomes. In essence, the exploratory nature of this analysis makes it difficult to develop strong hypotheses in this area.

Immigrant participants in UPSKILL took an average of three additional hours of training than their Canadian born counterparts. To control for different program dosage, the variable "total hours of training deviation from the average" was added to the regression models as a covariate, though the results are similar even when dosage is not controlled.[16]

Mental and physical health

- UPSKILL's impacts on the mental health measure (MCS) were not statistically significant for the overall participant group, nor did our analyses find significant differences due to immigration status;

The average impact on the physical health score (PCS) among immigrants was negative at -4.2 points (p<0.05), and somewhat less so - although still negative - among Canadian-born participants (-1.8 points, p-value=0.1059). This would appear to be consistent with the finding of overall negative effects of UPSKILL on physical health (bodily pain in particular), although the differential impact is challenging to explain. It is possible that immigrant workers comprise the bulk of those who reported increased employment and longer hours, and negative health outcomes as a result. In fact, the sub-group of immigrant UPSKILL participant was largely made up of housekeeping room attendants (HRAs). This occupation has the most significant demand for physical exertion and dexterity requirements among all occupations in hotels. Any increase in employment hours or productivity/efficiency of work arising from UPSKILL, would involve more significant physical demands on immigrants, given their disproportionate representation among HRAs.

Work stress

The use of the two available work stress indicators provided a different picture for immigrant and Canadian-born workers participating in UPSKILL:

- For the first model (using the QWL subscale), the LES training program worsened work stress for immigrants (by 0.23 points) but not for Canadian-born workers;

- In contrast, completely different results were found in the second model for differences in impacts between immigrants and Canadian-born on retrospectively reported work stress (see Table 23). UPSKILL had a substantial, statistically significant impact on self-reported work stress reduction among immigrants as well as Canadian-born participants, though this was more significant for the latter group, which saw an improvement of 25.3 percentage points (compared to 13.8 percentage points for immigrants). However, the difference in impacts between these two groups was not statistically significant;

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[16]   Other models excluding this variable are available on request.

- Length of training had a small but significant positive impact on work stress reduction. A one-hour increase in the amount of training increased the proportion of individuals who reported a reduction in work stress following UPSKILL by 1.5 percentage points (p<0.05).

Table 23   Impact and differences in impacts between immigrant and Canadian-born workers on work stress reduction (Difference-in-Differences)

	Control Group	Program Group	Impact (β) (Program – Control)
Canadian-born	0.0987	0.3521	0.2534 ***
Immigrant	0.4235	0.5617	0.1382 *
Difference in impacts			-0.1152
Number of observations = 558			
Notes: * p<.10, **p<.05, *** p<.01			

Health Literacy

UPSKILL's impacts on health literacy were modestly positive for both immigrants and Canadian-born participants; however, the effects were not statistically significant.

Quality of work life

As with gender, we did not find any significant effects of training on work control and work satisfaction (as measured by QWL subscales) between immigrant and Canadian-born UPSKILL participants.

Other variables

- We know from the UPSKILL Technical Report that the LES training intervention enhanced oral communication: program group members had an increase of nearly 20 percentage points in the likelihood of meeting industry standards for their ability to communicate with guests, compared to the change in the control group (Gyarmati, Leckie, Dowie, and Palameta, 2014). We therefore hypothesized that immigrants – whose first language is often not English – might particularly benefit. Our analyses supported this hypothesis; UPSKILL had a positive impact on immigrants' pass rate on the effective communication component of the job performance assessment by 20.8 percentage points, while the impact on Canadian-born was small and statistically insignificant (-3.7 points);

- In addition, we expected that UPSKILL might increase life satisfaction and self-efficacy for immigrants as a result of better ability to communicate and use documents. However, we found no statistically significant differences in impacts between immigrants and non-immigrants on these two variables.

6.2. Differential impacts by client characteristics

Work stress (as measured by the QWL tool) and self-efficacy at baseline were used as potential client characteristics that could affect the uptake of LES training and potentially, result in different average treatment effects for job performance and mental health outcomes. Cut-offs for low/high work stress and self-efficacy were defined at the median for both variables. For work stress, the reference group used was those who reported a *high* level of stress at work. For self-efficacy, the reference group was those who reported a *low* level of this characteristic.

Work stress level at baseline

Mental health

▪ The impact for the high stress-level group was positive for mental health, but not for the low-stress group (2.472 points and -0.2333 points respectively; see Table 24). This means that those who experienced high stress at work benefitted disproportionately compared to their low-stressed colleagues, who may have experienced small declines in mental health. However, these results – while approaching statistical significance – nevertheless did not achieve the threshold of significance for this sample, nor did differences in impacts between the two groups.

▪ These findings suggest a potential role for workplace LES training to help those with high stress-levels at work and thereby improve their mental health.

Table 24   Impact and differences in impacts between low/high level of work-stress at baseline on the MCS (Difference-in-Differences)

	Control Group	Program Group	Impact (β) (Program – Control)
High stress	0.093	2.565	2.472
Low stress	-1.3192	-1.5525	-0.2333
Difference in impacts			-2.7053
Number of observations =456			
Notes: * p<.10, **p<.05, *** p<.01			

Job performance

▪ There was no significant difference in impact between the low stress-level group and the high-stress-level group on *the* change in the proportion of those who passed or failed all types of *certification*, nor in the proportion who passed or failed the follow-up assessment;

▪ However, when we look at the follow-up assessment for *communication*, we found a small and significant effect (p<.10) in the difference in impacts - the high stress group experienced an impact of 18.4 percentage points compared to 4.4 percentage points for the low stress group. Not only was the change significant for those with high stress, but the difference between the groups was also

significant. In other words, the high-stress group benefited from UPSKILL training to a much greater degree in terms of communication than their lower-stressed colleagues;

▪ The same result held for the change between baseline and follow-up in the proportion of individuals who passed the *teamwork* certification (Table 25). While both groups benefitted from the training program, there was a significant difference of 16.5 percentage points in impact between the two groups (p<.05).

Table 25   Impact and difference in impacts in ATE between low/high-level of work stress at baseline on % of individuals who passed the teamwork certification (Difference-in-Differences)

	Control Group	Program Group	Impact (β) (Program – Control)
High stress	-0.0625	0.1429	0.2054***
Low stress	0.000	0.0403	0.0403
Difference in ATE			-0.1651**
Number of observations = 439			
Notes: * p<.10, **p<.05, *** p<.01			

Self-efficacy

Mental health and work stress

▪ While the LES training program improved MCS scores for both groups, and impacts were greater for individuals with higher self-efficacy (β= 0.1633) than those with low self-efficacy (β= 0.9491), the difference was not significant.

▪ For the retrospective indicator of work stress reduction following the training, both groups reported benefits of a similar magnitude (0.29 point impact among low self-efficacy group vs 0.27 point impact among the high self-efficacy group).

Job performance

▪ We found the UPSKILL training had a significant positive impact on overall job performance at follow-up for those who reported lower-than median self-efficacy at baseline (see Table 26). Those with higher self-efficacy at baseline also benefitted, although the difference with similar controls was not significant, nor was the difference in impacts between the two self-efficacy groups. It is possible this result may be due to a ceiling effect, such that the group with the highest self-efficacy had better job performance to begin with, and therefore, less room for improvement. In addition, other factors such as skills, tenure, and education are likely more important than self-efficacy in explaining differences in baseline performance level. Nevertheless, this finding suggests that LES training might particularly benefit those with low self-efficacy in terms of overall job performance.

Table 26   Impact and differences in impacts between low/high-level of self-efficacy at baseline on overall job performance at follow-up (Difference-in-Differences)

	Control Group	Program Group	Impact (β) (Program – Control)
Low self-efficacy	0.5393	0.7006	0.1613**
High self-efficacy	0.6210	0.7062	0.0852
Difference in impacts			-0.0761
Number of observations = 584			
Notes: * p<.10, **p<.05, *** p<.01			

Summary

Together, these results of the differential impacts analyses showed that most employees could potentially benefit from training such as UPSKILL. Both men and women, as well as immigrants and Canadian-born, benefitted equally from the program on job performance and on health-related outcomes such as work stress. However, certain client characteristics such as work stress and self-efficacy significantly influenced job performance assessments. While exploratory, the findings showed that UPSKILL had a larger impact of individuals who had higher levels of stress or lower levels of self-efficacy at the beginning of the training intervention.

7. Results (Part 3): Impacts of health and mental health on business outcomes

Summary:

▪ Business outcomes were derived from a survey of hotel managers at follow-up. Analyses were correlational, given the relatively small sample of firms (n=88).

▪ **Workers' self-esteem and reductions in work stress were associated with productivity gains** – particularly efficiency and improved error rates – though physical health was not.

▪ **Low work stress and physical health were associated with changes in the number of safety violations** (safety and emergency preparedness).

▪ Similarly, **low and declining work stress were both associated with a range of outcomes related to working safely** (e.g., injuries, claims). **Self-esteem was also a factor** in anticipated improvements in this area.

▪ **Low work stress was associated with positive changes in absenteeism** among certain occupations.

▪ Overall, **the relationship between worker health and business outcomes was more nuanced** than for worker-level outcomes and job performance. Mental health had limited and sometimes negative associations with business outcomes, and there was a pattern of negative association between health literacy and several business outcomes.

▪ Further analysis is needed to determine how these results may change among firms with different business needs, although preliminary results indicate firms that specifically included health and safety among their organizational priorities were likelier to see a disconnect between increasing health literacy and certain business outcomes.

7.1. Measurement of business outcomes and health-related measures

Business outcomes were determined through a survey of hotel management at each workplace participating in the UPSKILL study – including both program and control groups – which took place following the intervention period. Managers were asked to reflect on recent changes they had observed in their workplaces, and to anticipate potential future changes. For analytical purposes, the team looked at whether or not a firm experienced positive change for each business outcome.

Health-related measures were composed of individual-level survey responses, at both baseline and follow-up, for both program and control group participants. The difference between baseline and follow-up responses was also included in the analysis to indicate a participant's change over the course of the study. These individual-level responses were then transformed into firm-level averages.

As outlined in section 4, measures for physical and mental health, health literacy, and self-efficacy are composites, composed of multiple survey items. Stress was measured in two different ways: a composite score based on two survey items (on both baseline and follow-up surveys), and a question asking participants to indicate whether or not they had experienced any change in their stress level over the course of the study (at follow-up only). This second work stress variable is identified in the results as participant reported change. Self-esteem is based on a single survey item which asked participants to rate whether or not they see themselves as someone with high self-esteem.

7.2. Association between health and mental health, and business outcomes

As with the analysis of relationships between health and job performance of workers, relevant literature can provide a guide to identify which business outcomes are most likely to be influenced by health and mental health. Previous studies affirm industry knowledge about these relationships that is inherent in the design of the National Occupational Standards (NOS) for this sector. Together, these knowledge sources provide a strong basis for linking physical and mental health to business outcomes, both directly and indirectly, through their relationship with workers' job performance.

Business outcomes most likely to be influenced by worker health include productivity (through both efficiency metrics and error rates); emergency preparedness (through the effective application of emergency procedures in reducing incidents); working safely (the extent to which workers apply safe working practices and avoid injuries); and outcomes related to human resources and staffing (including staff morale, absenteeism, and retention).

While these and other factors were explored previously through behavioural indicators of workers' job performance, analyzing their associated business outcomes allows us to consider employer perspectives more explicitly, as opposed to the responses of participants and third-party assessors. The primary findings for each business outcome are explored below, focusing on those that are statistically significant and related to the job performance indicators examined previously.

This analysis utilizes simple correlations between business outcomes and health-related measures, since the small number of firms (n=88) limits the options for multivariate analysis of effects. While the small number of firm-level observations would generally limit the relevance of these simple correlations, they are largely consistent with the findings from the multivariate individual-level analysis – thus reinforcing our confidence in the emerging relationships. Again, we recognized that other factors might influence these relationships, especially variables related to management practices, rules and surveillance for their application, worker's experience in their current position, level of chronic conditions among workers, etc. However, these correlations are a first step to explore which variables are most relevant when we look at business outcomes. Among other important results, this analysis confirms that mental health and work-related stress have clear and significant relationships with a wide range of business outcomes, including worker productivity, health and safety, and human resources. The combination of the individual and business-level analysis suggests that a business case may indeed exist for improving worker mental health and reducing stress, given their consistent relationship with job performance and a breadth of business outcomes. One divergent result related to health literacy is highlighted for further study.

Productivity

To measure productivity, we used employer reports on whether or not their business had experienced any positive changes in staff efficiency or reductions in error rates in both core job tasks and general administration over the course of the study, for each of the four occupancy groups.

There are various hypotheses about the relationships between firm productivity and workers' physical health, mental health, and stress. These relationships differ based on the direction of effects and the underlying mechanisms. For instance, increased worker stress and poor mental health may decrease productivity (see Lowe, 2006), as workers' task efficiency decreases and/or the potential for errors increases when workers are under stress. This hypothesis can be explored directly in this project, since employers were asked about changes in both indicators of efficiency and error rates.

Similarly, efforts taken by firms to increase workers' productivity – such as investments in training, or efforts to support and acknowledge staff – may reduce stress and improve mental health, as workers become more confident completing tasks and even fulfilled by their work. In addition to stress declining with increased productivity, one would expect to see positive relationships between productivity and some of the psychosocial factors related to self-efficacy and self-esteem of workers.

Alternatively, if improved productivity of workers is driven not by increased employer support or workers' job satisfaction and fulfilment, but by increased effort and hours of work, the productivity gain may be accompanied by workers experiencing increased stress and deteriorating mental health. In this circumstance, one would expect no relationship or even negative correlations between psychosocial factors and productivity measures.

Physical health could also affect productivity quite directly through its relationships with efficiency and error rates. For instance, a physical health condition such as chronic pain may reduce a worker's speed or efficiency completing core job tasks and/or increase the likelihood of making errors.

Our correlation analysis confirmed that stress and mental health have important relationships with the productivity outcomes of UPSKILL firms. This analysis also found that psychosocial factors do play a role in the link between mental health and productivity. Specifically:

- **Reductions in work-related stress were associated with positive changes in efficiency and reductions in error rates in some of workers' key occupational job tasks.** However, mental health at follow-up was negatively associated with these productivity gains. This may indicate that while reductions in work-related stress may support productivity gains for employers, longer-term mental health can still deteriorate as work *effort* rises, as it did in the case of UPSKILL with increased job retention and hours of work.

- **Self-esteem of workers at follow-up was positively associated with productivity gains.** Given that the original UPSKILL analyses identified a broad range of improvements in psychological capital (including receptivity to continuous learning, future orientation, trust and self-efficacy), this finding supports the relevance of psychosocial factors to productivity – a key business outcome. In turn, it suggests that the relationship between declining stress and productivity observed in UPSKILL may stem in part from job fulfilment and employer support (the results of investment in psychological capital) rather than performance improvement alone.

- **Physical health was not significantly associated with productivity**, a result which was mirrored in the worker-level job performance analysis. This was not entirely unexpected, given the context of the tourism accommodations sector, which requires less in terms of physical health than other sectors, especially from front desk agents. In contrast, production-based industries that rely more heavily on the interaction between capital machinery and labour, and which involve significant dexterity requirements that can affect speed of task completion, might be expected to demonstrate a stronger link between physical health and productivity.

Safety and Emergency Preparedness

Safety and emergency preparedness was measured based on whether or not employers reported reductions in the number of safety violations experienced by each relevant department. Employers were also asked about their expectations for *future* changes in the number of safety violations. These violations manifest themselves differently across employers, but would usually involve some form of error in key safety-related practices or procedures, not necessarily as an injury or incident (which is considered below).

We hypothesized that physical health, mental health, and stress might have a relationship with the incidence of safety related violations, in that workers under higher levels of stress or with physical or mental health conditions may be less likely to follow assigned procedures, due, for instance, to higher levels of distraction or a lack of focus. It was also hypothesized that health literacy may have a positive association with safety and emergency preparedness, as it measures participants' ability to understand and utilize health and safety information. Our results indicate that:

- **Low work-related stress at follow-up was associated with reductions in the number of safety violations** in at least one department (food and beverage servers) and with anticipated reductions in the future number of safety violations in another (front desk agents in guest services). At the same time, participant reports of declining work stress were also associated with reductions in the number of safety violations within the housekeeping staff. Each of these relationships provides strong evidence that maintaining low-stress work environments and reducing stress among employees will support positive health and safety outcomes with respect to the application of safety and emergency preparedness procedures.

