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Measuring precarious employment in Sweden: Translation, adaptation and psychometric properties of the Employment Precariousness Scale (EPRES)

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Complete List of Authors:	<p>Jonsson, Johanna; Karolinska Institutet, Institute of Environmental Medicine, Unit of Occupational Medicine</p> <p>Vives, Alejandra; Pontificia Universidad Catolica de Chile Escuela de Medicina, Department of Public Health; Universitat Pompeu Fabra, Department of Political and Social Sciences, Health Inequalities Research Group, Employment Conditions Knowledge Network (GREDS-EMCONET)</p> <p>Benach, Joan; Universitat Pompeu Fabra, Department of Political and Social Sciences, Health Inequalities Research Group, Employment Conditions Knowledge Network (GREDS-EMCONET); Universidad Autonoma de Madrid, Transdisciplinary Research Group on Socioecological Transitions (GinTRANS2)</p> <p>Kjellberg, Katarina; Karolinska Institutet, Institute of Environmental Medicine, Unit of Occupational Medicine; Stockholm County Council, Center for Occupational and Environmental Medicine</p> <p>Johansson, Gun; Karolinska Institute, Institute of Environmental Medicine, Unit of Occupational Medicine; Stockholm County Council, Center for Occupational and Environmental Medicine</p> <p>Selander, Jenny; Karolinska Institutet, Institute of Environmental Medicine, Unit of Occupational Medicine</p> <p>Bodin, Theo; Karolinska Institutet, Unit of Occupational Medicine, Institute of Environmental Medicine; Stockholm County Council, Center for Occupational and Environmental Medicine</p>
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3 **Measuring precarious employment in Sweden: Translation,**
4 **adaptation and psychometric properties of the Employment**
5 **Precariousness Scale (EPRES)**
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12 Johanna Jonsson* (MSc)¹, Alejandra Vives (MD, PhD)^{2,3}, Joan Benach (MD, PhD)^{3,4},
13 Katarina Kjellberg (PhD)^{1,5}, Jenny Selander (PhD)¹, Gun Johansson (PhD)^{1,5} & Theo
14 Bodin (MD, PhD)^{1,5}
15
16
17
18
19

20 1 Institute of Environmental Medicine, Unit of Occupational Medicine, Karolinska Institutet, Stockholm,
21 Sweden
22

23 2 Department of Public Health, School of Medicine, Pontificia Universidad Católica de Chile
24

25 3 Health Inequalities Research Group, Employment Conditions Knowledge Network (GREDS-
26 EMCONET), Department of Political and Social Sciences, Universitat Pompeu Fabra, Barcelona, Spain
27

28 4 Transdisciplinary Research Group on Socioecological Transitions (GinTRANS2). Universidad
29 Autónoma Madrid, 28049 Madrid, Spain
30

31 5 Centre for Occupational and Environmental Medicine, Stockholm County Council, Stockholm,
32 Sweden
33
34
35

36 * Corresponding author:
37

38 Johanna Jonsson
39

40 Karolinska Institutet
41

42 Institute of Environmental Medicine, Unit of Occupational Medicine
43

44 Solnavägen 4, 11365
45

46 Stockholm, SWEDEN
47

48 Johanna.Jonsson@ki.se
49

50 Telephone: +46 737 665367
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ABSTRACT

Objectives: Precarious employment is a determinant of poor health and health inequality. However, the evidence of health consequences and mechanisms underlying the associations, are still limited due to a lack of a precise definition and measurement instrument. The Employment Precariousness Scale (EPRES) is a Spanish, multidimensional scale, developed to measure degree of precarious employment. This study aims to translate the EPRES-2010 into Swedish, adapt it to the Swedish context, and to assess the psychometric properties of the Swedish EPRES.

Method: EPRES was translated, adapted and implemented for data collection within the research project PREMIS. During 2016-2017, questionnaire data was collected from 483 non-standard employees in Stockholm, Sweden, sampled with web-based respondent-driven sampling. Analyses included item descriptive statistics, scale descriptive statistics and exploratory factor analysis.

Results: The final EPRES-Se consisted of six dimensions and 23 items. There was a high response rate to all items and response options. Global Cronbach's alpha was 0.83. Subscales 'vulnerability', 'rights' and 'exercise rights' had reliability coefficients between $\alpha = 0.78-0.89$ and item-subscale correlations between $r = 0.48-0.79$. 'Temporariness' had poor reliability ($\alpha = -0.08$) and inter-item correlation ($r = -0.04$), while 'disempowerment' showed acceptable psychometric properties ($\alpha = 0.5$; $r = 0.34$). Exploratory factor analysis confirmed the original EPRES factor structure.

Conclusions: 'Vulnerability', 'wages' 'rights', 'exercise rights' and 'disempowerment' worked in the Swedish context; however 'temporariness' would need revising before

1
2
3 implementing the EPRES-Se in further research. Continued work and validation of
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6 EPRES-Se is encouraged. In order to enable international comparisons and
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9 multinational studies, similar studies in other European countries are also called for.
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14 **Strengths and limitations of this study:**

- 16 • First translation and adaptation of the EPRES-2010 to Swedish and the Swedish
17 context
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- 20 • First assessment of the psychometric properties of the EPRES-Se
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- 22 • Relatively small sample restricted to non-standard employees
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- 24 • Limited generalizability of results
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INTRODUCTION

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6 Precarious employment (PE) is considered a social determinant of poor health and
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8 health inequality (1-3). PE is widespread in middle - and poor income countries but is
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10 becoming more common also in wealthy countries (4). However, evidence of the health
11
12 consequences of precarious employment, and by which mechanisms PE harm workers'
13
14 health, is still limited due to the lack of a precise definition and measurement
15
16 instrument (5). This lack also brings about challenges in terms of capturing the size of
17
18 the population in precarious employment, as well as conducting occupational health
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20 and safety surveillance (5, 6). The Employment Precariousness Scale (EPRES) is a
21
22 Spanish questionnaire developed to measure six dimensions of precarious
23
24 employment. EPRES has previously been validated in Spanish and Chilean populations
25
26 (7-10), and also applied to the population of Catalonia (11), but as of yet there is no
27
28 Swedish translation or adaptation.
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Precarious Employment

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41 Financial crises, deterioration of labor market conditions, increased trade competition,
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43 technological innovations and globalization has had a considerable impact on the
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45 dynamics of the labor market (12, 13). These impacts have resulted in a decline in
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47 attachment to employers, risk shifting from employer to employees, growth in
48
49 perceived and actual job insecurity and work-based stress, and increasing
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51 unemployment and non-standard work (12). There has been a shift from standard
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53 contracts (i.e., open-ended full-time contracts) towards more atypical and flexible
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3 contracts such as part-time work, temporary work, temporary agency work, zero hour
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5 contracts, "gig" work arrangements and self-employment (1, 4, 6, 13, 14). Non-standard
6
7 work can also include holding multiple jobs (15). A comprehensive term used to
8
9 describe forms of non-standard employment is "precarious employment" (16). These
10
11 types of employments usually have a higher risk of insecurity – precariousness – , often
12
13 characterized by low pay and lower levels of social security and rights as compared to
14
15 standard contracts (3, 4, 13). However, these elements are not exclusively found in non-
16
17 standard employments *per se*, but could also exist within a standard employment,
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19 meaning that employees in a standard employment also are at risk of experiencing
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21 precariousness (13, 17, 18). Thereby, it is important to move beyond a simplistic
22
23 categorical grouping of employment, such as temporary vs. permanent, and instead
24
25 work towards a multidimensional approach in order to better capture and understand
26
27 precarious employment (15, 18). As of yet there is no universally accepted definition of
28
29 precarious employment, although several definitions have been proposed. Commonly,
30
31 definitions of precarious employment are multidimensional and include several aspects
32
33 related to the employer-employee relation (2, 5, 19), such as temporariness/insecurity
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35 of the employment contract, vulnerability, wages and limited social protection and
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37 rights (3, 4, 13, 16, 20-23).
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54 **The Employment Precariousness Scale (EPRES)**

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56 EPRES is a Spanish, multidimensional scale, developed to measure degree of precarious
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58 employment among waged and salaried workers (7). EPRES is comprised of 22 items
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3 and six subscales corresponding to six dimensions: 'temporariness' (contract duration;
4 two items), 'wages' (low or insufficient; possible economic deprivation; three items),
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8 'disempowerment' (level of negotiation of employment conditions; two items),
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11 'vulnerability' (defenselessness to authoritarian treatment; five items), 'rights'
12
13 (entitlement to workplace rights and social security benefits; four items) and 'exercise
14
15 rights' (powerlessness, in practice, to exercise workplace rights; six items) (7, 8). EPRES
16
17 items are scored on a 5-point or 3-point scale, depending on item, and all items taken
18
19 together will give a global score ranging between 0 (least precarious) and 4 (most
20
21 precarious) (19). EPRES has demonstrated good acceptability, good internal
22
23 consistency and evidence of construct validity in Spanish and Chilean populations (7,
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25 8). The original EPRES scale was revised in 2015 (hereafter known as EPRES-2010), which
26
27 showed good metric properties and improved sensitivity to worker vulnerability and
28
29 employment stability (9).
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41 **Precarious employment in Sweden**

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43 Reports show that the Swedish labor market is growing increasingly more insecure (24).
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45 Sweden has, according to some definitions, one of the smallest proportions of
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47 precarious employees in Europe (21). However, in the perspective of Nordic countries,
48
49 Sweden has the highest proportion of precarious employed individuals (25) and the
50
51 highest proportion of fixed-term employment contracts (26). The latter has been
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53 around 15-17% since the late 1990's. However, there has been a shift within this group
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55 where longer-term positions have been replaced by a higher proportion of on-demand
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3 employees and day laborers, which are more precarious by nature (24, 27, 28).
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5 Especially women (19%, compared to 15% among men), 16-24 year olds (56%,
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7 compared to 21% among 25-34 year olds and 9% among 35-44 year olds), and foreign
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9 born (24%, compared to 15% among individuals born in Sweden) are likely of holding
10
11 a temporary employment (28). Around 10% of the employees in Sweden are not
12
13 covered by collective bargaining agreements and around 9% have multiple jobs. The
14
15 latter has seen an increase with 1.5% since 2005 (27). According to a definition by the
16
17 Swedish labor policy council, the group of atypical employees is constituted by those
18
19 that fulfil one of the following: not being covered by a collective bargaining agreement,
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21 have a temporary employment, are employed by a temp agency or are self-employed,
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23 have their own company, hold multiple jobs or are working in the informal sector. This
24
25 group of atypical workers is estimated to be around 35-39% of the Swedish workforce
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27 (27).
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38 Thus, a translation and adaptation of EPRES to Swedish and the Swedish context
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40 is an important step in the direction to fully comprehend the distribution and health
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42 consequences of precarious employment in Swedish population.
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48 **Aim**

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51 The aim of this study was to translate the EPRES-2010 into Swedish, adapt it to the
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53 Swedish context, and to assess the psychometric properties of the Swedish EPRES.
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58 **METHOD**

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3 In order to fulfil the study aims, the EPRES-2010 was first translated into Swedish and
4
5 subsequently adapted to suit the Swedish context (hereafter known as EPRES-Se).
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8 Thereafter, EPRES-Se was piloted and implemented as a part of the survey used in the
9
10 research project Precarious Employment in Stockholm (PREMIS).
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16 **Translation and adaptation of EPRES**

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19 The translation and adaptation process of the EPRES-2010 consisted of five steps: 1.
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21 Translation from Spanish to Swedish; 2. Cultural adaptation to fit the Swedish context;
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24 3. Back translation to Spanish and adjustments; 4. Pilot testing; 5. Final adaptations
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26 based on user feedback in pilot.
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30 1. The Spanish version of the revised EPRES-2010 scale, which has been
31
32 published elsewhere (9), was translated into Swedish. The translation was done by a
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34 bilingual member of the research team (TB) in close discussion with AV, a native
35
36 Spanish speaker with previous experience of validation studies of EPRES.
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40 2. Several adaptations of the questionnaire were implemented in order to fit
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42 Swedish labor market conditions. The questionnaire and its translation was discussed
43
44 during workshops in the project team, which consisted of Swedish, Spanish and Chilean
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46 researchers within public - and occupational health, as well as within the reference
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48 group, which consisted of labor union members and workers with experience of
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50 precarious employment.
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3 3. Several drafts of the Swedish questionnaire were translated back to Spanish
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5 during the adaptation process and discussed until the final translation was decided
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7 upon.
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11 4. A two-stage pilot testing was performed: first face-to-face with five volunteers
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13 from the reference group, and thereafter online with six volunteers who were currently
14
15 working but without a permanent full-time employment. The latter were also asked to
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17 participate in an evaluation of the survey either via the phone or online.
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21 5. With the input from the pilot, a few minor adaptations were made to the EPRES.
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25 Further, in order to offer non-Swedish speaking participants an opportunity to
26
27 participate in the PREMIS-study, the PREMIS-survey, including the Swedish version of
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29 EPRES, was translated into English by an external, professional, translator. After the
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31 translation, minor changes in terms of style and terminology was made by the research
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33 group. The English translation of the EPRES-Se was not validated in this study, nor has
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35 it been validated in any previous studies.
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46 **Implementation of the EPRES-Se**

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48 PREMIS is an ongoing, longitudinal, web-based study conducted in Stockholm county,
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50 Sweden, aiming at studying health outcomes of precarious employment. In 2016-2017,
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52 483 non-standard employees were sampled with web-based respondent-driven
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54 sampling (webRDS). WebRDS uses peer-to-peer recruitment to build a sample from
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56 populations that are hard-to-reach and therefore lacks a sampling frame (29).
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3 Questionnaire data was collected through an online survey tool specifically developed
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6 for RDS (30). The PREMIS-survey included all the items of the EPRES-Se, questions on
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8 employment type, occupational environment, health outcomes and background. The
9
10 survey could be completed in Swedish or English. Inclusion criteria for participants
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12 were: living and/or working in Stockholm County, being aged 18-65 years, having and
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14 indicating a Swedish personal identification number, and having a current
15
16 employment. Exclusion criteria were: having a fixed, full-time, employment, being
17
18 voluntarily self-employed or being a student. Out of the 483 participants included in
19
20 the sample, 68 participants were excluded due to being deemed ineligible after
21
22 participation or due to suspected deception, giving a final sample of 415 participants.
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30 The full description of the sampling process for PREMIS has been described elsewhere
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32 (31).
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36 **Statistical analysis**

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38 Item descriptive statistics (mean, standard deviations, response frequencies, missing
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40 responses and Pearson item-subscale correlations) and scale descriptive statistics
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42 (mean, standard deviations, missing items, range, floor and ceiling effects, and
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44 reliability (Cronbach's alpha coefficient) were assessed for the entire sample.
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47 Participants answering "No answer" on the question on income (question three in
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49 EPRES-Se) were excluded from the analyses of this question due to the ambiguity of
50
51 the response alternative. Exploratory factor analysis was conducted in order to
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53 determine the underlying factor structure of the data. Principal axis factoring, with
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55 varimax rotation, extracting eigenvalues >1 was used. Sub-analyses were conducted
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3 without informal workers. Further, as the sample was recruited with respondent-driven
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5 sampling (RDS), weighted analyses were conducted in addition to the unweighted
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7 analyses. RDSII weights (32) were calculated in RDS Analyst 0.42 for Windows (Los
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9 Angeles, CA). The results from these analyses will be shown in full in the supplementary
10
11 material. All analyses were performed using SPSS version 23 (IBM SPSS Statistics for
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17 Windows, Version 23. Armonk, NY:IBM Corp).

21 **Ethical considerations**

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24 Permission from the Regional Ethics Committee of Stockholm was given for the study,
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26 with dnr: 2016/1291-31/5. Informed consent was attained from all participants by the
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28 respondent clicking "Yes" to the question "I understand the information given above
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30 and want to participate".
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38 **Results**

41 **Adaptations of EPRES-Se**

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43 The following adaptations were made to the EPRES-Se in comparison with EPRES-2010.

- 44
45 (1) The response alternatives in 'temporariness' were stated as categories of duration,
46
47 as opposed to a free text value of number of days, months or years in EPRES-2010,
48
49 in order to increase usability. Further, in the first question, response options "I do
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51 not have a contract" was added in order to capture informal work and "Do not
52
53 know" was added in order to capture poor contractual relationship.
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3 (2) In 'wages', the question of income was presented in local currency (SEK) and
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5 intervals were set to ~300 EUR as the 150-200 EUR intervals used in the EPRES-2010
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7 version were perceived as too narrow. In EPRES-2010, intervals were 150 EUR - 200
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9 EUR below a monthly income of 1200 EUR, and 300 EUR above an income of 1201
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11 EUR.
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16 (3) Items on 'disempowerment' were adapted to reflect Swedish collective bargaining
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18 agreements: The two response alternatives where working conditions were decided
19
20 unilaterally by the employer were merged in the Swedish adaptation. As some
21
22 workers, especially freelancers, are given a fixed budget with no hours specified, the
23
24 response alternative "Not applicable. I work project-based" was added for the
25
26 question on how salary was decided upon,
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32 (4) One of the items in 'vulnerability', "afraid to demand better working conditions...",
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34 was taken from the original EPRES-scale (7) according to the recommendations
35
36 made by Vives et al 2015 (9).
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40 (5) In 'rights', the question on pension, which contained both pension due to old age
41
42 and disability in EPRES-2010, was split in two as these are distinct systems unrelated
43
44 to one another in the Swedish context. Retirement pension (i.e., pension due to old
45
46 age) was kept in EPRES-Se and disability pension was removed. However, a new
47
48 item assessing the right to sickness benefit was added in the subscale instead.
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53 (6) In 'exercise of rights' the item on taking a day off for family reasons was clarified by
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55 adding "care of a sick child, care of a sick relative etc." within parentheses.
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EPRES-Se

The final version of EPRES-Se consisted of a total of 23 items and six dimensions: 'temporariness' (two items), 'wages' (three items), 'disempowerment' (two items), 'vulnerability' (five items), 'rights' (five items) and 'exercise rights' (six items). As in the EPRES-2010, the response scales were 5-point ordinal scales for 'temporariness' and 'wages', 5-point frequency scales for 'vulnerability' and 'exercise rights', and 3-point categorical scales for 'disempowerment' and 'exercise rights'. See EPRES-Se in supplementary material A.

Coding of EPRES-Se

Similarly as EPRES-2010, subscale scores were computed as averages and transformed into a 0-4 scale. The global EPRES score is the average of the six subscales, ranging from 0-4, where 0 represent the lowest level of precariousness and 4 represent the highest level of precariousness.

For questions in 'temporariness', response options were coded slightly different compared to EPRES-2010 in order to accommodate the changes made in the Swedish version. For instance, in the question of duration of contract, response options "Do not have a contract" and "Do not know" were coded as 4 (most precarious), in comparison with the Spanish version where a contract length of less than six months was coded as 4. In the question on income, intervals were larger and consistent in size, as compared to the Spanish version. The cut-offs for income were based on the Swedish median net income for 2016, which was just above 18000 SEK for individuals 20-64 years of age

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3 (33). The merging of items in 'disempowerment' did not affect coding. The coding of
4
5
6 the individual items along with the English translation of EPRES-Se can be found in the
7
8
9 supplementary material B.

10 11 12 13 14 **Issues leading to recoding of 'temporariness' dimension**

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16 When conducting the data analyses it was revealed that 79% (n=139) of the
17
18 respondents answering 'indefinitely' to the EPRES question on contract length ("How
19
20 long is your current employment contract valid?") also answered that they were
21
22 employed on demand/by the hour on a question assessing employment type included
23
24 in the PREMIS-survey. We suspected that this combination could be a type of "zero
25
26 hour" contract, in which the employer is not required to offer the employee any fixed
27
28 number of hours of work at all per day, week or month (26). Thereby, this type of
29
30 employment situation could be regarded as contingent with a high degree of
31
32 precariousness. This was confirmed as the group indicating an indefinite contract
33
34 length *and* on-demand/by the hour employment, were most similar (in terms of the
35
36 other EPRES subscales) to employees with a contract lasting less than 1 month and
37
38 least alike employees with a fixed-term contract >2 years. Consequently, we re-coded
39
40 the group with an indefinite contract *and* on demand/by the hour-employment from
41
42 0 to 3 (i.e., the same coding as the response alternative <1 month contract). Those with
43
44 any other employment type and an indefinite contract (n=36) remained coded as 0.
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56 See results of subscale-average comparisons in the supplementary material C.
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Psychometric properties of EPRES-Se

The demographic characteristics of the sample is shown in Table 1. The sample consisted of a larger proportion 25-29-year olds (45%) compared to the other age-groups, and a larger proportion women (54%) as compared to men. Further, the sample was dominated by workers employed on demand/by the hour (59%).

Table 2 shows the item-descriptive statistics. There was a small proportion of missing values (below 5%). Item means were similar within subscales, with the greatest mean difference found within 'wages' (item mean difference = 1.4). All response options within the items were used by participants, although to a varying extent. Item-subscale correlations were around 0.6-0.8 in 'vulnerability' and 'exercise of rights'; and around 0.4-0.6 in 'wages' and 'rights'. There was a weak correlation between item and subscale in 'disempowerment' and no correlation between item and subscale in 'temporariness'. In the latter, all items correlated higher with their corresponding subscale compared to other subscales.

