

# **Injury rates and psychological wellbeing in temporary work: A study of seasonal workers in the New Zealand food processing industry**

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## **Abstract**

A growing body of research has examined the effects of job insecurity or different forms of precarious work, such as temporary employment, on occupational health and safety (OHS). A number of reasons have been proposed to explain the more mixed results with regard to studies of temporary employment, including the diversity of these work arrangements, the health indices used, and a number of other complicating factors. There have been very few studies of seasonal work, as a specific form of temporary employment. In addition to addressing this gap, this study provides evidence with regard to two other explanations of 'mixed results', namely the importance of controlling for exposure and the possibility that associations differ depending on the particular health indices/outcome measures selected. Findings highlight the importance of controlling for exposure when comparing OHS outcomes for permanent and temporary workers, using multiple health indices and the need for systematic research into different types of temporary work. Several factors that may explain why seasonal workers experience higher rates of injury but appear to have adapted positively to intermittent employment are identified. The study reinforces the need for a more nuanced explanation of how temporary work can affect health and safety.

**Key Words:** temporary employment; injury; frequency rates; seasonal employment; job insecurity; psychological well-being; occupational health and safety.

## **Introduction**

Since the mid-1990s a growing body of research has been undertaken into the health and safety effects of precarious employment (also known as contingent work), particularly the effects of job insecurity/organisational restructuring (like downsizing) and temporary employment. Using an array of methods and health indices, the vast majority of studies have found that precarious employment is associated with adverse health outcomes (for reviews of this research Quinlan et al 2001; Virtanen et al., 2005; Cheng and Chan, 2007; Quinlan and Bohle, 2008, 2009).

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Nonetheless, even in areas that have been the subject of comparatively more research, the findings have identified inconsistent outcomes and issues requiring further investigation. This includes understanding the mechanisms by which precarious employment affects health (the stress associated with insecurity, irregular working hours, work intensity and vulnerability) and if these effects are uniform across a range of health indices such as injury, disease, mental health (Underhill and Quinlan, 2011). For example, there appear to be differences in the results for research into temporary work depending on the indices used. Adverse effects have most often been found by studies using objective physical health measures (Benevides et al., 2000; Benach et al., 2004; Virtanen et al., 2005) while studies measuring psychosocial conditions and work-related injuries have been more mixed (Artazcoz et al., 2005; Saloniemi et al., 2004; Virtanen et al., 2005). This difference may be a reflection of the diversity of temporary employment or differences in exposure (discussed below), or that temporary employment may have differentiated effects on particular health indices (or do so in particular circumstances).

Other complicating issues to emerge include spillover effects. For example, the presence of precariously employed workers (like temporary agency workers or subcontractors) and the associated reorganization of work can have impacts on the health and safety of non-precarious workers in the same workplace or industry (Mayhew and Quinlan, 2006; Saksvik and Gustafsson, 2004). Another dimension of spillover effects is that the low wages or poverty associated with many precarious jobs can impact on living conditions like diet, drug use and accommodation (see for example Lewchuk et al., 2008; and Muntaner et al., 2006).

Another complexity is the diversity of work arrangements that have been labeled precarious. For example, temporary employment can take a range of different forms from short-term casual or day labour to people engaged for months and years in the same job (but still hired essentially on a short term basis without job security), those employed directly or via a temporary employment agency, those engaged under fixed term contracts, those working seasonally or continuously throughout the year, those working part-time and those working full-time, including multiple job holders (Louie et al., 2006; Saloniemi et al., 2004; Silla et al., 2005; Virtanen et al., 2003). Labour laws governing temporary employment and particular subcategories of this or overlapping categories like part-time work, can vary substantially between countries as can the degree of enforcement, particularly with regard to vulnerable groups like young workers in small business, undocumented immigrants or foreign workers (like students) working contrary to their visa conditions (Kalleberg, 2000; Olsen and Kalleberg, 2004; Sargeant and Tucker, 2009; Toh and Quinlan, 2009). In short, treating temporary workers as a single group may mask important differences between say immigrant day labourers, agency workers, temporary workers with longer average tenure, part or full-time temporary workers and seasonal workers (see Arulampalam and Booth, 1998; Benavides et al., 2006; Dupre, 2001; Fabiano et al., 2008; Guadalupe, 2003; Saloniemi et al., 2004; Seixas et al., 2008; Smith et al., 2010).

This paper seeks to help address three of the complexities just mentioned. First, it is a study of seasonal temporary workers. Seasonality is an important aspect of work in industries where weather precludes or influences activities (like construction, harvesting, slaughtering and related food processing), or because there are seasonal shifts in consumer demand (eg manufacturing peaks prior to major holidays or seasonal work in tourism).

Seasonal temporary work is episodic, but in many cases fairly predictable, enabling workers to plan their activities outside the seasonal work cycle or to travel for it. Depending on the level of predictability of work (including recurrent hiring of the same groups of workers), the earnings derived from it and the ability to dovetail it with other activities, seasonal work may not entail the same level of job insecurity as temporary employment in some other industries, but nor will it provide the possibility of working throughout the year, without changing jobs. This is very different to temporary work where seasonality is insignificant, and work is relatively continuous across the year, or where workers must deal with periods of employment and unemployment that are unpredictable. Unfortunately, there have been few studies of health and safety amongst temporary workers in seasonal industries like fishing, agriculture or food processing (see Dolan et al., 2005, Neis et al., 2001; Parejo-Moscoso et al., 2013). Our study adds to this small body of research on the OHS experiences of seasonal workers.

Second, another complicating factor this paper addresses is the variability in hazard exposure that can be associated with temporary employment. In measuring the health and safety effects of temporary employment it is critical to take account of the number of hours actually worked or time at work because this can often differ significantly from permanent/ongoing workers undertaking the same tasks. Daily, weekly, or annual differences in working hours can produce substantial variation in exposure to hazards even where permanent and temporary workers undertake essentially the same tasks (Johnson and Lipscomb, 2006; Vegso et al., 2007). In this context, comparison of the raw prevalence of injuries is likely to be misleading (Folkard and Lombardi, 2006). While a number of studies comparing health and safety indices for temporary and permanent workers do control for working hours, this has not been the case with all studies. Smith et al., (2010) for example, acknowledged this as a limitation in reviewing claims data extracted from the Washington State Workers Compensation Fund where working hours for temporary workers were not recorded. A study of day labourers by Seixas et al., (2008), on the other hand, attempted to quantify day laborers' exposures by estimating annual hours and used the median to estimate full-time equivalent (FTE) numbers so as to draw industry comparisons. Many temporary workers are engaged on a part-time basis and therefore are more likely to work irregular hours or engage in multiple-jobholding (Louie et al., 2006). Seasonal work represents another dimension of this because it means temporary workers are exposed to the hazards of work only part of the year, while their permanent counterparts are exposed throughout the year. Therefore, the exposure issue can be critical when comparing injury rates or indeed other OHS indices like instances of bullying (Keuskamp et al., 2012). Our study provides an indication of the importance this can make in the context of seasonal work, as well as highlighting the importance of this issue more generally.