- **Physical health at follow-up was also associated with anticipated reductions in the future number of safety violations among housekeeping staff, as were measures of self-esteem** of employees in this department. Given that housekeeping and custodial staff are at higher risk of repetitive workplace injury and chronic pain than other occupations, this was not entirely unexpected. Employers would have higher expectations of improved future safety with higher levels of physical health in these departments. Furthermore, housekeeping positions are often the most marginalized with respect to perceived support from their employers, access to training, and understanding their role and contribution towards business goals. Higher levels of self-esteem among workers in this department may well accompany improved employer expectations of future performance in any number of domains.

- **Two unexpected negative correlations were observed with health literacy, self-efficacy and changes in safety violations** in particular departments. Health literacy was negatively associated

with reductions reported by employers in the number of safety violations observed over the prior year among food and beverage servers. At the same time, increasing self-efficacy was negatively associated with employer reports of anticipated reductions in the future number of safety violations among food and beverage servers and front desk agents.

In order to better understand these findings, we explored the relationships between business outcomes of interest and the individual items of the health literacy and self-efficacy scales at follow-up; specifically, we wondered if the findings could be explained by responses to particular scale items For the most part, the results of these investigations were not significant.

However, we did find a significant negative correlation between the self-efficacy scale item, "*It is easy for me to stick to my aims and accomplish goals,"* and employer reports of anticipated reductions in the future number of safety violations among food and beverage servers. With regard to the relationship between anticipated positive changes in the future number of safety violations among front desk agents and self-efficacy, the only significant relationships among the scale items was a negative correlation with the item, "*If someone opposes me, I can find the means and ways to get what I want.*"

We urge caution with the interpretation of these results, since they involve single items on larger scales and in each case, pertain to only one occupation group. One possible interpretation is that employers may have perceived workers who experienced gains in health literacy and self-efficacy to be over-confident, and not sufficiently engaged regarding safety violations for that department. For instance, while workers may be more confident, both in general (as reflected in the self-efficacy scores) and specifically in health contexts (as reflected in the health literacy scores), these may be entirely unrelated to the specific safety procedures involved in the food and beverage tasks that are most pressing and in need of improvement for a particular employer; hence, the employer does not perceive the confidence or gains these measures imply.

We also explored these relationships more thoroughly by examining whether results differed for those firms who identified health and safety as an organizational need, and those who did not. Here, we found that the negative correlations between health literacy were potentially being driven by firms that prioritized health and safety. We can speculate that firms that identified health and safety as a particular organizational need might have very specific demands or expectations regarding health and safety that are linked to unique workplace behaviours and competencies. Another explanation is that this was a measurement issue; given that several of our health literacy questions focused on measuring self-confidence in health competencies *outside* the workplace context, it is also possible this measure was not precise or targeted enough to measure health literacy in a workplace context, and reflects the general lack of development in this field.

Working Safely

Working safely refers to reductions in the number of injuries, reports of pain and working while unwell, and employers' reported workers' compensation board (WCB) claims. The possible links between physical and mental health and firms' health and safety outcomes are similar to those described above. In fact, we hypothesize that they are likely to be even more prominent, particularly with respect to the effect of mental health and stress on one's attention to detail, focus, distractibility, and overall carefulness at work.

With regard to physical health, one's physical state may affect the degree to which we protect ourselves from injuries. Higher levels of health literacy may allow for a greater understanding of safe practices, but they may also result in a greater tendency to recognize injuries and report them.

These hypothesized relationships were not expected to be large. There are many factors besides health and mental health that can affect how carefully one works, including management practices related to injury prevention, short staffing, etc., and which are beyond the scope of this study.

Results of our analyses indicate that:

- **Low levels of work stress and participant reports of declining work stress were associated with a range of business improvements** reported by employers in both the current and expected number of injuries, reports of pain and staff working while unwell, and WCB claims. The relationships varied by department and whether they were current or future outcomes, but the pattern is clear: low and declining stress levels among participants were correlated with positive changes in health and safety outcomes of businesses.

- **Self-esteem was also associated with anticipated future reductions in the number of injuries** among at least one department (front desk agents), consistent with the results for other business outcomes.

- There are two sets of anomalous relationships that are inconsistent with hypotheses. First, **increasing physical health was negatively associated with reported reductions from employers on some outcomes** (the number of injuries and WCB claims) in at least two departments (front desk agent and food and beverage). At the same time, **a negative correlation was observed between health literacy and reductions in reports of pain and employees working while unwell**, from employers in some of these same departments. While these require further investigation, they may relate to the fact that the measures and simple correlations do not adequately capture the possible links between health, health literacy, and the specific health and safety issues that are most important for these employers – both from a firm and departmental perspective. An analysis that attempts to account for these needs and contextual factors would better explain these anomalous relationships.

The negative correlation between health literacy and reductions in reports of pain and working unwell, (among front desk agents, for instance), is potentially being driven by those firms that identified health and safety as an organizational need. As noted above, this may indicate a disconnect between a non-work health literacy measure, and firm-specific expectations regarding their health and safety outcomes.

In addition, when we examined the results in relation to individual items of the health literacy scale at follow-up. Although many of these results were not significant, there was a significant negative correlation between the item, "*How often do you have someone help you read medical materials?*", and reductions in reports of pain and working unwell among front desk agents.

Absenteeism

Absenteeism as a business outcome was measured as a reduction in the number of sick days by department, as reported by management during the follow-up stage of the UPSKILL intervention. This measure allows us to hypothesize that good physical and mental health, as well as lower stress might decrease the likelihood of absenteeism.

Alternatively, higher health literacy might increase awareness of health issues as well as confidence in one's ability to utilize health services, and result in increased absenteeism – at least in the short-term. One might expect that longer-term reductions in absenteeism would be observed from gains in health literacy as one more effectively utilizes health services. However, the short-term nature of the UPSKILL follow-up precludes investigation of this hypothesis.

Our results with respect to absenteeism indicate that:

- As expected, **low work stress reported by workers at follow-up was associated with an anticipated (by managers) reduction in the number of sick days taken by front desk agents**. Additionally, participant reports of declining work stress were associated with reductions in absenteeism among the housekeeping staff and food and beverage servers, and anticipated future reductions among food and beverage servers.

- **Increasing health literacy was negatively associated with reductions in the number of sick days taken** by front desk staff, consistent with our expectations.

Other findings related to revenue drivers and human resources

While business revenue and human resource (HR) outcomes were not hypothesized to have primary relationships with health and mental health, some additional correlations were considered on an exploratory basis. These included occupancy rates, food and beverage revenue, brand loyalty of customers, and a number of HR outcomes related to job satisfaction, retention, receptivity to new challenges, and the desire for further training and certification. Those which demonstrated relationships with health and psychosocial measures are described briefly below.

- Participant reports of declining work stress were associated with positive changes in revenue, including occupancy rates and food and beverage revenue;

- Management's reports of positive changes in guests' likelihood of returning to the hotel (brand loyalty) was associated with decreasing work stress among participants;

- Participant reports of declining work stress were associated with front desk agents experiencing positive changes in their upselling behavior, including their confidence, needs identification, technique, and ability to "pull the trigger" on upselling;

- Physical health at follow-up was associated with positive changes in participants' receptivity to new challenges and the staff desire for further training;

- Self-efficacy at follow-up was associated with positive changes in participants' desire for further training and certification;

- Participants' likelihood of staying on with the firm was associated with self-efficacy at follow-up;

- Self-esteem at follow-up was associated with positive changes in participants' job satisfaction and morale, their receptivity to new challenges, their desire for further training and certifications, and their likelihood of staying with the firm (as reported by management).

Summary

When considered along with the results of the job performance analyses, the business outcome correlation results presented in this section present a very compelling picture of associations between physical and mental health and business outcomes. These results also illustrate the important role that psychosocial factors can play, not only determining business outcomes through performance, but also in the influence the business environment may have on workers' experiences.

The results related to work stress in particular indicated a strong relationship between low and declining work stress and positive business outcomes across a full range of business areas, including revenue drivers, productivity, absenteeism, and human resource-related outcomes. Similarly, relationships were fairly consistent between psychosocial variables such workers' self-esteem and a range of business outcomes, reaffirming the importance of these factors not only to the wellbeing of workers, but also to firms' bottom line.

A pattern of negative association was observed between high and improving health literacy and some business outcomes that warrants further investigation. The fact that the current measures of health literacy are not inherently workplace-based makes their interpretation difficult, particularly when, to manage scope, the correlation analysis did not account for workplace context and depth of business needs. An analysis that incorporates some of this contextual information – particularly from employers' perspectives – may further elucidate these relationships. Finally, the development of indicators for health literacy remains an ongoing process, and further refinement of these tools may lead to a greater understanding of the links between health literacy and business outcomes.

8. Results (Part 4): Implications for workplace interventions

This section addresses Research Question #4 by considering the implications of UPSKILL Health results for other workplace interventions, so they too might positively influence workers' physical and mental health and job performance, and potentially, business outcomes as well. We begin by identifying workplace interventions that are similar to UPSKILL. We then focus briefly on the implications of UPSKILL Health findings on mental health and health literacy, as particularly promising areas. We will explore both areas further – and their implications for other types of workplace interventions – in conjunction with our qualitative inquiry and our upcoming discussions with PHAC representatives on overall policy implications.

8.1. Similar interventions to UPSKILL

A targeted search of academic and grey literature yielded several examples of different types of workplace LES training in both Canadian and international contexts:

Essential Skills Ontario

From 2010 to 2011, Essential Skills Ontario (formerly the Ontario Literacy Coalition) offered workplace literacy and basic skills training at work sites across a range of sectors, including hotels, manufacturing, warehousing, community housing agencies, an educational institution, a hospital, a mine, and several caregiver programs. The programs focused on basic computer skills, workplace document use, oral communication, teamwork, customer service, workplace writing, and understanding health and safety.

Some results from the training included improved workplace morale, greater workplace health and safety compliance and understanding, demonstrated through increased preventative maintenance and fewer slips and falls, and greater employee independence and confidence (Essential Skills Ontario, 2012).

National Workplace Literacy Program

The U.S. National Workplace Literacy Program (NWLP) ran from 1988 through 1996, and supported partnerships between educational organizations and business and community groups in the provision of adult education programs for literacy training that met workplace needs.

Final reports submitted by the various projects indicated increases in employee teamwork and safety. An evaluation of five NWLP programs in 1998, using an experimental design, found positive impacts on skills attainment, as well as increased teamwork, lower absenteeism, and higher employee job performance ratings by supervisors (Rosen, 2008).

Workplace Literacy Fund

The Workplace Literacy Fund (WLF) in New Zealand subsidizes literacy, language and numeracy programs in the workplace. This fund focuses on workplaces in the production sector, with a minority of workplaces in the services sector, and included a needs analysis at program onset in order to ensure that content was specific to the requirements of individual workplaces.

Interviews with participants, organizational management and trainers generally indicated the programs were successful. Some results included increased morale and employee confidence, decreased aggression, a decrease in injuries, and an increase in incidence reporting, which allowed hazards to be identified and managed (Gray & Sutton, 2007).

Conference Board of Canada Case Studies

The Conference Board of Canada has highlighted several workplace literacy programs in various case studies. These programs, often conducted in partnership between a workplace and an agency of the provincial government, provide literacy and essential skills training to employees, often in companies in the manufacturing sector.

Common outcomes identified have included increased self-confidence, self-esteem and sense of self-worth, improved teamwork, greater initiative and independence, increased morale, lower error rates, and better workplace safety (Conference Board of Canada, 2002; 2005a; 2005b; 2005c).

Summary

The interventions briefly described above have a number of similarities to UPSKILL, including the fact that they are workplace-based interventions. However, it is unclear the extent to which their respective training programs were based on the kind of detailed organizational needs assessment that was completed in UPSKILL.

We can also see that the range of reported outcomes from these interventions closely aligns with UPSKILL's own:

- Essential Skills;

- Psychosocial variables such as confidence, self-esteem, and morale;

- Job performance indicators such as teamwork, independence, and error rates; and

- Business outcomes such as absenteeism, injuries, workplace safety compliance and hazards management.

The specific evaluation findings for these interventions aside, the multiplicity and wide-ranging nature of their reported outcomes would seem to support the merit of taking a multi-dimensional approach to designing, implementing and evaluating health and non-health workplace interventions, one that considers multiple outcomes and multiple levels of analysis.

In addition to exploring outcomes at the level of worker and firm, for example, team and worksite levels might also be considered, to the extent these are structurally or operationally distinct. Exploring the extent to which workplace interventions have sector-specific needs in terms of design or implementation is another important consideration. While we address the extent to which the UPSKILL Health findings may be relevant for other employment sectors (see External validity in the section on Study Limitations), our Knowledge Synthesis Report will explore this issue in more detail.

A summary of the key findings from UPSKILL Health is provided in the Discussion section, but the majority and most compelling of these are related to health literacy and mental health. The next two sections discuss some of the preliminary implications of these findings.

8.2. UPSKILL as a health literacy intervention

As noted in an earlier section of this report, the definition of literacy and essential skills has expanded to include not just reading, numeracy and document use, but an individual's ability to understand, use and apply new knowledge to the benefit of themselves and others. Similarly, health literacy is increasingly defined in broad, proactive, and context-relevant terms:

> *…the ability of individuals to access and use health information to make appropriate health decisions and maintain basic health…It includes whether individuals can read and act upon written health information, as well as whether they possess the speaking skills to communicate their health needs to physicians and the listening skills to understand and act on the instructions they receive.*
>
> (Canadian Council on Learning, Health Literacy in Canada, 2007, p.3)

As the UPSKILL trial and UPSKILL Health analyses and others have demonstrated, health literacy is clearly closely linked to literacy and essential skills, what Zarcadoolas, Pleasant, and Greer (2005) call "fundamental literacy" (i.e., reading, writing, speaking, and working with numbers). One of the interesting implications of our findings is that Essential Skills gains can lead to health literacy gains, even without this having been identified as a primary training goal. UPSKILL trial data showed that individuals who took the training scored significantly higher on several items of our health literacy measure. Moreover, we showed that health literacy was linked with several mental health and psychosocial variables.

Workplace LES training interventions, therefore, have potential to improve workers' health literacy, which can have important additional benefits for both workers (e.g., mental health) and firms (e.g., health and safety outcomes). Our qualitative inquiry will explore the extent to which UPSKILL participants identify health literacy as a benefit they experienced, and whether this had "spillover" effects in life domains beyond the workplace.

UPSKILL's health literacy impacts may also have implications for the ways in which LES training interventions are designed and delivered. For example, these findings may motivate integrating health literacy as an explicit part of LES curriculum, or exploring ways to link health literacy learning to occupational health and safety practices and outcomes.

8.3. UPSKILL as a mental health promotion intervention

UPSKILL was not designed as a physical or mental health intervention. Rather, it was first and foremost a workplace LES training intervention, for which workers' Essential Skills gains were the primary goal, and health and safety only one of several potential business outcome areas.

Nevertheless, both UPSKILL Trial and UPSKILL Health analyses have demonstrated numerous health-related results – some impacts, some associations – particularly in the area of mental health, defined broadly. Although participants' overall mental health scores[17] did not show impacts relative to the control group, we did find evidence of impacts on work stress, well-being and other measures that are understood to be related to mental health. In fact, a substantial reduction in work stress was one of our most significant findings, along with the strong relationship of mental health scores to health literacy, psychosocial variables such as self-esteem, self-efficacy and resilience, and job performance outcomes such as teamwork, communication, and absenteeism.

Any intervention with potential benefits for mental health is highly relevant for employers and policymakers, particularly given the increasing costs of mental health-related disability claims, the heightened profile of workplace mental health as a policy priority, and the broader implications for preventing disability and social and economic exclusion. As one example of this heightened policy attention, the Mental Health Commission of Canada recently released a new, voluntary national standard for psychological health and safety in the workplace (BNQ/CSA/MHCC, 2013). Likewise, there have been a couple of high-profile publicity campaigns recently undertaken in Canada to increase public awareness of mental health issues, including Bell Canada's *Let's Talk* campaign.

