A B S T R A C T

Objective: To provide evidence-based recommendations for work-related population health indicators. **Methods:** Drawing on a framework of work-related experiences, we systematically reviewed studies that assess the association between these experiences and health and reviewed related measures at the population level that could be used as indicators. **Results:** We recommend (and grade the strength of evidence supporting our recommendation for) the following indicators for which data are already routinely collected: unemployment rate (strong), long-term unemployment rate (limited), and permanent lay-off rate (limited). As well, we recommend and grade our support for the following new indicators: insecurity associated with pending job loss (limited), with possible major organizational change (limited), and with actual major organizational change (limited); and job strain (medium). **Conclusion:** These evidence-based indicators can be used to monitor work-related determinants of health and thus to inform the conceptualization, development, and evaluation of policies and programs related to these determinants.

A B R É G É

Objectif : Formuler des recommandations fondées sur des preuves au sujet des indicateurs de santé de la population liés au travail. **Méthode :** En nous appuyant sur une typologie d'expériences d'ordre professionnel, nous avons systématiquement examiné des études portant sur les liens entre ces expériences et la santé; nous avons aussi évalué des mesures connexes de la population pouvant servir d'indicateurs. **Résultats :** Nous recommandons l'emploi des indicateurs suivants, pour lesquels on recueille déjà périodiquement des données (avec entre parenthèses le degré de pertinence des observations cliniques à l'appui) : taux de chômage (fort); taux de chômage chronique (limité); et taux de licenciement (limité). De plus, nous recommandons l'emploi des nouveaux indicateurs suivants : insécurité liée à une perte d'emploi imminente (limité); à d'éventuels changements organisationnels importants (limité); à de réels changements organisationnels importants (limité); et aux contraintes professionnelles (moyen). **Conclusion :** Ces indicateurs fondés sur des preuves peuvent servir à évaluer les déterminants professionnels de la santé et ainsi à éclairer la conceptualisation, l'élaboration et l'évaluation des politiques et des programmes connexes.

Work-Related Population Health Indicators

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Population-level indicators help us to monitor the condition of a population. When it comes to monitoring health, we face a dilemma: should we monitor the health status of the population or should we monitor the factors that give rise to a given level of health status (or both)? To date, most of our attention has focussed on the former. We routinely hear that overall life expectancy has increased and that fewer infants are dying in the first year of life.¹ Indicators like these tell us about trends in the net impact of all health determinants taken together; they tell us nothing about trends in the impact of specific health determinants like income inequality, employment/working conditions, social cohesion, and social support.

The solution seems straightforward: focus on indicators related to the determinants of health as well as on indicators related to the downstream health consequences of these determinants. A number of Canadian agencies have begun to move in this direction. A consensus conference on population health indicators recently endorsed focussing on indicators related to

non-medical determinants of health and health system performance in addition to indicators of health status.² As well, the *Second Report on the Health of Canadians* devoted six sections to the determinants of health and one section to health status.³ Some non-governmental organizations outside the health sector have also embraced this view.⁴

The challenge in broadening our focus to include indicators related to the determinants of health now resides in the selection of indicators. Some health determinants are defined and measured at the level of groups not individuals, even though they ultimately affect health at the individual level. For such determinants, like income inequality or social cohesion, an evidence-based approach to selecting indicators would involve identifying population-level measures that have been found to be associated with population-level measures of health status. For health determinants that are defined at an individual level, like employment/working conditions or social support, selecting indicators involves an additional step: identifying population-level measures that relate closely to identified individual-level measures. In this paper we apply an evidence-based approach to selecting population health indicators for one category of health determinants – employment/working conditions – which operate at the individual level.

METHODS

To identify the full range of employment/working conditions, we drew on a framework of work-related experiences.^{5,6} The framework comprises 12 categories of experiences related to the availability of

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TABLE I
Employment/Working Conditions Related to the Availability of Work

	Employment/Working Conditions	
	From a Short-term and/or Cyclical Perspective	From a Long-term and/or Structural Perspective
Discouraged Workers	e.g., lack of work	e.g., lack of skills
Unemployed	e.g., temporary lay-off	e.g., permanent job loss
Underemployed	e.g., forced work-sharing	e.g., involuntary part-time employment
Fear of Unemployment	e.g., job or employment insecurity	e.g., employability insecurity
Fully Employed		
Overemployed/Overworked	e.g., temporary increase in work hours	e.g., permanent increase in work hours