Table 1. Demographic characteristics of the study population (frequencies and percentages), N=415

		N	%
Age	18-24	122	29
	25-29	185	45
	30-64	108	26
Sex	Male	190	46
	Female	225	54
Employment	Temporary employment	121	29
	Employed on demand/by the hour	243	59
	Self-employed (involuntary)	13	3
	Intern	2	1
	Part-time employed (involuntary)	36	9

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6 Table 3 shows the scale descriptive statistics. The subscale mean scores ranged
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8 between 1.5 and 2.3, with a global average of 1.9. The proportion of participants with
9 any missing values in the subscales were around 1%, except in the case of 'wages'
10 where it was 2.2%. The latter also included participants answering "No answer" (n=9).
11
12 Subscale scores ranged between 0-4, and global scale score ranged between 0.09-3.07.
13
14 Both floor and ceiling effects were generally low (< 5%), with floor effects being highest
15 for 'disempowerment' (9.2%) and 'vulnerability' (11.7%), and ceiling effects for 'rights'
16 (18.0%). Cronbach's alpha coefficients were around 0.7 or higher for 'wages',
17 'vulnerability', 'rights' and 'exercise of rights'. Only 'temporariness' exhibited a
18 Cronbach's alpha coefficient close to 0. The global alpha coefficient was 0.83.
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32 The exploratory factor analysis extracted six factors with eigenvalues above 1
33 (eigenvalues = 5.3; 3.2; 2.3; 1.6; 1.3; 1.1). These factors were the same as in EPRES-2010,
34 thereby confirming the original factor structure. Together, the six factors explained
35 64.1% of the variance. The six factors and their rotated factor loadings are shown in
36 Table 4. All loadings were above 0.35, except in the case of "length of contract".
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46 Sub-analyses were conducted in order to investigate the potential effect of
47 including informal workers in the sample. Removing informal workers (n=35) had
48 minor influence on the correlation ($r=0.002$, $p=0.974$) and reliability (0.003). However,
49 in the factor analysis seven factors with eigenvalues >1 emerged (5.3; 3.2; 2.3; 1.6; 1.3;
50 1.1; 1.0), explaining 68.5% of the variance. The seventh factor was caused by a split of
51 the temporariness dimension, grouping items on length of contract (duration) and time
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3 working for employer (tenure) in separate factors, with factor loadings of 0.34 and 0.42
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6 respectively.
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8 The weighted population sample results remained virtually the same for item-
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10 subscale correlations, Cronbach's alpha coefficients, floor and ceiling effects, as well
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12 as factor loadings from the exploratory factor analysis of EPRES-Se, and did thereby
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14 not affect the interpretation of the results. See the weighted results in table 1-4 in
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19 Supplementary material D.
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Table 2. Item descriptive statistics and Pearson item-subscale correlations of EPRES-Se

Item	Missing % ¹	Mean	SD ²	Response value frequency (%) ³					Pearson item subscale correlations ⁴					
				0	1	2	3	4	T	W	D	V	R	ER
Temporariness⁵														
Length of contract	0.0	2.6	1.1	36 (8.7)	24 (5.8)	75 (18.1)	228 (54.9)	52 (12.5)	-	0.04	0.09	0.06	0.08	0.04
Time working empl.	0.0	2.1	0.9	17 (4.1)	92 (22.2)	171 (41.2)	119 (28.7)	16 (3.9)	0.04	-	0.06	0.10	-	0.31
									0.04			0.04		
Wages														
Income monthly	2.2	2.4	1.2	43 (10.6)	45 (11.1)	87 (21.4)	171 (42.1)	60 (14.8)	0.09	0.39	0.13	-	0.29	0.18
Cover basic need	1.0	0.8	0.9	175 (42.6)	171 (41.6)	44 (10.7)	14 (3.4)	7 (1.7)	-	0.60	0.08	0.21	0.13	0.27
Cover unforeseen expen.	1.0	1.8	1.1	60 (14.6)	113 (27.5)	136 (33.1)	70 (17.0)	32 (7.8)	0.02	0.55	0.08	0.39	0.14	0.26
Disempowerment⁵														
Working hour settled	0.0	2.1	1.2	84 (20.2)	8 (1.9)	110 (26.5)	190 (45.8)	23 (5.5)	0.13	0.17	0.34	0.08	0.24	0.21
Salary settled	0.0	2.2	1.2	77 (18.6)	8 (1.9)	101 (24.3)	210 (50.6)	19 (4.6)	0.07	0.03	0.34	0.02	0.13	0.10
Vulnerability														
Demand work cond.	1.0	1.6	1.2	79 (19.2)	129 (31.4)	113 (27.5)	63 (15.3)	27 (6.6)	0.01	0.13	0.09	0.75	0.04	0.29
Unfair treatment	1.0	1.3	1.1	114 (27.7)	159 (38.7)	67 (16.3)	50 (12.2)	21 (5.1)	-	0.12	0.08	0.79	-	0.26
									0.03				0.01	
Afraid fired	1.0	1.5	1.2	106 (25.8)	130 (31.6)	81 (19.7)	60 (14.6)	34 (8.3)	0.06	0.20	0.10	0.78	0.04	0.35
Treated authoritarian	1.0	1.3	1.1	107 (26.0)	160 (38.9)	87 (21.2)	36 (8.8)	21 (5.1)	-	0.20	-	0.63	0.02	0.23
									0.04		0.01			
Easily replaced	1.0	1.6	1.3	91 (22.1)	124 (30.2)	92 (22.4)	55 (13.4)	49 (11.9)	0.06	0.22	0.01	0.74	0.04	0.27
Rights														
Right parental leave	1.2	1.2	0.8	100 (24.4)	130 (31.7)	180 (43.9)			0.18	0.16	0.25	0.05	0.59	0.16
Right retirement	1.2	1.2	0.8	107 (26.1)	113 (27.6)	190 (46.3)			0.26	0.22	0.22	0.07	0.60	0.16
Right unemployment	1.2	1.0	0.9	156 (38.0)	100 (24.4)	154 (37.6)			0.15	0.24	0.14	-	0.60	0.09
												0.01		
Right severance pay	1.2	1.4	0.6	20 (4.9)	223 (54.4)	167 (40.7)			0.11	0.06	0.03	-	0.48	0.03
												0.02		
Right sickness benefits	1.2	1.0	0.9	160 (39.0)	110 (26.8)	140 (34.1)			0.26	0.18	0.16	0.03	0.53	0.12
Exercise of rights														

Take weekend off	1.0	1.6	1.2	86 (20.9)	93 (22.6)	154 (37.5)	48 (11.7)	30 (7.3)	-	0.23	0.16	0.18	0.10	0.62
									0.01					
Take vacation	1.2	1.9	1.1	50 (12.2)	88 (21.5)	163 (39.8)	77 (18.8)	32 (7.8)	0.14	0.22	0.19	0.30	0.15	0.68
Take day off	1.2	1.6	1.1	88 (21.5)	85 (20.7)	166 (40.5)	50 (12.2)	21 (5.1)	0.15	0.19	0.21	0.25	0.16	0.75
Take day off, pers.	1.0	1.9	1.2	63 (15.3)	78 (19.0)	159 (38.7)	69 (16.8)	42 (10.2)	0.11	0.21	0.06	0.36	0.07	0.74
Sick leave	1.2	1.6	1.2	98 (23.9)	74 (18.0)	163 (39.8)	50 (12.2)	25 (6.1)	0.06	0.22	0.19	0.26	0.12	0.69
Go to doctor	1.0	1.1	1.1	140 (34.1)	126 (30.7)	106 (25.8)	25 (6.1)	14 (3.4)	0.11	0.26	0.08	0.25	0.14	0.64

¹ Proportion of participants with any missing item; ² SD=Standard Deviation; ³ Frequency (%) of participants indicating the specific response. 0 indicates the lowest precariousness score, 4 indicating the highest precariousness score. ⁴ Corrected for overlap, i.e., item is removed from the corresponding subscale. T=Temporariness; W=Wages; D=Disempowerment; V=Vulnerability; R=Rights; ER=Exercise rights. ⁵ Inter-item correlations

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Table 3. Scale descriptive statistics: range, mean, standard deviation (SD), floor and ceiling effects and Cronbach's alpha coefficient

Subscale	Items	Mean	SD	Missing (%) ¹	Obs. range	Floor % ²	Ceiling % ²	Cronbach's alpha
Temporariness	2	2.3	0.7	0.0	0-4	0.5	1.0	-0.08
Wages	3	1.6	0.8	3.1	0-4	4.2	0.7	0.69
Disempowerment	2	2.2	1.0	0.0	0-4	9.2	1.4	0.50
Vulnerability	5	1.5	1.0	1.0	0-4	11.7	1.9	0.89
Rights	5	2.3	1.2	1.2	0-4	2.9	18.0	0.78
Exercise of rights	6	1.6	0.9	1.2	0-4	6.8	1.0	0.88
EPRES-se	23	1.9	0.5	3.4	0.09-3.07	0.2	0.2	0.83

¹ Proportion of participants with any missing item

² Proportion of participants with lowest (floor) and highest (ceiling) EPRES-Se scores

Table 4. Factor loadings from exploratory factor analysis of the EPRES-Se

	Factor					
	Exercise rights	Vulnerability	Rights	Wages	Disempowerment	Temporariness
Temporariness						
Length of contract						0.13
Time working empl.	0.12		0.35			-0.37
Wages						
Income monthly	0.15	-0.16	0.24	0.49		0.35
Cover basic need	0.18	0.13		0.71		
Cover unforeseen expen.	0.12	0.32		0.79		-0.11
Disempowerment						
Working hour settled	0.15		0.19		0.54	0.16
Salary settled					0.58	
Vulnerability						
Demand work cond.	0.14	0.80				
Unfair treatment	0.11	0.84				
Afraid fired	0.20	0.80				
Treated authoritarian	0.11	0.66		0.12		0.13
Easily replaced	0.12	0.77		0.15		
Rights						
Right parental leave			0.67		0.22	
Right retirement			0.69		0.16	
Right unemployment			0.70	0.11		0.28
Right severance pay			0.55		-0.11	
Right sickness benefits			0.59		0.12	
Exercise rights						

1						
2						
3	Take weekend off	0.65			0.11	0.14
4	Take vacation	0.70	0.18			-0.13
5	Take day off	0.80	0.10	0.10		-0.13
6	Take day off, pers.	0.78	0.24			-0.11
7	Sick leave	0.72	0.11		0.12	0.14
8	Go to doctor	0.66	0.11		0.13	
9						

Table showing factor loadings >0.1

DISCUSSION

Key findings and summary

The scale generally performed well, with a small proportion of missing values across all subscales, usage of all response options and good global reliability. The factor structure established in the Spanish EPRES-2010 (9) was confirmed. The subscales 'vulnerability', 'wages', 'rights' and 'exercise of rights' generally worked well in the Swedish context, with high item-subscale correlations, subscale reliability and factor loadings. However, 'temporariness' did not perform as expected and would need revision. In addition, although 'disempowerment' showed acceptable psychometric properties, the subscale might benefit from additional adaptation.

'Temporariness'

This subscale proved problematic due to several reasons: in terms of factor loading for the item assessing contractual length, the zero item-subscale correlations and negative Cronbach's alpha coefficient. On the basis of these results, we argue that the temporariness dimension should be redesigned. There are multiple reasons for this argument:

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3 First, the very poor psychometric properties indicate that the subscale does
4 not function in the current context. This was further highlighted when removing
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6 informal workers, a mere number of 35 participants, splitting the items in
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8 'temporariness' in two – showing greater factor loadings and explained variance.
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10 Thus, neither the adapted version nor the version without informal workers were
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12 acceptable.
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19 Second, we found that the type of employment in combination with duration
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21 of contract was associated with the precariousness of the employee. This in addition
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23 to the previous results, highlight that the duration-item is inadequate both on its own
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25 and together with the tenure-item, in assessing temporariness. Combining duration
26
27 and type of employment in an item could be an alternative to capture temporariness.
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29 However, the continuous flexibilization of the labor market challenge the standard
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31 employment relationship (5), moving towards a future in which the permanent full-
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33 time employment situation might no longer represent the norm and the "gold
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35 standard". Therefore, incorporating an item on employment type might not be
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37 feasible and as its rating and quantification might prove (increasingly) difficult.
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46 Third, it is not necessarily so that the relationship between tenure and
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48 temporariness is linear, i.e., that the shorter the tenure the greater the temporariness.
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50 In the current context, the Swedish legislation (the Employment Protection Act SFS
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52 1982:80) prevents an employer to hire an employee for more than two years during a
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54 five-year period (consecutive or in shorter repeated contracts) (34). Thereby, an
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56 employee with an 18-month tenure might be worse off than an employee with a 3-
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3 month tenure in the experience of temporariness. Further, approximately 50% of
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6 temporary employees in Sweden has had repeated contracts with the same employer
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8 (28). This is likely to contribute to the non-linear association between tenure and
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10 duration of contract. In order to adapt EPRES-Se further to the Swedish context, we
11
12 suggest that further work with the EPRES-Se consider whether the tenure-item could
13
14 be combined with an item assessing the number of repeated contracts with the same
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16 employer or an item assessing how often during a specific time interval the
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18 employment contract is up for renewal. It could also be explored whether the tenure-
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20 item could be replaced with an item assessing the remaining duration of the contract.
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27 On the basis of this discussion, we suggest that a future development of
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29 EPRES-Se takes a novel outlook on the 'temporariness' dimension and includes an
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31 evaluation of a number of new items in a population of both standard and non-
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33 standard employees.
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40 **'Wages'**

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43 The income-item showed a factor loading of 0.49, and a correlation of 0.39 with the
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45 items assessing how well the income covers basic needs and unforeseen expenses.
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47 Previous studies report similar findings for this item (7-9). One explanation to these
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49 results is the quantitative nature of the income-item compared to the other items. The
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51 majority, 57%, of the participants scored a precariousness level of 3 or 4 on income,
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53 which is not surprising as the sample is constituted by young non-standard employees.
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55 However, only 5% and 25% of the sample scored a precariousness level of 3 or 4 on
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3 the other two items respectively. How well one can cover basic needs and unforeseen
4 expenses could depend on more than income, such as family support. Approximately
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6 24% of adults aged 20-27 years in Sweden still live at home. This figure is more than
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8 50% in the majority of municipalities in large city regions. About half of those living at
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10 home pay nothing in rent (35). As 74% of the sample is between 18-29 years old, it is
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12 likely that some of the participants still live at home and receive help from their parents.
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14 A more diverse sample in terms of employment could potentially have increased the
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16 item-subscale correlation as we would expect more participants with higher income.
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25 Aside from the income-item, the other item-subscale correlations and the
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27 subscale reliability were acceptable and only a fraction of the sample did not provide
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29 an answer to the item on income (2.2%). Therefore, as in the other EPRES scales, we
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31 believe the subscale can be used in its current form in future studies.
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38 **'Disempowerment'**

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40 The items in 'disempowerment' had acceptable item-subscale correlations and
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42 reliability. However, some response options ("my working hours/salary was decided
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44 within my working team" and "do not know") were hardly used at all in, indicating that
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46 these options might not be appropriate for the current population in the Swedish
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48 context. Further, the remaining response options were also inadequate from an
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50 adaptational point of view. For example, the working hours/salary being in line with
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52 collective bargaining agreements does not imply that the working hours/salary was not
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54 set by the employer; these options are not mutually exclusive. In a revised EPRES-Se,
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3 the disempowerment-items would benefit from revision and clarification. Combining
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5 response options not mutually exclusive could be considered as one way of improving
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7 the subscale, such as "my working hours/salary are in accordance with Swedish law
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9 and the collective agreement, decided by my employer" and "my working hours/salary
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11 are not in accordance with Swedish law and the collective agreement, decided by my
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13 employer".
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22 **'Rights'**

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24 The new item assessing sickness benefit had an acceptable item-subscale correlation
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26 and factor loading, similar to the other item-subscale correlations and factor loadings
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28 in the subscale, Further, the subscale reliability was good. Taken together, these results
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30 point towards that the new item worked well in the subscale.
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38 **Limitations and generalizability**

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40 This study finds strength in the fact that it is the first study translating and adapting
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42 EPRES-2010 to the Swedish context. It is the first study to use EPRES to collect data in
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44 Sweden. In addition, this work provides context-specific recommendations for future
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46 research using EPRES-Se. This study is, however, not without limitations.
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51 One of the main limitations is the sample. The sample was restricted to
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53 employees with a non-standard employment and the sample was skewed towards on-
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55 demand/by the hour employees. EPRES, however, is developed to measure
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57 precariousness independent of the type of employment (7). By only sampling non-
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3 standard employees the scale properties cannot be directly compared to similar studies
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6 as the heterogeneity of the sample is limited. A sample with greater diversity could
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9 have provided better insights as to how the scale behaved. However, as the majority
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11 of non-standard contracts in Sweden are on-demand (27) it is not unlikely that the
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13 distribution would have been similar if conducting the study again, using the same
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15 inclusion criteria. Further, being a convenience sample limits the generalizability of the
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17 results.
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24 **Conclusion**

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27 The study found that the global reliability of the scale was good, that all response
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29 options were used for all items and that there were few missing values. Five out of six
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31 subscales worked well, considering this being the first translation and adaptation, while
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33 one subscale, 'temporariness', did not work at all and would need revision before
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35 implementing the scale in further research. As employment precariousness is an
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37 emergent determinant of health it is important that PE can be properly measured. The
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39 EPRES-Se is an important step in this direction. The researchers therefore encourage
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41 others to continue working with EPRES-Se and to validate it further in populations of
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43 both standard and non-standard employees. In order to enable international
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45 comparisons and multinational studies, similar studies in other European countries are
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47 also called for.
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STATEMENTS

Author contributions: The study was conceived by TB and GJ. All authors contributed to the design of the study. TB translated and back-translated the EPRES, AV supported the translation process and examined the back translation. JJ collected the data with support from TB and GJ. JJ and TB conducted the analyses. JJ wrote the draft(s) of the manuscript. All authors reviewed the drafts and provided feedback on its content.

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7 manuscript.
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14 **Data sharing:** Data are from the PREMIS study whose authors may be contacted at
15
16 johanna.jonsson@ki.se. Data cannot be made publicly available for ethical and legal
17
18 reasons, but could be made available to researchers who meet the criteria for access
19
20 to confidential data after approval from the Regional Ethics Committee of Stockholm.
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SUPPLEMENTARY MATERIAL

Supplementary material A. EPRES-Se

TEMPORALITET

1. Hur länge gäller ditt nuvarande kontrakt?

Om du har flera arbetsgivare anger du den arbetsgivare du arbetar för flest timmar en genomsnittlig månad.

- Tillsvidare
- 2 år eller mer
- 1 år eller mer
- 6 månader eller mer
- 3 månader eller mer
- 1 månad eller mer
- Kortare än 1 månad
- Har inget kontrakt
- Vet ej

2. Hur länge har du jobbat för samma arbetsgivare/uppdragsgivare?

Om du har flera arbetsgivare anger du den arbetsgivare du arbetar för flest timmar en genomsnittlig månad.

- Mindre än 1 månad
- 1 månad till mindre än 3 månader
- 3 månader till mindre än 6 månader
- 6 månader till mindre än 1 år
- 1 år till mindre än 2 år
- 2 år till mindre än 5 år
- 5 år eller mer

LÖN

3. Ungefär hur mycket tjänar du per månad netto (efter skatt)?

Lägg ihop summan för din vita lön efter skatt + svart lön + eventuell dricks, en genomsnittlig månad.

- 3 000 kr eller mindre
- Mellan 3 001 och 6 000 kr
- Mellan 6 001 och 9 000 kr
- Mellan 9 001 och 12 000 kr
- Mellan 12 001 och 15 000 kr
- Mellan 15 001 och 18 000 kr
- Mellan 18 001 och 21 000 kr
- Mellan 21 001 och 24 000 kr
- Mellan 24 001 och 27 000 kr
- Mellan 27 001 och 30 000 kr
- Mer än 30 000 kr
- Inget svar

Hur ofta tillåter din nuvarande lön dig att...

- Alltid
- Ofta

4. Täcka dina dagliga grundläggande behov?

- Ibland

5. Täcka oförutsedda utgifter av betydelse?

- Sällan
- Aldrig

MAKTLÖSHET

6. Hur bestämdes arbetstiderna för ditt nuvarande arbete?

Välj det alternativ som stämmer bäst in på dig. Om du har flera arbetsgivare anger du den arbetsgivare du arbetar för flest timmar en genomsnittlig månad.

- De följer lag och kollektivavtalet
- De bestämdes av arbetsgivaren
- De var en överenskommelse mellan mig och min chef
- De var en överenskommelse i mitt arbetslag
- Vet ej
- Ej relevant, arbetar uppdragsbaserat

7. Hur bestämdes lönen för ditt nuvarande arbete?

Välj det alternativ som stämmer bäst in på dig. Om du har flera arbetsgivare anger du den arbetsgivare du arbetar för flest timmar en genomsnittlig månad.

- Den följer kollektivavtalet
- Den bestämdes av arbetsgivaren
- Den var en överenskommelse mellan mig och min chef
- Den var en överenskommelse i mitt arbetslag
- Vet ej

SÅRBARHET

Ange hur ofta hos din arbetsgivare som...

Om du har flera arbetsgivare anger du den arbetsgivare du arbetar för flest timmar en genomsnittlig månad.

Var god besvara alla frågor.

8. Du är rädd för att kräva bättre arbetsvillkor

- Alltid
- Ofta

9. Du är försvarslös mot orättvis behandling från överordnande

- Ibland
- Sällan

10. Du är rädd för att få sparken om du inte gör allt arbetsgivaren ber om

- Aldrig

11. Du blir behandlad auktoritärt

12. De får dig att känna dig lätt utbytbar

RÄTTIGHETER

Har du rätt till något av följande?

Var god besvara alla frågor.

13. Föräldraledighet

- Ja

- Nej

14. Ålderspension

- Vet ej

15. A-kassa

16. Avgångsvederlag vid uppsägning

17. Sjukersättning/sjukpenning

UTÖVANDE AV RÄTTIGHETER

Hur ofta i den organisation där du arbetar kan du utöva följande rättigheter?

Om du har flera arbetsgivare anger du den arbetsgivare du arbetar för flest timmar en genomsnittlig månad.

Var god besvara alla frågor.

18. Ta helg/veckovila utan problem

- Alltid

- Ofta

19. Ta semesterdagar utan problem

- Ibland

- Sällan

20. Ta en ledig dag av familjescäl utan problem (vård av sjukt barn, vård av sjuk anhörig etc.)

- Aldrig

21. Ta en ledig dag av personliga skäl utan problem

22. Sjukskriva dig utan problem

23. Gå till läkare när du behöver

Supplementary material B. English translation of EPRES-Se with coding

TEMPORARINESS

Coding

1. How long is your current employment contract valid?	- Indefinitely	0
	- 2 years or more	1
If you have more than one employer, please indicate the employer you work the most hours for during an average month.	- 1 year or more	1
	- 6 months or more	2
	- 3 months or more	3
	- 1 month or more	3
	- Less than 1 month	3
	- Do not have a contract	4
	- Do not know	4

2. How long have you been working for the same employer?	- Less than 1 month	4
	- 1 month to less than 3 months	3
If you have more than one employer, please indicate the employer you work the most hours for during an average month.	- 3 months to less than 6 months	3
	- 6 months to less than 1 year	2
	- 1 year to less than 2 years	2
	- 2 years to less than 5 years	1
	- 5 years or more	0

WAGES

3. Approximately how much do you earn per month after taxes?	- 3000 SEK or less	4
	- Between 3001 and 6000 SEK	4
Add the amount for your salary after tax deductions + salary for illicit work + any tips, during an average month.	- Between 6001 and 9000 SEK	3
	- Between 9001 and 12 000 SEK	3
	- Between 12 001 and 15 000 SEK	2
	- Between 15 001 and 18 000 SEK	2
	- Between 18 001 and 21 000 SEK	1
	- Between 21 001 and 24 000 SEK	1
	- Between 24 001 and 27 000 SEK	0
	- Between 27 001 and 30 000 SEK	0
	- More than 30 000 SEK	0
	- No answer	-

How often does your current salary allow you to...	- Always	0
	- Often	1
4. Cover you daily basic needs?	- Sometimes	2
5. Cover unforeseen expenses of significance?	- Rarely	3
	- Never	4

DISEMPOWERMENT

6. How were your working hours settled for your current job?

Indicate the alternative that fits you best. If you have more than one employer, please indicate the employer you work the most hours for during an average month.

- | | |
|------------------------------------------------------------------------------------|---|
| - My working hours are in accordance with Swedish law and the collective agreement | 0 |
| - My employer decided my working hours | 3 |
| - My working hours are the result of an agreement between me and my manager | 2 |
| - My working hours are the result of an agreement within my work team | 1 |
| - Do not know | 4 |
| - Not applicable. I work project-based | 2 |

7. How was the salary settled for your current job?

Indicate the alternative that fits you best. If you have more than one employer, please indicate the employer you work the most hours for during an average month.

- | | |
|---------------------------------------------------------------------|---|
| - My salary is accordance with the collective agreement | 0 |
| - My salary was set by my employer | 3 |
| - My salary is the result of an agreement between me and my manager | 2 |
| - My salary is the result of an agreement in my work team | 1 |
| - Do not know | 4 |

VULNERABILITY

Indicate how often, at your employer...

If you have more than one employer, please indicate the employer you work the most hours for during an average month.

Please indicate an answer to all of the questions.