In light of UPSKILL's Health's outcomes and potential implications, it is worth considering how a non-health intervention like UPSKILL fits within an integrated mental health promotion approach in Figure 10, below.

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[17] As measured by the SF-12 MCS.

Figure 10   The three elements of an integrated approach to workplace mental health
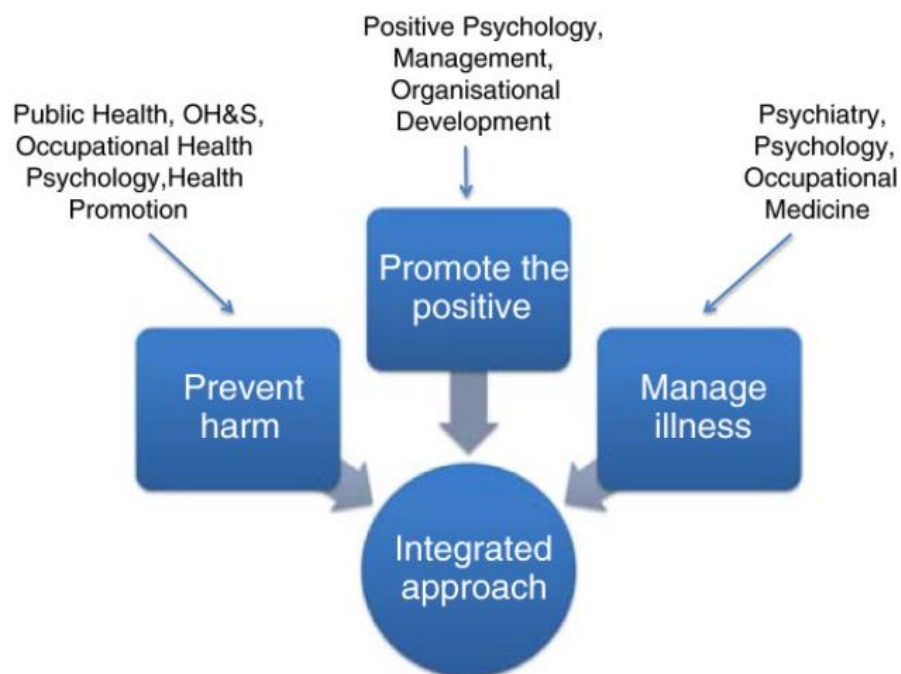
Source: LaMontagne, Martin, Page, Reavley, Noblet, Milner, Keegel, and Smith (2014).

According to LaMontagne, Martin, Page, Reavley, Noblet, Milner, Keegel, and Smith (2014), harm prevention interventions in this model include interventions that aim to modify how individuals respond to job stressors, "usually through strategies to improve employees' ability to cope with or withstand stressors" (LaMontagne et al., 2014), a key part of the guest relations element of job performance in UPSKILL, and for which communication skills are vital. The authors also emphasize the need for this type of intervention to be tailored and context appropriate. Readers will remember this was a key feature of UPSKILL, in that the training content was closely aligned with organizational needs and goals, the job requirements of different occupations, and the LES levels of the participants.

UPSKILL could also be seen as an intervention that aligns with the second element of the model – promoting positive mental health – by identifying and enhancing the strengths of individuals, groups, or organizations. Indeed, UPSKILL increased a number of psychosocial variables for participants compared to the control group and increased workers' general skills and capabilities. Both are seen as important to promote positive mental health (LaMontagne et al., 2014).

Moreover, the LES training intervention and performance assessments aspects of UPSKILL could easily be seen as complementing management practices and organizational development to promote workers' mental health.

Finally, it is important to note that UPSKILL focused on workers in the tourism accommodations sector, many of whom have relatively low occupational status. LaMontagne et al. (2014) acknowledge that as a

group, workers with low-status positions tend to have both a high prevalence of mental health problems and exposure to job stress, and are "the least likely to receive job stress or other workplace mental health intervention." In this light, framing a health promotion initiative within a larger intervention addressing other workplace-relevant skills, as with UPSKILL, may be an effective way to reduce health inequities for this disadvantaged population.

9.   Summary of results

The study objectives of the quantitative phase of inquiry for UPSKILL Health were:

1.   to develop a conceptual and empirical model that describes the relationships among health, mental health, and other mediating and moderating factors;

2.   to apply the model to the workplace to assess worker-level outcomes; and

3.   to analyze workers' health and mental health in relation to job performance and business outcomes.

The following are the main findings from UPSKILL Health in relation to each of these study objectives.

9.1. Personal and business factors affect workers' health

Based on a comprehensive review of the relevant literature, our conceptual model of worker health included a large number of worker and workplace factors as inputs to, or determinants of, worker health. These variables included individual socio-demographic characteristics, LES and other human capital measures, psychological and social capital measures, as well as contextual, employment, firm, and workplace characteristics.

Overall, our first round of empirical testing of the conceptual model confirmed much of what we found in the research literature, such as about the relationship between literacy practices and health literacy, between work stress and mental health, etc. Applying the conceptual model to UPSKILL data also showed the importance of worker–level variables to physical and mental health, as opposed to firm-level characteristics (i.e., work force size, union and collective agreement and training expenses per employee) which had few links with health. At the worker level, *workplace* characteristics (i.e., work control, work-home satisfaction) and workers' psychosocial variables (i.e., self-esteem, self-efficacy) were much more related to *mental* health, while literacy skills and education, and other psychosocial variables (i.e., resilience, network size) were mostly related to *physical* health.

Our analyses identified three promising areas of investigation: 1) exploring the mechanisms behind the observed relationship between health literacy and mental health; 2) looking at workplace characteristics and their relationship with mental health; and 3) examining the relationship among Essential Skills, safe work practices, and physical health.

Further analyses of these sets of relationships clarified many of the links identified in the conceptual model. However, some links remain unclear, such as the fact that no effects of safe work practices were found on workers' physical health (although numeracy was linked with safe work practices). This was not unexpected, since much of the research literature in this area is theoretical rather than empirical, meaning some of our hypotheses were fairly speculative.

Overall, our conceptual model provided a good, credible picture of worker health when applied to the UPSKILL data.

Health literacy is important for workers' mental health

In the conceptual model, health literacy is identified as an intermediary mechanism among psychosocial variables, LES and health. The middle part of the model specifies the main channels by which changes in workplace physical and mental health are thought to occur, particularly through the influence of health literacy and safe work practices and behaviours.

Testing the conceptual model highlighted the important role health literacy can play for mental health. Given the strong correlation between health literacy and mental health, we sought to explore the relationship further. The research literature provided us with little indication about the nature of this link and our hypothesis was to look at psychosocial variables as "channels of influence" between the two. While there was some evidence of a mediating effect of self-efficacy and self-esteem, we found the relationship between health literacy and mental health to be a much more direct association.

More research is needed on what aspects of health literacy affect mental health. We created a health literacy measure specifically for UPSKILL, on which the UPSKILL Health analyses relied heavily. While this measure allowed us to determine main associations among variables, it would be useful to have a validated health literacy measure with sub-scales of relevant constructs in order to learn more about the precise nature of this relationship and how it works. For example, we suspect our measure integrates the concept of social networks and social interaction, as well as managing one's own stress – both factors suggested in the literature as relating to mental health. The ways in which these factors are related to health literacy deserve more investigation.

Work stress is a key factor in mental health

The second area identified for investigation in UPSKILL Health concerned the direct effects of workplace and firm-level characteristics on mental health, and a possible mediating role for work stress and satisfaction at work.

We found that workplace and firm-level characteristics did not appear to play a major role in affecting employees' mental health scores, particularly when compared to the influence of self-esteem, health literacy, and self-efficacy. Only work-home satisfaction and the quality of (intra-firm) staff relations appear to be related to mental health. While not a strong mediating factor per se, work stress is one of the central variables in the models tested in this study because of its relationship with both workplace characteristics and mental health.

9.2. Effects of health on job performance and business outcomes

The right hand side of the model illustrates how worker and workplace health can enhance job performance and organizational performance or business outcomes. Several key findings from the UPSKILL Health study could be useful in terms of promoting health in the workplace to improve firms' performance.

The importance of workers' health and work stress in absenteeism

Both physical and mental health had substantial and statistically significant relationships with absenteeism. Among physical heath subscales, bodily pain and physical role functioning appeared to be most closely related, indicating that injuries or chronic pain might explain absences from work in the UPSKILL sample.

While the MCS did have an association with absenteeism, none of its subscales showed significant associations, which raises questions about what drives mental health-related absences, and the relevance of these sub-scale constructs. Interestingly, work stress had an even larger impact on absenteeism than mental health, and employees who reported high work stress levels were more likely to miss a day at work in the past four weeks than those with lower stress. How work stress and mental health are perceived, defined, and differentiated – in the literature and among workers and employers – is worthy of further exploration.

Mental health matters for teamwork and communication

Better self-reported mental health among UPSKILL workers was associated with a higher likelihood of passing the teamwork and communication performance assessments, controlling for other variables such as education and size of social network. While effects were modest, this finding is important: teamwork is an important component of productivity and employees who can effectively communicate with guests are also important for customer satisfaction. Both factors are integral to business outcomes in the tourism accommodations sector.

Our UPSKILL Health results point to the possibility that *promoting* workers' mental health could be an effective way to achieve business outcomes, not only by preventing absenteeism due to ill health, but also by enhancing job performance. At the same time, focusing on specific job performance skills such as communication and teamwork may yield mental health benefits for workers.

Employees' overall mental health: an important asset for business outcomes

The exploratory work linking workers' health with business outcomes arrived at similar conclusions as for the worker-level job performance assessments; that is, work stress and psycho-social variables are important for business outcomes. We found a relationship between low and declining work stress and positive business outcomes, including revenue, productivity, absenteeism, and staff costs. Self-esteem (strongly correlated with mental health) at follow-up was also associated with positive changes in participants' job satisfaction and morale, their receptivity to new challenges, their desire for further training and certifications, better sales and upselling by servers and their likelihood of staying with the firm, as reported by management.

Certain anomalous findings with regard to mental health and health literacy – which were often negatively related to business outcomes – need to be investigated further with sub-group analysis or future qualitative inquiry to better understand the degree to which this stems from measurement issues, contextual particularities, and/or differences in perspective and priorities.

9.3. Differential impacts of LES training on health and job performance

The UPSKILL trial found little or no impact on overall physical and mental health, as measured by the SF-12. Therefore, one of the objectives for UPSKILL Health was to examine subgroup differences in impacts on health-related measures. Our study did not find any evidence of gender differences in training effects on health, mental health, or work stress, meaning both sexes benefitted equally and there was no gender difference in outcomes.

Immigration status was a slightly different story, however. While the UPSKILL trial demonstrated that immigrants benefitted to a greater extent from the LES training program in terms of Essential Skills and job performance gains, Upskill Health results indicate that they did not experienced greater benefits in terms of mental or physical health or work stress.

Just as the UPSKILL trial tested impacts for other sub-groups (using program moderators such as ES level, trust, and network size at enrolment), we also tested factors we believed were key to participants' well-being in the workplace: work stress and self-efficacy. These two variables (high/low stress and high/low self-efficacy) were not found to cause any differences in impacts regarding mental or physical health. However, when we looked at job performance, greater impacts were found for individuals who reported a high level of stress at baseline than for those with low stress, and there was also a significant treatment effect for individuals with low self-efficacy. These results suggest that interventions such as LES training may be more beneficial for individuals at risk of diminished well-being at work.

9.4. Refining the conceptual model

As previously stated, applying UPSKILL data to the conceptual model provided a good test of its overall coherence and credibility, from which it emerged intact. While we did obtain some unexpected results – especially the lack of impact of working safely on physical health – these may be more related to measurement challenges (i.e., with the SF-12) or a lack of statistical power. At this point, we feel it is less a question of needing to change our conceptual model as a result of UPSKILL Health findings, than pointing to certain areas that require more testing.

Nevertheless, we recognize that trying to depict all the links between physical and mental health and performance for both workers and firms within *a single* conceptual model is extremely ambitious, even though it was necessary for this first stage of exploratory research. Possible future refinements could include focusing on specific processes or elements, or separating out worker and firm-level dimensions.

Another option would be to present mental and physical health relationships separately, although this would not be our recommendation. We remain committed to viewing health in a holistic manner, and feel there is much more to understand about how mental and physical health affect one another in a workplace context. This study is not the first to find differential effects for physical and mental health, even though the research literature indicates close links. A study by van den Berg, Alavinia, Bredt, Lindeboom, Elders, and Burdorf (2008) found that handling stress at work was associated with MCS but not with PCS scores.

Aside from questions this raises about whether the SF-12 is the most appropriate measure for both dimensions of workplace health, we suspect the mechanisms behind work-related mental and physical

health may operate differently than in a non-workplace context, and also that these mechanisms may operate differently across different sub-groups of workers. There may be temporal differences, for example, whereby the effects of work stress on mental health accumulate over the long-term, and the physical effects of work stress are perceived as short-term illnesses. Other links in our conceptual model rely on specific mechanisms, such as work injuries and working safely, where mental health may not appear to play any short-term role.

Incorporating a temporal aspect might illuminate the different mechanisms involved in the effects of work stress on health, but would require further exploration about how workers understand, define, and differentiate mental health and work stress, and how they cope with different types of stressful work situations (e.g., different patterns of absence). Other possible refinements could include consideration of how chronic health conditions and disabilities affect workers' physical and mental health, as well as changes in economic situations and other life stage events.

10. Study limitations

10.1. The exploratory nature of UPSKILL Health

The conceptual model developed for UPSKILL Health includes a myriad of worker and firm-level variables with many hypothesized mediating and direct effects. As opposed to potentially more straightforward questions about program effectiveness or cost-effectiveness (where outcomes and variables of interest may be well-defined) testing the model required considerable time and effort to identify important relationships and anticipate the direction of effects. Determining promising analytical pathways required not only looking at associations amongst hundreds of variables, but also making choices about which paths to take to deepen the analyses.

The exploratory nature of the UPSKILL Health study means we inevitably made difficult decisions about where to focus our analyses, with the result that some areas received less attention than others. For example, we focused more on workplace characteristics, work stress, mental health, job performance and psychosocial variables than on firm-level characteristics and quality of work life, since our initial analyses of these latter factors did not appear to yield promising results. This means there may yet be other aspects of the conceptual model that could provide useful information with further exploration. While no study completely exploits its analytical possibilities, we would be the first to say that UPSKILL Health does not represent the definitive study of all aspects of work-related health. Finally, reverse causation (e.g., health's effect on baseline essential skills) was always possible for models that used cross-sectional data, so the reader must be careful when interpreting the results.

10.2. UPSKILL Health not purpose-built

The main goal of UPSKILL was not to evaluate the effects of LES training on physical or mental health, but rather on job performance and business outcomes. In UPSKILL Health, we sought to explore how health is related to Essential Skills improvements, job performance, and business outcomes. While the latter admittedly included health and safety, this was only one of several business outcomes of interest. Measures of workers' physical health and mental health and health literacy were included in UPSKILL surveys as secondary impact measures, based on SRDC's interest in population health intervention research. Fortunately, this initiative was supported by PHAC and UPSKILL Health was launched, but long after the intervention and evaluation design for UPSKILL had been finalized and was underway.

This entailed several challenges for our study. Had we had the luxury of designing UPSKILL primarily as health intervention research, we would have asked additional questions of workers about chronic disease, disability stress at home, reasons for health-related absences, and any other health behaviours or life cycle variables that would possibly be considered as confounding variables for models that used cross-sectional data. Likewise, we would have asked additional questions and/or provided additional support to obtain information from employers about absenteeism, available health and disability benefits, workplace safety data and related claims; these in turn would have provided another means of verifying the self-report data. We might also have been in a position to help workers and employers understand the relevance of health-related survey questions, and try to minimize the low response rates we encountered for some health questions, particularly in the follow-up survey data.

Aside from data collection, the fact that UPSKILL Health was not purpose-built also entailed challenges for our analysis, since many of the derived variables, composite variables and indices created for UPSKILL did not address UPSKILL Health objectives. In some cases, we were not able to capitalize on UPSKILL's prior analyses, but had to go back to the raw data and re-create new variables or re-score sub-scales. Needless to say, this work required more time than anticipated, limiting the resources that might have been dedicated to other aspects of the exploratory analyses.