TABLE II
Employment/Working Conditions Related to the Nature of Work

	Employment/Working Conditions	
	At One Point in Time (static perspective)	Over Time (dynamic perspective)
Job Characteristics		
Single characteristic	e.g., repetitive work	e.g., increasing job demands
Multiple characteristics	e.g., high demand, low control job	e.g., accumulating career job strain
Job Position Within the Firm	e.g., low employment grade	e.g., lack of career mobility
Organizational Characteristics of the Firm		
Work organization	e.g., unwilling self-employment	e.g., contingent employment
System of remuneration	e.g., lack of gain-sharing	e.g., stagnant hourly wage
Skill upgrading/expansion	e.g., lack of training	e.g., deskilling
Workplace governance	e.g., hierarchical or flat	e.g., declining worker participation

work and 14 categories of experiences related to the nature of work. Examples of each category of experience are provided in Tables I and II. We categorized unemployment in youth (typically aged 16-24) separately from unemployment in adults because the experience of not entering the workforce is likely very different from exiting the workforce through job loss. As well, to identify the full range of health consequences that could follow from these experiences, we drew on a typology of health outcomes that distinguishes among individual responses (which may be behavioural or biological), health and function (which includes subjective assessments of health or functional status), and disease (which includes professionally designated medical conditions or disability status, as well as mortality).⁷

To provide an evidence base for selecting work-related indicators, we conducted a systematic review that proceeded in three phases. The first phase involved identifying and selecting published and unpublished studies that examine the association between work-related experiences and health. Studies were identified by searching electronic databases (Medline and EconLit, both up to June 1998), contacting investigators working in the field (operationalized as the lead authors of eligible articles), and searching the bibliographies of identified articles. Studies were selected

according to whether they met the following criteria: original research article, published in English, and cohort design (or, in the case of job characteristics, cohort or case-control design). Occasionally studies were also selected according to a criterion specific to work-related experience under consideration: only studies using a well-defined theoretical model – either the demand-control model⁸ or the effort-reward imbalance model⁹ – were considered for the job characteristics category and only studies that examined job position within a single firm, not in society at large, were considered for the job position category.

The second phase of the systematic review involved data extraction. Data about the number of participants (exposed and unexposed), criteria for exposure and outcome, incidence of the health outcome in both exposed and unexposed individuals, and the relative risk of the health outcome in the exposed individuals compared to the unexposed individuals were systematically extracted from each article. Absolute risk reduction (ARR) for the negative health outcome was calculated for each cohort study. These ARR estimates were not, however, combined across studies because of differences in exposures and validity assessments across studies.

The third phase of the systematic review involved blinded validity assessments con-

ducted by two reviewers (CM and JP) using objective validity criteria and seven-point Likert scales for the assessment of each study against these criteria (see Appendix). These validity assessments used four of the five validity criteria and the two results-based criteria for studies about harm proposed by the Evidence-Based Medicine Working Group,¹⁰ as well as four summary validity criteria. The validity criteria included: similarity of groups at baseline and adjustment for salient differences between groups (to assess confounding), similarity of measurement of exposures and outcomes (to assess measurement bias), completeness of follow-up (to assess ascertainment bias), and correctness of the temporal relationship (to assess the rigour with which causal direction of this relationship has been established). The fifth original validity criterion – existence of a dose-response relationship – could only have been applied to the small number of studies that examined this directly. The results-based criteria included the strength of association between exposure and outcome and the precision in the estimation of risk. The summary validity criteria included measurement validity, statistical validity, internal validity, and external validity.

Inter-rater reliability was assessed in two ways. First, we examined the difference in ratings between reviewers, which was reasonably small: a 0.8 unit difference using

TABLE III
Data Extracted from Studies that Assess the Association Between Individual-level Measures
(that correspond to potential population health indicators) and Health