The third complexity addressed is the possibility that comparisons of the health, safety or psychological wellbeing of permanent and temporary workers undertaking the same jobs may yield different results depending on the OHS indices selected. In this study we are comparing both self-reported injuries and psychological wellbeing as measured by the 12 item GHQ. Using multiple OHS indices may provide a more nuanced insight into how temporary employment can affect health and how specific circumstances or characteristics like seasonal work may shape this. It may also assist in isolating those specific features of temporary employment that are most health-damaging.

This exploratory study examines differences in injury frequencies and GHQ scores between seasonal temporary workers and permanent workers in three New Zealand food processing plants: meat, dairy, and produce (fruit and vegetables). Agriculture is New Zealand's main export earner, accounting for approximately 18% of Gross Domestic Product (GDP) (Statistics New Zealand, 2007) and employs around 15% of New Zealand's workforce with agricultural products comprising over half of all merchandise exports (Ministry of Agriculture and Forestry, 2005). It is therefore a critical part of the New Zealand economy.

Seasonality associated with agriculture requires fluctuating labour levels. These are reflected in marked differences between the annual working hours of permanent and seasonal workers. This flows through to the agricultural processing industries which are characterized by seasonal labor fluctuations and where extensive use is made of temporary workers during periods of peak processing demand. Additionally, according to the British Health and Safety Executive (HSE), the agricultural processing industries have amongst the worst injury rates in the manufacturing sector. The dairy industry was ranked second, meat processing third, and fruit and produce eighth (HSE, 1996, 1997, 1998). More recent rankings based on 2008/09 reports have the dairy industry first, meat and poultry second, and fruit and vegetable processing eighteenth. Putting this in perspective, the food and drink processing industry has an injury rate 1.8 times higher than the United Kingdom manufacturing average (HSE, 2011).

All participants in our study were involved in manual processing activities at speeds dictated by conveyors or automated machine cycles. Work in Dairy Co generally involved less labour intensive activities although some areas involved continuous lifting in a hot and humid environment and others in chilled areas. Meat Co activities in contrast were carried out in a cold, wet refrigerated plant and involved continuous use of knives to process a carcass into various cuts. Produce Co activities were a combination of those observed at the other two companies with fruit and vegetables being cooked or blanched before being blast frozen or canned.

This study's primary aim was to compare seasonal temporary and permanent workers in New Zealand's food processing industry in terms of raw injury frequencies, frequency rates based on exposure to workplace hazards, and psychological wellbeing as measured by GHQ scores. Considering research on temporary status is a risk factor, we hypothesized:

- *Hypothesis 1: There is a difference between seasonal and permanent employees in terms of injury and psychological wellbeing.*

## **Methods used**

### ***Sampling Frame***

This study was conducted in New Zealand at three food processing companies located in two separate urban regions that are surrounded by rural areas. The companies were multinational, multi-site employers but only the main site in each region was visited. Each worksite had been operated by the respective company for over 20 years with each employing more than 100 process workers. The permanent workforce is annually supplemented with seasonal temporary labour with seasons typically lasting between 8.5 and 10 months.

The workforce was unionized with collective employment contracts negotiated by the dominant site union covering all waged employees (those paid an hourly rate). Pay rates were specified according to the employee's skills, experience, and activity classification, with temporary and permanent employees and males and females occupying the same classifications and carrying out substantially the same repetitive tasks. Permanent and temporary employees differed primarily in their employment status and duration of employment rather than because they carried out different activities or were exposed to different hazards.

The data came from a cross-sectional survey administered by one of the authors and compared the self-reported OHS experiences of permanent and temporary employees. The questionnaire included items on demographics, training, regulatory awareness, psychological wellbeing and injury experience and had previously been used in Australian studies into precarious employment (Mayhew and Quinlan, 1999, 2002, 2006). All procedures and materials were approved by the University of New South Wales Human Ethics Committee (Approval No: HRC 01039).

Before the study, company management briefed supervisors on the purpose of the study and asked them to co-operate in releasing people. In addition a summary of the study's purpose was provided for display on company notice boards. The companies provided names of eligible employees, that is, those covered by the collective employment contract and working in processing areas. The lists identified all processing team locations and the employment status of individuals. Within each supervisor's area, training, work tasks, and weekly hours were common across all members of the work team. Area supervisors were approached and asked to release a mix of temporary and permanent employees from the list to participate in the study. Therefore supervisors determined who would participate and may have biased selection by releasing team members who they knew had experienced an injury, or those who were least critical to ongoing production requirements. Therefore responses are from a convenience sample (purposive selection), based on individual identification by area supervisors.

The collective employment contracts within the three companies defined part-time workers as those working fewer than 32 hours per week. The survey instrument recorded how many hours the respondent usually worked in categories, including 35-39 hours. To avoid including data from part-time employees, responses from those who worked less than 35 hours per week were excluded. This avoided the possibility of confounding part-time employment and multiple job-holding with permanent or temporary status. A similar approach was taken by Virtanen et al., (2005).

The survey was carried out during working time over an 18-month period that coincided with the approximate midpoint of each company's processing season. Each interview lasted approximately 60 minutes. Company support allowed participants to be released from the monotony of their activities without having their pay affected. The researcher explained the purpose and requirements of the study to prospective respondents individually. Ninety-eight percent of those approached agreed to participate. Respondents were taken to a private area to complete the consent form. They were read the questions by the researcher, with responses recorded directly on the questionnaire, which was then assigned a number for subsequent identification and analysis. At the end of the interview, respondents were provided with an information sheet.

There were several benefits of the face-to-face interviewing technique including establishing rapport and creating trust between the researcher and the respondents by providing reassurance about the confidentiality and the use of the responses. This is likely to have contributed to achieving a higher response rate than would have been expected from an anonymous questionnaire survey. This technique also overcame potential literacy issues by enabling verbal clarification of questions and allowing observations to accompany responses.