8. You feel afraid to demand better working conditions

- | | |
|-------------|---|
| - Always | 4 |
| - Often | 3 |
| - Sometimes | 2 |

9. You are defenceless towards unfair treatment by your superiors

- | | |
|----------|---|
| - Rarely | 1 |
| - Never | 0 |

10. You feel afraid of being fired if you do not comply with everything your employer asks of you

11. You are treated in an authoritarian manner

1
2
3 **12. You are made to feel easily replaceable**
4
5

6 **RIGHTS**
7

8
9 **Do you have the right to any of the following?**

10 Please indicate an answer to all of the questions.
11

12			
13	13. Parental leave	- Yes	0
14		- No	1
15	14. Retirement due to old age	- Do not know	2
16			
17	15. Unemployment insurance fund (A-kassa)		
18			
19	16. Severance pay in the event of termination		
20			
21	17. Sickness benefit		
22			
23			

24 **EXERCISE OF RIGHTS**
25

26
27
28 **How often, in the organisation where you work, are**
29 **you able to exercise the following rights?**

30 If you have more than one employer, please indicate the
31 employer you work the most hours for during an average
32 month.
33

34 Please indicate an answer to all of the questions.
35

36	18. Take the weekend off/ weekly rest without	- Always	0
37	problem	- Often	1
38	19. Take vacation days without problem	- Sometimes	2
39		- Rarely	3
40	20. Take a day off for family reasons without	- Never	4
41	problem (care of a sick child, care of a sick relative		
42	etc.)		
43			
44	21. Take a day off for personal reasons without		
45	problem		
46			
47	22. Go on sick leave without problem		
48			
49	23. Go to the doctor when needed		
50			
51			

Supplementary material C. Comparison of subscale means for recoding of participants with an indefinite contract and on demand/by the hour employment

Crosstabulation of type of employment and contractual length

Table showing crosstabulation of type of employment and contractual length (EPRES-Se item 1)

Contractual length	Type of employment			Total
	Temporary employment	Employed on demand/by the hour	Self-employed (involuntary), intern, part-time	
Indefinitely	16 ^a	139 ^b	20 ^a	175
2 years or more	3	3	1	7
1 year or more	9	7	1	17
6 months or more	34	32	9	75
3 months or more	24	19	6	49
1 month or more	16	6	2	24
Less than 1 month	11	5	0	16
I do not have a contract	2	21	12	35
Do not know	6	11	0	17
Total	121	243	51	415

^a Used in comparison 2

^b Used in comparison 1

1. Comparison of subscale means for employees with an indefinite contractual length and on demand/by the hour employment

Table showing subscale averages for employees with an indefinite contractual length and an on demand/by the hour employment

Subscale	N	Minimum	Maximum	Mean	Std. Deviation
Wages	135	0.00	3.67	1.76	0.72
Disempowerment	139	0.00	4.00	2.22	0.97
Vulnerability	137	0.00	4.00	1.35	0.94
Rights	136	0.00	4.00	2.35	1.06
Exercise of rights	136	0.00	3.50	1.74	0.71
Valid N	134				

Table showing least sum of squares-differences between subscale averages for employees with an on demand/by the hour employment, comparing employees with an indefinite contractual length vs. employees with any other contractual length

EPRES-Se item 1. How long is your current employment valid?								
Subscales	2 y	1y	6m	3m	1m	<1m	No contract	I don't know
Wages	0.014	0.652	0.320	0,100	0.348	0.096	0.142	0.025
Disempowerment	0.386	0.291	0.063	0,360	0.303	0.119	0.053	0.189
Vulnerability	1.216	0.092	0.320	0,004	0.518	0.251	0.461	0.658
Rights	2.086	0.467	0.053	0,659	0.180	0.113	0.123	0.338
Exercise of rights	0.185	0.764	0.135	0,191	0.315	0.040	0.046	0.558
Sum	3.887	2.266	0.891	1.313	1.664	0.620	0.824	1.769

2. Comparison of subscale means for employees with an indefinite contractual length and any other type of employment (excluding on demand/by the hour)

Table showing subscale averages for employees with an indefinite contract length and any other type of employment

Subscales	N	Minimum	Maximum	Mean	Std. Deviation
Wages	35	0.33	4.00	1.819	0.919
Disempowerment	36	0.00	4.00	2.194	1.104
Vulnerability	36	0.00	4.00	1.167	0.966
Rights	36	0.00	4.00	2.356	1.182
Exercise of rights	36	0.00	4.00	1.690	0.876
Valid N	35				

Table showing least sum of squares-differences between subscale averages for employees with any other employment (excluding on demand/by the hour employees), comparing employees with an indefinite contractual length vs. employees with any other contractual length

EPRES-Se item 1. How long is your current employment valid?								
Subscales	2 y	1y	6m	3m	1m	<1m	No contract	I don't know
Wages	1.402	0.486	0.510	0.624	0.504	0.819	0.264	0.459
Disempowerment	0.569	0.244	0.218	0.094	0.083	0.058	0.377	0.028
Vulnerability	0.533	0.233	0.517	0.667	0.500	0.258	0.276	0.633
Rights	1.456	0.836	0.132	0.276	0.378	0.792	0.298	0.422
Exercise of rights	0.357	0.957	0.252	0.179	0.227	0.311	0.404	0.032
Sum	4.317	2.756	1.629	1.839	1.692	2.238	1.619	1.575

Supplementary material D. Weighted results, table 1-4**Table 1. Weighted demographic characteristics of the study population (percentages), N=415**

		%
Age	18-24	34%
	25-29	43%
	30-64	23%
Sex	Male	50%
	Female	50%
Employment	Temporary employment	21%
	Employed on demand/by the hour	64%
	Self-employed (involuntary)	3%
	Intern	1%
	Part-time employed (involuntary)	10%

Table 2. Weighted item descriptive statistics and Pearson item-subscale correlations of EPRES-Se

Item	Missing % ¹	Mean	SD ²	Response frequency ³					Pearson item subscale correlations ⁴					
				0	1	2	3	4	T	W	D	V	R	ER
Temporariness														
Length of contract ⁵	0.0	2.5	1.1	9.5	5.8	17.9	56.0	10.9	-0.05	0.03	-0.02	0.06	0.06	0.05
Time working empl. ⁵	0.0	2.1	0.9	2.8	22.1	43.8	27.8	3.5	-0.05	0.15	0.16	0.05	0.36	0.21
Wages														
Income monthly	3.5	2.6	1.1	6.9	6.6	23.3	47.0	16.1	0.13	0.40	0.05	-0.00	0.28	0.24
Cover basic need	1.3	0.8	0.9	40.2	44.2	11.4	2.5	1.7	0.01	0.62	0.05	0.27	0.13	0.28
Cover unforeseen expen.	1.3	1.8	1.1	13.3	28.7	34.3	15.6	8.1	0.13	0.57	0.08	0.43	0.17	0.22
Disempowerment														
Working hour settled ⁵	0.0	2.2	1.2	18.7	0.7	26.3	47.8	6.5	0.08	0.14	0.33	0.08	0.19	0.15
Salary settled ⁵	0.0	2.2	1.2	19.3	2.1	19.3	54.1	5.2	0.07	-0.03	0.33	0.00	0.10	0.12
Vulnerability														
Demand work cond.	1.3	1.5	1.1	21.8	33.0	28.4	11.4	5.4	0.04	0.20	0.09	0.76	0.09	0.26
Unfair treatment	1.3	1.2	1.1	28.5	39.2	18.4	9.9	4.0	0.04	0.20	0.08	0.80	0.11	0.26
Afraid fired	1.3	1.4	1.2	28.4	30.9	21.4	13.3	6.0	0.09	0.31	0.10	0.79	0.17	0.38
Treated authoritarian	1.3	1.2	1.1	28.4	38.1	19.1	9.9	4.5	0.03	0.22	-0.04	0.64	0.12	0.23
Easily replaced	1.3	1.6	1.3	21.6	33.2	22.7	11.5	11.1	0.13	0.30	-0.02	0.74	0.15	0.24
Rights														
Right parental leave	1.3	1.2	0.8	23.0	33.7	43.3			0.19	0.20	0.22	0.12	0.59	0.22
Right retirement	1.3	1.2	0.8	24.4	29.8	45.8			0.29	0.20	0.23	0.17	0.59	0.28
Right unemployment	1.3	1.0	0.9	36.7	24.7	38.6			0.13	0.17	0.05	0.07	0.61	0.12
Right severance pay	1.3	1.4	0.6	6.0	53.2	40.8			0.14	0.11	0.04	0.05	0.50	0.05
Right sickness benefits	1.3	1.0	0.9	38.7	26.8	34.5			0.28	0.15	0.10	0.13	0.53	0.15
Exercise of rights														
Take weekend off	1.3	1.7	1.1	19.9	17.4	44.6	11.5	6.5	0.07	0.23	0.14	0.21	0.13	0.67
Take vacation	1.3	1.9	1.0	12.3	20.1	43.4	18.3	6.0	0.15	0.25	0.18	0.27	0.19	0.71
Take day off	1.3	1.7	1.1	21.4	17.8	41.4	13.6	5.8	0.18	0.22	0.19	0.25	0.20	0.77
Take day off, pers.	1.3	1.9	1.1	13.7	19.1	41.8	16.4	9.0	0.12	0.23	0.05	0.37	0.19	0.71
Sick leave	1.3	1.6	1.1	21.7	19.1	42.9	12.1	4.1	0.11	0.22	0.15	0.23	0.19	0.71
Go to doctor	1.3	1.2	1.1	34.3	27.1	28.2	7.2	3.2	0.19	0.28	0.07	0.24	0.19	0.68

¹ Proportion of participants with any missing item; ² SD=Standard Deviation; ³ Frequency (%) of participants indicating the specific response. 0 indicates the lowest precariousness score, 4 indicating the highest precariousness score. ⁴ Corrected for overlap, i.e., item is removed from the corresponding subscale. T=Temporariness; W=Wages; D=Disempowerment; V=Vulnerability; R=Rights; ER=Exercise rights. ⁵ Inter-item correlations

Table 3. Weighted scale descriptive statistics: range, mean, standard deviation (SD), floor and ceiling effects and Cronbach's alpha coefficient

Subscale	Items	Mean	SD	Missing (%) ¹	Obs. range	Floor % ²	Ceiling % ²	Cronbach's alpha
Temporariness	2	2.3	0.7	0.0	0-4	0.3	1.3	-0.10
Wages	3	1.7	0.8	4.7	0-4	2.9	0.9	0.70
Disempowerment	2	2.2	1.0	0.0	0-4	8.7	2.4	0.49
Vulnerability	5	1.4	1.0	1.2	0-4	14.1	2.0	0.90
Rights	5	2.3	1.2	1.3	0-4	3.8	17.7	0.78
Exercise of rights	6	1.6	0.9	1.3	0-4	7.2	1.0	0.89
EPRES-se	23	1.9	0.5	4.8	0.09-3.07	0.2	0.6	0.84

¹ Proportion of participants with any missing item

² Proportion of participants with lowest (floor) and highest (ceiling) EPRES-Se scores

Table 4. Weighted factor loadings from exploratory factor analysis of the EPRES-Se

	Factor					
	Exercise rights	Vulnerability	Rights	Wages	Disempowerment	Temporariness
Temporariness						
Length of contract						-0.21
Time working empl.	0.17		0.37		0.14	-0.39
Wages						
Income monthly	0.20	-0.11	0.25	0.49		-0.24
Cover basic need	0.20	0.19		0.66		
Cover unforeseen expen.		0.35		0.84		0.18
Disempowerment						
Working hour settled			0.13		0.43	
Salary settled					0.69	0.16
Vulnerability						
Demand work cond.	0.11	0.81				
Unfair treatment		0.86				
Afraid fired	0.24	0.78		0.12	0.13	-0.11
Treated authoritarian	0.11	0.68			-0.14	
Easily replaced		0.76		0.17		
Rights						
Right parental leave	0.15		0.69		0.20	
Right retirement	0.17		0.68		0.24	-0.12
Right unemployment			0.70			-0.17
Right severance pay			0.56			
Right sickness benefits			0.60			0.14
Exercise rights						
Take weekend off	0.69			0.11		-0.11
Take vacation	0.74	0.12			0.10	
Take day off	0.82	0.11				0.14
Take day off, pers.	0.73	0.26			-0.10	0.10
Sick leave	0.74				0.15	-0.15
Go to doctor	0.69		0.11	0.15		

Table showing factor loadings >0.1

The weighted exploratory factor analysis extracted six factor with eigenvalues >1 (eigenvalues: 5.6; 3.0; 2.5; 1.5; 1.4; 1.1). These factors were the same as in EPRES-2010, thereby confirming the EPRES-2010 scale structure. Together, the six factor explained 65.4% of the variance.

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For peer review only

STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract (b) Provide in the abstract an informative and balanced summary of what was done and what was found
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported
Objectives	3	State specific objectives, including any prespecified hypotheses
Methods		
Study design	4	Present key elements of study design early in the paper
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group
Bias	9	Describe any efforts to address potential sources of bias
Study size	10	Explain how the study size was arrived at
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding (b) Describe any methods used to examine subgroups and interactions (c) Explain how missing data were addressed (d) If applicable, describe analytical methods taking account of sampling strategy (e) Describe any sensitivity analyses
Results		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed (b) Give reasons for non-participation at each stage (c) Consider use of a flow diagram
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders (b) Indicate number of participants with missing data for each variable of interest
Outcome data	15*	Report numbers of outcome events or summary measures
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included (b) Report category boundaries when continuous variables were categorized (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses

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Discussion		
Key results	18	Summarise key results with reference to study objectives
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence
Generalisability	21	Discuss the generalisability (external validity) of the study results
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Measuring precarious employment in Sweden: Translation, adaptation and psychometric properties of the Employment Precariousness Scale (EPRES)

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Complete List of Authors:	<p>Jonsson, Johanna; Karolinska Institutet, Institute of Environmental Medicine, Unit of Occupational Medicine</p> <p>Vives, Alejandra; Pontificia Universidad Catolica de Chile Escuela de Medicina, Department of Public Health; Universitat Pompeu Fabra, Department of Political and Social Sciences, Health Inequalities Research Group, Employment Conditions Knowledge Network (GREDS-EMCONET)</p> <p>Benach, Joan; Universitat Pompeu Fabra, Department of Political and Social Sciences, Health Inequalities Research Group, Employment Conditions Knowledge Network (GREDS-EMCONET); Universidad Autonoma de Madrid, Transdisciplinary Research Group on Socioecological Transitions (GinTRANS2)</p> <p>Kjellberg, Katarina; Karolinska Institutet, Institute of Environmental Medicine, Unit of Occupational Medicine; Stockholm County Council, Center for Occupational and Environmental Medicine</p> <p>Selander, Jenny; Karolinska Institutet, Institute of Environmental Medicine, Unit of Occupational Medicine</p> <p>Johansson, Gun; Karolinska Institute, Institute of Environmental Medicine, Unit of Occupational Medicine; Stockholm County Council, Center for Occupational and Environmental Medicine</p> <p>Bodin, Theo; Karolinska Institutet, Unit of Occupational Medicine, Institute of Environmental Medicine; Stockholm County Council, Center for Occupational and Environmental Medicine</p>
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Manuscripts

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3 **Measuring precarious employment in Sweden: Translation,**
4 **adaptation and psychometric properties of the Employment**
5 **Precariousness Scale (EPRES)**
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12 Johanna Jonsson* (MSc)¹, Alejandra Vives (MD, PhD)^{2,3}, Joan Benach (MD, PhD)^{3,4},
13 Katarina Kjellberg (PhD)^{1,5}, Jenny Selander (PhD)¹, Gun Johansson (PhD)^{1,5} & Theo
14 Bodin (MD, PhD)^{1,5}
15
16
17
18
19

20 1 Institute of Environmental Medicine, Unit of Occupational Medicine, Karolinska Institutet, Stockholm,
21 Sweden
22

23 2 Department of Public Health, School of Medicine, Pontificia Universidad Católica de Chile
24

25 3 Health Inequalities Research Group, Employment Conditions Knowledge Network (GREDS-
26 EMCONET), Department of Political and Social Sciences, Universitat Pompeu Fabra, Barcelona, Spain
27

28 4 Transdisciplinary Research Group on Socioecological Transitions (GinTRANS2). Universidad
29 Autónoma Madrid, 28049 Madrid, Spain
30

31 5 Centre for Occupational and Environmental Medicine, Stockholm County Council, Stockholm,
32 Sweden
33
34
35

36 * Corresponding author:
37

38 Johanna Jonsson
39

40 Karolinska Institutet
41

42 Institute of Environmental Medicine, Unit of Occupational Medicine
43

44 Solnavägen 4, 11365
45

46 Stockholm, SWEDEN
47

48 Johanna.Jonsson@ki.se
49

50 Telephone: +46 737 665367
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ABSTRACT

Objectives: Precarious employment is a determinant of poor health and health inequality. However, the evidence of health consequences and mechanisms underlying the associations, are still limited due to a lack of a comprehensive multidimensional definition and measurement instrument. The Employment Precariousness Scale (EPRES) is a Spanish, multidimensional scale, developed to measure degree of precarious employment. The aim of this study was to translate the EPRES-2010 into Swedish, adapt it to the Swedish context, and to assess the psychometric properties of the Swedish EPRES.

Method: EPRES was translated, adapted and implemented for data collection within the research project PREMIS. During 2016-2017, questionnaire data was collected from 483 non-standard employees in Stockholm, Sweden, sampled with web-based respondent-driven sampling. Analyses included item descriptive statistics, scale descriptive statistics and exploratory factor analysis.

Results: The final EPRES-Se consisted of six dimensions and 23 items. There was a high response rate to all items and response options. Global Cronbach's alpha was 0.83. Subscales 'vulnerability', 'rights' and 'exercise rights' had reliability coefficients between $\alpha = 0.78-0.89$ and item-subscale correlations between $r = 0.48-0.78$. 'Temporariness' had poor reliability ($\alpha = -0.08$) and inter-item correlation ($r = -0.04$), while 'disempowerment' showed acceptable psychometric properties ($\alpha = 0.5$; $r = 0.34$). Exploratory factor analysis confirmed the original EPRES factor structure.

Conclusions: 'Vulnerability', 'wages' 'rights', 'exercise rights' and 'disempowerment'

1
2
3 worked in the Swedish context; however 'temporariness' would need revising before
4
5
6 implementing the EPRES-Se in further research. Continued work and validation of
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8
9 EPRES-Se is encouraged. In order to enable international comparisons and
10
11 multinational studies, similar studies in other European countries are also called for.
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17 **Strengths and limitations of this study:**
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- 19 • First translation and adaptation of the EPRES-2010 to Swedish and the Swedish
20 context
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- 23 • First assessment of the psychometric properties of the EPRES-Se
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- 26 • Relatively small sample restricted to non-standard employees
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- 29 • Limited generalizability of results
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INTRODUCTION

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6 Precarious employment (PE) is considered a social determinant of poor health and
7
8 health inequality (1-3). PE is present in both developing as well as developed countries
9
10 (4, 5). However, evidence of the health consequences of precarious employment, and
11
12 by which mechanisms PE harm workers' health, is still limited due to the lack of a
13
14 comprehensive multidimensional definition and measurement instrument (6). This lack
15
16 also brings about challenges in terms of capturing the size of the population in
17
18 precarious employment, conducting occupational health and safety surveillance (6, 7),
19
20 as well as cross-country comparisons. The Employment Precariousness Scale (EPRES) is
21
22 a Spanish questionnaire developed to measure six dimensions of precarious
23
24 employment. EPRES has previously been validated in Spanish and Chilean populations
25
26 (8-11), and also applied to the population of Catalonia (12), but as of yet there is no
27
28 Swedish translation or adaptation.
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Precarious Employment

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41 During the past decades, neoliberal economics and policies together with increased
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43 globalization, trade competition, technological innovation and financial crises, has had
44
45 a considerable impact on the dynamics of the labour market (5, 13, 14). These impacts
46
47 have had several implications, including an increase in privatization, downsizing,
48
49 outsourcing, a weakening of union input and collective regulation, and a more
50
51 competitive and uncertain context for workers, with increases in flexible work,
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53 unemployment and non-standard employment arrangements (5, 13, 14). Furthermore,
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3 there has been a decline in attachment to employers, risk shifting from employer to
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5 employees, growth in perceived and actual job insecurity and work-based stress, as
6
7 well as diminished bargaining power and rights (13, 14).
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11 Non-standard arrangements, in comparison with standard employment
12
13 contracts (i.e., open-ended full-time contracts), includes part-time work
14
15 (underemployment), temporary work, temporary agency work, zero hour contracts,
16
17 "gig" work arrangements and self-employment (1, 4, 7, 14, 15). Non-standard work can
18
19 also include holding multiple jobs (16). A comprehensive term used to describe forms
20
21 of non-standard employment is "precarious employment" (17). Precarious employment
22
23 does not, however, solely refer to the type of employment, but also to unfavorable
24
25 employment conditions, such as vulnerability, low pay, low levels of social security and
26
27 rights (3, 4, 14, 17-21). As these elements are not exclusively found in non-standard
28
29 employments *per se*, employees in a standard employment also are at risk of
30
31 experiencing precariousness (14, 22, 23). Thereby, it is important to move beyond a
32
33 simplistic categorical grouping of employment, such as temporary vs. permanent, and
34
35 instead work towards a comprehensive multidimensional approach that enables a
36
37 better understanding of precarious employment (16, 23). Today, several proposals and
38
39 attempts to create multidimensional constructs capturing precarious employment exist
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41 (e.g., (10, 21, 24-26)), but as of yet there is no universally accepted definition.
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54 By the means of a cross-national multidimensional definition and measurement
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56 instrument of precarious employment, comparative and more precise estimations of
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58 health effects are made possible. Previously, PE has been linked to an array of health
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3 issues including mental and physical health (2, 27) and occupational injuries (28).
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5
6 Previous research on related concepts such as job insecurity and temporary
7
8 employment also show consistent associations with various health outcomes (29-32).
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11 Mechanisms linking precarious employment and health are not yet fully understood
12
13 but pathways that have been suggested include more harmful working conditions,
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15 limited control over one's professional and personal lives, feelings of insecurity and
16
17 incomes below the subsistence level, which consequently can affect other social
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19 determinants of health such as housing quality, lifestyles and so on (33).
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27 **The Employment Precariousness Scale (EPRES)**

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30 EPRES is a Spanish, multidimensional theory-based scale, developed to measure
31
32 degree of precarious employment among waged and salaried workers (8). EPRES is
33
34 comprised of 22 items and six subscales corresponding to six dimensions:
35
36 'temporariness' (contract duration; two items), 'wages' (low or insufficient; possible
37
38 economic deprivation; three items), 'disempowerment' (level of negotiation of
39
40 employment conditions; two items), 'vulnerability' (defenselessness to authoritarian
41
42 treatment; five items), 'rights' (entitlement to workplace rights and social security
43
44 benefits; four items) and 'exercise rights' (powerlessness, in practice, to exercise
45
46 workplace rights; six items) (8, 9). EPRES items are scored on a 5-point or 3-point scale,
47
48 depending on item, and all items taken together will give a global score ranging
49
50 between 0 (least precarious) and 4 (most precarious) (34). EPRES has demonstrated
51
52 good acceptability, good internal consistency and evidence of construct validity in
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3 Spanish and Chilean populations (8, 9). The original EPRES scale was revised in 2015
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5 (hereafter known as EPRES-2010), which showed good metric properties and improved
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7
8 sensitivity to worker vulnerability and employment stability (10).
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11 12 13 **Precarious employment in Sweden**

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16 It is challenging to put Sweden in a comparative context of precarious employment as
17
18 there is no consensus on its operationalization. Sweden has, according to some
19
20 definitions (as defined by a typological approach of 11 indicators), one of the smallest
21
22 proportions of precarious employees among the Scandinavian countries (19). However,
23
24 in other measures (defined by involuntary part-time work, temporary employment and
25
26 fear of job-loss) Sweden has the highest proportion of precarious employed individuals
27
28 (25) and the highest proportion of fixed-term employment contracts (35) in the same
29
30 context. Reports show that the Swedish labour market is growing increasingly more
31
32 insecure, especially for temporary employees (36, 37). The proportion of temporary
33
34 employees has been stable around 15-17% since the late 1990's (37, 38). There has,
35
36 however, been reports on a shift within this group where longer-term positions have
37
38 been replaced by a higher proportion of on-demand employees and day laborers,
39
40 which are more precarious by nature (36, 37, 39). Especially women (19%, compared to
41
42 15% among men), 16-24 year-olds (56%, compared to 21% among 25-34 year-olds
43
44 and 9% among 35-44 year-olds), and foreign born (24%, compared to 15% among
45
46 individuals born in Sweden) are likely of holding a temporary employment (37). These
47
48 are groups that reportedly are exposed to high employment precariousness (19).
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3 Further, around 10% of the employees in Sweden are not covered by collective
4 bargaining agreements and around 9% have multiple jobs. The latter has seen an
5 increase with 1.5% percentage points since 2005 (39). According to a definition by the
6 Swedish Labour Policy Council, the group of atypical employees is constituted by those
7 that fulfil one of the following: not being covered by a collective bargaining agreement,
8 have a temporary employment, are employed by a temp agency or are self-employed,
9 have their own company, hold multiple jobs or are working in the informal sector. This
10 group of atypical workers is estimated to be around 35-39% of the Swedish workforce
11 (39), and likely of experiencing precariousness.