Study	Number of Participants		Criteria for Exposure	Criteria for Outcome	Incidence of Outcome (%)		Absolute Risk Difference (%)	Relative Risk
	Exposed	Not Exposed			Exposed	Not Exposed		
Unemployment and Mortality								
Moser et al. (1984) ¹¹	5861	161,699	Unemployed in week before 1971 census (vs. entire sample)	All-cause mortality within 10 years	5.60	4.99	0.61	1.12*
Moser et al. (1986) ¹²								
Moser et al. (1987) ¹³	14,675	163,680	Unemployed in week before 1981 census (vs. entire sample)	All-cause mortality within 2 years	1.25	1.22	0.03	1.02
Iversen et al. (1987) ¹⁴	15,107 (men)	1,267,289 (men)	Unemployed on day of 1970 census (vs. employed)	All-cause mortality within 10 years	11.15 (men)	7.03 (men)	4.12 (men)	1.59* (men)
	6659 (women)	717,719 (women)			4.11 (women)	3.22 (women)	0.89 (women)	1.28* (women)
Costa et al. (1987) ¹⁵	13,462	323,088	Unemployed in week before 1981 census (vs. entire sample)	All-cause mortality within 4 years	2.11	1.59	0.52	1.33*
Long-term Unemployment and Mortality								
Stefansson (1991) ¹⁶	28,896	18,855	Unemployed more than 300 days if aged 25-54 or 450 days if aged 55-64 (vs. employed)	All-cause mortality within 7 years	3.55	2.64	0.91	1.34*
Permanent Lay-off and Biology/Physiology								
Kasl et al. (1968) ¹⁷	14	27	Unemployed one month after anticipated job loss (vs. re-employed)	Increase in serum cholesterol	78.57	44.44	34.13	1.77*
Kasl et al. (1970) ¹⁸	41	17	Unemployed after anticipated job loss (vs. re-employed)	Decrease in diastolic blood pressure	39	76	-37	0.51*
Permanent Lay-off and Disability								
Westin et al. (1988) ¹⁹	85	87	Job loss through workplace closure (vs. employed in a workplace that didn't close)	Granted disability pension within 4 years of factory closure	25.9	8.2	17.7	3.16*
Westin et al. (1989) ²⁰				Granted disability pension within 10 years of factory closure	37.9	20.5	17.4	1.85*
Job Insecurity and Disease								
Ferrie et al. (1998) ²¹	1240 (men)	2641 (men)	Possible major organizational change (vs. not planned) Possible major organizational change (vs. not planned) Major organizational change has happened (vs. not planned) Major organizational change has happened (vs. not planned)	Ischemia (abnormal ECG or diagnosed angina)	7.4	7.3	0.1	1.01
	650 (women)	1185 (women)		Ischemia (abnormal ECG or diagnosed angina)	11.1	7.5	3.6	1.48*
	1077 (men)	2641 (men)		Ischemia (abnormal ECG or diagnosed angina)	8.2	7.3	0.9	1.12
	356 (women)	1185 (women)		Ischemia (abnormal ECG or diagnosed angina)	9.5	7.5	2.0	1.27
Job Insecurity and Disability								
Owens (1966) ²²	530	475	Worked in repair shop due for closure in 8-12 weeks (vs. did not work in repair shop due for closure)	Absence on sick leave during the three-month period before closure	3.40	1.68	1.72	2.02*
	392	475	Worked in repair shop due for closure in 4-8 weeks (vs. did not work in repair shop due for closure)	Absence on sick leave during the three-month period before closure	5.10	1.05	4.05	4.86*
	223	475	Worked in repair shop due for closure in 0-4 weeks (vs. did not work in repair shop due for closure)	Absence on sick leave during the three-month period before closure	1.35	1.05	0.30	1.29*
...continues/								

...continues/

the five validity criteria, a 0.3 unit difference using the results-based criteria, and a 0.6 unit difference using the summary criteria, all on a seven-point Likert scale. Second, we estimated the inter-rater reliability

for a composite validity rating using an intra-class correlation coefficient. The inter-rater reliability was reasonably high (0.73). For the purposes of presentation, we averaged ratings across reviewers. As

well, to further simplify the presentation of results, we averaged ratings across criteria within a category to generate a mean rating for each category (i.e., for validity, results-based, and summary criteria).

TABLE III - continued

Study	Number of Participants		Criteria for Exposure	Criteria for Outcome	Incidence of Outcome (%)		Absolute Risk Difference (%)	Relative Risk
	Exposed	Not Exposed			Exposed	Not Exposed		
Job Strain and Physical Health and Function								
Karasek et al. (1981) ²³	36	40	High demands and low intellectual discretion [high strain] (vs. low demands and high intellectual discretion [low strain])	Positive coronary heart disease indicator (two or more moderate symptoms or signs or one or more severe symptoms or signs, where the self-reported symptoms include ache in the breast and trouble breathing and the self-reported signs include hypertension and diagnosed heart disease) within 6 years	5	0	5	
Job strain and mortality								
Astrand et al. (1989) ²⁴	174	209	Low job decision latitude (vs. high job decision latitude)	All-cause mortality within 22 years	4544	3432	1112	1.32*
	70	159	Low job decision latitude and low job support (vs. high job decision latitude and high job support)	All-cause mortality within 22 years				1.38*
Falk et al. (1992) ²⁵	91	386	High job strain (vs. low job strain)	All-cause mortality within 7 years	25.27	16.58	8.69	1.52*
Alterman et al. (1994) ²⁶	117 (2493 person-years)	1566 (33,962 person-years)	High job strain (vs. low job strain)	Ischemic heart disease mortality within 25 years	1.06	0.76	0.30	1.39*
Relevant statistical comparison significant at the p<0.05 level.								