### ***Ascertaining Injury Experience***

Injury experience data were derived from the following question: “Have you suffered any work-related injuries in the last 12 months?” Respondents were offered three alternative answers: ‘yes’, ‘no’, and ‘little things that don’t stop you working’. As the responses were not mutually exclusive, in nine cases (3.5%), respondents reported more than one injury (seven permanent and two temporary employees). In these cases only the more serious injury was counted. For example, if a respondent recorded two minor injuries only one was recorded. If a respondent recorded one minor and one serious injury then the serious injury was recorded.

Self-reporting may have increased the effects of bias or unreliable recall so a check was carried out to determine whether the respondent was employed with their current employer when the injury occurred. This involved examining responses to the question, “If yes, describe your task and workstation at the time”. This allowed only injuries and days worked during the respondent’s current term of employment, or, in the case of permanent employees, within the last 12 months and with their current employer to be included in the analysis. Self-reported injuries were triangulated with company records and reported locations. Most serious injuries (those involving days absence from work) were matched with company records. Some discrepancies were noted in comparing a random selection of minor injuries (bruises and minor cuts) where many occurrences could not be matched to company records. Respondents and company representatives suggested that employees failed to notify or record minor injuries because they considered the injury too insignificant to report, because they thought it may impact on their ability to get a permanent position, because no treatment was sought, or because no first aider attended them.

### ***Calculation of Injury Frequency Rates***

The self-reported injury frequencies of temporary and permanent employees were compared in two ways. Initial comparisons were based on the raw numbers of workers in each group who reported either an injury or a serious injury. ‘Serious Harm Injury’ has a legislative definition within the New Zealand Health and Safety in Employment Act 1992 and covers a range of injuries including serious laceration, unconsciousness, amputations, and death. Serious harm is commonly understood to mean an injury that prevents a person from completing the normal range of their duties, defined here as an injury requiring at least one day off work due to incapacitation.

Initial data analysis did not control for exposure. In subsequent analyses, injury frequencies were converted to frequency rates based on each worker’s exposure (weeks worked with their current employer in the preceding 12 months). Temporary workers were employed for the same number of hours per week as their permanent counterparts but not for a full year. Consequently, they experienced less total exposure to workplace hazards across the year. Specific data was not collected on hours worked or overtime. However, responses indicated that both groups worked

similar weekly hours, that is, if overtime was required then all worked it. Total weeks worked was therefore used as the denominator to calculate injury frequency rates. The calculation was based on the following assumptions:

- One path to a permanent job was through satisfactory performance in a temporary position. Therefore, when permanent employees were asked about their length of service with the company, they were also asked if it included time on a temporary contract. Because of the transition from temporary to permanent positions, most permanent employees had completed more than one year of employment with the company. It is possible some of their injuries occurred before the respondent was appointed to a permanent position. However, in the analysis they were categorized as permanent.
- In five cases, permanent employees had completed less than one year with the company. In these cases, their injury rate was calculated using their length of employment in weeks, the same method as adopted for temporary workers.
- Permanent employees were estimated to work 47 weeks per year. This allowed for annual leave (three weeks) and statutory holidays and sick leave (two weeks). However, an unknown number of employees qualified for four weeks annual leave because of long service. There are also 11 statutory holidays in New Zealand although not all are working days. No questions were asked regarding sick leave and respondents may have taken less than the allowed maximum. No data was collected on the statutory holidays or sick leave taken by temporary workers.
- Exposure rates for temporary workers were based on the number of weeks they had been employed by their current employer.
- Checks were made to ensure reported injuries included only those incurred while on their current employment term for temporary workers or with their current employer in the case of permanent employees who had completed less than 12 months service.
- Injury frequency rates for temporary workers were calculated by dividing the injury or serious injury experienced by an individual by the number of weeks worked. Injury frequency rates for permanent workers were calculated by dividing the injury or serious injury experienced by an individual by 47 weeks worked.

It should be noted that while they were chosen to best reflect actual work exposure, the assumptions regarding holiday and sick leave for permanent and temporary workers were such that errors would tend to increase differences in working hours – and therefore exposure – between the two groups. For example, temporary workers' desire to secure a permanent position could influence their decision to take sick leave (Aronsson et al., 2002).

### ***Data Analysis***

The questionnaire provided predominantly categorical data, Chi-square tests and one-way analysis of variance (ANOVA) were used to identify whether there were significant differences in the sample, such as age or gender across the sample frame. Responses were analyzed using SPSS Version 22 with a critical probability of 0.05 used throughout. Rates, with 95% confidence intervals (95% CIs), were calculated for injured permanent and temporary workers for age group and gender. The 95% CIs were calculated in accordance with the methodology used by Horsburgh et al., (2001) in a study of work-related injuries in the agriculture sector and as defined by Armitage and Berry (1994).

***Psychological Wellbeing***

Psychological wellbeing was measured using the General Health Questionnaire (GHQ-12) scores. Instructions on the GHQ-12 asked respondents to report how they had felt over the last few weeks. This point was emphasised to each respondent. Five respondents in Dairy Co had been employed for less than one month, one had completed two weeks and four had completed three weeks. Meat Co and Produce Co had one employee each who had been employed for less than one month (three weeks in each case). As the instructions asked respondents how they felt in the preceding few weeks, an undefined time frame, and because psychological well-being is influenced by factors other than work, all responses were included in the analysis.

The standard form of the GHQ-12 (Goldberg and Williams, 1988) is designed to evaluate a respondent's psychological state over the preceding four weeks. It has been used in a variety of occupational and community settings as a measure of psychological well-being (Banks et al., 1980; Burvill and Knuiiman, 1983) and has been widely validated for use within diverse communities. Of relevance to this study are validations within the Pacific region of which three were identified, two Australian studies (Tennant, 1977; Tait et al., 2003) and one New Zealand study although that validated the GHQ-28 for use with New Zealand women (Romans-Clarkson et al., 1989).

The GHQ has been shown to be "appropriate for use in employment studies as an estimate of the severity of psychiatric illness in groups or individuals" and is "sensitive to ... differences in employment status" (Banks et al., 1980:192). It has been used successfully in studies of employment insecurity (Iwi et al., 1998; Sverke et al., 2002), downsizing and restructuring (Isaksson et al., 2002) and temporary workers (Aronsson et al., 2005; Mayhew and Quinlan, 2006; Neis et al., 2001; Saloniemi et al., 2004; Sverke et al., 1999; Virtanen et al., 2005). It was therefore considered appropriate for use in this study.