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Thereby, despite the stable levels of temporary employment in Sweden, it could
be assumed that the level of precariousness has increased on the Swedish labour
market. A study from Finland, however, indicate that the precariat (as defined by
atypical employment, previous unemployment, fear of job-loss, poor prospects of
employment and low earnings) has not seen an increase the past couple of decades
(40). Without longitudinal studies assessing changes in precarious employment over
time, evidence in Sweden remains inconclusive.

A translation and adaptation of EPRES to Swedish and the Swedish context is
thus an important step in the direction to fully comprehend the distribution and trends
of precarious employment in the Swedish population, as well as to allow for cross-
country comparisons. Such an instrument would also enable well-needed studies on
the health outcomes of precarious employment.

Aim

The aim of this study was to translate the EPRES-2010 into Swedish, adapt it to the Swedish context, and to assess the psychometric properties of the Swedish EPRES.

METHOD

In order to fulfil the study aims, the EPRES-2010 was first translated into Swedish and subsequently adapted to suit the Swedish context (hereafter known as EPRES-Se). Thereafter, EPRES-Se was piloted and implemented as a part of the survey used in the research project Precarious Employment in Stockholm (PREMIS).

Translation and adaptation of EPRES

The translation and adaptation process of the EPRES-2010 consisted of five steps: 1. Translation from Spanish to Swedish; 2. Cultural adaptation to fit the Swedish context; 3. Back translation to Spanish and adjustments; 4. Pilot testing; 5. Final adaptations based on user feedback in pilot.

1. The Spanish version of the revised EPRES-2010 scale, which has been published elsewhere (10), was translated into Swedish. The translation was done by a bilingual member of the research team (TB) in close discussion with AV, a native Spanish speaker with previous experience of validation studies of EPRES.

2. Several adaptations of the questionnaire were implemented in order to fit Swedish labour market conditions. The questionnaire and its translation was discussed during workshops in the project team, which consisted of Swedish, Spanish and Chilean

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3 researchers within public - and occupational health, as well as within the reference
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5 group involved in PREMIS, which consisted of labour union members and workers with
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7 experience of precarious employment.
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11 3. Several drafts of the Swedish questionnaire were translated back to Spanish
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13 during the adaptation process and discussed until the final translation was decided
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15 upon.
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19 4. A two-stage pilot testing was performed: first face-to-face with five volunteers
20
21 from the reference group, and thereafter online with six volunteers who were currently
22
23 working but without a permanent full-time employment. The latter were also asked to
24
25 participate in an evaluation of the survey either via the phone or online.
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29 5. With the input from the pilot, a few minor adaptations were made to the
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31 EPRES.
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37 Further, in order to offer non-Swedish speaking participants an opportunity to
38
39 participate in the PREMIS-study, the PREMIS-survey, including the Swedish version of
40
41 EPRES, was translated into English by an external, professional, translator. After the
42
43 translation, minor changes in terms of style and terminology was made by the research
44
45 group. The English translation of the EPRES-Se was not validated in this study, nor has
46
47 it been validated in any previous studies.
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56 **Implementation of the EPRES-Se**

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59 PREMIS is an ongoing, longitudinal, web-based study conducted in Stockholm county,
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3 Sweden. PREMIS aims at methodological development in terms of sampling strategies
4
5 and assessment of precarious employment, as well as at studying health outcomes of
6
7 precarious employment. In 2016-2017, 483 non-standard employees were sampled
8
9 with web-based respondent-driven sampling (webRDS). WebRDS uses peer-to-peer
10
11 recruitment to build a sample from populations that are hard-to-reach and therefore
12
13 lacks a sampling frame (41). Questionnaire data was collected through an online survey
14
15 tool specifically developed for RDS (42). The PREMIS-survey included all the items of
16
17 the EPRES-Se, as well as questions on employment type, occupational environment,
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19 health outcomes and background. The survey could be completed in Swedish or
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21 English.
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31 As one of the aims of PREMIS was to sample precarious employees with
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33 webRDS, a process which has been described elsewhere (43), participation in the study
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35 was restricted to individuals considered particularly vulnerable to precarious
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37 employment conditions, such as individuals with temporary employment, on-demand
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39 employment, involuntary part-time employment and involuntary self-employment. The
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41 inclusion criteria for participants were: living and/or working in Stockholm County,
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43 being aged 18-65 years, having and indicating a Swedish personal identification
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45 number, and having a current employment. Exclusion criteria were: having a fixed, full-
46
47 time, employment, being voluntarily self-employed or being a student. Out of the 483
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49 participants included in the sample, 68 participants were excluded due to not matching
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51 criteria of county (n=6), re-using or giving an incorrect personal number (n = 8 and
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53 n=17, respectively), being underage (n = 1) or suspected cheating (i.e., systematic
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3 repeated participation; n=36), giving a final sample of 415 participants.
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6 7 **Statistical analysis** 8

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10 Item descriptive statistics (mean, standard deviations, response frequencies, missing
11 responses and Pearson item-subscale correlations) and scale descriptive statistics
12 (mean, standard deviations, missing items, range, floor and ceiling effects, and
13 reliability (Cronbach's alpha coefficient) were assessed for the entire sample.
14
15 Participants answering "No answer" on the question on income (question three in
16 EPRES-Se) were excluded from the analyses of this question due to the ambiguity of
17 the response alternative. Exploratory factor analysis was conducted in order to
18 determine the underlying factor structure of the data. Principal axis factoring, with
19 varimax rotation, extracting eigenvalues >1 was used, which is the method used in
20 previous EPRES-studies (8-10). Subanalyses were conducted without informal workers,
21 i.e., participants answering "I have no contract" to the question on contract duration
22 (question one in EPRES-Se). Further, as the sample was recruited with respondent-
23 driven sampling (RDS), weighted analyses were conducted in addition to the
24 unweighted analyses. RDSII weights (44) were calculated in RDS Analyst 0.42 for
25 Windows (Los Angeles, CA). The results from the weighted analyses will be shown in
26 full in the supplementary material. All analyses were performed using SPSS version 23
27 (IBM SPSS Statistics for Windows, Version 23. Armonk, NY:IBM Corp).
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57 **Ethical considerations** 58

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60 Permission from the Regional Ethics Committee of Stockholm was given for the study,

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3 with dnr: 2016/1291-31/5. Informed consent was attained from all participants by the
4
5 respondent clicking "Yes" to the question "I understand the information given above
6
7 and want to participate".
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10 11 12 13 14 **Patient and public involvement**

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16 In PREMIS, a reference group consisting of individuals with experience from
17
18 precarious employment and labour union representatives, was involved in the design
19
20 of the PREMIS-survey (design of survey and formulation of questions not otherwise
21
22 standardized) and data collection process (deciding on the appropriate compensation
23
24 for participation, recruitment of participants and testing the survey software) through
25
26 active discussions and workshops. Results will be disseminated to study participants
27
28 through the website of the PREMIS-study.
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40 **RESULTS**

41 42 43 44 45 **Adaptations of EPRES-Se**

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47 The following adaptations were made to the EPRES-Se in comparison with EPRES-2010.
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- 50
51 (1) The response alternatives in 'temporariness' were stated as categories, as opposed
52
53 to free text values of number of days, months or years in EPRES-2010, in order to
54
55 increase usability in the web-survey context. For the same reason, the question on
56
57 contract duration which contained three dependent items in EPRES-2010, was
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1
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3 collapsed into one question in EPRES-Se. In addition, the response options "I do
4
5 not have a contract" was added in order to capture informal work and "Do not
6
7 know" was added in order to capture poor contractual relationship.
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11 (2) In 'wages', the question of income was presented in local currency (SEK) and
12
13 intervals were set to ~300 EUR as the 150-200 EUR intervals used in the EPRES-2010
14
15 version were perceived as too narrow in the Swedish context. In EPRES-2010,
16
17 intervals were 150 EUR - 200 EUR below a monthly income of 1200 EUR, and 300
18
19 EUR above an income of 1201 EUR.
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23
24 (3) In EPRES-2010, the two response alternatives capturing working conditions that
25
26 were decided unilaterally by the employer, were merged into one response option
27
28 in the Swedish adaptation in order to enhance usability . Further, as some workers,
29
30 especially freelancers, are given a fixed budget with no hours specified, the
31
32 response alternative "Not applicable. I work project-based" was added for the
33
34 question on how salary was decided upon,
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40 (4) One of the items in 'vulnerability', "afraid to demand better working conditions...",
41
42 was taken from the original EPRES-scale (8) according to the recommendations
43
44 made by Vives et al. 2015 (10).
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49 (5) In 'rights', the question on pension in EPRES-2010 , which contained both pension
50
51 due to old age and disability, was split in two as these are distinct systems unrelated
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53 to one another in the Swedish context. Retirement pension (i.e., pension due to old
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55 age) was kept in EPRES-Se and disability pension was removed. However, a new
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3 item assessing the right to sickness benefit was added in the subscale instead,
4
5 capturing both long term sick leave and shorter spells of sickness absence.
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8 (6) In 'exercise of rights' the item on taking a day off for family reasons was clarified by
9
10 adding "care of a sick child, care of a sick relative etc." within brackets.
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16 **EPRES-Se**

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18 The final version of EPRES-Se consisted of a total of 23 items and six dimensions:
19
20 'temporariness' (two items), 'wages' (three items), 'disempowerment' (two items),
21
22 'vulnerability' (five items), 'rights' (five items) and 'exercise rights' (six items). As in the
23
24 EPRES-2010, the response scales were 5-point ordinal scales for 'temporariness', 5-
25
26 point ordinal and 5-point frequency scales for 'wages', 5-point frequency scales for
27
28 'vulnerability' and 'exercise rights', and 5-point and 3-point categorical scales for
29
30 'disempowerment' and 'exercise rights', respectively. See EPRES-Se in supplementary
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32 material A.
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43 **Coding of EPRES-Se**

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45 Similarly as EPRES-2010, subscale scores were computed as averages and transformed
46
47 into a 0-4 scale. The global EPRES score is the average of the six subscales, ranging
48
49 from 0-4, where 0 represent the lowest level of precariousness and 4 represent the
50
51 highest level of precariousness.
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56 For questions in 'temporariness', response options were coded slightly different
57
58 compared to EPRES-2010 in order to accommodate the changes made in the Swedish
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1
2
3 version. For instance, in the question of duration of contract, response options “Do not
4 have a contract” and “Do not know” were coded as 4 (most precarious), in comparison
5
6 with the Spanish version where a contract length of less than six months was coded as
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11 4. In the question on income, intervals were larger and consistent in size, as compared
12
13 to the Spanish version. The cut-offs for income were based on the Swedish median net
14
15 income for 2016, which was just above 18000 SEK for individuals 20-64 years of age
16
17 (45). The merging of items in ‘disempowerment’ did not affect the coding. The coding
18
19 of the individual items along with the English translation of EPRES-Se can be found in
20
21 the supplementary material B.
22
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30 **Issues leading to recoding of ‘temporariness’ dimension**

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32 When conducting the data analyses it was revealed that 79% (n=139) of the
33
34 respondents answering ‘indefinitely’ to the EPRES question on contract length (“How
35
36 long is your current employment contract valid?”) also answered that they were
37
38 employed on demand/by the hour on a question assessing employment type included
39
40 in the PREMIS-survey. We suspected that this combination could be a type of “zero
41
42 hour” contract, in which the employer is not required to offer the employee any fixed
43
44 number of hours of work at all per day, week or month (35). Thereby, this type of
45
46 employment situation could be regarded as contingent with a high degree of
47
48 precariousness. This was confirmed as the group indicating an indefinite contract
49
50 length *and* on-demand/by the hour employment, were most similar (in terms of the
51
52 other EPRES subscales) to employees with a contract lasting less than 1 month and
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3 least alike employees with a fixed-term contract >2 years. Consequently, we re-coded
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5
6 the group with an indefinite contract *and* on demand/by the hour-employment from
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9 0 to 3 (i.e., the same coding as the response alternative <1 month contract). Those with
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11 any other employment type and an indefinite contract (n=36) remained coded as 0.
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14 See results of subscale-average comparisons in the supplementary material C.
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19 **Psychometric properties of EPRES-Se**

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22 The demographic characteristics of the sample is shown in Table 1. The sample
23
24 consisted of a larger proportion 25-29 year-olds (45%) compared to the other age-
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26
27 groups, and a larger proportion women (54%) as compared to men. Further, the sample
28
29 was dominated by workers employed on demand/by the hour (59%).
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31

32
33 Table 2 shows the item-descriptive statistics. There was a small proportion of
34
35 missing values (< 3%). Item means were similar within subscales, with the greatest
36
37 mean difference found within 'wages' (item mean difference = 1.6). All response
38
39 options within the items were used by participants, although to a varying extent. Item-
40
41 subscale correlations were around 0.6-0.8 in 'vulnerability' and 'exercise of rights'; and
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43 around 0.4-0.6 in 'wages' and 'rights'. There was a weak correlation between item and
44
45 subscale in 'disempowerment' and no correlation between items in 'temporariness'.
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51 With exception of the latter, all items correlated higher with their corresponding
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53 subscale compared to other subscales.
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58 **Table 1. Demographic characteristics of the study** 59 **population (frequencies and percentages), N=415**

		N	%
Age	18-24	122	29
	25-29	185	45
	30-64	108	26
Sex	Male	190	46
	Female	225	54
Employment	Temporary employment	121	29
	Employed on demand/by the hour	243	59
	Self-employed (involuntary)	13	3
	Intern	2	1
	Part-time employed (involuntary)	36	9

Table 3 shows the scale descriptive statistics. The subscale mean scores ranged between 1.4 and 2.3, with a global average of 1.9. The proportion of participants with any missing values in the subscales were around 1%, except in the case of 'wages' where it was 3.1%. The latter also included participants answering "No answer" (n=9). Subscale scores ranged between 0-4, and global scale score ranged between 0.09-3.07. Both floor and ceiling effects were generally low (< 5%), with floor effects being highest for 'disempowerment' (9.2%) and 'vulnerability' (11.7%), and ceiling effects being highest for 'rights' (18.0%). Cronbach's alpha coefficients were around 0.7 or higher for 'wages', 'vulnerability', 'rights' and 'exercise of rights'. Only 'temporariness' exhibited a Cronbach's alpha coefficient close to 0. The global alpha coefficient was 0.83.

The exploratory factor analysis extracted six factors with eigenvalues above 1 (eigenvalues = 5.3; 3.2; 2.3; 1.6; 1.3; 1.1). The emerging factors were the same as in EPRES-2010, thereby confirming the original factor structure. Together, the six factors explained 64.1% of the variance. The six factors and their rotated factor loadings are

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3 shown in Table 4. All loadings were above 0.35, except in the case of “length of
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6 contract”.

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8 Subanalyses were conducted in order to investigate the potential effect of
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10 including informal workers in the sample (n=35), which had minor influence on the
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12 correlation between temporariness-items ($r=0.002$) and reliability of the subscale (-
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14 0.003). However, in the factor analysis seven factors with eigenvalues >1 emerged (5.3;
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16 3.2; 2.3; 1.6; 1.3; 1.1; 1.0), explaining 68.5% of the variance. The seventh factor was
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18 caused by a split of the temporariness dimension, grouping items on length of contract
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20 (duration) and time working for employer (tenure) in separate factors, with factor
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22 loadings of 0.33 and 0.42 respectively.
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30 Analyses for the weighted population sample resulted in virtually the same
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32 results in regard to item-subscale correlations, Cronbach’s alpha coefficients, floor
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34 and ceiling effects, as well as factor loadings from the exploratory factor analysis of
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36 EPRES-Se, and did thereby not affect the interpretation of the results. See the
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38 weighted results in table 1-4 in Supplementary material D.
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Table 2. Item descriptive statistics and Pearson item-subscale correlations of EPRES-Se

Item	Missing % ¹	Mean	SD ²	Response value frequency (%) ³					Pearson item subscale correlations ⁴					
				0	1	2	3	4	T	W	D	V	R	ER
Temporariness⁵														
Length of contract	0.0	2.6	1.1	36 (8.7)	24 (5.8)	75 (18.1)	228 (54.9)	52 (12.5)	-	0.04	0.05	0.06	0.08	0.04
Time working empl.	0.0	2.1	0.9	17 (4.1)	92 (22.2)	171 (41.2)	119 (28.7)	16 (3.9)	0.04	-	0.06	0.11	-	0.31
									0.04			0.04		
Wages														
Income monthly	2.2	2.4	1.2	43 (10.6)	45 (11.1)	87 (21.4)	171 (42.1)	60 (14.8)	0.09	0.39	0.14	-	0.29	0.17
Cover basic need	1.0	0.8	0.9	175 (42.6)	171 (41.6)	44 (10.7)	14 (3.4)	7 (1.7)	-	0.60	0.07	0.21	0.13	0.26
Cover unforeseen expen.	1.0	1.8	1.1	60 (14.6)	113 (27.5)	136 (33.1)	70 (17.0)	32 (7.8)	0.02	0.55	0.08	0.39	0.14	0.26
Disempowerment⁵														
Working hour settled	0.0	2.1	1.2	84 (20.2)	8 (1.9)	110 (26.5)	190 (45.8)	23 (5.5)	0.12	0.17	0.34	0.10	0.26	0.23
Salary settled	0.0	2.2	1.2	77 (18.6)	8 (1.9)	101 (24.3)	210 (50.6)	19 (4.6)	0.07	0.03	0.34	0.02	0.13	0.09
Vulnerability														
Demand work cond.	1.0	1.6	1.2	79 (19.2)	129 (31.4)	113 (27.5)	63 (15.3)	27 (6.6)	0.01	0.13	0.09	0.75	0.04	0.28
Unfair treatment	1.0	1.3	1.1	114 (27.7)	159 (38.7)	67 (16.3)	50 (12.2)	21 (5.1)	-	0.12	0.08	0.78	-	0.26
									0.03				0.01	
Afraid fired	1.0	1.5	1.2	106 (25.8)	130 (31.6)	81 (19.7)	60 (14.6)	34 (8.3)	0.06	0.20	0.10	0.78	0.04	0.35
Treated authoritarian	1.0	1.3	1.1	107 (26.0)	160 (38.9)	87 (21.2)	36 (8.8)	21 (5.1)	-	0.20	-	0.63	0.02	0.23
									0.04		0.01			
Easily replaced	1.0	1.6	1.3	91 (22.1)	124 (30.2)	92 (22.4)	55 (13.4)	49 (11.9)	0.06	0.22	0.02	0.74	0.04	0.27
Rights														
Right parental leave	1.2	1.2	0.8	100 (24.4)	130 (31.7)	180 (43.9)			0.18	0.16	0.26	0.05	0.58	0.16
Right retirement	1.2	1.2	0.8	107 (26.1)	113 (27.6)	190 (46.3)			0.26	0.22	0.23	0.07	0.60	0.16
Right unemployment	1.2	1.0	0.9	156 (38.0)	100 (24.4)	154 (37.6)			0.15	0.24	0.15	-	0.60	0.08
												0.01		
Right severance pay	1.2	1.4	0.6	20 (4.9)	223 (54.4)	167 (40.7)			0.11	0.06	0.03	-	0.48	0.03
												0.02		
Right sickness benefits	1.2	0.9	0.8	160 (39.0)	110 (26.8)	140 (34.1)			0.26	0.18	0.17	0.03	0.53	0.12
Exercise of rights														

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Take weekend off	1.0	1.6	1.1	86 (20.9)	93 (22.6)	154 (37.5)	48 (11.7)	30 (7.3)	-	0.23	0.18	0.18	0.10	0.62
									0.01					
Take vacation	1.2	1.9	1.1	50 (12.2)	88 (21.5)	163 (39.8)	77 (18.8)	32 (7.8)	0.14	0.22	0.20	0.30	0.15	0.68
Take day off	1.2	1.6	1.1	88 (21.5)	85 (20.7)	166 (40.5)	50 (12.2)	21 (5.1)	0.15	0.19	0.21	0.24	0.16	0.75
Take day off, pers.	1.0	1.9	1.2	63 (15.3)	78 (19.0)	159 (38.7)	69 (16.8)	42 (10.2)	0.11	0.21	0.08	0.36	0.07	0.74
Sick leave	1.2	1.6	1.1	98 (23.9)	74 (18.0)	163 (39.8)	50 (12.2)	25 (6.1)	0.06	0.22	0.20	0.26	0.12	0.69
Go to doctor	1.0	1.1	1.1	140 (34.1)	126 (30.7)	106 (25.8)	25 (6.1)	14 (3.4)	0.11	0.26	0.09	0.25	0.14	0.64

¹ Proportion of participants with any missing item; ² SD=Standard Deviation; ³ Frequency (%) of participants indicating the specific response. 0 indicates the lowest precariousness score, 4 indicating the highest precariousness score. ⁴ Corrected for overlap, i.e., item is removed from the corresponding subscale. T=Temporariness; W=Wages; D=Disempowerment ;V=Vulnerability; R=Rights; ER=Exercise rights. ⁵ Inter-item correlations

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Table 3. Scale descriptive statistics: range, mean, standard deviation (SD), floor and ceiling effects and Cronbach's alpha coefficient

Subscale	Items	Mean	SD	Missing (%) ¹	Obs. range	Floor % ²	Ceiling % ²	Cronbach's alpha
Temporariness	2	2.3	0.7	0.0	0-4	0.5	1.0	-0.08
Wages	3	1.6	0.8	3.1	0-4	4.2	0.7	0.69
Disempowerment	2	2.1	1.0	0.0	0-4	9.2	1.4	0.50
Vulnerability	5	1.4	1.0	1.0	0-4	11.7	1.9	0.89
Rights	5	2.3	1.2	1.2	0-4	2.9	18.0	0.78
Exercise of rights	6	1.6	0.9	1.2	0-4	6.8	1.0	0.88
EPRES-se	23	1.9	0.5	3.4	0.09-3.07	0.2	0.2	0.83

¹ Proportion of participants with any missing item

² Proportion of participants with lowest (floor) and highest (ceiling) EPRES-Se scores

Table 4. Factor loadings from exploratory factor analysis of the EPRES-Se

	Factor					
	Exercise rights	Vulnerability	Rights	Wages	Disempowerment	Temporariness
Temporariness						
Length of contract						0.12
Time working empl.	0.12		0.36			-0.36
Wages						
Income monthly	0.14	-0.16	0.23	0.49		0.35
Cover basic need	0.17	0.13		0.71		
Cover unforeseen expen.	0.12	0.32		0.79		-0.10
Disempowerment						
Working hour settled	0.17		0.21		0.52	0.15
Salary settled					0.60	
Vulnerability						
Demand work cond.	0.14	0.80				
Unfair treatment	0.11	0.84				
Afraid fired	0.20	0.80				
Treated authoritarian	0.11	0.66		0.12		0.13
Easily replaced	0.12	0.77		0.15		
Rights						
Right parental leave			0.67		0.21	
Right retirement			0.69		0.16	
Right unemployment			0.69	0.11		0.29
Right severance pay			0.55		-0.10	
Right sickness benefits			0.60		0.11	
Exercise rights						

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3	Take weekend off	0.65			0.10	0.14
4	Take vacation	0.70	0.18			-0.13
5	Take day off	0.80	0.10	0.10		-0.13
6	Take day off, pers.	0.78	0.24			-0.10
7	Sick leave	0.72	0.11		0.12	0.15
8	Go to doctor	0.66	0.11		0.13	
9						

Table showing factor loadings >0.1

DISCUSSION

Key findings and summary

The scale generally performed well, with a small proportion of missing values across all subscales, usage of all response options and good global reliability. The factor structure established in the Spanish EPRES-2010 (10) was confirmed. The subscales 'vulnerability', 'wages', 'rights' and 'exercise of rights' generally worked well in the Swedish context, with high item-subscale correlations, subscale reliability and factor loadings. However, 'temporariness' did not perform as expected and would need revision. In addition, although 'disempowerment' showed acceptable psychometric properties, the subscale might benefit from additional adaptation.