Relevant statistical comparison significant at the $p < 0.05$ level.

To make our recommendations for work-related indicators, we reviewed population-level measures that correspond to those individual-level measures highlighted by our systematic review. Each possible indicator was graded according to the strength of supporting evidence. Strong support can be provided for an indicator when the measure underpinning the indicator closely matches the individual-level measure found to be associated with health in one or more studies and when the mean validity scores for these studies are high (i.e., 4 or greater on a 7-point Likert scale for validity, results-based, and summary criteria). Medium-level support can be provided when one of these conditions can be satisfied and limited support when neither condition can be satisfied.

RESULTS

The first phase of the systematic review – identification and selection of studies – yielded 102 eligible studies. The categories of work-related experiences examined in these studies, in descending order of their share of eligible studies, were as follows:

unemployment, job insecurity, job characteristics, and job position within the firm. The full range of potential health consequences have not been examined for each of these four categories of work-related experiences. For example, disease has been the only health outcome not examined in unemployed adults whereas health-related behaviours and mental health and function have been almost the only health outcomes examined in unemployed youth.

The second phase of the systematic review – data extraction – yielded complete usable data for 29 studies. These studies generally found that unemployment, job insecurity, high job strain, and low job position within the firm are associated with poor health outcomes. To simplify the presentation of data extracted from these studies, only those studies that contained an individual-level measure of work-related experiences for which a population-level measure could be created are provided in Table III. One excluded measure – unemployed one or more times in the past year or more – would have too much measurement error because of recall bias if it were used as a population-level indicator.²⁷ The

other excluded measure – job position within the firm – makes sense at the firm-level, not the population-level where it cannot be measured in a comparable way across firms without invoking the notion of occupational class. Being in the managerial occupational class may lead to different health consequences depending on whether managers work in a hierarchically organized firm or in a “flat” firm. All of the associations from the remaining 16 studies are in the predicted direction, except for health-related behaviours like smoking or alcohol consumption (which could be explained by the relatively high cost of such behaviours for unemployed individuals).

The final phase of the systematic review – validity assessments – identified great variability in the quality of these studies. Studies that assess associations involving job characteristics had the highest validity ratings across all three criteria sets. Studies that assess associations involving mortality as the health outcome had the highest validity ratings, followed closely by professionally designated disease. Again to simplify the presentation of results, only the validity assessment ratings from the 16 studies that

TABLE IV
Mean Validity Assessment Ratings for Studies that Assess the
Association Between Individual-level Measures
(that correspond to potential population-level indicators) and Health

Study	Mean Rating on Seven-point Likert Scales Validity Criteria	Mean Rating on Seven-point Likert Scales Results-based Criteria	Summary Criteria
Unemployment and Mortality			
Moser et al., 1984 ¹¹	5.5	5.2	5
Moser et al., 1986 ¹²	3.3	4.7	4.6
Moser et al., 1987 ¹³	4	5	4.5
Iversen et al., 1987 ¹⁴	4.8	4.7	4.3
Costa & Segnan, 1987 ¹⁵	4.6	5.7	4.6
Long-term Unemployment and Mortality			
Stefansson, 1991 ¹⁶	5.5	3.7	5.5
Permanent Lay-off and Biology/Physiology			
Kasl et al., 1968 ¹⁷	4.4	1.5	2.2
Kasl et al., 1970 ¹⁸	4.3	4.5	3.8
Permanent Lay-off and Disability			
Westin et al., 1988 ¹⁹	4.6	2.5	4.5
Westin et al., 1989 ²⁰	5.5	4.5	4.3
Job Insecurity and Disease			
Ferrie et al., 1997 ²¹	5.3	4.5	5.2
Job Insecurity and Disability			
Owens, 1966 ²²	6.2	4.5	5.1
Job Strain and Physical Health and Function			
Karasek, 1981 ²³	4.9	4.2	5.1
Job Strain and Mortality			
Astrand et al., 1989 ²⁴	4.5	1	4.1
Falk et al., 1992 ²⁵	3.9	3.5	4.6
Alterman et al., 1994 ²⁶	3.6	3.5	4.7

informed the selection of a population health indicator are provided in Table IV.