The GHQ-12 has been scored using two methods, the binary method described by Goldberg and the Likert method (Tennant, 1977). Under the Likert method, each item is scored from 0 to 3, yielding a maximum score of 36. A score of 11 may be considered to indicate a possible case of impairment and higher scores may "serve as an index of the severity of neurotic impairment" (Tennant, 1977:393). The Likert method is the more widely used in research as it allows parametric statistical testing (Norusis, 1998). Banks et al., (1980), for example, stated that although the Goldberg GHQ scoring system was "adequate with respect to discriminating between 'cases' and 'normals'" (p.190), the Likert method was: "likely to produce a wider and less skewed distribution of scores more appropriate for correlational analyses and intergroup comparisons based on parametric statistics" (p.190). Likert scoring is used in this study.

Given the inconclusiveness of previous studies that identify the factor structure of the GHQ-12, the present study used confirmatory factor analysis to test for two-factor and three-factor formulations (Kalliath et al., 2004). The relationships of the 12 items were analysed to determine if the model was constructed on a two-factor or three-factor structure predetermined in the principal-components analysis (Bank et al., 1980; Politi et al., 1994; Werneke et al., 2000). Table 1 shows the GHQ has a strong structure, with factor loadings ranging from 0.52 to 0.76. Since the two-factor loadings were greater than 0.5, the two-factor structure of GHQ-12 was established,



providing evidence of construct validity (Hair et al., 2006). These twelve factors accounted for 42.2% of the total variance to form the General Health Questionnaire-12 subscale ( $\alpha = 0.77$ ).

**Table 1: Factor Loadings from Principal Components Factoring (Confirmatory Factor Analysis): General Health Questionnaire-12 Factor loading**

Scale Item	1	2
<b>Factor 1</b>		
1. Feeling unhappy or depressed	0.76	
2. Losing confidence in yourself	0.74	
3. Felt constantly under strain	0.64	
4. Thinking of yourself as a worthless person	0.64	
5. Lost much sleep over worry	0.53	
6. Could not overcome your difficulties	0.63	
<b>Factor 2</b>		
7. Face up to your problems		0.65
8. Feeling reasonable happy		0.64
9. Able to concentrate on what you are doing		0.61
10. Enjoy your normal day-to-day activities		0.56
11. Playing a useful part in things		0.54
12. Capable of making decisions about things		0.52
Eigen Value	5.0	
Cumulative percent variance explained	42.2	

## Results

### *Demographics*

The three companies employed 1102 permanent and 500 seasonal temporary employees. In total, 262 workers were sampled. Three declined to participate after they were briefed on the purpose of the study, two from Meat Co and one from Produce Co, resulting in the questionnaire being completed by 259 respondents, almost evenly split between the companies Meat N=87, Dairy N=89 and Produce N=79). Four responses were excluded as they were from part-time workers. The final sample comprised 255 usable responses, 156 (61.2%) temporary and 99 (38.8%) permanent employees, a response rate of 23.5%. The response ratio between temporary and permanent employees was almost the inverse of their employment ratio. This was because the focus of the study was on temporary workers' OHS experiences and because the selection criteria required in each processing area that a questionnaire be completed by a permanent employee, and at least one by a temporary worker. The high response rate is attributed to participation being encouraged by management and respondents being provided with the opportunity for a paid break of approximately one hour.

Table 2 shows the distributions of gender, age, and employment status of the sample. The gender difference was statistically significant. For males ( $\chi^2(5, N = 131) = 13.044, p < 0.05$ ) and for females ( $\chi^2(5, N = 124) = 18.673, p < 0.05$ ).

**Table 2: Age, Gender, Work Injury by Employment Status (95% CI)**

Gender	Permanent	95% CI	Temporary	95% CI	Total	95% CI
Male	n (%)		n (%)		n (%)	
<b>21 and Under</b>	4(4)	1.6 to 9.9	23(14.7)	10 to 21.2	27 (10.6)	7.4 to 15.0
<b>22-25 years</b>	7(7.1)	3.5 to 13.9	13 (8.3)	4.9 to 13.7	20 (7.8)	5.1 to 11.8
<b>26-34 years</b>	19(19.2)	12.7 to 28.0	22 (14.1)	9.5 to 20.4	41 (16.1)	12.1 to 21.1
<b>35-44 years</b>	11(11.1)	6.3 to 18.8	13 (8.3)	4.9 to 13.7	24 (9.4)	6.4 to 13.6
<b>45-54 years</b>	2(2)	0.6 to 7.1	11 (7.5)	4 to 12.2	13 (5.1)	3 to 8.5
<b>55-64 years</b>	4(4)	1.6 to 9.9	2 (1.3)	0.4 to 4.6	6 (2.4)	1.1 to 5.0
<b>Total</b>	47(47.5)	38 to 57.2	84 (53.9)	46 to 61.5	131 (51.4)	45.3 to 57.4
Female						
<b>21 and Under</b>	1 (0.1)	0 to 0.6	13 (8.3)	4.9 to 13.7	14 (5.5)	0.3 to 9.0
<b>22-25 years</b>	2 (2)	0.6 to 7.1	13 (8.3)	4.9 to 13.7	15 (5.9)	3.6 to 9.5
<b>26-34 years</b>	13 (13.1)	7.8 to 21.2	17 (10.9)	6.9 to 16.8	30 (11.8)	0.8 to 16.3
<b>35-44 years</b>	18 (18.2)	11.8 to 26.9	19 (12.2)	7.9 to 18.2	37 (14.5)	10.7 to 19.4
<b>45-54 years</b>	15 (15.2)	9.4 to 23.5	9 (5.6)	3.1 to 10.6	24 (9.4)	6.4 to 13.6
<b>55-64 years</b>	3 (3)	0.1 to 8.5	1 (0.6)	0 to 3.5	4 (1.6)	0.6 to 4.0
<b>Total</b>	52 (52.5)	42.8 to 62.1	72 (46.2)	38.5 to 54	124 (48.6)	42.6 to 54.7
<b>Work Injury</b>	49 (49.5)	39.8 to 59.2	73 (46.8)	39.1 to 54.6	122 (47.8)	41.8 to 54.0
<b>Non-injury</b>	50 (50.5)	40.8 to 60.2	83 (53.2)	45.4 to 60.9	133 (52.2)	46.0 to 58.2

There was a statistically significant relationship between age and employment status ( $\chi^2 (5, N = 255) = 22.774, p < 0.05$ ). There were higher percentages of young temporary workers (under 25 years) ( $n = 62, 39.8\%$ ) than permanent employees ( $n = 14, 14.1\%$ ). Temporary male employees were over represented in the two younger age groups: under 21 and 26-34 years. Low percentages of females in both under 25 year age groups were notable. There were decreasing percentages of temporary employees in the older age groups, dropping to less than 2% of those aged over 55 years.