'Temporariness'

As opposed to previous studies, (8-10), temporariness yielded very poor psychometric properties. The items in the subscale did not correlate, there was a negative Cronbach's alpha coefficient and a low factor loading for the item on contract duration. Only minor changes in terms of correlation and Cronbach's alpha was initiated by the removal of informal workers and self-employed. This subanalysis

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3 did, however, split the temporariness dimension in two separate factors, both of
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5 which had higher factor loadings. On the basis of these results, we believe that the
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7 temporariness dimension needs further development and evaluation in a population
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9 of both standard and non-standard employees. Based on the results from the present
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11 study, we offer the following thoughts on this matter:
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16 Firstly, it is important to acknowledge the sample selection. As the sample was
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18 restricted to non-standard employees (i.e., permanent, full-time, employees were
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20 excluded), the lower end of the precariousness scale had a smaller proportion than
21
22 what would be expected if standard employees with longer duration and tenure
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24 would have been included in the sample. This limitation is likely to have contributed
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26 to the lack of correlation between the items. However, considering that the sample
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28 was intentionally recruited in order to capture a population of precariously employed
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30 individuals, the poor psychometric properties of temporariness also shows that these
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32 items are not necessarily related in a meaningful way when measuring precariousness
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34 among non-standard employees.
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43 Secondly, in the current context, the Swedish legislation (the Employment
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45 Protection Act SFS 1982:80) prevents an employer to hire an employee for more than
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47 two years during a five-year period (consecutive or in shorter repeated contracts)
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49 without having to employ (or dismiss) the employee in a permanent contract (46).
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51 Thereby, an employee with an 18-month tenure might be more precarious than an
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53 employee with a 6-month tenure as the latter has longer time left before being
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55 forced in or out. Further, approximately 50% of temporary employees in Sweden has
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3 had repeated contracts with the same employer (37), which is an additional reasons
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5 that could contribute to the lack of correlation between tenure and duration of
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7 contract.
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11 Thirdly, we found that several participants were employed by the hour or on
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13 demand while still indicating an indefinite contract length. This highlights the
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15 difficulties in assessing temporariness only by contract duration (and tenure).
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17 Temporariness is the dimension most likely to be dependent on context. Given the
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19 proposed mechanism of temporariness leading to ill-health mediated via feelings of
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21 insecurity, temporariness is most relevant in labour markets which do not offer
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23 regulatory protection for certain groups of workers, such as permanent employees in
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25 most European countries, which does not apply to the same extent in the USA (47).
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33 However tempting it would be suggest the inclusion of questions regarding
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35 "contract type" in a future development of EPRES, the continuous flexibilization of the
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37 labour market and fast changes in employment practices in combination with
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39 contextual differences, makes it increasingly difficult – at least if international
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41 comparison using similar scales is sought after.
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47 From a mechanistic standpoint and with an aspiration to develop a scale which
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49 could be used in international comparison independent of context, we believe that an
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51 item that measures the future employment opportunities with the current employer
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53 as objectively as possible should be developed. EPRES-Se and other translations
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55 could further be adapted, for example by combining the contract duration and
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57 tenure-items with an item assessing the number of repeated contracts with the same
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3 employer or an item assessing how often during a specific time interval the
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5 employment contract is up for renewal. Contract duration could also be
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8 complemented or replaced by a question more explicitly assessing the remaining
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11 duration of the contract at the time of answering the survey.
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16 **'Wages'**

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19 The income-item correlated moderately with the other items in the subscale (items
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21 assessing how well the income covers basic needs and unforeseen expenses). Previous
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23 studies report similar findings for this item (8-10). One explanation to these results is
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25 the quantitative nature of the income-item as compared to the other items. Slightly
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27 more than half, 57%, of the participants scored a precariousness level of 3 or 4 on
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29 income, which is not surprising as the sample is constituted by young non-standard
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31 employees. However, only 5% and 25% of the sample scored a precariousness level of
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33 3 or 4 on the other two items respectively. How well one can cover basic needs and
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35 unforeseen expenses could depend on more than income, such as family support.
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38 Approximately 24% of adults aged 20-27 years in Sweden still live at home. In the
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40 majority of municipalities in large city regions, this figure is more than 50% in the
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42 majority of municipalities in large city regions. About half of those living at home pay
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44 nothing in rent (48). As 74% of the sample is between 18-29 years old, it is likely that
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46 at least a part of the participants still live at home and receive help from their family.
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49 Including standard employees in the sample could potentially have increased the item-
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3 subscale correlation as we would expect a larger proportion of participants with a high
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8 Aside from the income-item, item-subscale correlations for the remaining two
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10 items and subscale reliability were acceptable and only a fraction of the sample did not
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12 provide an answer to the item on income (2.2%). Therefore, as in the other EPRES scales,
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14 we believe the subscale can be used in its current form in future studies.
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22 **'Disempowerment'**

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24 The items in 'disempowerment' had acceptable item-subscale correlations and
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26 reliability. However, some response options ("my working hours/salary was decided
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28 within my working team" and "do not know") were hardly used at all in, indicating that
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30 these options might not be appropriate for the current population in the Swedish
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32 context. Further, the remaining response options were also inadequate from an
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34 adaptational point of view. For example, the working hours/salary being in line with
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36 collective bargaining agreements does not imply that the working hours/salary was not
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38 set by the employer; these options are not mutually exclusive. In a revised EPRES-Se,
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40 the disempowerment-items would benefit from revision and clarification. Combining
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42 response options not mutually exclusive could be considered as one way of improving
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44 the subscale, such as "my working hours are in accordance with Swedish law and the
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46 collective agreement, decided by my employer" and "my working hours are not in
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48 accordance with Swedish law and the collective agreement, decided by my employer".
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'Rights'

The new item assessing sickness benefit had an acceptable item-subscale correlation and factor loading, similar to the other item-subscale correlations and factor loadings in the subscale. Further, the subscale reliability was good. Taken together, these results point towards that the new item worked well in the subscale.

Strengths and limitations

This study finds strength in the fact that it is the first study translating and adapting EPRES-2010 to the Swedish context, as well as the first study to assess the psychometric properties of the resulting EPRES-Se. In addition, this work provides context-specific recommendations for future research using EPRES-Se. This study is, however, not without limitations.

The main limitations is the sample. As this study lies within the frame of the PREMIS-project (43), the sample was restricted to employees with a non-standard employment. EPRES, however, is developed to measure precariousness independent of the type of employment (8). By only assessing the psychometric properties of the scale in a population of non-standard employees, the scale properties cannot be directly compared to similar studies as the heterogeneity of the sample is limited. A sample representative of the entire work force would have provided better insights as to how the scale behaves among Swedish employees. A next step which this study has provided strong grounds for.

Further, being a convenience sample limits the generalizability of the results.

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3 However, as the weighted results confirmed the psychometric properties of the scale,
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6 we could expect similar results in a representative sample applying the same sample
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8 restrictions.
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10 11 12 13 **Conclusion**

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16 The study found that EPRES-Se worked well in the current context, with high global
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18 reliability, endorsement of all response options (for all items) and few missing values.
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20 The psychometric properties for five out of six subscales were satisfactory, considering
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22 this being the first translation and adaptation. However, one subscale, 'temporariness',
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24 worked poorly and would need revision before implementing the scale in further
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26 research. As employment precariousness is an emergent determinant of health it is
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28 important that PE can be properly measured. The EPRES-Se is an important step in this
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30 direction. We therefore encourage others to continue working with EPRES-Se and to
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32 validate it further in populations of both standard and non-standard employees. In
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34 order to enable international comparisons and multinational studies, similar studies in
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36 other European countries are also called for.
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STATEMENTS

Author contributions: The study was conceived by Theo Bodin (TB) and Gun Johansson (GJ). All authors, TB, GJ, Johanna Jonsson (JJ), Alejandra Vives (AV), Joan Benach (JB), Katarina Kjellberg (KK) and Jenny Selander (JS), contributed to the design of the study. TB translated and back-translated the EPRES, and AV supported the translation process and examined the back translation. JJ collected the data with support from TB and GJ. JJ and TB conducted the analyses. JJ wrote the draft(s) of the manuscript. All authors, TB, GJ, JJ, AV, JB, KK and JS reviewed the draft(s) and provided feedback on its content. All authors approved the contents of the final manuscript.

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12 design, data collection and analysis, decision to publish, or preparation of the
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14 manuscript.
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21 **Data sharing:** Deidentified participant data are from the PREMIS study whose
22
23 authors may be contacted at johanna.jonsson@ki.se. Data cannot be made publicly
24
25 available for ethical and legal reasons, but could be made available to researchers
26
27 who meet the criteria for access to confidential data after approval from the Regional
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Ethics Committee of Stockholm.

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SUPPLEMENTARY MATERIAL

Supplementary material A. EPRES-Se

TEMPORALITET

1. Hur länge gäller ditt nuvarande kontrakt?

Om du har flera arbetsgivare anger du den arbetsgivare du arbetar för flest timmar en genomsnittlig månad.

- Tillsvidare
- 2 år eller mer
- 1 år eller mer
- 6 månader eller mer
- 3 månader eller mer
- 1 månad eller mer
- Kortare än 1 månad
- Har inget kontrakt
- Vet ej

2. Hur länge har du jobbat för samma arbetsgivare/uppdragsgivare?

Om du har flera arbetsgivare anger du den arbetsgivare du arbetar för flest timmar en genomsnittlig månad.

- Mindre än 1 månad
- 1 månad till mindre än 3 månader
- 3 månader till mindre än 6 månader
- 6 månader till mindre än 1 år
- 1 år till mindre än 2 år
- 2 år till mindre än 5 år
- 5 år eller mer

LÖN

3. Ungefär hur mycket tjänar du per månad netto (efter skatt)?

Lägg ihop summan för din vita lön efter skatt + svart lön + eventuell dricks, en genomsnittlig månad.

- 3 000 kr eller mindre
- Mellan 3 001 och 6 000 kr
- Mellan 6 001 och 9 000 kr
- Mellan 9 001 och 12 000 kr
- Mellan 12 001 och 15 000 kr
- Mellan 15 001 och 18 000 kr
- Mellan 18 001 och 21 000 kr
- Mellan 21 001 och 24 000 kr
- Mellan 24 001 och 27 000 kr
- Mellan 27 001 och 30 000 kr
- Mer än 30 000 kr
- Inget svar

Hur ofta tillåter din nuvarande lön dig att...

- Alltid
- Ofta
- Ibland
- Sällan
- Aldrig

4. Täcka dina dagliga grundläggande behov?

5. Täcka oförutsedda utgifter av betydelse?

- Ibland
- Sällan
- Aldrig

MAKTLÖSHET

6. Hur bestämdes arbetstiderna för ditt nuvarande arbete?

Välj det alternativ som stämmer bäst in på dig. Om du har flera arbetsgivare anger du den arbetsgivare du arbetar för flest timmar en genomsnittlig månad.

- De följer lag och kollektivavtalet
- De bestämdes av arbetsgivaren
- De var en överenskommelse mellan mig och min chef
- De var en överenskommelse i mitt arbetslag
- Vet ej
- Ej relevant, arbetar uppdragsbaserat

7. Hur bestämdes lönen för ditt nuvarande arbete?

Välj det alternativ som stämmer bäst in på dig. Om du har flera arbetsgivare anger du den arbetsgivare du arbetar för flest timmar en genomsnittlig månad.

- Den följer kollektivavtalet
- Den bestämdes av arbetsgivaren
- Den var en överenskommelse mellan mig och min chef
- Den var en överenskommelse i mitt arbetslag
- Vet ej

SÅRBARHET

Ange hur ofta hos din arbetsgivare som...

Om du har flera arbetsgivare anger du den arbetsgivare du arbetar för flest timmar en genomsnittlig månad.

Var god besvara alla frågor.

8. Du är rädd för att kräva bättre arbetsvillkor

- Alltid
- Ofta

9. Du är försvarslös mot orättvis behandling från överordnande

- Ibland
- Sällan

10. Du är rädd för att få sparken om du inte gör allt arbetsgivaren ber om

- Aldrig

11. Du blir behandlad auktoritärt

12. De får dig att känna dig lätt utbytbar

RÄTTIGHETER

Har du rätt till något av följande?

Var god besvara alla frågor.

1
2
3 **13. Föräldraledighet**

- Ja

4
5 **14. Ålderspension**

- Nej

- Vet ej

6
7 **15. A-kassa**

8
9 **16. Avgångsvederlag vid uppsägning**

10
11 **17. Sjukersättning/sjukpenning**

12 13 14 15 **UTÖVANDE AV RÄTTIGHETER**

16
17
18 **Hur ofta i den organisation där du arbetar kan du utöva**
19 **följande rättigheter?**

20 Om du har flera arbetsgivare anger du den arbetsgivare du
21 arbetar för flest timmar en genomsnittlig månad.

22
23 Var god besvara alla frågor.

24
25
26 **18. Ta helg/veckovila utan problem**

- Alltid

- Ofta

27
28 **19. Ta semesterdagar utan problem**

- Ibland

- Sällan

29
30 **20. Ta en ledig dag av familjeskäl utan problem (vård av**
31 **sjukt barn, vård av sjuk anhörig etc.)**

- Aldrig

32
33 **21. Ta en ledig dag av personliga skäl utan problem**

34
35 **22. Sjukskriva dig utan problem**

36
37 **23. Gå till läkare när du behöver**

Supplementary material B. English translation of EPRES-Se with coding

TEMPORARINESS

Coding

1. How long is your current employment contract valid?	- Indefinitely	0
	- 2 years or more	1
If you have more than one employer, please indicate the employer you work the most hours for during an average month.	- 1 year or more	1
	- 6 months or more	2
	- 3 months or more	3
	- 1 month or more	3
	- Less than 1 month	3
	- Do not have a contract	4
	- Do not know	4

2. How long have you been working for the same employer?	- Less than 1 month	4
	- 1 month to less than 3 months	3
If you have more than one employer, please indicate the employer you work the most hours for during an average month.	- 3 months to less than 6 months	3
	- 6 months to less than 1 year	2
	- 1 year to less than 2 years	2
	- 2 years to less than 5 years	1
	- 5 years or more	0

WAGES

3. Approximately how much do you earn per month after taxes?	- 3000 SEK or less	4
	- Between 3001 and 6000 SEK	4
Add the amount for your salary after tax deductions + salary for illicit work + any tips, during an average month.	- Between 6001 and 9000 SEK	3
	- Between 9001 and 12 000 SEK	3
	- Between 12 001 and 15 000 SEK	2
	- Between 15 001 and 18 000 SEK	2
	- Between 18 001 and 21 000 SEK	1
	- Between 21 001 and 24 000 SEK	1
	- Between 24 001 and 27 000 SEK	0
	- Between 27 001 and 30 000 SEK	0
	- More than 30 000 SEK	0
	- No answer	-

How often does your current salary allow you to...	- Always	0
	- Often	1
4. Cover you daily basic needs?	- Sometimes	2
5. Cover unforeseen expenses of significance?	- Rarely	3
	- Never	4

DISEMPOWERMENT

6. How were your working hours settled for your current job?

Indicate the alternative that fits you best. If you have more than one employer, please indicate the employer you work the most hours for during an average month.

- My working hours are in accordance with Swedish law and the collective agreement 0
- My employer decided my working hours 3
- My working hours are the result of an agreement between me and my manager 2
- My working hours are the result of an agreement within my work team 1
- Do not know 4
- Not applicable. I work project-based 2

7. How was the salary settled for your current job?

Indicate the alternative that fits you best. If you have more than one employer, please indicate the employer you work the most hours for during an average month.

- My salary is accordance with the collective agreement 0
- My salary was set by my employer 3
- My salary is the result of an agreement between me and my manager 2
- My salary is the result of an agreement in my work team 1
- Do not know 4

VULNERABILITY

Indicate how often, at your employer...

If you have more than one employer, please indicate the employer you work the most hours for during an average month.

Please indicate an answer to all of the questions.

8. You feel afraid to demand better working conditions

- Always 4
- Often 3
- Sometimes 2

9. You are defenceless towards unfair treatment by your superiors

- Rarely 1
- Never 0

10. You feel afraid of being fired if you do not comply with everything your employer asks of you

11. You are treated in an authoritarian manner

1
2
3 **12. You are made to feel easily replaceable**
4
5

6 **RIGHTS**
7

8
9 **Do you have the right to any of the following?**

10 Please indicate an answer to all of the questions.
11

12			
13	13. Parental leave	- Yes	0
14		- No	1
15	14. Retirement due to old age	- Do not know	2
16			
17	15. Unemployment insurance fund (A-kassa)		
18			
19	16. Severance pay in the event of termination		
20			
21	17. Sickness benefit		
22			
23			

24 **EXERCISE OF RIGHTS**
25

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28 **How often, in the organisation where you work, are**
29 **you able to exercise the following rights?**

30 If you have more than one employer, please indicate the
31 employer you work the most hours for during an average
32 month.
33

34 Please indicate an answer to all of the questions.
35

36	18. Take the weekend off/ weekly rest without	- Always	0
37	problem	- Often	1
38	19. Take vacation days without problem	- Sometimes	2
39		- Rarely	3
40	20. Take a day off for family reasons without	- Never	4
41	problem (care of a sick child, care of a sick relative		
42	etc.)		
43			
44	21. Take a day off for personal reasons without		
45	problem		
46			
47	22. Go on sick leave without problem		
48			
49	23. Go to the doctor when needed		
50			
51			

Supplementary material C. Comparison of subscale means for recoding of participants with an indefinite contract and on demand/by the hour employment

Crosstabulation of type of employment and contractual length

Table showing crosstabulation of type of employment and contractual length (EPRES-Se item 1)

Contractual length	Type of employment			Total
	Temporary employment	Employed on demand/by the hour	Self-employed (involuntary), intern, part-time	
Indefinitely	16 ^a	139 ^b	20 ^a	175
2 years or more	3	3	1	7
1 year or more	9	7	1	17
6 months or more	34	32	9	75
3 months or more	24	19	6	49
1 month or more	16	6	2	24
Less than 1 month	11	5	0	16
I do not have a contract	2	21	12	35
Do not know	6	11	0	17
Total	121	243	51	415

^a Used in comparison 2

^b Used in comparison 1

1. Comparison of subscale means for employees with an indefinite contractual length and on demand/by the hour employment

Table showing subscale averages for employees with an indefinite contractual length and an on demand/by the hour employment

Subscale	N	Minimum	Maximum	Mean	Std. Deviation
Wages	135	0.00	3.67	1.76	0.72
Disempowerment	139	0.00	4.00	2.21	0.97
Vulnerability	137	0.00	4.00	1.35	0.94
Rights	136	0.00	4.00	2.35	1.06
Exercise of rights	136	0.00	3.50	1.74	0.71
Valid N	134				

Table showing least sum of squares-differences between subscale averages for employees with an on demand/by the hour employment, comparing employees with an indefinite contractual length vs. employees with any other contractual length

EPRES-Se item 1. How long is your current employment valid?								
Subscale	2 y	1y	6m	3m	1m	<1m	No contract	I don't know
Wages	0.014	0.652	0.320	0,100	0.348	0.096	0.142	0.025
Disempowerment	0.379	0.284	0.072	0.367	0.295	0.212	0.165	0.151
Vulnerability	1.216	0.092	0.320	0,004	0.518	0.251	0.461	0.658
Rights	2.086	0.467	0.053	0,659	0.180	0.113	0.123	0.338
Exercise of rights	0.185	0.764	0.135	0,191	0.315	0.040	0.046	0.558
Sum	3.880	2.258	0.899	1.320	1.657	0.713	0.936	1.731

2. Comparison of subscale means for employees with an indefinite contractual length and any other type of employment (excluding on demand/by the hour)

Table showing subscale averages for employees with an indefinite contract length and any other type of employment

Subscale	N	Minimum	Maximum	Mean	Std. Deviation
Wages	35	0.33	4.00	1.819	0.919
Disempowerment	36	0.00	4.00	2.167	1.095
Vulnerability	36	0.00	4.00	1.167	0.966
Rights	36	0.00	4.00	2.356	1.182
Exercise of rights	36	0.00	4.00	1.690	0.876
Valid N	35				

Table showing least sum of squares-differences between subscale averages for employees with any other employment (excluding on demand/by the hour employees), comparing employees with an indefinite contractual length vs. employees with any other contractual length

EPRES-Se item 1. How long is your current employment valid?								
Subscale	2 y	1y	6m	3m	1m	<1m	No contract	I don't know
Wages	1.402	0.486	0.510	0.624	0.504	0.819	0.264	0.459
Disempowerment	0.541	0.216	0.190	0.083	0.083	0.121	0.190	0.000
Vulnerability	0.533	0.233	0.517	0.667	0.500	0.258	0.276	0.633
Rights	1.456	0.836	0.132	0.276	0.378	0.792	0.298	0.422
Exercise of rights	0.357	0.957	0.252	0.179	0.227	0.311	0.404	0.032
Sum	4.289	2.727	1.601	1.828	1.692	2.301	1.433	1.547

Supplementary material D. Weighted results, table 1-4**Table 1. Weighted demographic characteristics of the study population (percentages), N=415**

		%
Age	18-24	34%
	25-29	43%
	30-64	23%
Sex	Male	50%
	Female	50%
Employment	Temporary employment	21%
	Employed on demand/by the hour	64%
	Self-employed (involuntary)	3%
	Intern	1%
	Part-time employed (involuntary)	10%

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Table 2. Weighted item descriptive statistics and Pearson item-subscale correlations of EPRES-Se