Overall, UPSKILL Health represents an efficient way of capitalizing on a pre-existing demonstration project to develop rigorous population health intervention research. However, we are now in a position to recognize the advantages of integrating the two studies from the start.

10.3. Challenges measuring mental health and physical health

UPSKILL Health relied on a bespoke measure of health literacy and the SF-12 as our primary health measures. While the SF-12 is a well-validated measure of health status and includes physical and mental health subscales, the UPSKILL trial showed little or no training impacts, except for a small but significant negative impact on bodily pain, which appeared to result from increased employment and longer hours.

Our UPSKILL Health findings are more promising, such as when looking at the effects of physical and mental health on specific job performance assessments such as teamwork, communication, and absenteeism. However, the inconsistencies and weak effects we found for other variables of interest could have several explanations.

First, ours is not the first study to experience inconsistencies with the SF-12. Other studies have reported in both SF-12 and SF-36 subscales, likely caused by the scoring algorithm. For example, Taft, Karlsson, and Sullivan (2001) showed that higher MCS scores drove PCS scores down, and higher physical functioning scores drove the MCS scores down (in Farivar, Cunningham, & Hays, 2007). That could help explain why we found a negative correlation between PCS and MCS scores, and several other inconsistencies among the different subscales.

However, since inconsistencies are not present in all studies using the SF-12, we must look into other factors as well. We suspect the context in which respondents answered the questionnaire might also have played a part. The administration of the SF-12 was done in the context of a much larger survey (at baseline and follow-up), which itself measured a vast array of other outcomes. Moreover, the survey was generally administered at the same time as the TOWES assessment – likely contributing to respondent fatigue – and in a few cases, with employer representatives present in the same room as respondents.

We would guess these factors may have influenced responses to mental health-related questions differently than to questions about physical health, either reflecting respondents' current state of mind[18] or introducing an element of social desirability bias to protect themselves from possible stigma. In sum, inconsistencies would depend on the pattern of response to the questions across the different

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[18]   After answering earlier survey questions on how they feel about their work, for example.

weighted components of the scales. However, we did not have the resources to investigate this possibility.

The absence of strong effects or relationships between the SF-12 and other job performance measures could also depend on our sample, which was comprised (at least at baseline) of people who were currently employed. In other words, our results may reflect the "healthy worker effect" of a sample that is healthier than average. This could explain in part why we did not found any significant effect between health and mental health and productivity (especially on task efficiency). While the SF-12 has been validated with a working population, we might have been better able to detect relationships with physical health in a more diverse sample, in which some respondents might have more severe or chronic health conditions that could affect job performance.

To conclude, the choice of the SF-12 for UPSKILL was the right one as it is a well-validated measure of health status that imposes minimal burden on respondents. That said, subsequent study of the factors involved in work-related health should include additional measures to more fully capture the physical and mental health status of employees. These could include questions about the presence of a specific medical condition that could be related to work stress or mental health (e.g., burnout or exhaustion) or physical health (e.g., presence of a chronic condition, such as diabetes) that would require absence from work or potentially affect overall job performance.

10.4. Sample sizes and missing data

We have already mentioned the problem of missing data for certain health variables, particularly in the follow-up survey. After discussion with the UPSKILL team, one of the explanations for this is that some participants may not have understood the link between UPSKILL and physical and mental health, and so perceived these questions as less relevant or important. Moreover, the sample size for job performance assessment observations at follow-up was low because of scheduling challenges at some program sites. The combination of these two factors impaired our ability to test the conceptual model with longitudinal data; hence our decision to use the larger baseline dataset for cross-sectional analyses.

For UPSKILL Health analyses that used follow-up data to compare program and control groups (which comprised the majority of missing data on job performance), the analysis of non-response shows that missing data did not bias the results (see Appendix A for more details). However, our analyses that used baseline data (such as models that look at the association between health and job performance), we recognized that non response might be problematic. Likewise, individuals who had a missing value for their performance assessment may also present different characteristics than other who had not (e.g., less skilled). While this may limit external validity of these models for the entire hotel sector, this is somewhat mitigated by the fact that an important aspect of the non-response was at the firm-level (i.e., performance assessment).

Another implication of limited sample sizes is that, while many of our analyses in UPSKILL Health resulted in estimates that were statistically significant at a ten or five or in some cases even one per cent level of probability, for other variables we lacked the necessary statistical power to detect effects. Most of the models presented in this report had sufficient power to detect medium or large effects but not necessarily small ones. This was particularly true for the stratification required for the subgroup

analyses, which decreased power to detect the influence of being in a particular sub-group. While UPSKILL presented an excellent opportunity to explore a large dataset overall, we were not always able to take advantage of this scope in terms of the health data.

10.5. External validity

Finally, it should be remembered that the UPSKILL project used a convenience sample and not a probabilistic sample. In other words, local delivery partners invited employers whom they thought could benefit from participation in the project, rather than randomly drawing from an overall list of businesses in the tourism accommodations sector. Therefore, SRDC is limited in its ability to generalize either the UPSKILL or UPSKILL Health results to other firms in the tourism accommodations sector or to other sectors.

That said, the UPSKILL and UPSKILL Health project results have strong face validity in that the large number and variety employers and employees enrolled appear to be typical of those in the tourism accommodations sector more generally. The detailed information about participant profiles (workers and firms) will allow readers to determine for themselves the potential relevance of the findings to the broader tourism accommodations sector and other sectors such as retail. We will explore this issue in more detail in the knowledge synthesis report, as we explore the policy and practice implications of the findings.

11. Conclusions and next steps

The limitations described in the previous section should not diminish the success and importance of the UPSKILL Health study. With foresight on the part of SRDC, collaboration from OLES, and financial support from PHAC, we were able to capitalize on an exceptionally well-designed, large-scale demonstration project and undertake complementary population health intervention research with efficiency and rigour.

The quantitative component of UPSKILL Health has allowed us to deeply interrogate a rich and comprehensive dataset on work-related health. Moreover, UPSKILL's experimental design meant our research, though exploratory, could nevertheless identify associations among variables as well as some true impacts – a rare opportunity in Canada.

At a very high level, the results of our analyses highlighted the importance of workers' health literacy for their mental health, and the role of mental health in achieving both job performance and business outcomes. This appeared to be based in part on reduced work stress, as well as gains in communication and teamwork. Investment in programs that reduce work stress or increase self-esteem and mental health among workers could yield numerous benefits, especially for workers at risk of diminished well-being at work.

The breadth of UPSKILL Health results means there are many areas with potential implications for policy and practice, whether in terms of LES training, other workplace interventions, organizational development and management, or health promotion. Given the results presented here, an important area for focus will be work stress and well-being of employees, and the link to job performance. It would be premature, however, to go too far in this direction without considering the results of our qualitative inquiry, which is currently underway.

At the time of writing, the last of our focus groups with UPSKILL participants is being conducted, and we expect to learn a great deal about how participants perceive links between LES training, health literacy, and health, what effect the training may have had for them, and what means they use to cope with limited LES. The results of our qualitative inquiry will be provided in a technical report delivered in June 2015.

In turn, we expect these qualitative results will help us interpret and extend some of our quantitative research findings, particularly those concerning the links between physical and mental health and work stress, and with job performance. We will synthesize the results of the two lines of inquiry and explore their policy and practice implications with PHAC representatives to ensure our final report has the greatest potential relevance and potential reach. This final UPSKILL Health report will be delivered in September 2015.

References

ABC Life Literacy Canada (2010). *Essential Skills Training: The Foundation of Workplace Health & Safety,* case studies, 2010.
http://abclifeliteracy.ca/Essential_Skills_The_Foundation_of_Workplace_Health_Safety

Assmann, S. F., Pocock, S., Enos, L. E., Kasten, L. E. (2000). Subgroup analysis and other (mis)uses of baseline data in clinical trials. *Lancet,* 355, 1064-1069.

Baker, D. W. (2006). The meaning and the measure of health literacy. *Journal of General Internal Medicine, 21*, 878-883. Available at: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1831571/

Berkman, N. D., DeWalt, D. A., Pignone, M. P., Sheridan, S. L., Lohr, K. N., Lux, L., Sutton, S. F., Swinson, T., & Bonito, A. J. (2004). *Literacy and Health Outcomes, Literacy and Health Outcomes*, prepared for Agency for Healthcare Research and Quality (AHRQ), U.S. Department of Health and Human Services, Evidence Report/Technology Assessment No. 87.
http://archive.ahrq.gov/downloads/pub/evidence/pdf/literacy/literacy.pdf

Berkman, N. D., Sheridan, S. L., Donahue, K. E., Halpern, D. J., Viera, A., Cortty, K., Holland, A., Brasure, M., Lohr, K. N., Harden, E., Tant, E., Wallace, I., & Viswanathan, M. (2011). *Health Literacy Interventions and Outcomes: An Updated systematic Review*, prepared for the Agency for Healthcare Research and Quality (AHRQ), U.S. Department of Health and Human Services, Evidence Report/Technology Assessment No. 199.
http://effectivehealthcare.ahrq.gov/ehc/products/151/671/Health_Literacy_Update_FinalTechBrief_20110502.pdf

Bureau de normalisation du Québec, Canadian Standards Association, & Mental Health Commission of Canada (2013). *National Standard of Canada: Psychological health and safety in the workplace - Prevention, promotion, and guidance to staged implementation*. Mississauga, ON & Québec, QC: CSA Group and BNQ.

Burton, Joan (2010). *WHO Healthy Workplace Framework and Model: Background and Supporting Literature and Practices*, World Health Organization, February 2010.
http://www.who.int/occupational_health/healthy_workplace_framework.pdf

Campbell, A. (2010). *What You Don't Know Can Hurt You: Literacy's Impact on Workplace Health and Safety.* Conference Board of Canada. http://www.conferenceboard.ca/e-library/abstract.aspx?did=3661

Campos-Serna, J., Ronda-Pérez, E., Artazcoz, L., Moen, B. E., & Benavides, F. G. (2013) Gender inequalities in occupational health related to the unequal distribution of working and employment conditions: a systematic review. *International Journal for Equity in Health, 12*, 57.

Canadian Centre for Occupational Safety and Health (CCOSH, 2012). *Health Promotion / Wellness / Psychosocial*, website, September, 2012, http://www.ccohs.ca/oshanswers/psychosocial/

Canadian Council on Learning. (2015). *Reading the Future*. Accessed from http://www.ccl-cca.ca/CCL/Reports/ReadingFuture/LiteracyLevels.html

Canadian Council on Learning. (2008). *Reading the future: Planning to meet Canada's future literacy needs.* Ottawa: Canadian Council on Learning.

Chew, L. D., Bradley, K. A., & Boyko, E. J. (2004). Brief questions to identify patients with inadequate health literacy. *Fam Med,* 36, 588-94.

Conference Board of Canada. (2002). *Excellence in Workplace Literacy, Medium Business Winner, 2002: Royal Star Foods Limited.* Accessed from http://www.conferenceboard.ca/temp/5729b0e5-2d3b-4dfb-8187-72053a66a5a6/rsf-cs.pdf

Conference Board of Canada. (2005a). *Building Essential Skills in the Workplace: Empowering Employee-Learners with Essential Skills at Durabelt Inc.* Accessed from http://www.conferenceboard.ca/Libraries/EDUC_PUBLIC/DurabeltCS.sflb

Conference Board of Canada. (2005b). Building Essential Skills in the Workplace: Producing "Productivity through People" at Minas Basin Pulp & Power Company Limited. Accessed from http://www.conferenceboard.ca/Libraries/EDUC_PUBLIC/MinasBasin-CS.sflb

Conference Board of Canada. (2005c). *Building Essential Skills in the Workplace: Shaping Performance at BHP Billiton Diamonds Inc.* Accessed from http://www.conferenceboard.ca/Libraries/EDUC_PUBLIC/BHPBillitonCS.sflb

Davis, T. C., Long, S. W., Jackson, R. H., Mayeaux, E. J., George, R. B., Murphy, P. W., & Crouch, M. A. (1993). Rapid estimate of adult literacy in medicine: a shortened screening instrument. Family Medicine, 25(6), 391-395.

De Coulon, A., Meschi, E., & Yates, M. (2010). *Education, basic skills and health-related outcomes.* National Research and Development Centre for adult literacy and numeracy. http://www.voced.edu.au/content/ngv22305

D'Eon, M., Sadownik, L., Harrison, A., & Nation, J. (2008). Using self-assessment to detect workshop success: Do they work? *American Journal of Evaluation, 29*, 98-98.

Department for Business Innovation & Skills. (2012). The 2011 Skills for Life Survey: A Survey of Literacy, Numeracy and ICT Levels in England. *BIS Research Paper Number 81.* Retrieved from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/36000/12-p168-2011-skills-for-life-survey.pdf

Edwards, J., Van Laar, D. L., Easton, S., & Kinman, G. (2009). The Work-Related Quality of Life (WRQoL) scale for Higher Education Employees. *Quality in Higher Education, 15*(3), 207-219.

Employment and Social Development Canada. (2013). Essential Skills Profiles. Retrieved from http://www.esdc.gc.ca/eng/jobs/les/profiles/index.shtml

Employment and Social Development Canada. (2014). Skills Definitions and Levels of Complexity. Retrieved from http://www.esdc.gc.ca/eng/jobs/les/definitions/index.shtml

Essential Skills Ontario. (2012). *Collaborative Development Approaches: Piloting Illustrative Workplace Models. Executive Summary.* Accessed from

http://www.essentialskillsontario.ca/sites/www.essentialskillsontario.ca/files/Collaborative%20Development%20Approaches%20Report_Executive%20Summary_Final_0.pdf

Farivar, S. S., Cunningham, W. E., & Hays, R. D. (2007). Correlated physical and mental health summary scores for the SF-36 and SF-12 Health Survey, V.1. *Health and Quality of Life Outcomes, 5*, 54. Doi: 10.1186/1477-7525-5-54

Feinstein, L., & Hammond, C. (2004). The contribution of adult learning to health and social capital. *Wider Benefits of Learning, Research Report No. 8.* London: Institute of Education.

Feinstein, L., Hammond, C., Woods, L., Preston, J., & Bynner, J. (2003). *The contribution of adult learning to health and social capital.* Report 8. London: institute of Education: Centre for Research on the Wider Benefits of Learning.

Gilmour, Heather and Scott B. Patten (2007). Depression at Work, *Perspectives*, November 2007, Statistics Canada Cat. No. 75-001-XIE. http://www.statcan.gc.ca/pub/75-001-x/2007111/article/10406-eng.pdf

Gray, A. & Sutton, A. (2007). *The Workplace Literacy Fund: A Review.* Accessed from http://www.dol.govt.nz/PDFs/workplace-literacy-fund-august-2007.pdf

Gyarmati, D., Leckie, N., Dowie, M., & Palameta, B. (2014). *UPSKILL: A Credible Test of Workplace Literacy and Essential Skills Training.* Ottawa, ON: Social Research and Demonstration Corporation. Accessed from http://www.srdc.org/media/199774/upskill-technical-report-en.pdf

Jackson, Andrew (2009). The Unhealthy Canadian Workplace. Chapter 7 of: Dennis Raphael (editor), *Social Determinants of Health*, second edition. Toronto: Canadian Scholars' Press Inc. http://books.google.ca/books?hl=en&lr=&id=QL1nJVEOJqEC&oi=fnd&pg=PP1&dq=raphael+education+health&ots=Zt_fIgLkJI&sig=g3dDF7r-qcn4l0TDRv0HHLue5JE#v=onepage&q=education%20&f=false

Kickbusch, I., Wait, S., & Maag, D. (2006). *Navigating Health: The Role of Health Literacy.* London, UK: International Longevity Centre.

Kuji-Shikatani, K and R. Zorzi (2007). *Impact of Workplace-Supported Literacy and Essential Skills Enhancement in Small and Medium Size Businesses in Canada.* Ottawa: Strategic Policy Research Directorate, Department of Human Resources and Social Development.

Lalonde, M. (1974). *A New Perspective on the Health of Canadians.* Ottawa: Ministry of National Health and Welfare.