Gender differences were most apparent in the high percentage of male employees in Dairy Co and female employees in Meat Co. The Dairy Co difference was statistically significant ( $\chi^2 (1, N = 89) = 0.98, p < 0.05$ ) although there was no statistically significant gender difference in the overall sample, ( $\chi^2 (1, N = 255) = 0.98, p > 0.05$ ). Males and females performed substantially similar jobs and were mixed throughout all processing areas. Therefore gender differences were not task related.

### ***Injury Experience***

Those injuries considered serious (those that required time off work) were analysed. Three reported serious injuries without corresponding days off work were included in this analysis as they occurred on the last day of a working week or before a public holiday. This meant the incapacitation occurred during a scheduled break. This rule was applied across all reported injuries. For the purposes of calculations in the following section, days lost from work were based on self-reported work injuries and individuals' recall of the length of time they were absent from work. Initial calculations compared injury severity in terms of the number of individuals who experienced a serious injury.

**Table 3: Number of days lost/year due to injury by employment status**

Days off for injury	Permanent (n)	Temporary (n)
Less than 10 days	9	11
11-20 days	3	6
21-30 days	4	4
31-40 days	3	-
41-50 days	3	2
51-60 days	-	-
61-70 days	-	-
71-80 days	-	-
81-90 days	-	2
91-100 days	-	1
More than 100 days off	-	3
Total (n) (percentage)	22 (43.1%)	29 (56.9%)
Mean (standard deviation)	4.1 (10.76)	6.5 (23.8)

Table 3 shows the number of days lost per year due to an injury by employment status. In total, permanent employees comprised 38.8% of respondents and suffered 43.1% of the total number of serious injuries. Temporary employees comprised 61.2% of respondents and suffered 56.9% of the serious injuries. Temporary employees reported six injuries that accounted for over half of all days lost (52.3%). The mean number of days lost due to injuries was compared using the independent samples T-test. For permanent employees, the mean number of days lost was 4.1, ( $SD = 10.76$ ) and for temporary employees it was 6.5, ( $SD = 23.8$ ). The difference was not significant ( $t(253) = -0.927, p > 0.05$ ).

#### ***Injury Frequency Rates and Employment Status***

To test the hypothesis that 'Permanent employees have a lower injury frequency rate than temporary employees after controlling for exposure', the mean injury frequency rate was compared using the independent samples t-test (equal variances not assumed as Levene's test was significant,  $p < 0.05$ ). For permanent employees the mean injury frequency rate was 0.014 injuries per week, ( $SD = 0.015$ ), and for temporary employees 0.039 injuries per week, ( $SD = 0.051$ ). This difference was significant ( $t(193.821) = -5.566, p < 0.05$ ), indicating that temporary workers experience injury, more frequently.

The hypothesis that 'Permanent employees have a lower serious injury frequency rate than temporary employees when exposure is controlled for' was tested by comparing frequency rates using the independent samples t-test (equal variances not assumed as Levene's test was significant,  $p < 0.05$ ). The mean serious injury frequency rate for permanent employees was 0.00665 serious injuries per week, ( $SD = 0.0157$ ); for temporary employees it was 0.0133 serious injuries per week, ( $SD = 0.0331$ ). This difference was significant ( $t(236.928) = -2.160, p < 0.05$ ).

***Psychological wellbeing as measured by GHQ Scores***

GHQ responses were analysed using SPSS Version 22 with a critical probability of 0.05 used throughout. Preliminary analyses tested for differences in age and gender distributions within each company and across the sample. There was a statistically significant relationship between age and employment status ( $\chi^2(5, N = 255) = 22.774, p < 0.05$ ), reflecting a higher proportion of young workers (under 25 years) in seasonal employment ( $n = 62, 39.8\%$ ) than in permanent employment ( $n = 14, 14.1\%$ ). Approximately 20% of all respondents had scores of 12 or more, suggesting a degree of psychological impairment. A one-way analysis of variance was used to test for differences in GHQ-12 scores between companies. It revealed no significant differences ( $F(2, 252) = 0.339, p = 0.713$ ), suggesting that psychological well-being was not influenced by organisational differences. Scores had a slight positive skew across both temporary and permanent employees.

To examine differences between permanent and temporary employees, the mean GHQ-12 scores were compared using the independent samples t-test (equal variances assumed). There was no significant difference ( $t(253) = 1.569, p > 0.05$ ), indicating employment status had no effect on scores in the sample overall however a significant difference was identified in Produce Co ( $t(79) = 2.134, p < 0.05$ ) where permanent employees scored significantly higher GHQ scores.

An independent samples t-test revealed no significant differences in GHQ-12 scores between male and female respondents in the total sample ( $t(253) = 1.747, p > 0.05$ ). To examine differences in GHQ-12 between age groups, Likert scores were converted into two groups, cases and non-cases and cross-tabulated. In the 22-25 years old age group, almost 29 per cent of respondents had GHQ-12 scores indicating possible impairment, although a chi-square test did not reveal a relationship between age and psychological well-being ( $\chi^2(5, N = 255) = 3.28, p > 0.05$ ).

The GHQ-12 scores of approximately 20% of all respondents indicated possible psychological impairment, with 23.3% of permanent employees and 17.9% of seasonal employees scoring in this range. There was no significant difference ( $t(253) = 1.569, p > 0.05$ ), indicating employment status had no effect on GHQ-12 scores.

**Table 4: GHQ-12 Score, Possible Psychological Impairment and Age Group**

Age Bracket	No Problem (Number)	No Problem %	Possible Impairment (Number)	Possible Impairment %	Total (Number)
21 and Under	39	17.9	2	5.4	41
22-25 years	25	11.5	10	27.0	35
26-34 Years	60	27.5	11	29.7	71
35-44 Years	55	25.2	6	16.2	61
45-54 Years	30	13.8	7	18.9	37
55-64 Years	9	4.1	1	2.7	10
<b>Total</b>	<b>218</b>	<b>100.0</b>	<b>37</b>	<b>100.0</b>	<b>255</b>

## Discussion

### *Injury frequency rates*

This study compared the injury experiences of permanent and seasonal temporary workers in three of the more hazardous food processing sectors: meat, dairy, and produce. To our knowledge there have been very few studies of seasonal work (for exceptions see Dolan et al., 2005; Neis et al., 2001) even though it is a longstanding form of temporary employment in industries such as tourism, agriculture, fishing, and forestry. Therefore this study adds to the body of knowledge on seasonal work and on the injury experiences of a sample of temporary workers.