Item	Missing % ¹	Mean	SD ²	Response frequency ³					Pearson item subscale correlations ⁴					
				0	1	2	3	4	T	W	D	V	R	ER
Temporariness														
Length of contract ⁵	0.0	2.5	1.1	9.5	5.8	17.9	56.0	10.9	-0.05	0.02	-0.03	0.06	0.06	0.05
Time working empl. ⁵	0.0	2.1	0.9	2.8	22.1	43.8	27.8	3.5	-0.05	0.15	0.17	0.05	0.36	0.21
Wages														
Income monthly	3.5	2.6	1.0	6.9	6.6	23.3	47.0	16.1	0.13	0.40	0.04	0.01	0.27	0.23
Cover basic need	1.2	0.8	0.9	40.2	44.2	11.4	2.5	1.7	0.01	0.61	0.03	0.27	0.13	0.28
Cover unforeseen expen.	1.2	1.8	1.1	13.3	28.7	34.3	15.6	8.1	0.13	0.57	0.08	0.42	0.17	0.22
Disempowerment														
Working hour settled ⁵	0.0	2.2	1.2	18.7	0.7	31.3	42.7	6.5	0.06	0.13	0.33	0.08	0.20	0.16
Salary settled ⁵	0.0	2.2	1.2	19.3	2.1	19.3	54.1	5.2	0.07	-0.03	0.33	0.00	0.10	0.11
Vulnerability														
Demand work cond.	1.2	1.4	1.1	21.8	33.0	28.4	11.4	5.4	0.04	0.20	0.09	0.76	0.09	0.25
Unfair treatment	1.2	1.2	1.1	28.5	39.2	18.4	9.9	4.0	0.04	0.20	0.08	0.80	0.10	0.26
Afraid fired	1.2	1.4	1.2	28.4	30.9	21.4	13.3	6.0	0.09	0.31	0.10	0.79	0.17	0.38
Treated authoritarian	1.2	1.2	1.1	28.4	38.1	19.1	9.9	4.5	0.03	0.21	-0.04	0.64	0.12	0.23
Easily replaced	1.2	1.6	1.2	21.6	33.2	22.7	11.5	11.1	0.13	0.30	-0.02	0.74	0.15	0.24
Rights														
Right parental leave	1.2	1.2	0.8	23.0	33.7	43.3			0.19	0.20	0.22	0.12	0.59	0.22
Right retirement	1.2	1.2	0.8	24.4	29.8	45.8			0.29	0.20	0.23	0.17	0.59	0.28
Right unemployment	1.2	1.0	0.9	36.7	24.7	38.6			0.13	0.17	0.05	0.07	0.60	0.12
Right severance pay	1.2	1.3	0.6	6.0	53.2	40.8			0.14	0.11	0.04	0.05	0.50	0.05
Right sickness benefits	1.2	1.0	0.9	38.7	26.8	34.5			0.28	0.15	0.10	0.13	0.53	0.15
Exercise of rights														
Take weekend off	1.2	1.7	1.1	19.9	17.4	44.6	11.5	6.5	0.07	0.23	0.14	0.21	0.13	0.67
Take vacation	1.2	1.9	1.0	12.3	20.1	43.4	18.3	6.0	0.15	0.25	0.18	0.27	0.19	0.71
Take day off	1.2	1.7	1.1	21.4	17.8	41.4	13.6	5.8	0.18	0.22	0.19	0.25	0.20	0.77
Take day off, pers.	1.2	1.9	1.1	13.7	19.1	41.8	16.4	9.0	0.12	0.23	0.05	0.37	0.19	0.71
Sick leave	1.2	1.6	1.1	21.7	19.1	42.9	12.1	4.1	0.11	0.22	0.15	0.23	0.19	0.70
Go to doctor	1.2	1.2	1.1	34.3	27.1	28.2	7.2	3.2	0.19	0.28	0.07	0.24	0.19	0.67

¹ Proportion of participants with any missing item; ² SD=Standard Deviation; ³ Frequency (%) of participants indicating the specific response. 0 indicates the lowest precariousness score, 4 indicating the highest precariousness score. ⁴ Corrected for overlap, i.e., item is removed from the corresponding subscale. T=Temporariness; W=Wages; D=Disempowerment ;V=Vulnerability; R=Rights; ER=Exercise rights. ⁵ Inter-item correlations

Table 3. Weighted scale descriptive statistics: range, mean, standard deviation (SD), floor and ceiling effects and Cronbach's alpha coefficient

Subscale	Items	Mean	SD	Missing (%) ¹	Obs. range	Floor % ²	Ceiling % ²	Cronbach's alpha
Temporariness	2	2.3	0.7	0.0	0-4	0.3	1.3	-0.10
Wages	3	1.7	0.8	4.7	0-4	3.0	1.0	0.70
Disempowerment	2	2.2	1.0	0.0	0-4	8.7	2.4	0.50
Vulnerability	5	1.4	1.0	1.2	0-4	14.3	2.0	0.90
Rights	5	2.3	1.1	1.3	0-4	3.8	17.9	0.78
Exercise of rights	6	1.6	0.9	1.3	0-4	7.3	1.0	0.89
EPRES-se	23	1.9	0.5	4.8	0.09-3.07	0.2	0.7	0.84

¹ Proportion of participants with any missing item

² Proportion of participants with lowest (floor) and highest (ceiling) EPRES-Se scores

Table 4. Weighted factor loadings from exploratory factor analysis of the EPRES-Se

	Factor					
	Exercise rights	Vulnerability	Rights	Wages	Disempowerment	Temporariness
Temporariness						
Length of contract						-0.21
Time working empl.	0.17		0.37		0.14	-0.36
Wages						
Income monthly	0.20	-0.11	0.24	0.49		-0.25
Cover basic need	0.20	0.19		0.66		
Cover unforeseen expen.		0.35		0.84		0.19
Disempowerment						
Working hour settled			0.14		0.43	
Salary settled					0.69	0.15
Vulnerability						
Demand work cond.	0.11	0.81				
Unfair treatment		0.86				
Afraid fired	0.24	0.80		0.12	0.13	-0.12
Treated authoritarian	0.11	0.67			-0.14	
Easily replaced		0.76		0.17		
Rights						
Right parental leave	0.15		0.69		0.19	
Right retirement	0.17		0.68		0.24	-0.13
Right unemployment			0.70			-0.17
Right severance pay			0.56			
Right sickness benefits			0.60			0.14
Exercise rights						
Take weekend off	0.69			0.11		-0.11
Take vacation	0.74	0.12			0.10	
Take day off	0.82	0.10				0.14
Take day off, pers.	0.73	0.25			-0.10	0.10
Sick leave	0.74				0.15	-0.16
Go to doctor	0.69		0.11	0.15		

Table showing factor loadings >0.1

The weighted exploratory factor analysis extracted six factor with eigenvalues >1 (eigenvalues: 5.6; 3.0; 2.5; 1.5; 1.4; 1.1). These factors were the same as in EPRES-2010, thereby confirming the EPRES-2010 scale structure. Together, the six factor explained 65.4% of the variance.

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60STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract (b) Provide in the abstract an informative and balanced summary of what was done and what was found
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported
Objectives	3	State specific objectives, including any prespecified hypotheses
Methods		
Study design	4	Present key elements of study design early in the paper
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group
Bias	9	Describe any efforts to address potential sources of bias
Study size	10	Explain how the study size was arrived at
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding (b) Describe any methods used to examine subgroups and interactions (c) Explain how missing data were addressed (d) If applicable, describe analytical methods taking account of sampling strategy (e) Describe any sensitivity analyses
Results		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed (b) Give reasons for non-participation at each stage (c) Consider use of a flow diagram
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders (b) Indicate number of participants with missing data for each variable of interest
Outcome data	15*	Report numbers of outcome events or summary measures
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included (b) Report category boundaries when continuous variables were categorized (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses

Discussion		
Key results	18	Summarise key results with reference to study objectives
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence
Generalisability	21	Discuss the generalisability (external validity) of the study results
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Measuring precarious employment in Sweden: Translation, adaptation and psychometric properties of the Employment Precariousness Scale (EPRES)

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Measuring precarious employment in Sweden: Translation, adaptation and psychometric properties of the Employment Precariousness Scale (EPRES)

Johanna Jonsson* (MSc)¹, Alejandra Vives (MD, PhD)^{2,3}, Joan Benach (MD, PhD)^{3,4},
Katarina Kjellberg (PhD)^{1,5}, Jenny Selander (PhD)¹, Gun Johansson (PhD)^{1,5} & Theo
Bodin (MD, PhD)^{1,5}

1 Institute of Environmental Medicine, Unit of Occupational Medicine, Karolinska Institutet, Stockholm,
Sweden

2 Department of Public Health, School of Medicine, Pontificia Universidad Católica de Chile

3 Health Inequalities Research Group, Employment Conditions Knowledge Network (GREDS-
EMCONET), Department of Political and Social Sciences, Universitat Pompeu Fabra, Barcelona, Spain

4 Transdisciplinary Research Group on Socioecological Transitions (GinTRANS2). Universidad
Autónoma Madrid, 28049 Madrid, Spain

5 Centre for Occupational and Environmental Medicine, Stockholm County Council, Stockholm,
Sweden

* Corresponding author:

Johanna Jonsson

Karolinska Institutet

Institute of Environmental Medicine, Unit of Occupational Medicine

Solnavägen 4, 11365

Stockholm, SWEDEN

Johanna.Jonsson@ki.se

Telephone: +46 737 665367

ABSTRACT

Objectives: Precarious employment is a determinant of poor health and health inequality. However, the evidence of health consequences and mechanisms underlying the associations, are still limited due to a lack of a comprehensive multidimensional definition and measurement instrument. The Employment Precariousness Scale (EPRES) is a Spanish, multidimensional scale, developed to measure degree of precarious employment. The aim of this study was to translate the EPRES-2010 into Swedish, adapt it to the Swedish context, and to assess the psychometric properties of the Swedish EPRES.

Method: EPRES was translated, adapted and implemented for data collection within the research project PREMIS. During 2016-2017, questionnaire data was collected from 483 non-standard employees in Stockholm, Sweden, sampled with web-based respondent-driven sampling. Analyses included item descriptive statistics, scale descriptive statistics and exploratory factor analysis.

Results: The final EPRES-Se consisted of six dimensions and 23 items. There was a high response rate to all items and response options. Global Cronbach's alpha was 0.83. Subscales 'vulnerability', 'rights' and 'exercise rights' had reliability coefficients between $\alpha = 0.78-0.89$ and item-subscale correlations between $r = 0.48-0.78$. 'Temporariness' had poor reliability ($\alpha = -0.08$) and inter-item correlation ($r = -0.04$), while 'disempowerment' showed acceptable psychometric properties ($\alpha = 0.5$; $r = 0.34$). Exploratory factor analysis confirmed the original EPRES factor structure.

Conclusions: 'Vulnerability', 'wages' 'rights', 'exercise rights' and 'disempowerment'

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3 worked in the Swedish context; however 'temporariness' would need revising before
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6 implementing the EPRES-Se in further research. Continued work and validation of
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9 EPRES-Se is encouraged. In order to enable international comparisons and
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11 multinational studies, similar studies in other European countries are also called for.
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16 **Strengths and limitations of this study:**

- 17 • First translation and adaptation of the EPRES-2010 to Swedish and the Swedish
18 context
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- 20 • First assessment of the psychometric properties of the EPRES-Se
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- 22 • Relatively small sample restricted to non-standard employees
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- 24 • Limited generalizability of results
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INTRODUCTION

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6 Precarious employment (PE) is considered a social determinant of poor health and
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8 health inequality (1-3). PE is present in both developing as well as developed countries
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10 (4, 5). However, evidence of the health consequences of precarious employment, and
11
12 by which mechanisms PE harm workers' health, is still limited due to the lack of a
13
14 comprehensive multidimensional definition and measurement instrument (6). This lack
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16 also brings about challenges in terms of capturing the size of the population in
17
18 precarious employment, conducting occupational health and safety surveillance (6, 7),
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20 as well as cross-country comparisons. The Employment Precariousness Scale (EPRES) is
21
22 a Spanish questionnaire developed to measure six dimensions of precarious
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24 employment. EPRES has previously been validated in Spanish and Chilean populations
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26 (8-11), and also applied to the population of Catalonia (12), but as of yet there is no
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28 Swedish translation or adaptation.
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Precarious Employment

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41 During the past decades, neoliberal economics and policies together with increased
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43 globalization, trade competition, technological innovation and financial crises, has had
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45 a considerable impact on the dynamics of the labour market (5, 13, 14). These impacts
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47 have had several implications, including an increase in privatization, downsizing,
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49 outsourcing, a weakening of union input and collective regulation, and a more
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51 competitive and uncertain context for workers, with increases in flexible work,
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53 unemployment and non-standard employment arrangements (5, 13, 14). Furthermore,
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3 there has been a decline in attachment to employers, risk shifting from employer to
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5 employees, growth in perceived and actual job insecurity and work-based stress, as
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7 well as diminished bargaining power and rights (13, 14).
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11 Non-standard arrangements, in comparison with standard employment
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13 contracts (i.e., open-ended full-time contracts), includes part-time work
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15 (underemployment), temporary work, temporary agency work, zero hour contracts,
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17 "gig" work arrangements and self-employment (1, 4, 7, 14, 15). Non-standard work can
18
19 also include holding multiple jobs (16). A comprehensive term used to describe forms
20
21 of non-standard employment is "precarious employment" (17). Precarious employment
22
23 does not, however, solely refer to the type of employment, but also to unfavorable
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25 employment conditions, such as vulnerability, low pay, low levels of social security and
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27 rights (3, 4, 14, 17-21). As these elements are not exclusively found in non-standard
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29 employments *per se*, employees in a standard employment also are at risk of
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31 experiencing precariousness (14, 22, 23). Thereby, it is important to move beyond a
32
33 simplistic categorical grouping of employment, such as temporary vs. permanent, and
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35 instead work towards a comprehensive multidimensional approach that enables a
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37 better understanding of precarious employment (16, 23).
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49 Several definitions and attempts to create multidimensional constructs
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51 capturing precarious employment already exist. In terms of the previous, Rodgers and
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53 Rodgers include employment instability, employment insecurity, lack of protection and
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55 economic/social vulnerability as components in their definition of precarious
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57 employment (17); and the International Labour Organization (ILO) include low wage,
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3 poor protection from termination of employment, lack of access to social
4 protection/benefits (usually associated with full-time standard employment) and lack
5 of/limited access to exercise rights at work (21). To our knowledge, two validated
6 questionnaires have been developed for the purpose of measuring precarious
7 employment: The Employment Precarity Index, identifying employment precarity by
8 ten questions and dividing scores in four groups: secure, stable, vulnerable and
9 precarious (23); and the EPRES with its six dimensions: 'temporariness', 'wages',
10 'disempowerment', 'vulnerability', 'rights' and 'exercise rights', where precarity ranges
11 from low to high (10). Several studies have also used a combination of indicators as
12 proxy measures in order to identify precarious employment (see e.g. (24-26)). Despite
13 these efforts, there is of yet no universally accepted definition or operationalization.

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16 By the means of a cross-national multidimensional definition and measurement
17 instrument of precarious employment, comparative and more precise estimations of
18 health effects would be made possible. Previously, PE has been linked to an array of
19 health issues including mental and physical health (2, 27) and occupational injuries (28).
20 Previous research on related concepts such as job insecurity and temporary
21 employment also show consistent associations with various health outcomes (29-32).
22 Mechanisms linking precarious employment and health are not yet fully understood
23 but pathways that have been suggested include more harmful working conditions,
24 limited control over one's professional and personal lives, feelings of insecurity and
25 incomes below the subsistence level, which consequently can affect other social
26 determinants of health such as housing quality, lifestyles and so on (33).

The Employment Precariousness Scale (EPRES)

EPRES is a Spanish, multidimensional theory-based scale, developed to measure degree of precarious employment among waged and salaried workers (8). EPRES is comprised of 22 items and six subscales corresponding to six dimensions: 'temporariness' (contract duration; two items), 'wages' (low or insufficient; possible economic deprivation; three items), 'disempowerment' (level of negotiation of employment conditions; two items), 'vulnerability' (defenselessness to authoritarian treatment; five items), 'rights' (entitlement to workplace rights and social security benefits; four items) and 'exercise rights' (powerlessness, in practice, to exercise workplace rights; six items) (8, 9). EPRES items are scored on a 5-point or 3-point scale, depending on item, and all items taken together will give a global score ranging between 0 (least precarious) and 4 (most precarious) (34). EPRES has demonstrated good acceptability, good internal consistency and evidence of construct validity in Spanish and Chilean populations (8, 9). The original EPRES scale was revised in 2015 (hereafter known as EPRES-2010), which showed good metric properties and improved sensitivity to worker vulnerability and employment stability (10). Further details about EPRES and its development has been described elsewhere (34).

Precarious employment in Sweden

In Sweden, much of previous research has focused on health outcomes of PE and related exposures. Some studies have focused on exposures such as temporary

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3 employment (35), peripheral employment (36), and temporary employment and job
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5 insecurity (37). Fewer studies have created proxies of multidimensional exposures of
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7 PE, for instance by combining previous unemployment, temporary/permanent
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9 employment and perceived job insecurity (38); or by identifying multiple indicators of
10
11 precarious employment (e.g., type of contract, income, working times etc.) (26). It is
12
13 challenging to put Sweden in a larger comparative context of precarious employment
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15 as there is no consensus on its operationalization. Sweden has, according to some
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17 definitions (as defined by a typological approach of 11 indicators), one of the smallest
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19 proportions of precarious employees among the Scandinavian countries (19). However,
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21 in other measures (defined by involuntary part-time work, temporary employment and
22
23 fear of job-loss) Sweden has the highest proportion of precarious employed individuals
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25 (24) and the highest proportion of fixed-term employment contracts (39) in the same
26
27 context. Reports show that the Swedish labour market is growing increasingly more
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29 insecure, especially for temporary employees (40, 41). The proportion of temporary
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31 employees has been stable around 15-17% since the late 1990's (41, 42). There has,
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33 however, been reports on a shift within this group where longer-term positions have
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35 been replaced by a higher proportion of on-demand employees and day laborers,
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37 which are more precarious by nature (40, 41, 43). Especially women (19%, compared to
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39 15% among men), 16-24 year-olds (56%, compared to 21% among 25-34 year-olds
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41 and 9% among 35-44 year-olds), and foreign born (24%, compared to 15% among
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43 individuals born in Sweden) are likely of holding a temporary employment (41). These
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45 are groups that reportedly are exposed to high employment precariousness (19).
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3 Further, around 10% of the employees in Sweden are not covered by collective
4 bargaining agreements and around 9% have multiple jobs. The latter has seen an
5 increase with 1.5% percentage points since 2005 (43). According to a definition by the
6 Swedish Labour Policy Council, the group of atypical employees is constituted by those
7 that fulfil one of the following: not being covered by a collective bargaining agreement,
8 have a temporary employment, are employed by a temp agency or are self-employed,
9 have their own company, hold multiple jobs or are working in the informal sector. This
10 group of atypical workers is estimated to be around 35-39% of the Swedish workforce
11 (43), and likely of experiencing precariousness.

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Thereby, despite the stable levels of temporary employment in Sweden, it could
be assumed that the level of precariousness has increased on the Swedish labour
market. A study from Finland, however, indicate that the precariat (as defined by
atypical employment, previous unemployment, fear of job-loss, poor prospects of
employment and low earnings) has not seen an increase the past couple of decades
(44). Without longitudinal studies with precise measures of precarious employment
assessing changes over time, evidence in Sweden remains inconclusive.

To our knowledge, this is the first study in Sweden aiming at translating and
adapting a validated multidimensional measurement of precarious employment,
EPRES, to Swedish and the Swedish context. It is an important step in the direction to
more precisely and fully comprehend the distribution and trends of precarious
employment in the Swedish population, as well as it will allow for future studies on
health outcomes of precarious employment. Further, such an instrument will also

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3 enable well-needed cross-country comparisons.
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8 **Aim**

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11 The aim of this study was to translate the EPRES-2010 into Swedish, adapt it to the
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13 Swedish context, and to assess the psychometric properties of the Swedish EPRES.
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17 **METHOD**

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21 In order to fulfil the study aims, the EPRES-2010 was first translated into Swedish and
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23 subsequently adapted to suit the Swedish context (hereafter known as EPRES-Se).
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25 Thereafter, EPRES-Se was piloted and implemented as a part of the survey used in the
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27 research project Precarious Employment in Stockholm (PREMIS).
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35 **Translation and adaptation of EPRES**

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37 The translation and adaptation process of the EPRES-2010 consisted of five steps: 1.
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39 Translation from Spanish to Swedish; 2. Cultural adaptation to fit the Swedish context;
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41 3. Back translation to Spanish and adjustments; 4. Pilot testing; 5. Final adaptations
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43 based on user feedback in pilot.
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49 1. The Spanish version of the revised EPRES-2010 scale, which has been
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51 published elsewhere (10), was translated into Swedish. The translation was done by a
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53 bilingual member of the research team (TB) in close discussion with AV, a native
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55 Spanish speaker with previous experience of validation studies of EPRES.
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3 2. Several adaptations of the questionnaire were implemented in order to fit
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5 Swedish labour market conditions. The questionnaire and its translation was discussed
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7 during workshops in the project team, which consisted of Swedish, Spanish and Chilean
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9 researchers within public - and occupational health, as well as within the reference
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11 group involved in PREMIS, which consisted of labour union members and workers with
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13 experience of precarious employment.
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19 3. Several drafts of the Swedish questionnaire were translated back to Spanish
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21 during the adaptation process and discussed until the final translation was decided
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23 upon.
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27 4. A two-stage pilot testing was performed: first face-to-face with five volunteers
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29 from the reference group, and thereafter online with six volunteers who were currently
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31 working but without a permanent full-time employment. The latter were also asked to
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33 participate in an evaluation of the survey either via the phone or online.
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38 5. With the input from the pilot, a few minor adaptations were made to the
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40 EPRES.
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45 Further, in order to offer non-Swedish speaking participants an opportunity to
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47 participate in the PREMIS-study, the PREMIS-survey, including the Swedish version of
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49 EPRES, was translated into English by an external, professional, translator. After the
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51 translation, minor changes in terms of style and terminology was made by the research
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53 group. The English translation of the EPRES-Se was not validated in this study, nor has
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55 it been validated in any previous studies.
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Implementation of the EPRES-Se

PREMIS is an ongoing, longitudinal, web-based study conducted in Stockholm county, Sweden. PREMIS aims at methodological development in terms of sampling strategies and assessment of precarious employment, as well as at studying health outcomes of precarious employment. In 2016-2017, 483 non-standard employees were sampled with web-based respondent-driven sampling (webRDS). WebRDS uses peer-to-peer recruitment to build a sample from populations that are hard-to-reach and therefore lacks a sampling frame (45). Questionnaire data was collected through an online survey tool specifically developed for RDS (46). The PREMIS-survey included all the items of the EPRES-Se, as well as questions on employment type, occupational environment, health outcomes and background. The survey could be completed in Swedish or English.

As one of the aims of PREMIS was to sample precarious employees with webRDS, a process which has been described elsewhere (47), participation in the study was restricted to individuals considered particularly vulnerable to precarious employment conditions, such as individuals with temporary employment, on-demand employment, involuntary part-time employment and involuntary self-employment. The inclusion criteria for participants were: living and/or working in Stockholm County, being aged 18-65 years, having and indicating a Swedish personal identification number, and having a current employment. Exclusion criteria were: having a fixed, full-time, employment, being voluntarily self-employed or being a student. Out of the 483

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3 participants included in the sample, 68 participants were excluded due to not matching
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5 criteria of county (n=6), re-using or giving an incorrect personal number (n = 8 and
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7 n=17, respectively), being underage (n = 1) or suspected cheating (i.e., systematic
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9 repeated participation; n=36), giving a final sample of 415 participants.
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16 **Statistical analysis**

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18 Item descriptive statistics (mean, standard deviations, response frequencies, missing
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20 responses and Pearson item-subscale correlations) and scale descriptive statistics
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22 (mean, standard deviations, missing items, range, floor and ceiling effects, and
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24 reliability (Cronbach's alpha coefficient) were assessed for the entire sample.
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26 Participants answering "No answer" on the question on income (question three in
27
28 EPRES-Se) were excluded from the analyses of this question due to the ambiguity of
29
30 the response alternative. Exploratory factor analysis was conducted in order to
31
32 determine the underlying factor structure of the data. Principal axis factoring, with
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34 varimax rotation, extracting eigenvalues >1 was used, which is the method used in
35
36 previous EPRES-studies (8-10). Subanalyses were conducted without informal workers,
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38 i.e., participants answering "I have no contract" to the question on contract duration
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40 (question one in EPRES-Se). Further, as the sample was recruited with respondent-
41
42 driven sampling (RDS), weighted analyses were conducted in addition to the
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44 unweighted analyses. RDSII weights (48) were calculated in RDS Analyst 0.42 for
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46 Windows (Los Angeles, CA). In short, weights are based on the self-reported network
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48 size in the target population (*degree*) of the participant and applied in order to account
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3 for over-sampling of individuals included in large social networks. Participants with
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5 large social networks are given a smaller weight, and vice versa (48, 49). The results
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7 from the weighted analyses will be shown in full in the supplementary material. All
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9 analyses were performed using SPSS version 23 (IBM SPSS Statistics for Windows,
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11 Version 23. Armonk, NY:IBM Corp).
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19 **Ethical considerations**

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21 Permission from the Regional Ethics Committee of Stockholm was given for the study,
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23 with dnr: 2016/1291-31/5. Informed consent was attained from all participants by the
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25 respondent clicking "Yes" to the question "I understand the information given above
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27 and want to participate".
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35 **Patient and public involvement**

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37 In PREMIS, a reference group consisting of individuals with experience from
38
39 precarious employment and labour union representatives, was involved in the design
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41 of the PREMIS-survey (design of survey and formulation of questions not otherwise
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43 standardized) and data collection process (deciding on the appropriate compensation
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45 for participation, recruitment of participants and testing the survey software) through
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47 active discussions and workshops. Results will be disseminated to study participants
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49 through the website of the PREMIS-study.
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RESULTS

Adaptations of EPRES-Se

The following adaptations were made to the EPRES-Se in comparison with EPRES-2010.