LaMontagne, A. D., Martin, A., Page, K. M., Reavley, N. J., Noblet, A. J., Milner, A. J., Keegel, T., & Smith, P. M. (2014). Workplace mental health: developing an integrated intervention approach. *BioMed Central Psychiatry, 14*(131), 1-11.

Lefebvre, S., Belding, P., Brehaut, M., Dermer, S., Kaskens, A., Lord, E., McKay, W., & Sookermany, N. (2006). "I've Opened Up": Exploring Learners' Perspectives on Progress. Level 1 and Level 2 Learners in Community-Based Adult Literacy Programs. Available at http://www.nald.ca/library/research/openup/openup.pdf (accessed Jan. 10, 2010).

Leigh, J., & Schnall, P. (2000). Costs of occupational circulatory disease. *State of the Art Reviews: Occupational Medicine,* 15, 22-45.

Lowe, Graham (2006). Under Pressure: Implications of Work-Life Balance and Job Stress, *Human Solutions Report* 2006-07: Job Stress, Fall 2006. http://www.grahamlowe.ca/documents/182/Under%20Pressure%2010-06.pdf

Marchand, A. and P. Durand (2011). Psychosocial and Biological Indicators in the Evaluation of and Intervention in Mental Health Problems at Work. *Healthcare Papers* 11(Special Issue), pp. 6–19. http://www.longwoods.com/content/22407

Marmot, Michael, Johannes Siegrist, and Tores Theorell (2006). Health and the Psychosocial Environment, Chapter 6 of Michael Marmot and Richard G. Wilkinson (eds.) *Social Determinants of Health*, second edition, Oxford University Press.

Martin, A. J. (2009). Motivation and engagement in the workplace: Examining a multidimensional framework and instrument from a measurement and evaluation perspective. *Measurement and Evaluation in Counseling and Development, 41*, 223-243.

Mental Health Commission of Canada (2013). *Making the Case for Investing in Mental Health in Canada.* http://www.mentalhealthcommission.ca/English/node/5020#sthash.tpEh1Dez.dpuf

Messing, K. (1997). Women's Occupational Health: A Critical Review and Discussion of Current Issues. *Women & Health*, *25*(4), pp. 39-68. http://www.tandfonline.com/doi/abs/10.1300/J013v25n04_03#.VQhUjxs5BoL

Mond, J., Mitchison, D., Latner, J., Hay, P., Owen, C., & Rodgers, B. (2013). Quality of life impairment associated with body dissatisfaction in a general population sample of women. *BMC Public Health 2013, 13*:920. http://www.biomedcentral.com/content/pdf/1471-2458-13-920.pdf

National Institute for Health and Clinical Excellence (2009). Promoting mental wellbeing at work, Business case, *NICE public health guidance*, November, 2009. http://www.nice.org.uk/nicemedia/live/12331/46023/46023.PDF

National Institute for Occupational Safety and Health (1999). *Stress…At Work Booklet* (online), by the NIOSH working group : Steven Sauter, Lawrence Murphy, Michael Colligan, Naomi Swanson, Joseph Hurrell, Jr., Frederick Scharf, Jr., Raymond Sinclair Paula Grubb, Linda Goldenhar, Toni Alterman, Janet Johnston, Anne Hamilton, and Julie Tisdale), US Department of Health and Human Services (DHHS), Publication Number 99-101 (online), 1999. http://www.cdc.gov/niosh/docs/99-101/

Noblet, A., & LaMontagne, A. D. (2006). The role of workplace health promotion in addressing job stress. *Health Promotion International, 21*(4):346.

Ontario Literacy Coalition. (2010). The Meaning of Essential Skills, *The Essential Skills Bulletin,* 2010-2011, Issue #1. http://www.essentialskillsontario.ca/sites/www.essentialskillsontario.ca/files/PDF_%20The%20Essential_Skills_Bulletin_2010-2011_Issue%20_1.pdf

O'Donnell, O., van Doorslaer, E., Wagstaff, A., & Lindelow, M. (2008). *Analyzing Health Equity Using Household Survey Data: A Guide to Techniques and Their Implementation*. Washington, DC: World Bank.

Park, Jungwee (2007). Work stress and job performance, *Perspectives*, December 2007, Statistics Canada catalogue no. 75-001-XIE. http://www.statcan.gc.ca/pub/75-001-x/2007112/article/10466-eng.pdf

Perrin, Burt (1998). *How Does Literacy Affect the Health of Canadians?* A Profile Paper, presented to Policy Health Promotion and Programs Branch, Health Canada (now Population Health Agency of Canada), 1998. http://en.copian.ca/library/research/howdoes/howdoes.pdf

Perrin, Burt (1990). *Research Report: Literacy and Health Project Phase One*. Ontario Public Health Association, Toronto.

Pratt, C. C., McGuigan, W. M., & Katzev, A. R. (2000). Measuring program outcomes: Using retrospective pretest methodology. *American Journal of Evaluation*, 21, 341-349.

Public Health Agency of Canada. (2002). *What is the Population Health Approach.* Accessed on 9/12/2005 from http://www.phac-aspc.gc.ca/ph-sp/phdd/approach/approach.html

Roberts, B. W. (2009). Back to the future: Personality and assessment and personality development. *Journal of Research in Personality, 43*, 137–145.

Robins, R. W., Hendin, H. M., & Trzesniewski, K. H. (2001). Measuring Global Self-Esteem: Construct Validation of a Single-Item Measure of the Rosenberg Self-Esteem Scale. *Personality and Social Psychology Bulletin, 27,* 151-161.

Rootman, I. & Ronson, B. (2005). Literacy and Health Research in Canada. *Canadian Journal of Public Health, 96*(2), S62-S77.

Rosen, D. J. (2008). *International Workforce Literacy Review: United States.* Accessed from http://dol.govt.nz/PDFs/upskilling-2007-united-states.pdf

Sabates, R., & Feinstein, L. (2004). *Education, training and the uptake of preventative health care.* Wider Benefits of Learning, Report no. 12, 2004. http://www.learningbenefits.net/Publications/ResReps/ResRep12.pdf

Schwarzer, R., & Jerusalem, M. (1995). Generalized self-efficacy scale. *Measures in health psychology: A user's portfolio. Causal and control beliefs, 1*, 35-37.

The Scientific Advisory Committee to The Global Business and Economic Roundtable on Addiction and Mental Health (2002). *Mental Health and Substance Use at Work: perspectives from research and implications for leaders*, November 14, 2002. http://www.mentalhealthroundtable.ca/jan_2003/mentalhealth2_nov11_021.pdf

Shah, D. (2009). "Healthy worker effect phenomenon." *Indian Journal of Occupational and Environmental Medicine 13*(2): 77-79.

Smith, Peter and Michael Polanyi (2009). Understanding and Improving the Health of Work. Chapter 8 of: Dennis Raphael (editor), *Social Determinants of Health*, second edition. Toronto: Canadian Scholars' Press Inc. http://books.google.ca/books?hl=en&lr=&id=QL1nJVEOJqEC&oi=fnd&pg=PP1&dq=raphael+education+health&ots=Zt_fIgLkJI&sig=g3dDF7r-qcn4l0TDRv0HHLue5JE#v=onepage&q=education%20&f=false

Spitzer, D. L. (2005). Engendering Health Disparities. *Canadian Journal of Public Health, 96*, Suppl. 2, S78-S96.

Statistics Canada. (2013). *Skills in Canada: First Results from the Programme for the International Assessment of Adult Compentencies (PIAAC).* Ottawa: Statistics Canada.

Taft, C., Karlsson, J., & Sullivan, M. (2001). Do SF-36 summary component scores accurately summarize subscale scores? *Quality of Life Research, 10*(5), 395-404.

TOWES. (2015). *Literacy & Complexity.* Accessed from http://www.towes.com/en/about-towes/what-is-towes/literacy--complexity

TOWES. (2015a). About TOWES. Retrieved from http://www.towes.com/en/about-towes/about-us

TOWES. (2015b). Literacy and Essential Skills. Retrieved from http://www.towes.com/en/literacy-and-essential-skills/overview

Van den Berg, T. I. J., Alavinia, S. M., Bredt, F. J., Lindeboom, D., Elders, L. A. M., & Burdorf, A. (2008). The influence of psychosocial factors at work and life style on health and work ability among professional workers. *International Archives of Occupational and Environmental Health, 81*(8), 1029-1036. Doi: 10.1007/s00420-007-0296-7

Van Laar, D., Edwards, J. A., & Easton, S. (2007). The work-related quality of life scale for healthcare workers. *Journal of Advanced Nursing, 60*(3), 325-333.

Wallace, L. S., Rogers, E. S., Roskos, S. E., Holiday, D. B., & Weiss, B. D. (2006). Screening Items to Identify Patients with Limited Health Literacy Skills. *Journal of General Internal Medicine, 21*(8), 874-877. Doi:10.1111/j:1525-1497.2006.00532.x

Ware, J. E., Kosinski, M., Bayliss, M. S., McHorney, C. A., Rogers, W. H., & Raczek, A. (1995). Comparison of methods for the socring and statistical analysis of SF-36 Health Profile and Summary Measures: Summary of results from the Medical Outcomes Study. *Med Care, 33:* AS264.

Ware, J. E., Konsinski, M., & Keller, S. D. (1996). A 12-item Short-Form Health Survey: Construction of scales and preliminary tests of reliability and validity. *Medical Care, 34*(3), 220-233.

Weiss, M. J., Bloom, H., & Brock, T. (2014). A Conceptual Framework for Studying the Sources of Variation in Program Effects. In MRDS Working Papers on Research Methodology. Retrieved from http://www.mrdc.org/publication/conceptual-framework-studying-sources-variation-program-effects

Wen, J., Shi, Y., Li, Y., Yuan, P., & Wang, F. (2012). Quality of Life, Physical Diseases, and Psychological Impairment among Survivors 3 Years after Wenchuan Earthquake: A Population Based Survey. *PLoS ONE, 7*(8): e43081. Doi:10.1371/journal.pone.0043081

Zarcadoolas, C., Pleasant, A., & Greer, D.S. (2006). *Advancing Health Literacy: A Framework for Understanding and Action.* San Francisco, CA: Jossey-Bass.

Zimbardo, P. G., & Boyd, J. M. (1999). Putting Time in Perspective: A Valid, Reliable Individual-Differences Metric. *Journal of Personality and Social Psychology, 77*(6), 1271-1288.

Appendix A: Random assignment, non-response analysis, and regression adjustment

The assignment of participants into the program and control groups was done randomly and independent of any pre-existing characteristics. Nonetheless, it is possible that the members of the two groups could be dissimilar simply by chance. This is unusual if the random assignment is properly implemented and the sample size is adequate, yet it is important in any RCT to verify the success of random assignment in avoiding bias. This is particularly true in cases such as UPSKILL, where random assignment was conducted at the firm level, and might not reduce the pre-existing difference between program and control groups as effectively as in the case of individual level random assignment. A second area of potential sample bias is non-response: if it is not randomly distributed among participants, it can result in the analysis sample of program group participants is very different from that of the control group participants. Therefore, it is crucial to examine whether the program and control groups are balanced both at the time of the baseline survey and at the follow-up survey to account for any differences arising from attrition.

This appendix presents the results of the investigation of program-control balance and non-response of the baseline and analysis samples. The investigation suggests that although there were some differences between the program and control groups at baseline and at the follow-up survey, these differences were minor and within expected randomization errors. Although non-response to the follow-up survey was not completely random,[19] there were only minor differences in non-response between the program and control groups such that the observed post-program differences (and difference-in-differences) between the two groups remain valid estimates of the true program impacts among those who responded to the follow-up survey. However, it should be noted that findings based on the follow-up sample may not be representative to all recruited participants since non-responses are not completely random. Nevertheless, the impact analysis is, indeed, internally valid.

For minor ex-post differences of characteristics between program and control due to random assignment and non-response, regression adjustment can be used to improve precision of the estimates. Adjustment variables were chosen based on the results of the program-control balance and non-response analysis. This appendix also describes the process and rationale of the adjustment variables selected.

Balance of characteristics between program and control group participants at baseline

Summary statistics of participants' characteristics in the program and control groups are presented in Table A.1. The program-control differences were tested by Student t-tests, and statistical significant differences are denoted by asterisks. Some statistical significant differences are

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[19] It can be shown that item non-responses of certain baseline survey questions were good predictors of follow-up survey non-responses. However, identification of predictors of non-responses to the follow-up survey is insufficient to ensure representativeness of the follow-up sample to that of all recruited participants.

expected. On average, 5 out of every 100 independent t-tests would have been flagged as statistically significant at a 5 per cent significance level simply due to sampling errors, even if there is no systematic difference between the two groups.[20] As shown in Table A.1, the observed personal characteristics of program and control group participants were essentially identical, aside from marital status and Aboriginal status.

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[20] This problem is referred to as multiple comparisons in the statistical literature. There are proposed methods to account for the higher false-positive rate due to a large number of t-tests. However, there is no consensus on which method is the most appropriate. This appendix assumes that the two groups are not substantially different if the proportion of significant t-tests is smaller than the level of significance.

Table A.1   Selected characteristics of UPSKILL participants at baseline, by treatment group

Outcome	Program	Control	Difference	Standard Error
Demographics				
Age (average years)	38.1	37.6	**0.4**	(1.4)
Age Distribution (%)				
Under 20	1.5	2.5	**-1.0**	(1.0)
20-24	14.7	16.6	**-1.8**	(2.9)
25-34	26.6	26.1	**0.5**	(3.4)
35-44	21.5	18.6	**2.8**	(2.1)
45-54	20.8	20.5	**0.3**	(2.9)
55 and over	10.9	11.1	**-0.1**	(2.6)
Not reported	3.9	4.6	**-0.6**	(1.4)
Gender (%)				
Male	28.1	26.9	**1.2**	(3.5)
Female	71.3	72.5	**-1.2**	(3.7)
Not reported	0.6	0.6	**0.0**	(0.5)
Marital Status (%)				
Single / Divorced / Widowed	45.2	51.3	**-6.1 ****	(3.0)
Married or Common Law	51.5	46.6	**4.9 ***	(2.9)
Not reported	3.3	2.1	**1.2**	(1.1)
Number of people in household				
Average number of people in household	3.0	2.9	**0.1**	(0.1)
Average number of income generating people in ho	2.1	2.1	**0.1**	(0.1)
Presence of Children (%)				
No child	37.1	34.9	**2.2**	(2.9)
Have a child / children	38.4	36.8	**1.6**	(3.5)
Not applicable / not reported	24.5	28.3	**-3.8**	(3.0)
Highest Educational Attainment (%)				
A university degree	14.7	14.7	**0.0**	(2.8)
A college diploma or certificate	24.0	24.6	**-0.6**	(2.7)
A trade/vocational diploma or certificate	13.9	15.2	**-1.3**	(2.4)
An apprenticeship diploma	0.4	0.6	**-0.3**	(0.3)
A high school diploma	32.5	31.4	**1.1**	(2.9)
Less than high school diploma	10.5	9.6	**0.9**	(2.1)
Not reported	3.9	3.8	**0.1**	(1.5)
Aboriginal Status (%)				
Not aboriginal	85.1	90.2	**-5.1 ****	(2.5)
Aboriginal	5.5	2.8	**2.6**	(1.7)
Not reported	9.4	7.0	**2.5**	(2.0)
Immigrant Status (%)				
Not an immigrant	55.1	58.6	**-3.5**	(8.3)
Immigrant	43.2	39.3	**3.9**	(7.8)
Not reported	1.7	2.1	**-0.4**	(0.9)
Number of Years Since Immigration (%)				
5 Years or LESS	15.0	12.3	**2.7**	(3.8)
6-10 Years	7.1	4.9	**2.2**	(1.7)
11-15 Years	4.7	2.8	**1.9**	(1.4)
16 - 20 Years	4.8	6.6	**-1.8**	(2.9)
Over 20 Years	9.5	10.6	**-1.1**	(2.9)
Not an immigrant or not reported	58.8	62.7	**-3.9**	(7.4)
Age of Immigration Arrival (Years)				
Average Age	26.8	26.9	**-0.1**	(1.2)
Age of Immigration Arrival (%)				
Not reported as an immigrant	56.8	60.7	**-3.9**	(7.8)
0 - 5 years	1.1	1.3	**-0.1**	(0.6)
6 - 17 years	5.1	4.6	**0.5**	(1.5)
18 - 24 years	11.3	8.4	**2.9**	(2.9)
25 - 34 years	11.4	11.2	**0.2**	(2.5)
35 - 44 yea4rs	6.7	6.2	**0.6**	(1.6)
45 and over	2.2	1.6	**0.6**	(0.9)
Not reported	5.3	6.2	**-0.8**	(1.7)
Language use at home (%)				
English	66.3	68.7	**-2.4**	(6.5)
French	0.4	2.5	**-2.1**	(1.7)
Other	21.2	16.0	**5.3**	(3.9)
More than one	8.9	10.0	**-1.1**	(2.7)
Not reported	3.2	2.8	**0.3**	(1.5)
Household Income				
Less than $30,000	35.3	35.2	**0.1**	(3.9)
$30,000 or more	43.3	39.8	**3.5**	(4.0)
Not reported / not applicable	21.3	25.0	**-3.6**	(3.1)
Job Characteristics				
Position (%)				
House service staff	41.4	44.2	**-2.8**	(4.6)
Kitchen staff	10.7	11.8	**-1.2**	(2.7)
Front desk staff	24.9	25.1	**-0.2**	(2.6)
Food service staff	22.9	18.2	**4.7**	(3.9)
Not reported	0.1	0.6	**-0.5**	(0.4)
Permanent / Temporary (%)				
Not permanent	10.5	8.1	**2.5**	(2.1)
Permanent	83.6	87.5	**-3.9**	(3.0)
Not reported	5.8	4.4	**1.4**	(2.0)
Tenure (Year)				
Average length of tenure	5.6	5.6	**0.0**	(0.9)
Tenure (%)				
Less than 3 years	52.2	53.6	**-1.3**	(5.8)
3 years and over	44.6	43.0	**1.6**	(5.7)
Not reported	3.2	3.5	**-0.3**	(1.7)
Wage (%)				
Average hourly wage	11.5	12.0	**-0.5**	(0.7)
Sample size	**787**	**633**	**1,420**	

Sources: Calculations from the baseline survey.
Notes: Sample sizes vary for individual measures due to missing values.
Two-tailed t-tests were applied to difference between the program and control group outcomes.
Statistical significance levels are indicated as: * = 10 per cent; ** = 5 per cent; *** = 1 per cent.