The key finding from this study demonstrated that seasonal temporary workers in an integrated team performing the same or similar jobs as permanent workers were more than twice as likely to experience work-related injuries and serious injuries requiring time off work. These differences were only apparent when exposure was controlled by using injury frequency rates based on the number of weeks of work completed in a 12 month period with their current employer. The evidence that differences were not apparent in comparisons of the raw frequencies of injury, offers one explanation for the mixed results reported in previous studies of OHS and temporary work.

Spill-over effects from the working conditions of temporary workers to their permanent counterparts may mask workgroup differences (Eiken and Saksvik, 2009; Mayhew and Quinlan, 2006). However, the integration of temporary and permanent employees within the same work groups eliminated the potential confounding effects of different hazard exposures arising from one group performing more or less dangerous work. When injury frequency rates were compared, compensating for the reduced exposure of temporary workers due to the shorter periods of employment, differences in the rates of minor and serious injuries became statistically significant. The findings of this study are valuable due to the scarcity of research on seasonal work, except day labor and harvest work. They are also likely to have broader relevance as seasonal temporary employment is not only common in food production, but also in other cyclical industries, such as tourism, forestry, and fishing.

This study highlighted four other important issues. First, seasonal employment differs significantly from other forms of temporary employment such as casual and day labor, which often involve short periods of engagement with multiple employers. It is therefore important not to assume temporary workers are a homogeneous group and to carefully examine and describe the employment conditions of the workers under investigation, particularly their working hours so as to be able to systematically sample and compare workers according to a consistent definition (Virtanen et al., 2005). This will avoid masking effects due to the diversity of the sample, which may give rise to more diverse OHS outcomes.

Second, finding that differences between the comparison groups were not significant until variations in the duration of employment were taken into account indicates that such differences should be carefully investigated. This is particularly important where it is likely that working hours vary between comparison groups. The use of aggregate databases (medical or insurance data), make it hard to control for specific job task factors, occupational clusters, individual hours, and transitions between periods of employment and unemployment. These will all affect exposure levels that may differentiate permanent and temporary workers' experiences.

Third, a common risk facing temporary workers is associated with short job tenure such as lack of familiarity with the workplace hazards and lack of organizational knowledge (Benavides et al., 2006). A growing body of research has highlighted the greater injury risks associated with short job tenure (Breslin and Smith, 2006; Dupre, 2001). A recent Canadian study (Morassaei et al., 2013) which examined lost time injuries over a decade (1999-2008) found that injury rates were significantly higher amongst workers with shorter job tenure even after controlling for gender, age, industry and occupation. The growth of temporary employment (including agency labour) has contributed to shorter job tenure and for seasonal workers short job tenure is the norm even if they are re-engaged on an annual basis. Future studies of OHS outcomes amongst temporary workers need to take greater account of job tenure.

Fourth, while the study was unable to investigate the specific reasons why temporary workers experienced a significantly higher rate of injury, the findings do raise some issues in this regard. Unlike other temporary workers, these seasonal workers did not appear to experience a significant level of job insecurity. In this study, 57% of temporary workers reported working more than one season with their current employer with a typical season's employment lasting between 8.5 and 10 months. Many workers interviewed, reported fashioning their lifestyle around seasonal processing work (undertaking farming, fishing or forestry work at other times). Demand for processing work was fairly predictable over time and was not subject to erratic shifts in demand or long term decline experienced in some food processing industries (such as the North Atlantic cod industry). This may be exceptional in terms of temporary work (including some seasonal work). It may also help explain why there was no significant difference in the mental wellbeing (as measured by GHQ scores) for these temporary and permanent workers. The latter finding also supports the possibility that comparing OHS amongst temporary and permanent workers will yield different results for different OHS indices.

Further, another potential contributor to injury amongst temporary workers is the lower level of training they typically receive. However, here too the differences were less pronounced in our study. Regular re-employment of seasonal temporary workers effectively reduces training demands associated with hiring new workers, provides for better utilization of the temporary employee across a wider range of tasks and improves the return on the training investment (Neis et al., 2001). Work-related training has been positively correlated with union presence, collective bargaining, and organization size although individuals on fixed-term contracts have been identified as receiving less work-related training "... because of the expected shorter post-training period over which the investment can be amortized" (Arulampalam and Booth, 1998:527). However, what was observed in this study was that at the commencement of the new season, returning temporary employees were not retrained or reassessed but were assumed to be competent and performing at the same level they were when their employment was terminated at the end of the preceding season. This assumption is inherently risky as it relies on the individual retaining knowledge between seasons and can potentially lead to strain injuries due to a lack of "match fitness" or other injuries due to changes in processes or equipment.

Training is carried out by supervisors or other workers considered proficient in that activity. With the rapid ramp-up of labour at the season's start, this situation contributed to anecdotes of slightly more experienced workers training new starters, increasing the likelihood of variance in the

quality of the training or failure to communicate tacit knowledge. It should be noted that training is a requirement of New Zealand's OHS legislation, and it is also one of the most common initiatives used to ensure safety whereby the knowledge and skills to perform the task safely are imparted (Barling et al., 2003). As technology and work processes reportedly did not undergo significant changes between seasons and the companies have extensive on-the-job training programs, our findings do not appear to support lack of training as a primary reason for the different injury experiences. Rather, broken job tenure or other factors not identified in this study appear to explain the significantly different injury frequencies between seasonal temporary and permanent workers.

Other potential explanations for the higher rate of injury amongst temporary workers include work intensity or a weakening of OHS management systems (see Parejo-Moscoso et al., 2013). Our study was unable to shed light on these. Nonetheless, it does indicate these and other explanations require investigation along with the conditions that may mediate their influence.

The findings also help quantify workplace hazard exposure and injury experiences. While the exact hours that temporary and permanent workers worked, and therefore were exposed to common hazards and risks were not available, an approximation using weeks of employment was made. Despite this limitation, the analysis of this data revealed that exposure is a key element that should be considered when undertaking any comparative study of precarious workers' injury experiences, particularly when studies involve looking at groups who are unlikely to be fully employed.