- (1) The response alternatives in 'temporariness' were stated as categories, as opposed to free text values of number of days, months or years in EPRES-2010, in order to increase usability in the web-survey context. For the same reason, the question on contract duration which contained three dependent items in EPRES-2010, was collapsed into one question in EPRES-Se. In addition, the response options "I do not have a contract" was added in order to capture informal work and "Do not know" was added in order to capture poor contractual relationship.
- (2) In 'wages', the question of income was presented in local currency (SEK) and intervals were set to ~300 EUR as the 150-200 EUR intervals used in the EPRES-2010 version were perceived as too narrow in the Swedish context. In EPRES-2010, intervals were 150 EUR - 200 EUR below a monthly income of 1200 EUR, and 300 EUR above an income of 1201 EUR.
- (3) In EPRES-2010, the two response alternatives capturing working conditions that were decided unilaterally by the employer, were merged into one response option in the Swedish adaptation in order to enhance usability . Further, as some workers, especially freelancers, are given a fixed budget with no hours specified, the response alternative "Not applicable. I work project-based" was added for the question on how salary was decided upon,

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3 (4) One of the items in 'vulnerability', "afraid to demand better working conditions...",
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6 was taken from the original EPRES-scale (8) according to the recommendations
7
8 made by Vives et al. 2015 (10).
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10
11 (5) In 'rights', the question on pension in EPRES-2010 , which contained both pension
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13 due to old age and disability, was split in two as these are distinct systems unrelated
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15 to one another in the Swedish context. Retirement pension (i.e., pension due to old
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17 age) was kept in EPRES-Se and disability pension was removed. However, a new
18
19 item assessing the right to sickness benefit was added in the subscale instead,
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21 capturing both long term sick leave and shorter spells of sickness absence,
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27 (6) In 'exercise of rights' the item on taking a day off for family reasons was clarified by
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29 adding "care of a sick child, care of a sick relative etc." within brackets.
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35 **EPRES-Se**

36
37 The final version of EPRES-Se consisted of a total of 23 items and six dimensions:
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39 'temporariness' (two items), 'wages' (three items), 'disempowerment' (two items),
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41 'vulnerability' (five items), 'rights' (five items) and 'exercise rights' (six items). As in the
42
43 EPRES-2010, the response scales were 5-point ordinal scales for 'temporariness', 5-
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45 point ordinal and 5-point frequency scales for 'wages', 5-point frequency scales for
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47 'vulnerability' and 'exercise rights', and 5-point and 3-point categorical scales for
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49 'disempowerment' and 'exercise rights', respectively. See EPRES-Se in supplementary
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51 material A.
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Coding of EPRES-Se

Similarly as EPRES-2010, subscale scores were computed as averages and transformed into a 0-4 scale. The global EPRES score is the average of the six subscales, ranging from 0-4, where 0 represent the lowest level of precariousness and 4 represent the highest level of precariousness.

For questions in 'temporariness', response options were coded slightly different compared to EPRES-2010 in order to accommodate the changes made in the Swedish version. For instance, in the question of duration of contract, response options "Do not have a contract" and "Do not know" were coded as 4 (most precarious), in comparison with the Spanish version where a contract length of less than six months was coded as 4. In the question on income, intervals were larger and consistent in size, as compared to the Spanish version. The cut-offs for income were based on the Swedish median net income for 2016, which was just above 18000 SEK for individuals 20-64 years of age (50). The merging of items in 'disempowerment' did not affect the coding. The coding of the individual items along with the English translation of EPRES-Se can be found in the supplementary material B.

Issues leading to recoding of 'temporariness' dimension

When conducting the data analyses it was revealed that 79% (n=139) of the respondents answering 'indefinitely' to the EPRES question on contract length ("How long is your current employment contract valid?") also answered that they were employed on demand/by the hour on a question assessing employment type included

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3 in the PREMIS-survey. We suspected that this combination could be a type of “zero
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5 hour” contract, in which the employer is not required to offer the employee any fixed
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7 number of hours of work at all per day, week or month (39). Thereby, this type of
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9 employment situation could be regarded as contingent with a high degree of
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11 precariousness. This was confirmed as the group indicating an indefinite contract
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13 length *and* on-demand/by the hour employment, were most similar (in terms of the
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15 other EPRES subscales) to employees with a contract lasting less than 1 month and
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17 least alike employees with a fixed-term contract >2 years. Consequently, we re-coded
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19 the group with an indefinite contract *and* on demand/by the hour-employment from
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21 0 to 3 (i.e., the same coding as the response alternative <1 month contract). Those with
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23 any other employment type and an indefinite contract (n=36) remained coded as 0.
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25 See results of subscale-average comparisons in the supplementary material C.
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38 **Psychometric properties of EPRES-Se**

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40 The demographic characteristics of the sample is shown in Table 1. The sample
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42 consisted of a larger proportion 25-29 year-olds (45%) compared to the other age-
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44 groups, and a larger proportion women (54%) as compared to men. Further, the sample
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46 was dominated by workers employed on demand/by the hour (59%).
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50
51 Table 2 shows the item-descriptive statistics. There was a small proportion of
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53 missing values (< 3%). Item means were similar within subscales, with the greatest
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55 mean difference found within ‘wages’ (item mean difference = 1.6). All response
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57 options within the items were used by participants, although to a varying extent. Item-
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subscale correlations were around 0.6-0.8 in 'vulnerability' and 'exercise of rights'; and around 0.4-0.6 in 'wages' and 'rights'. There was a weak correlation between item and subscale in 'disempowerment' and no correlation between items in 'temporariness'. With exception of the latter, all items correlated higher with their corresponding subscale compared to other subscales.

Table 1. Demographic characteristics of the study population (frequencies and percentages), N=415

		N	%
Age	18-24	122	29
	25-29	185	45
	30-64	108	26
Sex	Male	190	46
	Female	225	54
Employment	Temporary employment	121	29
	Employed on demand/by the hour	243	59
	Self-employed (involuntary)	13	3
	Intern	2	1
	Part-time employed (involuntary)	36	9

Table 3 shows the scale descriptive statistics. The subscale mean scores ranged between 1.4 and 2.3, with a global average of 1.9. The proportion of participants with any missing values in the subscales were around 1%, except in the case of 'wages' where it was 3.1%. The latter also included participants answering "No answer" (n=9). Subscale scores ranged between 0-4, and global scale score ranged between 0.09-3.07. Both floor and ceiling effects were generally low (< 5%), with floor effects being highest for 'disempowerment' (9.2%) and 'vulnerability' (11.7%), and ceiling effects being highest for 'rights' (18.0%). Cronbach's alpha coefficients were around 0.7 or higher for

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2
3 'wages', 'vulnerability', 'rights' and 'exercise of rights'. Only 'temporariness' exhibited a
4
5
6 Cronbach's alpha coefficient close to 0. The global alpha coefficient was 0.83.
7

8
9 The exploratory factor analysis extracted six factors with eigenvalues above 1
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11 (eigenvalues = 5.3; 3.2; 2.3; 1.6; 1.3; 1.1). The emerging factors were the same as in
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13 EPRES-2010, thereby confirming the original factor structure. Together, the six factors
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15 explained 64.1% of the variance. The six factors and their rotated factor loadings are
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17 shown in Table 4. All loadings were above 0.35, except in the case of "length of
18
19 contract".
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25 Subanalyses were conducted in order to investigate the potential effect of
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27 including informal workers in the sample (n=35), which had minor influence on the
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29 correlation between temporariness-items ($r=0.002$) and reliability of the subscale (-
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31 0.003). However, in the factor analysis seven factors with eigenvalues >1 emerged (5.3;
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33 3.2; 2.3; 1.6; 1.3; 1.1; 1.0), explaining 68.5% of the variance. The seventh factor was
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35 caused by a split of the temporariness dimension, grouping items on length of contract
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37 (duration) and time working for employer (tenure) in separate factors, with factor
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39 loadings of 0.33 and 0.42 respectively.
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46 Analyses for the weighted population sample resulted in virtually the same
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48 results in regard to item-subscale correlations, Cronbach's alpha coefficients, floor
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50 and ceiling effects, as well as factor loadings from the exploratory factor analysis of
51
52 EPRES-Se, and did thereby not affect the interpretation of the results. See the
53
54 weighted results in table 1-4 in Supplementary material D.
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Table 2. Item descriptive statistics and Pearson item-subscale correlations of EPRES-Se

Item	Missing % ¹	Mean	SD ²	Response value frequency (%) ³					Pearson item subscale correlations ⁴					
				0	1	2	3	4	T	W	D	V	R	ER
Temporariness⁵														
Length of contract	0.0	2.6	1.1	36 (8.7)	24 (5.8)	75 (18.1)	228 (54.9)	52 (12.5)	-	0.04	0.05	0.06	0.08	0.04
Time working empl.	0.0	2.1	0.9	17 (4.1)	92 (22.2)	171 (41.2)	119 (28.7)	16 (3.9)	0.04	-	0.06	0.11	-	0.31
									0.04			0.04		
Wages														
Income monthly	2.2	2.4	1.2	43 (10.6)	45 (11.1)	87 (21.4)	171 (42.1)	60 (14.8)	0.09	0.39	0.14	-	0.29	0.17
Cover basic need	1.0	0.8	0.9	175 (42.6)	171 (41.6)	44 (10.7)	14 (3.4)	7 (1.7)	-	0.60	0.07	0.21	0.13	0.26
Cover unforeseen expen.	1.0	1.8	1.1	60 (14.6)	113 (27.5)	136 (33.1)	70 (17.0)	32 (7.8)	0.02	0.55	0.08	0.39	0.14	0.26
Disempowerment⁵														
Working hour settled	0.0	2.1	1.2	84 (20.2)	8 (1.9)	110 (26.5)	190 (45.8)	23 (5.5)	0.12	0.17	0.34	0.10	0.26	0.23
Salary settled	0.0	2.2	1.2	77 (18.6)	8 (1.9)	101 (24.3)	210 (50.6)	19 (4.6)	0.07	0.03	0.34	0.02	0.13	0.09
Vulnerability														
Demand work cond.	1.0	1.6	1.2	79 (19.2)	129 (31.4)	113 (27.5)	63 (15.3)	27 (6.6)	0.01	0.13	0.09	0.75	0.04	0.28
Unfair treatment	1.0	1.3	1.1	114 (27.7)	159 (38.7)	67 (16.3)	50 (12.2)	21 (5.1)	-	0.12	0.08	0.78	-	0.26
									0.03				0.01	
Afraid fired	1.0	1.5	1.2	106 (25.8)	130 (31.6)	81 (19.7)	60 (14.6)	34 (8.3)	0.06	0.20	0.10	0.78	0.04	0.35
Treated authoritarian	1.0	1.3	1.1	107 (26.0)	160 (38.9)	87 (21.2)	36 (8.8)	21 (5.1)	-	0.20	-	0.63	0.02	0.23
									0.04		0.01			
Easily replaced	1.0	1.6	1.3	91 (22.1)	124 (30.2)	92 (22.4)	55 (13.4)	49 (11.9)	0.06	0.22	0.02	0.74	0.04	0.27
Rights														
Right parental leave	1.2	1.2	0.8	100 (24.4)	130 (31.7)	180 (43.9)			0.18	0.16	0.26	0.05	0.58	0.16
Right retirement	1.2	1.2	0.8	107 (26.1)	113 (27.6)	190 (46.3)			0.26	0.22	0.23	0.07	0.60	0.16
Right unemployment	1.2	1.0	0.9	156 (38.0)	100 (24.4)	154 (37.6)			0.15	0.24	0.15	-	0.60	0.08
												0.01		
Right severance pay	1.2	1.4	0.6	20 (4.9)	223 (54.4)	167 (40.7)			0.11	0.06	0.03	-	0.48	0.03
												0.02		
Right sickness benefits	1.2	0.9	0.8	160 (39.0)	110 (26.8)	140 (34.1)			0.26	0.18	0.17	0.03	0.53	0.12
Exercise of rights														

1															
2															
3	Take weekend off	1.0	1.6	1.1	86 (20.9)	93 (22.6)	154 (37.5)	48 (11.7)	30 (7.3)	-	0.23	0.18	0.18	0.10	0.62
4										0.01					
5	Take vacation	1.2	1.9	1.1	50 (12.2)	88 (21.5)	163 (39.8)	77 (18.8)	32 (7.8)	0.14	0.22	0.20	0.30	0.15	0.68
6	Take day off	1.2	1.6	1.1	88 (21.5)	85 (20.7)	166 (40.5)	50 (12.2)	21 (5.1)	0.15	0.19	0.21	0.24	0.16	0.75
7	Take day off, pers.	1.0	1.9	1.2	63 (15.3)	78 (19.0)	159 (38.7)	69 (16.8)	42 (10.2)	0.11	0.21	0.08	0.36	0.07	0.74
8	Sick leave	1.2	1.6	1.1	98 (23.9)	74 (18.0)	163 (39.8)	50 (12.2)	25 (6.1)	0.06	0.22	0.20	0.26	0.12	0.69
9	Go to doctor	1.0	1.1	1.1	140 (34.1)	126 (30.7)	106 (25.8)	25 (6.1)	14 (3.4)	0.11	0.26	0.09	0.25	0.14	0.64

¹ Proportion of participants with any missing item; ² SD=Standard Deviation; ³ Frequency (%) of participants indicating the specific response. 0 indicates the lowest precariousness score, 4 indicating the highest precariousness score. ⁴ Corrected for overlap, i.e., item is removed from the corresponding subscale. T=Temporariness; W=Wages; D=Disempowerment; V=Vulnerability; R=Rights; ER=Exercise rights. ⁵ Inter-item correlations

Table 3. Scale descriptive statistics: range, mean, standard deviation (SD), floor and ceiling effects and Cronbach's alpha coefficient

Subscale	Items	Mean	SD	Missing (%) ¹	Obs. range	Floor % ²	Ceiling % ²	Cronbach's alpha
Temporariness	2	2.3	0.7	0.0	0-4	0.5	1.0	-0.08
Wages	3	1.6	0.8	3.1	0-4	4.2	0.7	0.69
Disempowerment	2	2.1	1.0	0.0	0-4	9.2	1.4	0.50
Vulnerability	5	1.4	1.0	1.0	0-4	11.7	1.9	0.89
Rights	5	2.3	1.2	1.2	0-4	2.9	18.0	0.78
Exercise of rights	6	1.6	0.9	1.2	0-4	6.8	1.0	0.88
EPRES-se	23	1.9	0.5	3.4	0.09-3.07	0.2	0.2	0.83

¹ Proportion of participants with any missing item

² Proportion of participants with lowest (floor) and highest (ceiling) EPRES-Se scores

Table 4. Factor loadings from exploratory factor analysis of the EPRES-Se

	Factor					
	Exercise rights	Vulnerability	Rights	Wages	Disempowerment	Temporariness
Temporariness						
Length of contract						0.12
Time working empl.	0.12		0.36			-0.36
Wages						
Income monthly	0.14	-0.16	0.23	0.49		0.35
Cover basic need	0.17	0.13		0.71		
Cover unforeseen expen.	0.12	0.32		0.79		-0.10
Disempowerment						
Working hour settled	0.17		0.21		0.52	0.15
Salary settled					0.60	
Vulnerability						
Demand work cond.	0.14	0.80				
Unfair treatment	0.11	0.84				
Afraid fired	0.20	0.80				
Treated authoritarian	0.11	0.66		0.12		0.13
Easily replaced	0.12	0.77		0.15		
Rights						
Right parental leave			0.67		0.21	
Right retirement			0.69		0.16	
Right unemployment			0.69	0.11		0.29
Right severance pay			0.55		-0.10	
Right sickness benefits			0.60		0.11	
Exercise rights						

1						
2						
3	Take weekend off	0.65			0.10	0.14
4	Take vacation	0.70	0.18			-0.13
5	Take day off	0.80	0.10	0.10		-0.13
6	Take day off, pers.	0.78	0.24			-0.10
7	Sick leave	0.72	0.11		0.12	0.15
8	Go to doctor	0.66	0.11		0.13	
9						

Table showing factor loadings >0.1

DISCUSSION

Key findings and summary

The scale generally performed well, with a small proportion of missing values across all subscales, usage of all response options and good global reliability. The factor structure established in the Spanish EPRES-2010 (10) was confirmed. The subscales 'vulnerability', 'wages', 'rights' and 'exercise of rights' generally worked well in the Swedish context, with high item-subscale correlations, subscale reliability and factor loadings. However, 'temporariness' did not perform as expected and would need revision. In addition, although 'disempowerment' showed acceptable psychometric properties, the subscale might benefit from additional adaptation.

'Temporariness'

As opposed to previous studies, (8-10), temporariness yielded very poor psychometric properties. The items in the subscale did not correlate, there was a negative Cronbach's alpha coefficient and a low factor loading for the item on contract duration. Only minor changes in terms of correlation and Cronbach's alpha was initiated by the removal of informal workers. This subanalysis did, however, split

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2
3 the temporariness dimension in two separate factors, both of which had higher factor
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5 loadings. On the basis of these results, we believe that the temporariness dimension
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7 needs further development and evaluation in a population of both standard and non-
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9 standard employees. Based on the results from the present study, we offer the
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11 following thoughts on this matter:
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15
16 Firstly, it is important to acknowledge the sample selection. As the sample was
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18 restricted to non-standard employees (i.e., permanent, full-time, employees were
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20 excluded), the lower end of the precariousness scale had a smaller proportion than
21
22 what would be expected if standard employees with longer duration and tenure
23
24 would have been included in the sample. This limitation is likely to have contributed
25
26 to the lack of correlation between the items. However, considering that the sample
27
28 was intentionally recruited in order to capture a population of precariously employed
29
30 individuals, the poor psychometric properties of temporariness also shows that these
31
32 items are not necessarily related in a meaningful way when measuring precariousness
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34 among non-standard employees.
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43 Secondly, in the current context, the Swedish legislation (the Employment
44
45 Protection Act SFS 1982:80) prevents an employer to hire an employee for more than
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47 two years during a five-year period (consecutive or in shorter repeated contracts)
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49 without having to employ (or dismiss) the employee in a permanent contract (51).
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51 Thereby, an employee with an 18-month tenure might be more precarious than an
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53 employee with a 6-month tenure as the latter has longer time left before being
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55 forced in or out. Further, approximately 50% of temporary employees in Sweden has
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3 had repeated contracts with the same employer (41), which is an additional reasons
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5 that could contribute to the lack of correlation between tenure and duration of
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7 contract.
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11 Thirdly, we found that several participants were employed by the hour or on
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13 demand while still indicating an indefinite contract length. This highlights the
14
15 difficulties in assessing temporariness only by contract duration (and tenure).
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17 Temporariness is the dimension most likely to be dependent on context. Given the
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19 proposed mechanism of temporariness leading to ill-health mediated via feelings of
20
21 insecurity, temporariness is most relevant in labour markets which do not offer
22
23 regulatory protection for certain groups of workers, such as permanent employees in
24
25 most European countries, which does not apply to the same extent in the USA (52).
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33 However tempting it would be suggest the inclusion of questions regarding
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35 "contract type" in a future development of EPRES, the continuous flexibilization of the
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37 labour market and fast changes in employment practices in combination with
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39 contextual differences, makes it increasingly difficult – at least if international
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41 comparison using similar scales is sought after.
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47 From a mechanistic standpoint and with an aspiration to develop a scale which
48
49 could be used in international comparison independent of context, we believe that an
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51 item that measures the future employment opportunities with the current employer
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53 as objectively as possible should be developed. EPRES-Se and other translations
54
55 could further be adapted, for example by combining the contract duration and
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57 tenure-items with an item assessing the number of repeated contracts with the same
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3 employer or an item assessing how often during a specific time interval the
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5 employment contract is up for renewal. Contract duration could also be
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8 complemented or replaced by a question more explicitly assessing the remaining
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11 duration of the contract at the time of answering the survey.
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16 **'Wages'**

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18
19 The income-item correlated moderately with the other items in the subscale (items
20
21 assessing how well the income covers basic needs and unforeseen expenses). Previous
22
23 studies report similar findings for this item (8-10). One explanation to these results is
24
25 the quantitative nature of the income-item as compared to the other items. Slightly
26
27 more than half, 57%, of the participants scored a precariousness level of 3 or 4 on
28
29 income, which is not surprising as the sample is constituted by young non-standard
30
31 employees. However, only 5% and 25% of the sample scored a precariousness level of
32
33 3 or 4 on the other two items respectively. How well one can cover basic needs and
34
35 unforeseen expenses could depend on more than income, such as family support.
36
37
38 Approximately 24% of adults aged 20-27 years in Sweden still live at home. In the
39
40 majority of municipalities in large city regions, this figure is more than 50% in the
41
42 majority of municipalities in large city regions. About half of those living at home pay
43
44 nothing in rent (53). As 74% of the sample is between 18-29 years old, it is likely that
45
46 at least a part of the participants still live at home and receive help from their family.
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49 Including standard employees in the sample could potentially have increased the item-
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3 subscale correlation as we would expect a larger proportion of participants with a high
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6 income.

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8 Aside from the income-item, item-subscale correlations for the remaining two
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10 items and subscale reliability were acceptable and only a fraction of the sample did not
11
12 provide an answer to the item on income (2.2%). Therefore, as in the other EPRES scales,
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14 we believe the subscale can be used in its current form in future studies.
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22 **'Disempowerment'**

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24 The items in 'disempowerment' had acceptable item-subscale correlations and
25
26 reliability. However, some response options ("my working hours/salary was decided
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28 within my working team" and "do not know") were hardly used at all in, indicating that
29
30 these options might not be appropriate for the current population in the Swedish
31
32 context. Further, the remaining response options were also inadequate from an
33
34 adaptational point of view. For example, the working hours/salary being in line with
35
36 collective bargaining agreements does not imply that the working hours/salary was not
37
38 set by the employer; these options are not mutually exclusive. In a revised EPRES-Se,
39
40 the disempowerment-items would benefit from revision and clarification. Combining
41
42 response options not mutually exclusive could be considered as one way of improving
43
44 the subscale, such as "my working hours are in accordance with Swedish law and the
45
46 collective agreement, decided by my employer" and "my working hours are not in
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48 accordance with Swedish law and the collective agreement, decided by my employer".
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'Rights'

The new item assessing sickness benefit had an acceptable item-subscale correlation and factor loading, similar to the other item-subscale correlations and factor loadings in the subscale. Further, the subscale reliability was good. Taken together, these results point towards that the new item worked well in the subscale.