The review of population-level measures that correspond to those individual-level measures highlighted by our systematic review yielded seven work-related population health indicators, each of which is defined in Table V. Six of the possible

indicators are related to the availability of work, four of them having a short-term or cyclical perspective (the unemployment rate and three indicators related to job insecurity) and two of them having a long-term or structural perspective (the long-term unemployment rate and the permanent lay-off rate). Only one indicator is

related to the nature of work: the rate of high job strain. Data for less than half of these indicators are routinely collected.

The strength of the evidence supporting these possible indicators varies from strong to limited. The first condition for a strong grade of support – i.e., the population-level measure closely matches the individual-level measure found to be associated with health in one or more studies – is met by four indicators: the unemployment rate, the long-term unemployment rate, the permanent lay-off rate, and the rate of high job strain. The unemployment rate, for example, closely mirrors individual-level unemployment in a cross-section of the population as measured in several studies, albeit with a slightly different reference period (e.g., refs.11-15). The second condition for a strong grade of support – i.e., the mean validity scores for these studies are high (4 or greater on a 7-point Likert scale) – is met convincingly only by the unemployment rate and to a lesser extent by the rate of high job strain.

DISCUSSION

Evidence-based population health indicators can be used to inform the conceptualization, development, and evaluation of policies and programs related to specific health determinants. For work-related

TABLE V
Possible Work-related Population Health Indicators, Graded by the Strength of Supporting Evidence

Indicator	Definition	Data Routinely Collected	Grade of Support
Unemployment Rate	Number of survey respondents who are unemployed in a given reference week and who had been seeking work in the preceding four weeks, as a percentage of the number of survey respondents in the labour force	yes	strong
Long-term Unemployment Rate	Number of survey respondents who have been unemployed for more than twelve months, as a percentage of the number of survey respondents who are unemployed in a given reference week and who had been seeking work in the preceding four weeks	yes	limited
Permanent Lay-off Rate	Number of survey respondents who were permanently laid off in a given reference period, as a percentage of the number of survey respondents in the labour force	yes	limited
Rate of Insecurity Associated with Pending Job Loss	Number of survey respondents who reported pending job loss in a given reference period, as a percentage of the number of survey respondents in the labour force	no	limited
Rate of Insecurity Associated with Possible Major Organizational Change	Number of survey respondents who reported facing a possible major organizational change at their workplace in a given reference period, as a percentage of the number of survey respondents in the labour force	no	limited
Rate of Insecurity Associated with Actual Major Organizational Change	Number of survey respondents who reported facing an actual major organizational change at their workplace in a given reference period, as a percentage of the number of survey respondents in the labour force	no	limited
Rate of High Job Strain	Number of survey respondents reporting high psychological demands and low decision latitude in their jobs (as determined using a brief questionnaire), as a percentage of the number of survey respondents in the labour force	no*	medium

* Unfortunately data on job strain were collected only in wave 1 of the National Population Health Survey, not in the later two waves.

indicators, these policies and programs reside mostly at the level of the federal government. New work-related indicators or changes for the worse in existing work-related indicators can bring an issue onto the political agenda in Ottawa. The empirical research about the health consequences that can be expected to follow from a change in a work-related indicator can add a new dimension to how an issue is approached and addressed once on that agenda. Changes in the level of an indicator can help federal policy and program advisors to determine whether the chosen course of action is making a difference. Indicators related to other determinants of health may be more relevant at the provincial or regional level.

The strength of our approach to selecting population health indicators lies in its transparency. Each step in this process can be critiqued: identifying work-related experiences using an existing framework, conducting a systematic review of studies that assess the association between individual-level measures of these experiences and health, and reviewing population-level measures that correspond to the individual-level measures highlighted by the systematic review. If researchers or policy decision-makers feel that criteria are too stringent (or too lax), the process can be easily repeated and different recommendations put forward. For example, unlike previous reviews in this area (e.g., refs.28,29), we restricted the systematic review to studies using a rigorous design (i.e., cohort studies instead of cross-sectional and population-level studies). This criterion could be relaxed. To increase transparency, we also provided precise specifications of "exposure" to the work-related experience and used quantitative summaries of the results instead of qualitative summaries.