Statistical tests of the program-control difference on the distribution of answers (or means for composite scales) provided in Sections C, D, E, F, G and H of the baseline survey were also conducted. The answers of questions/scale with a statistically significant difference are presented in Table A.2. The t-test results of all other items from the baseline survey are not statistically significant at 5 per cent significance level, and are not presented.[21] These statistically significant differences do not reveal any particular consistent pattern of differences between the program and control groups.

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[21]   Results produced upon request.

Table A.2   Selected characteristics of UPSKILL participants at baseline, by treatment group

Outcome	Program	Control	Difference	Standard Error
Section C: Health				
Social Functioning				
0	1.9	2.1	-0.1	(0.9)
1 - 25	3.9	3.0	0.9	(0.9)
26 - 50	17.7	17.1	0.6	(2.4)
51 - 75	25.3	21.3	4.0 *	(2.3)
76 - 100	46.1	53.1	-7.0 **	(3.1)
Not available	5.1	3.5	1.6	(1.6)
Section E: Skills				
Freqency of doing match outside of work				
Never	5.2	5.1	0.2	(1.3)
Rarely	11.6	9.6	1.9	(1.6)
Less than once a week	10.4	10.1	0.3	(1.7)
Once a week	19.6	20.5	-1.0	(2.4)
A few times a week	26.4	31.3	-4.9 **	(2.4)
Every day	18.8	18.8	0.0	(2.4)
Not reported	8.0	4.6	3.4	(2.2)
Feeling anxious when figuring out such amounts as discounts, sales tax or tips				
Strongly disagree	14.6	12.0	2.6 *	(1.6)
Disagree	28.0	28.4	-0.5	(3.0)
Neutral	23.8	31.8	-8.0 ***	(2.5)
Agree	20.5	18.2	2.3	(2.4)
Strongly Agree	3.4	3.9	-0.5	(0.9)
Not reported	9.8	5.7	4.1 *	(2.4)
Reading is one of my favourite activities				
Strongly disagree	6.0	4.7	1.2	(1.4)
Disagree	13.9	10.6	3.3	(2.0)
Neutral	23.8	29.7	-5.9 **	(2.9)
Agree	25.8	25.8	0.0	(3.1)
Strongly Agree	23.0	23.7	-0.7	(2.8)
Not reported	7.6	5.5	2.1	(2.3)
Frequncy of writing or filling reports, bills, invoices, spreadsheets, or budget tables				
Never	34.7	39.0	-4.3	(3.5)
Rarely	15.2	18.0	-2.8	(2.1)
Less than once a week	5.0	4.9	0.1	(1.1)
Once a week	4.7	3.5	1.2	(1.0)
A few times a week	9.5	9.5	0.1	(1.6)
Every day	20.3	19.7	0.6	(2.1)
Not reported	10.5	5.4	5.2 **	(2.4)
Efficacy of having the math skills to do the main job well				
Strongly disagree	1.7	0.3	1.3 **	(0.6)
Disagree	4.6	2.7	1.9	(1.2)
Neutral	15.4	14.4	1.0	(2.0)
Agree	31.1	34.3	-3.2	(2.8)
Strongly agree	38.9	40.6	-1.7	(3.7)
Not reported	8.4	7.7	0.6	(3.0)
Section G: Non-work Life				
Volunteering				
Did not volunteer	42.8	49.1	-6.3 **	(3.0)
Participated in formal volunteering	49.4	42.8	6.6 **	(3.1)
Not reported	7.8	8.1	-0.3	(3.0)
How many contacts were from work				
None	19.9	19.0	1.0	(2.2)
Very few	25.5	25.0	0.6	(2.7)
Some	29.2	29.4	-0.2	(3.0)
Most	6.6	8.4	-1.8	(1.7)
All	3.2	3.8	-0.6	(1.1)
Can't say	5.2	2.7	2.5 **	(1.2)
Not reported	0.1	0.1	0.0	(0.0)
Section H: Feelings and attitudes about oneself, work and life				
Motivation/Engagement: Average Score on Anxiousness	4.2	4.3	-0.1 **	(0.0)
Motivation/Engagement: I sometimes reduce my chances of doing well in my job				
Strongly disagree	22.2	24.8	-2.6	(3.3)
Disagree	28.3	30.3	-2.0	(3.2)
Neutral	20.1	18.8	1.3	(2.4)
Agree	10.5	9.2	1.4	(2.0)
Strongly Agree	3.6	1.1	2.5 ***	(0.9)
Not reported	15.2	15.8	-0.6	(5.6)
Sample size	**787**	**633**	**1,420**	

Sources: Calculations from the baseline survey.

Notes: Sample sizes vary for individual measures due to missing values.

Two-tailed t-tests were applied to difference between the program and control group outcomes.

Statistical significance levels are indicated as: * = 10 per cent; ** = 5 per cent; *** = 1 per cent.

Out of the 464 t-tests conducted for the baseline characteristics, only 15 were statistically significant at 5 per cent level of significance. **It was concluded that the minor differences found at baseline were sporadic and within expectation of random error.** In other words, there was no evidence to support that the random assignment was systematically biased towards certain types of participants.

Non-response and balance of baseline characteristics between program and control group participants at the follow-up survey

In terms of participant demographics and job characteristics, there were minor differences in follow-up survey attrition between program and control groups. Table A.3 presents the program-control differences in demographics and job characteristics, separated by the attrition status of the follow-up survey. Chi-squared tests were applied to test the differential attrition by various characteristics, and the statistical significance denoted by plus signs.

The higher proportion of married program group participants than married control group participants appears to carry over only to the follow-up survey sample, but the lower proportion of permanent workers in the program group only carried over to the non-respondents of the follow-up survey. The program group participants with a college diploma or certificate as the highest educational attainment were more likely to respond to the follow-up survey than their counterparts in the control group. Similarly, there was a higher proportion of program group immigrants who arrived 6 to 10 years before the program responding to the follow-up survey than their control group counterparts. **Despite these differences, the demographic and job characteristics of program and control groups remained largely balance in the follow-up sample. The results do not support a hypothesis that differential response among the program and control group participants biased the sample substantially towards a particular group.**

Table A.3 Selected characteristics of participants at baseline, by treatment and response status

Outcome	Non-respondents Program	Control	Diff	St	Respondents Program	Control	Diff	Chi-squared test
Demographics								
Age (average years)	35.7	36.3	0.7		40.2	39.0	-1.2	
Age Distribution (%)								
Under 20	1.9	2.8	0.9		1.2	2.3	1.1	
20-24	20.1	19.7	-0.4		9.9	13.3	3.4	
25-34	28.3	28.6	0.3		24.9	23.4	-1.6	
35-44	19.8	17.5	-2.2		23.0	19.8	-3.2	
45-54	17.1	16.9	-0.2		24.2	24.4	0.1	
55 and over	8.3	10.2	1.9		13.3	12.0	-1.3	
Not reported	4.5	4.3	-0.2		3.4	4.9	1.5	
Gender (%)								
Male	29.1	27.4	-1.8		27.1	26.3	-0.8	
Female	70.9	72.3	1.5		71.7	72.7	1.1	
Not reported	0.0	0.3	0.3		1.2	1.0	-0.2	
Marital Status (%)								
Single / Divorced / Widowed	51.6	54.2	2.5		39.5	48.4	8.9 **	
Married or Common Law	44.7	44.0	-0.7		57.6	49.4	-8.3 **	
Not reported	3.7	1.8	-1.9		2.9	2.3	-0.6	
Number of people in household								
Average number of people in household	3.0	2.9	0.0		3.1	2.9	-0.2	
Average number of income generating people in ho	2.1	2.1	0.0		2.1	2.0	-0.1	
Presence of Children (%)								
No child	35.3	33.8	-1.4		38.7	36.0	-2.7	
Have a child / children	41.2	35.7	-5.5		35.8	38.0	2.2	
Not applicable / not reported	23.5	30.5	6.9		25.4	26.0	0.6	
Highest Educational Attainment (%)								
A university degree	16.3	13.5	-2.8		13.3	15.9	2.6	
A college diploma or certificate	23.0	28.6	5.6		24.9	20.5	-4.5	++
A trade/vocational diploma or certificate	14.2	13.5	-0.6		13.6	16.9	3.3	
An apprenticeship diploma	0.8	0.9	0.1		0.0	0.3	0.3	
A high school diploma	29.9	29.5	-0.4		34.9	33.4	-1.4	
Less than high school diploma	10.4	10.2	-0.3		10.7	9.1	-1.6	
Not reported	5.3	3.7	-1.7		2.7	3.9	1.2	
Aboriginal Status (%)								
Not aboriginal	83.4	89.8	6.4 **		86.7	90.6	3.9	
Aboriginal	7.0	3.4	-3.6		4.1	2.3	-1.8	
Not reported	9.6	6.8	-2.9		9.2	7.1	-2.1	
Immigrant Status (%)								
Not an immigrant	61.0	60.9	0.0		49.9	56.2	6.3	
Immigrant	37.4	37.2	-0.2		48.4	41.6	-6.9	
Not reported	1.6	1.8	0.2		1.7	2.3	0.6	
Number of Years Since Immigration (%)								
5 Years or LESS	19.8	14.8	-5.0		10.7	9.7	-0.9	
6-10 Years	4.8	5.8	1.0		9.2	3.9	-5.3 **	++
11-15 Years	3.5	3.1	-0.4		5.8	2.6	-3.2 *	+
16 - 20 Years	3.2	3.7	0.5		6.3	9.7	3.4	
Over 20 Years	4.5	8.6	4.1		14.0	12.7	-1.4	
Not an immigrant or not reported	64.2	64.0	-0.2		54.0	61.4	7.4	
Age of Immigration Arrival (Years)								
Average Age	27.5	26.7	-0.8		26.4	27.1	0.8	
Age of Immigration Arrival (%)								
Not reported as an immigrant	62.6	62.8	0.2		51.6	58.4	6.9	
0 - 5 years	1.1	0.9	-0.1		1.2	1.6	0.4	
6 - 17 years	3.2	4.6	1.4		6.8	4.5	-2.2	
18 - 24 years	11.5	8.9	-2.6		11.1	7.8	-3.3	
25 - 34 years	9.1	11.1	2.0		13.6	11.4	-2.2	
35 - 44 yea4rs	5.6	5.2	-0.4		7.7	7.1	-0.6	
45 and over	2.4	1.5	-0.9		1.9	1.6	-0.3	
Not reported	4.5	4.9	0.4		6.1	7.5	1.4	
Language use at home (%)								
English	73.3	70.2	-3.1		60.0	67.2	7.2	+
French	0.3	2.5	2.2		0.5	2.6	2.1	
Other	17.6	14.8	-2.9		24.5	17.2	-7.2	
More than one	6.1	9.5	3.4		11.4	10.4	-1.0	
Not reported	2.7	3.1	0.4		3.6	2.6	-1.0	
Household Income								
Less than $30,000	40.1	36.3	-3.8		31.0	34.1	3.1	
$30,000 or more	37.4	35.4	-2.0		48.7	44.5	-4.2	
Not reported / not applicable	22.5	28.3	5.8		20.3	21.4	1.1	
Job Characteristics								
Position (%)								
House service staff	38.2	44.0	5.8		44.3	44.5	0.2	
Kitchen staff	9.9	11.7	1.8		11.4	12.0	0.6	
Front desk staff	26.7	25.2	-1.5		23.2	25.0	1.8	
Food service staff	24.9	18.2	-6.7		21.1	18.2	-2.9	
Not reported	0.3	0.9	0.7		0.0	0.3	0.3	
Permanent / Temporary (%)								
Not permanent	16.8	9.2	-7.6 **		4.8	6.8	2.0	++
Permanent	78.9	87.4	8.5 **		87.9	87.7	-0.2	+
Not reported	4.3	3.4	-0.9		7.3	5.5	-1.7	
Tenure (Year)								
Average length of tenure	3.9	4.9	1.0		7.1	6.3	-0.8	
Tenure (%)								
Less than 3 years	61.5	58.2	-3.3		43.8	48.7	4.9	
3 years and over	34.2	37.5	3.3		54.0	48.7	-5.3	
Not reported	4.3	4.3	0.0		2.2	2.6	0.4	
Wage (%)								
Average hourly wage	11.2	11.5	0.4		11.7	12.4	0.7	
Sample size	**374**	**325**			**413**	**308**		

Sources: Calculations from the baseline survey and follow-up survey

Notes: Sample sizes vary for individual measures due to missing values.
Two-tailed t-tests were applied to difference between the program and control group outcomes.
Statistical significance levels are indicated as: * = 10 per cent; ** = 5 per cent; *** = 1 per cent.
Chi-squared tests were applied to difference between the respondents and non-respondents program-control differences.
Statistical significance levels are indicated as: + = 10 per cent; ++ = 5 per cent; +++ = 1 per cent.