Strengths and limitations

This study finds strength in the fact that it is the first study translating and adapting EPRES-2010 to the Swedish context, as well as the first study to assess the psychometric properties of the resulting EPRES-Se. In addition, this work provides context-specific recommendations for future research using EPRES-Se. This study is, however, not without limitations.

The main limitations is the sample. As this study lies within the frame of the PREMIS-project (47), the sample was restricted to employees with a non-standard employment. EPRES, however, is developed to measure precariousness independent of the type of employment (8). By only assessing the psychometric properties of the scale in a population of non-standard employees, the scale properties cannot be directly compared to similar studies as the heterogeneity of the sample is limited. A sample representative of the entire work force would have provided better insights as to how the scale behaves among Swedish employees. A next step which this study has provided strong grounds for.

Finally, the relatively small sample size could influence the reliability of the

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3 results, which should be kept in mind when interpreting and generalizing the results.
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6 Further, being a convenience sample limits the generalizability of the results. However,
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8 as the weighted results confirmed the psychometric properties of the scale, we could
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10 expect similar results in a representative sample applying the same sample restrictions.
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22 **Conclusion**

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24 The study found that EPRES-Se worked well in the current context, with high global
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26 reliability, endorsement of all response options (for all items) and few missing values.
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28 The psychometric properties for five out of six subscales were satisfactory, considering
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30 this being the first translation and adaptation. However, one subscale, 'temporariness',
31
32 worked poorly and would need revision before implementing the scale in further
33
34 research. As employment precariousness is an emergent determinant of health it is
35
36 important that PE can be properly measured. The EPRES-Se is an important step in this
37
38 direction. We therefore encourage others to continue working with EPRES-Se and to
39
40 validate it further in populations of both standard and non-standard employees. Our
41
42 hope is for a revised EPRES-Se with satisfactory psychometric properties to be
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44 implemented in research both as an independent tool and included in nation-wide
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46 surveys. In order to enable international comparisons and multinational studies, similar
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48 studies in other European countries are also called for.
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STATEMENTS

Author contributions: The study was conceived by Theo Bodin (TB) and Gun Johansson (GJ). All authors, TB, GJ, Johanna Jonsson (JJ), Alejandra Vives (AV), Joan Benach (JB), Katarina Kjellberg (KK) and Jenny Selander (JS), contributed to the design of the study. TB translated and back-translated the EPRES, and AV supported the translation process and examined the back translation. JJ collected the data with support from TB and GJ. JJ and TB conducted the analyses. JJ wrote the draft(s) of the manuscript. All authors reviewed the draft(s) and provided feedback on its content. All authors approved the contents of the final manuscript.

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12
13
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16
17 manuscript.
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23
24 authors may be contacted at johanna.jonsson@ki.se. Data cannot be made publicly
25
26
27 available for ethical and legal reasons, but could be made available to researchers
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30 who meet the criteria for access to confidential data after approval from the Regional
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33 Ethics Committee of Stockholm.
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SUPPLEMENTARY MATERIAL

Supplementary material A. EPRES-Se

TEMPORALITET

1. Hur länge gäller ditt nuvarande kontrakt?

Om du har flera arbetsgivare anger du den arbetsgivare du arbetar för flest timmar en genomsnittlig månad.

- Tillsvidare
- 2 år eller mer
- 1 år eller mer
- 6 månader eller mer
- 3 månader eller mer
- 1 månad eller mer
- Kortare än 1 månad
- Har inget kontrakt
- Vet ej

2. Hur länge har du jobbat för samma arbetsgivare/uppdragsgivare?

Om du har flera arbetsgivare anger du den arbetsgivare du arbetar för flest timmar en genomsnittlig månad.

- Mindre än 1 månad
- 1 månad till mindre än 3 månader
- 3 månader till mindre än 6 månader
- 6 månader till mindre än 1 år
- 1 år till mindre än 2 år
- 2 år till mindre än 5 år
- 5 år eller mer

LÖN

3. Ungefär hur mycket tjänar du per månad netto (efter skatt)?

Lägg ihop summan för din vita lön efter skatt + svart lön + eventuell dricks, en genomsnittlig månad.

- 3 000 kr eller mindre
- Mellan 3 001 och 6 000 kr
- Mellan 6 001 och 9 000 kr
- Mellan 9 001 och 12 000 kr
- Mellan 12 001 och 15 000 kr
- Mellan 15 001 och 18 000 kr
- Mellan 18 001 och 21 000 kr
- Mellan 21 001 och 24 000 kr
- Mellan 24 001 och 27 000 kr
- Mellan 27 001 och 30 000 kr
- Mer än 30 000 kr
- Inget svar

Hur ofta tillåter din nuvarande lön dig att...

- Alltid
- Ofta
- Ibland
- Sällan
- Aldrig

4. Täcka dina dagliga grundläggande behov?

5. Täcka oförutsedda utgifter av betydelse?

- Ibland
- Sällan
- Aldrig

MAKTLÖSHET

6. Hur bestämdes arbetstiderna för ditt nuvarande arbete?

Välj det alternativ som stämmer bäst in på dig. Om du har flera arbetsgivare anger du den arbetsgivare du arbetar för flest timmar en genomsnittlig månad.

- De följer lag och kollektivavtalet
- De bestämdes av arbetsgivaren
- De var en överenskommelse mellan mig och min chef
- De var en överenskommelse i mitt arbetslag
- Vet ej
- Ej relevant, arbetar uppdragsbaserat

7. Hur bestämdes lönen för ditt nuvarande arbete?

Välj det alternativ som stämmer bäst in på dig. Om du har flera arbetsgivare anger du den arbetsgivare du arbetar för flest timmar en genomsnittlig månad.

- Den följer kollektivavtalet
- Den bestämdes av arbetsgivaren
- Den var en överenskommelse mellan mig och min chef
- Den var en överenskommelse i mitt arbetslag
- Vet ej

SÅRBARHET

Ange hur ofta hos din arbetsgivare som...

Om du har flera arbetsgivare anger du den arbetsgivare du arbetar för flest timmar en genomsnittlig månad.

Var god besvara alla frågor.

8. Du är rädd för att kräva bättre arbetsvillkor

- Alltid
- Ofta

9. Du är försvarslös mot orättvis behandling från överordnande

- Ibland
- Sällan

10. Du är rädd för att få sparken om du inte gör allt arbetsgivaren ber om

- Aldrig

11. Du blir behandlad auktoritärt

12. De får dig att känna dig lätt utbytbar

RÄTTIGHETER

Har du rätt till något av följande?

Var god besvara alla frågor.

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3 **13. Föräldraledighet**

- Ja

- Nej

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5 **14. Ålderspension**

- Vet ej

6
7 **15. A-kassa**

8
9 **16. Avgångsvederlag vid uppsägning**

10
11 **17. Sjukersättning/sjukpenning**

12 13 14 15 **UTÖVANDE AV RÄTTIGHETER**

16
17
18 **Hur ofta i den organisation där du arbetar kan du utöva**
19 **följande rättigheter?**

20 Om du har flera arbetsgivare anger du den arbetsgivare du
21 arbetar för flest timmar en genomsnittlig månad.

22
23 Var god besvara alla frågor.

24
25
26 **18. Ta helg/veckovila utan problem**

- Alltid

- Ofta

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28 **19. Ta semesterdagar utan problem**

- Ibland

- Sällan

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30 **20. Ta en ledig dag av familjescäl utan problem (vård av**
31 **sjukt barn, vård av sjuk anhörig etc.)**

- Aldrig

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33 **21. Ta en ledig dag av personliga skäl utan problem**

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35 **22. Sjukskriva dig utan problem**

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37 **23. Gå till läkare när du behöver**
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Supplementary material B. English translation of EPRES-Se with coding

TEMPORARINESS

Coding

1. How long is your current employment contract valid?	- Indefinitely	0
	- 2 years or more	1
If you have more than one employer, please indicate the employer you work the most hours for during an average month.	- 1 year or more	1
	- 6 months or more	2
	- 3 months or more	3
	- 1 month or more	3
	- Less than 1 month	3
	- Do not have a contract	4
	- Do not know	4

2. How long have you been working for the same employer?	- Less than 1 month	4
	- 1 month to less than 3 months	3
If you have more than one employer, please indicate the employer you work the most hours for during an average month.	- 3 months to less than 6 months	3
	- 6 months to less than 1 year	2
	- 1 year to less than 2 years	2
	- 2 years to less than 5 years	1
	- 5 years or more	0

WAGES

3. Approximately how much do you earn per month after taxes?	- 3000 SEK or less	4
	- Between 3001 and 6000 SEK	4
Add the amount for your salary after tax deductions + salary for illicit work + any tips, during an average month.	- Between 6001 and 9000 SEK	3
	- Between 9001 and 12 000 SEK	3
	- Between 12 001 and 15 000 SEK	2
	- Between 15 001 and 18 000 SEK	2
	- Between 18 001 and 21 000 SEK	1
	- Between 21 001 and 24 000 SEK	1
	- Between 24 001 and 27 000 SEK	0
	- Between 27 001 and 30 000 SEK	0
	- More than 30 000 SEK	0
	- No answer	-

How often does your current salary allow you to...	- Always	0
	- Often	1
4. Cover you daily basic needs?	- Sometimes	2
5. Cover unforeseen expenses of significance?	- Rarely	3
	- Never	4

DISEMPOWERMENT

6. How were your working hours settled for your current job?

Indicate the alternative that fits you best. If you have more than one employer, please indicate the employer you work the most hours for during an average month.

- My working hours are in accordance with Swedish law and the collective agreement 0
- My employer decided my working hours 3
- My working hours are the result of an agreement between me and my manager 2
- My working hours are the result of an agreement within my work team 1
- Do not know 4
- Not applicable. I work project-based 2

7. How was the salary settled for your current job?

Indicate the alternative that fits you best. If you have more than one employer, please indicate the employer you work the most hours for during an average month.

- My salary is accordance with the collective agreement 0
- My salary was set by my employer 3
- My salary is the result of an agreement between me and my manager 2
- My salary is the result of an agreement in my work team 1
- Do not know 4

VULNERABILITY

Indicate how often, at your employer...

If you have more than one employer, please indicate the employer you work the most hours for during an average month.

Please indicate an answer to all of the questions.

8. You feel afraid to demand better working conditions

- Always 4
- Often 3
- Sometimes 2

9. You are defenceless towards unfair treatment by your superiors

- Rarely 1
- Never 0

10. You feel afraid of being fired if you do not comply with everything your employer asks of you

11. You are treated in an authoritarian manner

1
2
3 **12. You are made to feel easily replaceable**
4
5

6 **RIGHTS**
7

8
9 **Do you have the right to any of the following?**

10 Please indicate an answer to all of the questions.
11

12			
13	13. Parental leave	- Yes	0
14		- No	1
15	14. Retirement due to old age	- Do not know	2
16			
17	15. Unemployment insurance fund (A-kassa)		
18			
19	16. Severance pay in the event of termination		
20			
21	17. Sickness benefit		
22			
23			

24 **EXERCISE OF RIGHTS**
25

26
27
28 **How often, in the organisation where you work, are**
29 **you able to exercise the following rights?**

30 If you have more than one employer, please indicate the
31 employer you work the most hours for during an average
32 month.
33

34 Please indicate an answer to all of the questions.
35

36	18. Take the weekend off/ weekly rest without	- Always	0
37	problem	- Often	1
38	19. Take vacation days without problem	- Sometimes	2
39		- Rarely	3
40	20. Take a day off for family reasons without	- Never	4
41	problem (care of a sick child, care of a sick relative		
42	etc.)		
43			
44	21. Take a day off for personal reasons without		
45	problem		
46			
47	22. Go on sick leave without problem		
48			
49	23. Go to the doctor when needed		
50			
51			

Supplementary material C. Comparison of subscale means for recoding of participants with an indefinite contract and on demand/by the hour employment

Crosstabulation of type of employment and contractual length

Table showing crosstabulation of type of employment and contractual length (EPRES-Se item 1)

Contractual length	Type of employment			Total
	Temporary employment	Employed on demand/by the hour	Self-employed (involuntary), intern, part-time	
Indefinitely	16 ^a	139 ^b	20 ^a	175
2 years or more	3	3	1	7
1 year or more	9	7	1	17
6 months or more	34	32	9	75
3 months or more	24	19	6	49
1 month or more	16	6	2	24
Less than 1 month	11	5	0	16
I do not have a contract	2	21	12	35
Do not know	6	11	0	17
Total	121	243	51	415

^a Used in comparison 2

^b Used in comparison 1

1. Comparison of subscale means for employees with an indefinite contractual length and on demand/by the hour employment

Table showing subscale averages for employees with an indefinite contractual length and an on demand/by the hour employment

Subscale	N	Minimum	Maximum	Mean	Std. Deviation
Wages	135	0.00	3.67	1.76	0.72
Disempowerment	139	0.00	4.00	2.21	0.97
Vulnerability	137	0.00	4.00	1.35	0.94
Rights	136	0.00	4.00	2.35	1.06
Exercise of rights	136	0.00	3.50	1.74	0.71
Valid N	134				

Table showing least sum of squares-differences between subscale averages for employees with an on demand/by the hour employment, comparing employees with an indefinite contractual length vs. employees with any other contractual length

EPRES-Se item 1. How long is your current employment valid?								
Subscale	2 y	1y	6m	3m	1m	<1m	No contract	I don't know
Wages	0.014	0.652	0.320	0,100	0.348	0.096	0.142	0.025
Disempowerment	0.379	0.284	0.072	0.367	0.295	0.212	0.165	0.151
Vulnerability	1.216	0.092	0.320	0,004	0.518	0.251	0.461	0.658
Rights	2.086	0.467	0.053	0,659	0.180	0.113	0.123	0.338
Exercise of rights	0.185	0.764	0.135	0,191	0.315	0.040	0.046	0.558
Sum	3.880	2.258	0.899	1.320	1.657	0.713	0.936	1.731

2. Comparison of subscale means for employees with an indefinite contractual length and any other type of employment (excluding on demand/by the hour)

Table showing subscale averages for employees with an indefinite contract length and any other type of employment

Subscale	N	Minimum	Maximum	Mean	Std. Deviation
Wages	35	0.33	4.00	1.819	0.919
Disempowerment	36	0.00	4.00	2.167	1.095
Vulnerability	36	0.00	4.00	1.167	0.966
Rights	36	0.00	4.00	2.356	1.182
Exercise of rights	36	0.00	4.00	1.690	0.876
Valid N	35				

Table showing least sum of squares-differences between subscale averages for employees with any other employment (excluding on demand/by the hour employees), comparing employees with an indefinite contractual length vs. employees with any other contractual length

EPRES-Se item 1. How long is your current employment valid?								
Subscale	2 y	1y	6m	3m	1m	<1m	No contract	I don't know
Wages	1.402	0.486	0.510	0.624	0.504	0.819	0.264	0.459
Disempowerment	0.541	0.216	0.190	0.083	0.083	0.121	0.190	0.000
Vulnerability	0.533	0.233	0.517	0.667	0.500	0.258	0.276	0.633
Rights	1.456	0.836	0.132	0.276	0.378	0.792	0.298	0.422
Exercise of rights	0.357	0.957	0.252	0.179	0.227	0.311	0.404	0.032
Sum	4.289	2.727	1.601	1.828	1.692	2.301	1.433	1.547

Supplementary material D. Weighted results, table 1-4**Table 1. Weighted demographic characteristics of the study population (percentages), N=415**

		%
Age	18-24	34%
	25-29	43%
	30-64	23%
Sex	Male	50%
	Female	50%
Employment	Temporary employment	21%
	Employed on demand/by the hour	64%
	Self-employed (involuntary)	3%
	Intern	1%
	Part-time employed (involuntary)	10%

Table 2. Weighted item descriptive statistics and Pearson item-subscale correlations of EPRES-Se

Item	Missing % ¹	Mean	SD ²	Response frequency ³					Pearson item subscale correlations ⁴					
				0	1	2	3	4	T	W	D	V	R	ER
Temporariness														
Length of contract ⁵	0.0	2.5	1.1	9.5	5.8	17.9	56.0	10.9	-0.05	0.02	-0.03	0.06	0.06	0.05
Time working empl. ⁵	0.0	2.1	0.9	2.8	22.1	43.8	27.8	3.5	-0.05	0.15	0.17	0.05	0.36	0.21
Wages														
Income monthly	3.5	2.6	1.0	6.9	6.6	23.3	47.0	16.1	0.13	0.40	0.04	0.01	0.27	0.23
Cover basic need	1.2	0.8	0.9	40.2	44.2	11.4	2.5	1.7	0.01	0.61	0.03	0.27	0.13	0.28
Cover unforeseen expen.	1.2	1.8	1.1	13.3	28.7	34.3	15.6	8.1	0.13	0.57	0.08	0.42	0.17	0.22
Disempowerment														
Working hour settled ⁵	0.0	2.2	1.2	18.7	0.7	31.3	42.7	6.5	0.06	0.13	0.33	0.08	0.20	0.16
Salary settled ⁵	0.0	2.2	1.2	19.3	2.1	19.3	54.1	5.2	0.07	-0.03	0.33	0.00	0.10	0.11
Vulnerability														
Demand work cond.	1.2	1.4	1.1	21.8	33.0	28.4	11.4	5.4	0.04	0.20	0.09	0.76	0.09	0.25
Unfair treatment	1.2	1.2	1.1	28.5	39.2	18.4	9.9	4.0	0.04	0.20	0.08	0.80	0.10	0.26
Afraid fired	1.2	1.4	1.2	28.4	30.9	21.4	13.3	6.0	0.09	0.31	0.10	0.79	0.17	0.38
Treated authoritarian	1.2	1.2	1.1	28.4	38.1	19.1	9.9	4.5	0.03	0.21	-0.04	0.64	0.12	0.23
Easily replaced	1.2	1.6	1.2	21.6	33.2	22.7	11.5	11.1	0.13	0.30	-0.02	0.74	0.15	0.24
Rights														
Right parental leave	1.2	1.2	0.8	23.0	33.7	43.3			0.19	0.20	0.22	0.12	0.59	0.22
Right retirement	1.2	1.2	0.8	24.4	29.8	45.8			0.29	0.20	0.23	0.17	0.59	0.28
Right unemployment	1.2	1.0	0.9	36.7	24.7	38.6			0.13	0.17	0.05	0.07	0.60	0.12
Right severance pay	1.2	1.3	0.6	6.0	53.2	40.8			0.14	0.11	0.04	0.05	0.50	0.05
Right sickness benefits	1.2	1.0	0.9	38.7	26.8	34.5			0.28	0.15	0.10	0.13	0.53	0.15
Exercise of rights														
Take weekend off	1.2	1.7	1.1	19.9	17.4	44.6	11.5	6.5	0.07	0.23	0.14	0.21	0.13	0.67
Take vacation	1.2	1.9	1.0	12.3	20.1	43.4	18.3	6.0	0.15	0.25	0.18	0.27	0.19	0.71
Take day off	1.2	1.7	1.1	21.4	17.8	41.4	13.6	5.8	0.18	0.22	0.19	0.25	0.20	0.77
Take day off, pers.	1.2	1.9	1.1	13.7	19.1	41.8	16.4	9.0	0.12	0.23	0.05	0.37	0.19	0.71
Sick leave	1.2	1.6	1.1	21.7	19.1	42.9	12.1	4.1	0.11	0.22	0.15	0.23	0.19	0.70
Go to doctor	1.2	1.2	1.1	34.3	27.1	28.2	7.2	3.2	0.19	0.28	0.07	0.24	0.19	0.67

¹ Proportion of participants with any missing item; ² SD=Standard Deviation; ³ Frequency (%) of participants indicating the specific response. 0 indicates the lowest precariousness score, 4 indicating the highest precariousness score. ⁴ Corrected for overlap, i.e., item is removed from the corresponding subscale. T=Temporariness; W=Wages; D=Disempowerment; V=Vulnerability; R=Rights; ER=Exercise rights. ⁵ Inter-item correlations

Table 3. Weighted scale descriptive statistics: range, mean, standard deviation (SD), floor and ceiling effects and Cronbach's alpha coefficient

Subscale	Items	Mean	SD	Missing (%) ¹	Obs. range	Floor % ²	Ceiling % ²	Cronbach's alpha
Temporariness	2	2.3	0.7	0.0	0-4	0.3	1.3	-0.10
Wages	3	1.7	0.8	4.7	0-4	3.0	1.0	0.70
Disempowerment	2	2.2	1.0	0.0	0-4	8.7	2.4	0.50
Vulnerability	5	1.4	1.0	1.2	0-4	14.3	2.0	0.90
Rights	5	2.3	1.1	1.3	0-4	3.8	17.9	0.78
Exercise of rights	6	1.6	0.9	1.3	0-4	7.3	1.0	0.89
EPRES-se	23	1.9	0.5	4.8	0.09-3.07	0.2	0.7	0.84

¹ Proportion of participants with any missing item

² Proportion of participants with lowest (floor) and highest (ceiling) EPRES-Se scores

Table 4. Weighted factor loadings from exploratory factor analysis of the EPRES-Se

	Factor					
	Exercise rights	Vulnerability	Rights	Wages	Disempowerment	Temporariness
Temporariness						
Length of contract						-0.21
Time working empl.	0.17		0.37		0.14	-0.36
Wages						
Income monthly	0.20	-0.11	0.24	0.49		-0.25
Cover basic need	0.20	0.19		0.66		
Cover unforeseen expen.		0.35		0.84		0.19
Disempowerment						
Working hour settled			0.14		0.43	
Salary settled					0.69	0.15
Vulnerability						
Demand work cond.	0.11	0.81				
Unfair treatment		0.86				
Afraid fired	0.24	0.80		0.12	0.13	-0.12
Treated authoritarian	0.11	0.67			-0.14	
Easily replaced		0.76		0.17		
Rights						
Right parental leave	0.15		0.69		0.19	
Right retirement	0.17		0.68		0.24	-0.13
Right unemployment			0.70			-0.17
Right severance pay			0.56			
Right sickness benefits			0.60			0.14
Exercise rights						
Take weekend off	0.69			0.11		-0.11
Take vacation	0.74	0.12			0.10	
Take day off	0.82	0.10				0.14
Take day off, pers.	0.73	0.25			-0.10	0.10
Sick leave	0.74				0.15	-0.16
Go to doctor	0.69		0.11	0.15		

Table showing factor loadings >0.1

The weighted exploratory factor analysis extracted six factor with eigenvalues >1 (eigenvalues: 5.6; 3.0; 2.5; 1.5; 1.4; 1.1). These factors were the same as in EPRES-2010, thereby confirming the EPRES-2010 scale structure. Together, the six factor explained 65.4% of the variance.

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For peer review only

STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract (b) Provide in the abstract an informative and balanced summary of what was done and what was found
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported
Objectives	3	State specific objectives, including any prespecified hypotheses
Methods		
Study design	4	Present key elements of study design early in the paper
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group
Bias	9	Describe any efforts to address potential sources of bias
Study size	10	Explain how the study size was arrived at
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding (b) Describe any methods used to examine subgroups and interactions (c) Explain how missing data were addressed (d) If applicable, describe analytical methods taking account of sampling strategy (e) Describe any sensitivity analyses
Results		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed (b) Give reasons for non-participation at each stage (c) Consider use of a flow diagram
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders (b) Indicate number of participants with missing data for each variable of interest
Outcome data	15*	Report numbers of outcome events or summary measures
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included (b) Report category boundaries when continuous variables were categorized (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses

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Discussion		
Key results	18	Summarise key results with reference to study objectives
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence
Generalisability	21	Discuss the generalisability (external validity) of the study results
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.