### ***Psychological wellbeing***

The finding that there was no significant difference in the psychological wellbeing (as measured by GHQ scores) of temporary and permanent workers may seem inconsistent with earlier research indicating that workers in insecure positions exhibit higher GHQ scores (Ferrie et al., 1998; Iwi et al., 1998). However, more recent research paints a more complex and nuanced picture, including higher levels of stress and work intensity amongst permanent employees which have been attributed to different levels of life satisfaction and demand and control (Benavides et al., 2000; Bohle et al., 2011; Saonemi et al., 2004; Virtanen et al., 2002). For example, while temporary workers may exercise less control they may also have fewer demands placed on them than their permanent counterparts. A reinforcing influence on psychological wellbeing is the possibility of spill-over effects whereby the presence of temporary workers places additional requirements on permanent workers in terms of workload, including the need to train and supervise temporary employees (Eiken and Saksvik, 2009; Parker et al., 2002).

In our study, apart from a few exceptions, seasonal workers generally had fewer strain inducing role demands in terms of training, supervision or responsibility for product quality/quantity. Seasonal and permanent employees were carefully sampled to ensure that, due to their integration into mixed work teams, there were very limited differences in training or work tasks and duties performed. Specific data was not collected on hours worked or overtime. However responses indicated that both groups worked similar weekly hours; that is, if overtime was required then all worked it. Therefore, although seasonal workers were employed for the same number of hours per week as their permanent counterparts, they were not employed for a full year. Consequently, they experienced less total exposure to the work environment and routines across the year.

Stresses arising from intermittent work and income also appeared less of an issue. Seasonal workers in this study were engaged for relatively long periods, between 8.5 and 10 months, with an expectation of return work in subsequent seasons. This may be exceptional in terms of temporary work as it offers seasonal workers the potential benefits to combine regular and predictable income for much of the year that could be augmented by social security or alternative work during the relatively short 'off-work' period thereby helping avoid the budgeting issues identified by Aronsson et al., (2005). This allowed planning of activities around a regular cycle. Consistent with this, a number of both male and female respondents commented on leisure activities they wanted to pursue at the season's conclusion including fishing, gardening and travelling with still other respondents stating that they would not want to work anymore of the year than the season requires as they were looking forward to the season ending so they could 'do their own thing'. These comments were not universal, with some respondents indicating they hoped good performance as a seasonal worker would result in a permanent job offer.

Responses suggest three possible explanations for failing to find support for the expected worse GHQ outcomes amongst temporary workers. Firstly, it suggests support for the 'voluntary temporary worker' (Isaksson and Bellagh, 2002) where temporary work is a preferred work option for whatever reason. Secondly, for those seeking permanent positions, the knowledge that the three companies recruit permanent staff from the ranks of temporary workers provides them with an opportunity to achieve their employment goal thereby fitting with their preference and ambition (DeCuyper et al., 2009). Thirdly, the temporary nature of seasonal work allows temporary workers a work life balance, not available to most in full time permanent employment. In short, many of these seasonal workers had a positive perception of their employment status due to the leisure and lifestyle opportunities it allowed them to pursue. This is in line with the Department of Labour findings that reported that almost 60 per cent of temporary workers "preferred work in a temporary job" (2009:3).

Analysis of the relationships between company, employment status, gender and age group revealed no support for previous findings indicating that temporary workers are more likely to be older (Louie et al., 2006; Vosko, 2006) with similar findings reported on Canadian seasonal temporary workers (deRaaf et al., 2003; Neis et al., 2001). There are several potential explanations for this finding. Firstly, it may reflect the effects of a social welfare benefit (The Community Wage) which allows those who are unemployed and over 55 years to receive a benefit slightly lower than superannuation (payable at 65 years), subject to them remaining available for work and being annually income tested (MacKinnon, 1995). As those approaching retirement may have less financial and family commitments, they may consider themselves to have retired early and therefore not present themselves (Jackson, 1985). Secondly, it could be an example of the healthy worker effect where workers who are less fit or able, self-select out of the employment market and onto social welfare benefits (Arrighi and Hertz-Picciotto, 1994; Choi, 1992). Thirdly, it may reflect the population distribution within the region or recruitment bias within the companies. Therefore although age maybe "a critical variable in defining vulnerability to the psychological consequences of unemployment" (Jackson, 1985:90), it was not apparent in this population.



A link has been identified between fair treatment and positive psychological outcomes (Kochan et al., 1994; Mauno et al., 2005; Probst, 2004). Positive perceptions of work and positive psychological well-being amongst temporary workers have been linked to situations where work related benefits and opportunities are comparable and temporary workers trust their employer to provide them with opportunities to obtain a permanent position (Connelly and Gallagher, 2004; DeCuyper et al., 2009; McDonald and Makin, 2000). These circumstances are also evident in our study. Seasonal temporary workers were an integral part of each company's workforce and processing requirements with no apparent difference in treatment, task allocation or pay. Seasonal workers have the opportunity for re-engagement each season along with opportunities to obtain a permanent position. While a number of temporary employees indicated they would prefer a permanent job, their GHQ scores did not suggest psychological impairment. On the other hand, as noted earlier, a number of respondents commented positively about only having to work part of the year with breaks between seasons being seen as an opportunity to engage in preferred activities.

An accommodation process or adjusted expectations have been identified by other studies of temporary workers. For example Ferrie (2001) observed that workers "in this secondary labour market regard job insecurity as an integral part of their work experience and consequently have a relatively stable set of beliefs about the labour market and their prospects" (p.71). Eiken and Saksvik (2009) make a similar point, suggesting that temporary workers have limited expectations of security making them somewhat immune to concerns of job finiteness and insecurity. This response is most likely where workers accept a job knowing it is insecure and concerns about the loss of income arising from unemployment are mitigated by the operation of the social welfare system along with the potential for employment in future seasons (Artazcoz et al., 2005; Bernhard-Oettel et al., 2005; DeWitte and Naswall, 2003; Pearce, 1998). Our study could not determine whether respondent's acceptance of periodic unemployment was an adaptation to the reality of their circumstances or reflected a pre-existing set of preferences. Nonetheless, our study adds support to the view that employment insecurity may be an objective risk factor that is not universal across all forms of precarious employment or temporary work (De Cuyper et al., 2008). As Benach et al., (2002) observe, perceptions of job insecurity "... its meaning and health related impact may vary according to different labour market characteristics such as type of flexible work contract, social class, race/ethnicity, age or genders" (p.405). More specifically, our study provides empirical support for Virtanen et al.'s (2005) contention about the heterogeneity of temporary employment. Temporary employment cannot be grouped as a single category but rather more differentiated analysis of particular subsets of temporary work, such as seasonal work, is required (along with comparisons that take important contextual factors into account).