Out of the 464 t-tests of program-control differences conducted for the baseline characteristics among the follow-up survey respondent sample, only 18 were statistically significant at 5 per cent level of significance. Out of the 464 Chi-squared tests of baseline characteristics' differential responses between the program and control groups, 27 were statistically significant at 5 per cent level of significance. The baseline characteristic differences that were statistically significant within the follow-up sample or those that were statistically significant compared to the non-respondents are presented in Table A.4. **Again, these differences are sporadic and the results suggest that if there was any systematic difference in responses between program and control, the differences would be marginal.**

Table A.4   Selected characteristics of participants at baseline, by treatment and response status

Outcome	Non-respondents Program	Control	Diff	St	Respondents Program	Control	Diff		Chi-squared test
Section C: Health									
Vitality									
0	2.1	0.6	-1.5	*	1.5	3.9	2.4	**	+++
1 - 25	6.7	8.9	2.2		4.4	6.8	2.5		
26 - 50	23.8	17.5	-6.3	*	22.8	25.3	2.6		+
51 - 75	44.9	52.6	7.7	**	47.0	47.7	0.8		
76 - 100	16.0	16.6	0.6		17.7	11.4	-6.3	**	+
Not available	6.4	3.7	-2.7		6.8	4.9	-1.9		
Section E: Skills									
Freqency of reading or using information from books									
Never	7.5	9.8	2.4		7.0	7.1	0.1		
Rarely	20.6	15.4	-5.2		20.3	21.1	0.8		
Less than once a week	11.0	14.8	3.8		10.7	10.7	0.1		
Once a week	9.6	11.7	2.1		9.2	5.8	-3.4	*	++
A few times a week	21.9	17.8	-4.1		16.2	24.7	8.5	***	+++
Every day	21.9	25.2	3.3		25.2	24.7	-0.5		
Not reported	7.5	5.2	-2.3		11.4	5.8	-5.5		
Feeling anxious when figuring out such amounts as discounts, sales tax or tips									
Strongly disagree	16.6	12.3	-4.3	**	12.8	11.7	-1.1		
Disagree	31.0	26.8	-4.2		25.2	30.2	5.0		
Neutral	22.5	31.1	8.6	**	24.9	32.5	7.5	**	
Agree	18.4	21.2	2.8		22.3	14.9	-7.3	**	++
Strongly Agree	3.2	3.4	0.2		3.6	4.5	0.9		
Not reported	8.3	5.2	-3.1		11.1	6.2	-5.0		
I read only when I have to									
Strongly disagree	35.8	28.6	-7.2	*	24.5	32.1	7.7		+++
Disagree	28.3	35.4	7.0	*	28.8	26.9	-1.9		++
Neutral	10.2	14.8	4.6	*	16.2	14.0	-2.3		++
Agree	15.8	13.2	-2.5		19.1	17.5	-1.6		
Strongly Agree	3.2	3.1	-0.1		3.4	3.9	0.5		
Not reported	6.7	4.9	-1.8		8.0	5.5	-2.5		
Reading is one of my favourite activities									
Strongly disagree	7.8	5.5	-2.2		4.4	3.9	-0.5		
Disagree	15.8	10.5	-5.3	**	12.1	10.7	-1.4		
Neutral	22.5	31.7	9.2	***	24.9	27.6	2.7		
Agree	21.7	27.1	5.4		29.5	24.4	-5.2		++
Strongly Agree	25.1	20.0	-5.1	*	21.1	27.6	6.5		++
Not reported	7.2	5.2	-2.0		8.0	5.8	-2.1		
Enjoy talking about what have read with other people									
Strongly disagree	4.0	2.2	-1.9		2.9	1.6	-1.3		
Disagree	9.4	9.2	-0.1		8.0	7.8	-0.2		
Neutral	23.0	27.4	4.4		24.0	22.4	-1.6		
Agree	36.6	42.8	6.1		40.9	44.8	3.9		
Strongly agree	19.0	12.3	-6.7	**	16.2	17.5	1.3		++
Not reported	8.0	6.2	-1.9		8.0	5.8	-2.1		
Frequency of reading or using directions, instructions, manuals, or reference books									
Never	10.2	10.8	0.6		10.2	13.3	3.1		
Rarely	18.4	18.2	-0.3		20.8	19.5	-1.3		
Less than once a week	12.8	9.8	-3.0		8.0	12.7	4.7	**	++
Once a week	9.6	7.1	-2.5		9.9	7.8	-2.1		
A few times a week	20.6	20.6	0.0		15.7	17.9	2.1		
Every day	22.7	26.8	4.0		23.7	23.7	0.0		
Not reported	5.6	6.8	1.2		11.6	5.2	-6.4	*	++
Frequency of reading or using reports, bills, invoices, spreadsheets or budget tables									
Never	27.5	29.8	2.3		23.7	26.6	2.9		
Rarely	15.5	16.9	1.4		16.9	14.9	-2.0		
Less than once a week	5.9	4.6	-1.3		5.3	7.8	2.5		
Once a week	6.7	4.3	-2.4		5.6	6.5	0.9		
A few times a week	11.0	10.5	-0.5		8.2	9.4	1.2		
Every day	26.5	24.6	-1.9		25.9	29.9	4.0		
Not reported	7.0	9.2	2.3		14.3	4.9	-9.4	***	+++
Frequency of writing or filling out letters, memos or emails									
Never	26.7	31.4	4.6		27.4	29.9	2.5		
Rarely	19.3	18.8	-0.5		19.4	19.8	0.4		
Less than once a week	4.8	6.2	1.3		6.3	6.5	0.2		
Once a week	5.6	4.0	-1.6		4.8	4.9	0.0		
A few times a week	14.4	12.6	-1.8		9.9	12.0	2.1		
Every day	21.9	21.8	-0.1		20.6	21.8	1.2		
Not reported	7.2	5.2	-2.0		11.6	5.2	-6.4	**	
Frequncy of writing or filling out directions, instructions, manual or reference books									
Never	31.6	33.2	1.7		26.4	32.1	5.8		
Rarely	22.5	20.3	-2.2		21.1	23.1	2.0		
Less than once a week	6.1	5.5	-0.6		9.2	8.4	-0.8		
Once a week	6.1	3.4	-2.8		6.1	5.5	-0.5		
A few times a week	12.3	16.3	4.0		10.4	11.4	1.0		
Every day	13.6	14.8	1.1		13.6	13.3	-0.2		
Not reported	7.8	6.5	-1.3		13.3	6.2	-7.1	**	+
Frequency of writing or filling out reports, bills, invoices, spreadingsheets or budget tables									
Never	36.4	41.8	5.5		33.2	36.0	2.9		
Rarely	15.2	17.5	2.3		15.3	18.5	3.3		
Less than once a week	4.0	5.2	1.2		5.8	4.5	-1.3		
Once a week	4.5	2.5	-2.1		4.8	4.5	-0.3		
A few times a week	11.0	7.7	-3.3		8.2	11.4	3.1		++
Every day	21.7	19.4	-2.3		19.1	20.1	1.0		
Not reported	7.2	5.8	-1.4		13.6	4.9	-8.7	***	++
Frequency of calculating prices, costs, or budgets as part of the main job									
Never	36.1	38.8	2.7		37.3	36.7	-0.6		
Rarely	15.0	15.4	0.4		14.0	19.5	5.4	**	
Less than once a week	4.0	3.4	-0.6		2.7	4.2	1.6		
Once a week	4.5	4.0	-0.5		3.9	5.5	1.6		
A few times a week	13.1	9.5	-3.6		9.4	10.1	0.6		
Every day	18.4	21.5	3.1		18.2	17.5	-0.6		
Not reported	8.8	7.4	-1.4		14.5	6.5	-8.0	**	+
Efficacy of having the math skills to do the main job well									
Strongly disagree	1.9	0.3	-1.6	**	1.5	0.3	-1.1		
Disagree	3.5	2.5	-1.0		5.6	2.9	-2.6		
Neutral	13.6	13.8	0.2		16.9	14.9	-2.0		
Agree	30.2	32.9	2.7		32.0	35.7	3.8		
Strongly agree	43.0	43.4	0.3		35.1	37.7	2.6		
Not reported	7.8	7.1	-0.7		9.0	8.4	-0.5		
Efficacy of having the technical skills to do the main job well									
Strongly disagree	1.3	0.0	-1.3	**	1.2	1.3	0.1		
Disagree	3.2	2.2	-1.1		3.4	1.0	-2.4	**	
Neutral	11.5	12.3	0.8		14.8	10.1	-4.7	**	
Agree	34.0	34.8	0.8		35.4	42.9	7.5	*	
Strongly agree	42.2	43.7	1.4		36.6	36.7	0.1		
Not reported	7.8	7.1	-0.7		8.7	8.1	-0.6		
Sample size	374	325			413	308			

Sources: Calculations from the baseline survey and follow-up survey
Notes: Sample sizes vary for individual measures due to missing values.
    Two-tailed t-tests were applied to difference between the program and control group outcomes.
    Statistical significance levels are indicated as: * = 10 per cent; ** = 5 per cent; *** = 1 per cent.
    Chi-squared tests were applied to difference between the respondents and non-respondents program-control differences.
    Statistical significance levels are indicated as: + = 10 per cent; ++ = 5 per cent; +++ = 1 per cent.

Table A.4   Selected characteristics of participants at baseline, by treatment and response status

Outcome	Non-respondents Program	Control	Diff St	Respondents Program	Control	Diff	Chi-squared test
Section G: Non-work Life							
Number of contacts for specialized advice							
None	9.4	12.0	2.6	14.0	11.7	-2.4	
One to three	51.6	44.9	-6.7	39.2	49.0	9.8 *	+++
Four to six	15.8	17.5	1.8	16.0	16.2	0.3	
Seven to ten	4.5	7.1	2.5	4.1	4.2	0.1	
More than ten	6.1	3.1	-3.1 **	5.1	3.6	-1.5	
Can't say	3.7	4.0	0.3	6.3	4.5	-1.7	
Not reported	8.8	11.4	2.6	15.3	10.7	-4.5	+
How often provided unpaid help to groups or organizations							
Less than once a month	50.8	51.7	0.9	46.5	45.5	-1.0	
About once a month	7.2	8.0	0.8	9.0	10.7	1.8	
About once a week	7.2	2.8	-4.5 ***	3.1	5.8	2.7	+++
A few times a week	3.5	3.1	-0.4	2.4	4.5	2.1 *	
Every day	0.3	0.3	0.0	0.7	0.3	-0.4	
Not reported	31.0	34.2	3.1	38.3	33.1	-5.1	
Number of organizations engaged							
Average number	1.0	0.7	-0.3 **	0.8	0.9	0.0	++
Number of contacts for help with job or career							
None	11.2	10.5	-0.8	11.1	14.9	3.8	
One to three	40.1	36.0	-4.1	38.7	34.7	-4.0	
Four to six	17.4	20.9	3.5	17.2	16.9	-0.3	
Seven to ten	7.8	8.6	0.9	5.8	8.1	2.3	
More than ten	8.8	5.5	-3.3 *	3.9	6.5	2.6 *	++
Can't say	6.1	5.8	-0.3	7.5	8.1	0.6	
Not reported	8.6	12.6	4.1	15.7	10.7	-5.0	++
Total number of people with contacts							
None	2.9	3.4	0.4	3.6	3.2	-0.4	
One to three	22.5	20.9	-1.5	23.7	22.4	-1.3	
Four to six	22.7	21.5	-1.2	23.2	22.7	-0.5	
Seven to ten	14.4	18.8	4.3	14.8	16.2	1.5	
More than ten	22.7	18.2	-4.6	15.5	20.1	4.6	++
Can't say / not reported	14.7	17.2	2.5	19.1	15.3	-3.9	
Number of contacts in different occupations							
None	4.5	5.8	1.3	8.2	6.2	-2.1	
One to three	7.5	11.4	3.9	9.7	9.4	-0.3	
Four to six	28.1	25.8	-2.2	24.5	25.3	0.9	
Seven to ten	30.7	26.2	-4.6	23.7	29.2	5.5	++
More than ten	15.2	15.7	0.5	16.7	13.6	-3.1	
Can't say	4.3	1.5	-2.7 **	3.9	3.9	0.0	
Not reported	9.6	13.5	3.9	13.3	12.3	-1.0	
Number of contacts within the same community							
None	6.7	8.6	1.9	9.0	8.1	-0.8	
One to three	18.4	12.9	-5.5 *	15.5	15.6	0.1	
Four to six	24.9	30.5	5.6	23.7	26.9	3.2	
Seven to ten	23.8	17.2	-6.6 **	19.6	22.7	3.1	++
More than ten	12.8	17.2	4.4	15.3	9.1	-6.2 *	++
Can't say	3.7	1.2	-2.5 **	3.6	3.9	0.3	+
Not reported	9.6	12.3	2.7	13.3	13.6	0.3	
Number of contacts from work							
None	19.5	20.3	0.8	20.3	17.5	-2.8	
One to three	27.3	26.2	-1.1	24.0	23.7	-0.3	
Four to six	31.0	27.1	-3.9	27.6	31.8	4.2	+
Seven to ten	6.4	8.3	1.9	6.8	8.4	1.7	
More than ten	2.4	4.6	2.2	3.9	2.9	-1.0	
Can't say	4.5	1.8	-2.7 *	5.8	3.6	-2.2	
Not reported	8.8	11.7	2.9	11.6	12.0	0.4	
Section H: Feelings and attitudes about oneself, work and life							
Motivation/Engagement: I sometimes reduce my chances of doing well in my job							
Strongly disagree	22.7	24.9	2.2	21.8	24.7	2.9	
Disagree	31.8	31.7	-0.1	25.2	28.9	3.7	
Neutral	20.1	19.4	-0.7	20.1	18.2	-1.9	
Agree	9.9	8.6	-1.3	11.1	9.7	-1.4	
Strongly Agree	3.2	1.2	-2.0 *	3.9	1.0	-2.9 **	
Not reported	12.3	14.2	1.9	17.9	17.5	-0.4	
Sample size	**374**	**325**		**413**	**308**		

Sources: Calculations from the baseline survey and follow-up survey

Notes: Sample sizes vary for individual measures due to missing values.

Two-tailed t-tests were applied to difference between the program and control group outcomes.

Statistical significance levels are indicated as: * = 10 per cent; ** = 5 per cent; *** = 1 per cent.

Chi-squared tests were applied to difference between the respondents and non-respondents program-control differences.

Statistical significance levels are indicated as: + = 10 per cent; ++ = 5 per cent; +++ = 1 per cent.

Selection of regression adjustment variables

The previous two subsections suggest that any observed differences between the program and control groups were likely results of random errors and some very small differences from non-response at the follow-up survey. The difference-in-difference model used for impact estimation accounts for these minor baseline differences. Therefore, it is expected that the impact estimations are not substantially different whether covariates are included to capture outcome variations, though regression adjustment may improve the estimation power. Unless an outcome or the treatment assignment is only correlated with a covariate's extreme value (or an extremely small category), results are not sensitive to the choice of adjustment variables.

Since regression adjustment is used to improve the statistical power of impact estimations, any baseline variable that is correlated to the program-control indicator and differential response of the follow-up survey can be used as adjustment variable. However, some of the differences in baseline characteristics between program and control groups or between respondents and non-respondents shown in the previous two subsections could be explained by other selected regression adjustment variables. Further, inclusion of too many regression adjustment variables can introduce inefficiency. In order to find the additional regression adjustment variables that would contribute to estimation efficiency, multivariable models were used in UPSKILL trial technical report to help identify a reduced set of effective adjustment variables. In the end, adjusted models in the UPSKILL trial did not improve precision of estimates. This is why it was decided in UPSKILL Health to not included covariates in models for the subgroups impact analysis.

Appendix B: Descriptive statistics

Baseline Employee Survey, TOWES, and Performance Assessments

Continuous Variables

Variable	Number of Observations	Mean	Standard Deviation	Minimum	Maximum
LES Assessment Scores					
Numeracy Score	1286	251.7255054	47.3951688	139	351
Document Use Score	1212	231.3432343	39.008259	112	298
Age	1361	37.8750918	12.5569516	0	73
Psychosocial Variables					
Self-efficacy	1271	31.238395	5.3170922	7	40
Trust	1229	1.9457554	0.5357263	1	3
Motivation & Engagement	1230	4.0725329	0.5060368	1.625	5
Attitudes to Learning	1306	12.0153139	2.0510148	5	15
Future-orientation	1207	3.126802	0.6603183	1	5
Indicators of Health & Well-being					
Life Satisfaction & Well-being	1356	3.7248648	0.6361262	1	5
Work Stress	1336	3.1040419	0.9569529	1	5
Mental Health	1129	50.3078388	9.6432237	9	72
Mental Health	1307	50.6712242	9.5379831	15.77	64.54
Vitality	1341	55.0657644	8.967759	27.62	67.88
Role functioning – Emotional	1271	49.0541542	9.3657206	11.35	56.08
Social Functioning	1358	48.4634315	10.0549938	16.18	56.57
Physical Health	1129	51.5465013	7.50857	12.41	66.74
General Health	1391	51.9602804	8.6001305	18.87	61.99
Bodily Pain	1353	50.0516851	9.1147213	16.68	57.44
Role Functioning – Physical	1267	50.0371034	9.3210195	20.32	57.18
Physical Functioning	1295	50.8317761	9.3285765	22.11	56.47
Health Literacy	1244	20.585209	3.2458858	9	25

Sociodemographic Variables

Gender	Frequency	Per cent
Male	391	27.71
Female	1020	72.29

Number of observations = 1411

Missing = 25

Highest Level of Education	Frequency	Per cent
Bachelor's Degree of Greater	209	15.31
College Diploma/Certificate	345	25.27
Trade/Vocational Diploma/Certificate	205	15.02
Apprenticeship Diploma	7	0.51
High School Diploma/Certificate	455	33.33
Less Than High School Diploma	144	10.55

Number of observations = 1365

Missing = 71

Marital Status	Frequency	Per cent
Married or Common Law	700	50.69
Single, Never Married	539	39.03
Separated/Divorced/Widowed	142	10.28

Number of observations = 1381

Missing = 55

Immigration Status	Frequency	Per cent
Canadian-born	805	57.75
Immigrant	589	42.25

Number of observations = 1394

Missing = 42

Network Size	Frequency	Per cent
None	47	3.97
One to three	319	26.97
Four to six	321	27.13
Seven to ten	226	19.10
More than ten	270	22.82

Number of observations = 1183

Missing = 253

Psychosocial Variables

Low and high self-efficacy were defined around the mean self-efficacy score in the scale detailed above. Those with less than 31 points were categorized as possessing low self-efficacy, and those with 31 points or greater as possessing high self-efficacy.