The weakness of any evidence-based approach to selecting population health indicators for determinants that operate at an individual level, like employment/working conditions or social support, is that the move from individual-level association to population-level indicator cannot be validated. The only way to validate an indicator developed in this way would be to conduct a population-level study that examined the association between the popula-

tion-level indicator (e.g., the unemployment rate) and a population-level measure of health (e.g., the mortality rate) across time or across jurisdictions. Such studies (e.g., ref.30) have been severely criticized because of the difficulty of selecting other factors that can affect population-level measures of health (omitted variables bias) and the difficulty of selecting appropriate lag times over which changes in the indicator can lead to changes in health.³¹

The weakness of our application of an evidence-based approach to selecting work-related population health indicators is that the study of individual-level associations between work-related experiences and health is at an early stage of development. Relatively few studies met our eligibility criteria (especially the criterion that studies must have used a cohort design) and, of those that did, few researchers conducted their analyses or presented their results in ways that permitted systematic data extraction. For example, instead of comparing individual-level transitions from one health-related state to another, many researchers compared mean outcomes between groups (which makes poor use of a cohort design) and did not present their results using a discrete event as an outcome (which would have allowed an incidence rate to be calculated). This was particularly true of studies examining unemployment in youth. Moreover, as the validity assessment ratings suggest, many studies have significant methodological limitations, most notably the unexamined but potential differences at baseline and over time between those exposed to a specific work-related experience and those not exposed.

Some overlap exists between the work-related population health indicators with a medium or strong grade of support as found by us using an evidence-based approach and those recommended by others using a consensus-based approach. The consensus-based approach involved a modified Delphi process with experts drawn from the federal, provincial and territorial governments, regional health authorities, universities or other research organizations, and consumer groups.² This approach yielded four work-related indicators, two of which were found to have a medium or strong grade of support using our approach

(unemployment rate and a measure of job strain) and two of which did not have such support (long-term unemployment rate and youth unemployment rate). The *Second Report on the Health of Canadians* reports data for the two indicators with a medium or strong grade of support: unemployment rate and high job strain.³ National agencies appear to be headed in the right direction. As well, their efforts will be helped by recent developments like the creation of the National Population Health Survey which will facilitate longitudinal data collection.

Once indicators have been selected and monitoring mechanisms put in place, the next step must be taken by governments, not these agencies. For indicators to have any meaningful effect, governments must establish their individual and collective accountability to act on the basis of this monitoring. These efforts can be informed by experiences in other jurisdictions^{32,33} and in other sectors (e.g., the environmental sector^{34,35}). Any such efforts can be seen as complementary to government efforts to evaluate public policies using health impact assessment.³⁶ By monitoring and acting on the basis of changes in work-related population health indicators, governments can develop public policies that are likely to positively influence health. By evaluating the health impact of public policies, governments can learn about which public policies positively influenced health and which did not.

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Appendix Validity Assessment Form

(1.)	Were the comparison groups similarly described with respect to important determinants of outcome other than the one of interest? e.g., age, race, sex, marital status, education, income, employment grade, health status	Unclear 1 2	3	Fair 4	5	Very Clear 6 7
(2a.)	Were the exposures measured in the same way in the groups being compared?	Poor 1 2	3	Fair 4	5	Excellent 6 7
(2b.)	Were the outcomes measured in the same way in the groups being compared?	1 2	3	4	5	6 7
(3.)	Was the follow-up after exposure to the labour market experience sufficiently long and complete?	1 2	3	4	5	6 7
(4.)	Is the temporal relationship correct? (does exposure precede adverse outcome?)	1 2	3	4	5	6 7
(5.)	How strong is the association (after adjustment) between exposure and outcome?	Weak 1 2	3	Fair 4	5	Strong 6 7
(6.)	How precise is the estimation of risk?	Imprecise 1 2	3	Fair 4	5	Precise 6 7
(7a.)	How strongly would you rate the measurement validity of this study?	Weak 1 2	3	Fair 4	5	Strong 6 7
(7b.)	How strongly would you rate the statistical validity of this study?	1 2	3	4	5	6 7
(7c.)	How strongly would you rate the internal validity of this study?	1 2	3	4	5	6 7
(7d.)	How strongly would you rate the external validity of this study?	1 2	3	4	5	6 7

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