## **Limitations**

Several limitations of the present study should be noted. First, this study sampled workers from three large organizations involved in food processing in New Zealand. New Zealand's accident compensation, social welfare, and industrial relations legislation will differentiate this study from other jurisdictions. Similarly the presence of industrial unions and a collective employment contract providing minimum terms and conditions also differentiate these sites from other organizations. This convenience sample was employed in workplaces with formalized safety

procedures and training programs (although their effectiveness was not assessed). These may not be present to the same extent in smaller independent food processing plants. It also means generalizing these results to other populations should be done with considerable caution. However, this sample was particularly suited to comparing the injury experiences of temporary and permanent workers exposed to common training and operating environments. Further, it explores an under-researched area of temporary work, the seasonal employee.

Second, these findings are based on self-reports of injuries and employment duration and may therefore be subject to inaccuracy due to recall error despite our efforts to mitigate this by triangulating reports with company records. Additionally, any workers absent as a result of injury or who had been so badly injured that they could not return to work would not appear in the sampling frame. However, while self-reported data have been found to underestimate injury frequency and severity (Landen and Hendriks, 1995; Veazie et al., 1994), self-reports of serious injury in this study closely corresponded with company records. Thus, this study has been controlled for error variance associated with common scale formats by assessing injury records (Spector, 2006).

Third, the greatest numbers of days off work were recorded by temporary workers. Lost time has been criticized as an indicator of injury severity because it is a function of injury seriousness, job demands, workplace policies, and compensation criteria (Veazie et al., 1994). For example, lost time can be influenced by the implementation of enhanced rehabilitation programs or efforts to 'massage' compensation claim costs by discouraging time off or re-arranging work schedules (Walters et al., 1995). Therefore, the observation in this study that temporary workers experienced the most days absent from work due to injury, warrants further investigation.

Significant explanation was provided on how frequency rates were calculated. These relied on assumptions concerning working hours, holidays, and sick leave taken. In the absence of access to individual time sheets to calculate exposures and therefore frequencies, the method of calculation used in this study is likely to contain some inaccuracies.

Fourth, the sample was not randomly selected as supervisors determined who would participate and may have biased selection by releasing team members who they knew had experienced an injury or those who were least critical to ongoing production requirements. As respondents reported to many different supervisors and the study was conducted in three companies, the ability of any one supervisor to bias overall selection of the sample was limited. However, despite this, the results of a convenience sample cannot be generalized with confidence to the population. Further, this study involved fewer than 1000 respondents thereby having a greater sampling error than in larger studies. Notwithstanding these limitations, this exploratory study identified a point of interest in the relationship between exposure and injury.

Fifth and finally, another limitation of the study was the failure to systematically consider the impact of non-work issues or work/family balance on GHQ scores. Several respondents reported non-work issues likely to impact on their psychological well-being although their results did not exhibit in the extreme category. This finding illustrates the difficulty in concluding a relationship between psychological well-being and independent variables of company, employment status, gender or age based on the self-administered GHQ, when other possible non work related influences may be present.

## Conclusions

Results for studies of temporary workers OHS have been less consistent than those for other forms of precarious employment. Several reasons for this have been suggested. These include the diversity of temporary work that may have either led to methodological problems that masked effects or the diversity of the respondents may have given rise to more diverse OHS outcomes. Previous research has noted the absence of frequencies in studies of adverse OHS in precarious workforces (Johnson and Lipscomb, 2006; Smith et al., 2010; Vegso et al., 2007). Therefore, one central objective of this paper was to account for systemic differences in working hours, and consequently hazard exposure, when comparing the injury experience of temporary and permanent workers. Controlling for exposure has been uncommon in previous studies of injury in temporary work. While it is widely acknowledged that temporary work is associated with irregular working hours, the secondary datasets used in many studies preclude this factor being addressed during data analysis. As a result, few studies have controlled for exposure while comparing the injury experiences of permanent and temporary workers in workplaces where both groups perform the same, or very similar, tasks.

This study identified the presence of a higher likelihood of injury amongst temporary workers when exposure was controlled for despite the workforce receiving similar training and carrying out similar tasks. These findings point to length of service being a factor that increases risk of injury. Therefore, it is essential that temporary employees receive thorough integration and training to try and assimilate organizational knowledge, if higher injury frequencies for those with short job tenure are to be avoided. This has implications for any new employees being employed in an organization. Further research that more accurately assesses hours worked to calculate exposure when using objective injury data would be beneficial. This should also identify the characteristics of particular groups of temporary workers so they are clearly identifiable and avoid the homogenization that has occurred in some studies involving large data sets.

Importantly, the study found that while there were significant differences in injury frequency rates between seasonal and permanent workers, there were no significant differences in mental health and wellbeing as measured by the GHQ. This finding raises a number of important issues warranting further research. First, and most obviously it provides support for other studies which have found that health outcomes may not be worse for temporary workers (see Eiken and Saksvik, 2009; Keuskamp et al., 2012) which may help to explain the more 'mixed' results obtained by meta reviews of temporary employment (see Virtanen et al., 2005) than has been the case with reviews of research into the OHS effects of downsizing/job insecurity and subcontracting. Second, possible explanations as to why results are affected by the particular OHS outcome indices used include that temporary work is more hazardous in terms of injury than mental health (perhaps because in job strain terms, lower control is matched by lower demands). Another possible explanation, which doesn't necessarily exclude the last one, is that the very diverse character of temporary employment (from fairly long term and predictable work arrangements to, at the other extreme, very insecure and intermittent day labour) and the vulnerability of those undertaking it (especially recent immigrants or undocumented workers) has significant implications for health outcomes. In either case, there is a need for more nuanced studies which use multiple OHS indices and take account of the particular type of temporary work being studied.

Consistent with the last point, another key finding of this study is it identifies seasonal work as a distinct form of temporary employment. There is a need for further research into seasonal work. This can and should form part of research into the full array of temporary work arrangements, using a range of OHS indices, so that any distinctive features affecting health outcomes are better understood. Such research could also constitute an important step towards understanding the mechanisms by which precarious employment affects health.

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