Self-efficacy	Frequency	Per cent
Low	589	46.34
High	682	53.66

Number of observations = 1271

Missing = 165

Self-esteem was measured using a single survey item, a question which asked respondents to agree or disagree with the statement: *I see myself as someone who has high self-esteem.*

Self-esteem	Frequency	Per cent
Strongly disagree	40	3.24
Disagree	106	8.58
Neutral	340	27.53
Agree	561	45.43
Strongly Agree	188	15.22

Number of observations = 1235

Missing = 201

Indicators of Health and Well-being

Stress was measured here on the basis of a single survey item, asking respondents to rate the amount of stress they experience on a day-to-day basis in their life, along the following scale.

Stress	Frequency	Per cent
Not at all stressful	171	12.69
Not very stressful	546	33.83
A bit stressful	554	41.10
Quite a bit stressful	144	10.68
Extremely stressful	23	1.71

Number of observations = 1348

Missing = 88

Job Performance Assessments

	Fail	Pass	Number of observations	Missing
Teamwork			**764**	**672**
Frequency	86	678		
Per cent	11.26	88.74		
Task Efficiency			**753**	**683**
Frequency	63	690		
Per cent	8.37	91.63		
Productivity			**843**	**593**
Frequency	201	642		
Per cent	23.84	76.16		
Communication			**822**	**614**
Frequency	153	669		
Per cent	18.61	81.39		
Safety & Emergency			**649**	**787**
Frequency	286	363		
Per cent	44.07	55.93		

	Fail	Pass	Number of observations	Missing
Working Safely			**609**	**827**
Frequency	201	408		
Per cent	33.00	67.00		
Health & Safety			**837**	**599**
Frequency	297	540		
Per cent	35.48	64.52		

Absenteeism	Frequency	Per cent
No missed days in the past 4 weeks	892	76.04
Missed a day of week or more in the past 4 weeks for any reason	281	23.96

Number of observations = 1173

Missing = 263

Follow-up Employee Survey, TOWES, and Performance Assessments

Continuous Variables

Variable	Number of Observations	Mean	Standard Deviation	Minimum	Maximum
LES Assessment Scores					
Numeracy Score	687	252.8122271	52.3216501	138	375
Document Use Score	683	236.7686676	42.2852943	96	350
Psychosocial Variables					
Motivation & Engagement	621	4.006077	0.4746506	2.4444444	5
Attitudes to Learning	669	11.6053812	1.8376553	5	15
Work Control	691	3.4872166	0.8338389	1	5
Self-efficacy	614	30.1889251	6.7936354	7	40
Indicators of Health & Well-Being					
Work Stress	638	3.0219436	1.0021114	1	5
Work Condition	694	3.7154179	0.7090208	1	5
Career Satisfaction	704	3.7624763	0.6293216	1	5
General Satisfaction	702	3.6874406	0.6696463	1	5
Mental Health	521	49.6711516	9.7340979	8.5	70.29
Role functioning – Emotional	598	48.375	10.3283728	11.35	56.08
Social Functioning	597	48.6525963	10.1596072	16.18	56.57
Vitality	599	63.7312187	23.4087471	0	100
Mental Health	591	49.7924704	9.7007216	15.77	64.54

Variable	Number of Observations	Mean	Standard Deviation	Minimum	Maximum
Physical Health	521	50.084357	7.8558928	16.78	71.14
Physical Functioning	671	49.9922951	9.5862718	22.11	56.47
Role Functioning – Physical	664	48.9287801	9.26299	20.32	57.18
Bodily Pain	582	47.6526976	11.1857056	16.68	57.44
General Health	710	49.9119437	9.7212658	18.87	61.99
Health Literacy	507	20.4358974	3.276056	9	25
Total Training Hours	1419	5.7791402	7.9334875	0	36.3333333

Indicators of Health and Well-being

Work Stress Reduction Post-UPSKILL	Frequency	Per cent
No reduction	350	61.73
Reduction	217	38.27
Number of observations = 567		
Missing = 869		

Job Performance Assessments

	Fail	Pass	Number of observations	Missing
All Performance			559	877
Frequency	200	359		
Per cent	35.75	64.22		
Communication			552	884
Frequency	80	472		
Per cent	14.49	85.51		
Teamwork			505	931
Frequency	27	478		
Per cent	5.35	94.65		

Absenteeism	Frequency	Per cent
No missed days in the past 4 weeks	540	77.36
Missed a day of week or more in the past 4 weeks for any reason	158	22.68
Number of observations = 698		
Missing = 738		

Business Outcomes

	Housekeepers		Front Desk Agents		Servers	
	Frequency	Per cent	Frequency	Per cent	Frequency	Per cent
Efficiency						
No or negative changes	43	66.15	41	63.08	51	78.46
Positive changes	22	33.85	24	36.92	14	21.54
Errors						
No or negative changes	44	67.69	44	67.69	54	83.08
Positive changes	21	32.31	21	32.31	11	16.92
Sick Leave						
No or negative changes	51	78.46	55	84.62	59	90.77
Positive changes	14	21.54	10	15.38	6	9.23
Injuries						
No or negative changes	53	81.54	56	86.15	58	89.23
Positive changes	12	18.46	9	13.85	7	10.77
Safety Violations						
No or negative changes	54	83.08	56	86.15	59	90.77
Positive changes	11	16.92	9	13.85	6	9.23
Reports of Pain & Working Unwell						
No or negative changes	54	83.08	57	87.69	58	89.23
Positive changes	11	16.92	8	12.31	7	10.77
WCB Claims						
No or negative changes	52	80.00	57	87.69	59	90.77
Positive changes	13	20.00	8	12.31	6	9.23
Anticipated Future Injuries						
No or negative changes	43	66.15	42	64.62	49	75.38
Positive changes	22	33.85	23	35.38	16	24.62
Anticipated Future Sick Leave						
No or negative changes	46	70.77	44	67.69	48	73.85
Positive changes	19	29.23	21	32.31	17	26.15
Anticipated Future Safety Violations						
No or negative changes	46	70.77	44	67.69	50	76.92
Positive changes	19	29.23	21	32.31	15	23.08

Number of observations = 65

Missing = 24

Upselling	Front Desk Agents		Servers	
	Frequency	Per cent	Frequency	Per cent
Confidence				
No or negative changes	45	69.23	56	86.15
Positive changes	20	30.77	9	13.85
Needs Identification				
No or negative changes	45	69.23	56	86.15
Positive changes	20	30.77	9	13.85
Technique				
No or negative changes	45	69.23	56	86.15
Positive changes	20	30.77	9	13.85
Pulling the Trigger				
No or negative changes	45	69.23	57	87.69
Positive changes	20	30.77	8	12.31

Number of observations = 65

Missing = 24

	Frequency	Per cent
Job Satisfaction		
No or negative changes	34	52.31
Positive changes	31	47.69
Receptivity to new challenges		
No or negative changes	34	52.31
Positive changes	31	47.69
Staff desire for further training and/or certification		
No or negative changes	35	53.85
Positive changes	30	46.15
Staff likelihood of staying on with the firm		
No or negative changes	39	60.00
Positive changes	26	40.00

Number of observations = 65

Missing = 24

	Frequency	Per cent
Occupancy Rates		
No or negative changes	37	56.92
Positive changes	28	43.08
Food and Beverage Revenue		
No or negative changes	36	55.38
Positive changes	29	44.62
Guests' likelihood of returning to the hotel		
No or negative changes	34	52.31
Positive changes	31	47.69

Number of observations = 65

Missing = 24

Appendix C: Job performance measures and relationship with physical and mental health

Measures	Description	Hypothesis	Results (baseline data)
Teamwork	Effective collaboration among coworkers, both within and between departments. i.e., "Help coworkers who need help", "Ability to carry own share of workload", "Ability to recognize how own actions affect other".	• Influenced positively by good mental health • Satisfaction at work, work stress and well-being might influence teamwork through motivation • Essential skills are likely to improve teamwork, but channels of improvements are unknown (ABC Life Literacy, 2010, Kuji-Shikatani, & Zori, 2007). • We hypothesize that psychosocial variables and mental health can act **as mediators** between essential skills and better teamwork	• Numeracy and document use are not associated with teamwork. • Document use is negatively associated with teamwork, but it is a false relation caused by a measurement error. • **Mental health (MCS) is positively associated with teamwork.** • **Self-efficacy, self-esteem, attitudes to learning, trust, and motivation are not mediators in the relationship between LES and teamwork.** • **Attitudes to learning and life satisfaction are positively associated with teamwork.**
Task efficiency	Task are performed efficiently through better task organization at the occupation-level and through improved organizational skills of workers. i.e., "Check room assignment sheet", "Ability to assess tasks", "Remain calm when busy", "Ability to prioritize tasks"	• Stress and mental health could decrease productivity, by workers being less focused at work and more disorganized. • Physical health and each of the subscales can affect productivity	• Stress, work stress and mental health (MCS) are not associated signs with task efficiency. • LES at baseline are not associated with task efficiency. • Physical health (PCS) is not associated with task efficiency. • **Attitudes to learning are associated with task efficiency.**
Productivity (Teamwork + task efficiency)	A combination of the two categories above	• Stress and poor mental health might decrease productivity (Lowe, 2006) • Poor general physical health or injuries might decrease productivity	• No effect of mental health (MCS), physical health (PCS), work stress, or stress on productivity.

Measures	Description	Hypothesis	Results (baseline data)
Functional Communication	Closely related to essential skills of oral communication. Staff are able to routinely communicate with guests. i.e., "When communicate guest room features, listen and communicate attentively", "Ability to use correct grammar and punctuation", "Speak directly to the person they are addressing"	• Essential skills are likely to improve functional communication • Mental health, stress and psychosocial variables might influence the degree and way we want to communicate with each other. • Therefore, they can also act as **mediators** between essential skills and communication. • Psychosocial variables will have a direct impact on functional communication and **may act as mediators** between LES and communication.	• **Numeracy at baseline is significantly associated with communication, but not document use.** • **Mental health (MCS) is almost significant (p=0.0961).** • **Less work stress is significantly associated with communication but not to overall stress or life satisfaction.** • Trust is negatively associated with communication: one can hypothesize that the less you trust people, the more you pay attention to what's been said (there are components in the assessment related to listening abilities). • Psychosocial variables do not act as mediators. However, introducing self-efficacy and trust in some models modifies the numeracy coefficient by 5-7%.
Safety and Emergency	Following safety procedures and being prepared for emergencies. i.e., "Be familiar with safety equipment and procedures of property", Announce self and wait a moment", "Lock guest room door when leaving", "Assist with building evacuation", "know what to do in case in case of injuries and illness"	• Will be positively influenced by LES. • No expected direct association with mental health or physical health	• **Numeracy is strongly associated with Safety and Emergency Preparedness but not document use.** • Mental health (MCS) and physical health (PCS) are not significantly associated with this variable.
Working safely	Protecting form injuries i.e., "Use electrical appliances and equipment carefully", "Squat down to pick up object on the ground", "Dealing with traffic".	• Might be influenced by LES on how to use work tools, and chemicals • Mental health can have an impact on how carefully we work. • However, working safely should impact physical health	• **Document use is associated with working safely but not numeracy.** • Mental health (MCS) is not associated with working safely. • **Attitudes to learning are associated with working safely.**

Measures	Description	Hypothesis	Results (baseline data)
Safe work practices (Emergency guidelines + Working safely)	Combination of the two categories above.	• Will reduce likelihood of workplace injuries (back, repetitive strain) and absenteeism by increasing participants' ability to grasp and follow safety guidelines	• Same as above. • Self-efficacy is associated with health and safety but is negative. Since self-efficacy is related to confidence, confidence may be involved in taking calculated risks.
Absenteeism	At least one day in the past 4 weeks for ANY reasons	• Good physical and mental health and less stress are likely to decrease absenteeism • Role of essential skills in analyses is unclear yet: we could hypothesize that better essential skills increase positive mental health so *mental health* could act as **mediator** between LES and less absenteeism.	• **A high score on physical health (PCS) and mental health (MCS) decreases the probability of absenteeism.** • **Higher work stress increases the probability of absenteeism.** • No effects of LES on absenteeism. • Remaining work: a closer look at the reasons for absenteeism and health and mental health scores.

Appendix D: Sample formula for sub-group analyses

Treatment X (0=control; 1=program)

Covariate Z (Z=0 male, Z=1 female)

$Y = \beta_0 + \beta_1 X + \beta_2 Z + \beta_3 XZ$

Where Y is the *change* in the outcome between follow-up and baseline (FU – Baseline)

Treatment-covariate Interaction

|	Control	Program	Treatment effect
Male	β_0	$\beta_0 + \beta_1$	β_1
Female	$\beta_0 + \beta_2$	$\beta_0 + \beta_1 + \beta_2 + \beta_3$	$\beta_1 + \beta_3$
Gender effect	β_2	$\beta_2 + \beta_3$	

Example: Assessing gender differences in average treatment effects on work stress (QWL subscale)

Parameter	Estimate (β)	SE	Pr > |Z|
Intercept	-0,1776	0,1165	0,1272
Treatment group	0,039	0,1657	0,8139
Control group	0	0	.
Female	0,2009	0,1331	0,1311
Male	0	0	.
*Treatment group *Female*	*-0,0796*	*0,1732*	*0,646*
N=602			

	Control	Program	Treatment effect
Male	-0,1776	-0,1776+0,039= -0,1386	0,039
Female	-0,1776+0,2009 = 0,0233	-0.1386 +0,2009-0,0796 = -0,0173	0,039-0,0796= -0,0406
Gender effect	0,2009	0,2009-0,0796=0,1213	-0,0796

Appendix E: A note on scoring the Health Literacy Scale

▪ All items are on 5 points for a total of 25 points;

▪ Two items have been reversed so a higher score in all items suggest a higher health literacy level: "*A lot of health information is confusing and unclear*…" and "*Some people find it stressful to depend on others for help…*"

▪ The item "*If you had difficulty understanding and using health information (such as figuring out how much medication to take, or if you should get a flu shot)*…" also had to be recoded so the coping strategies are ranked as follows: guess, do nothing, friends and family , self-search, and health care professionals;

▪ The item "*In the past 12 months, which of the following happened to you because health information was not clear?*" was recoded such that a person who indicated "*None of the above*" would have a higher score (5). If respondents indicated at least one problem, one obtained a decreased score (if 2 problems identified, score=3, etc.);

▪ Score was based on summation of the five items.

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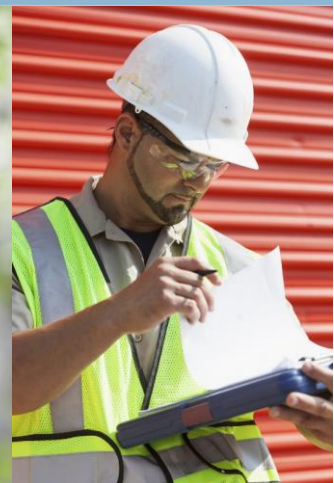
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