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Published in:
Archives of Physical Medicine and Rehabilitation

DOI:
10.1016/j.apmr.2020.05.027

ACRM
AMERICAN CONGRESS OF REHABILITATION MEDICINE

Archives of Physical Medicine and Rehabilitation

journal homepage: www.archives-pmr.org

Archives of Physical Medicine and Rehabilitation 2020;101:2157-66

ORIGINAL RESEARCH

Employment Among People With Spinal Cord Injury in 22 Countries Across the World: Results From the International Spinal Cord Injury Community Survey

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Abstract

Objectives: To describe the employment situation of individuals with spinal cord injury (SCI) in 22 countries participating in the International Spinal Cord Injury community survey, to compare observed and predicted employment rates, to estimate gaps in employment rates among people with SCI compared with the general population, and to study differences in employment between men and women.

Design: Cross-sectional survey.

Setting: Community.

Presented to the International Society for Physical Medicine and Rehabilitation, June 9-13, 2019, Kobe, Japan.

Disclosures: none.

0003-9993/20/$36 - see front matter
https://doi.org/10.1016/j.apmr.2020.05.027

Participants: People of employable age (N = 9875; 18-64 y) with traumatic or non-traumatic SCI (including cauda equina syndrome) who were at least 18 years of age at the time of the survey, living in the community, and able to respond to one of the available language versions of the questionnaire.
Interventions: Not applicable
Main Outcome Measures: The observed employment rate was defined as performing paid work for at least 1 hour a week, and predicted employment rate was adjusted for sample composition from mixed logistic regression analysis.
Results: A total of 9875 participants were included (165-1174 per country). Considerable differences in sample composition were found. The observed worldwide employment rate was 38%. A wide variation was found across countries, ranging from 10.3% to 61.4%. Some countries showed substantially higher or lower employment rates than predicted based on the composition of their sample. Gaps between the observed employment rates among participants with SCI and the general population ranged from 14.8% to 54.8%. On average, employment rates were slightly higher among men compared with women, but with large variation across countries. Employment gaps, however, were smaller among women for most countries.
Conclusions: This first worldwide survey among people with SCI shows an average employment rate of 38%. Differences between observed and predicted employment rates across countries point at country-specific factors that warrant further investigation. Gaps with employment rates in the general population were considerable and call for actions for more inclusive labor market policies in most of the countries investigated.
Archives of Physical Medicine and Rehabilitation 2020;101:2157-66

Employment is a key indicator of successful rehabilitation and community integration of people with disabilities, including spinal cord injury (SCI). Participation in paid work not only ensures income and economic self-sufficiency, but it is also associated with enhanced self-esteem, building social relationships, life satisfaction, and longevity.[1-3] For the society as a whole, successful integration of people with disabilities into the workforce in effect increases work productivity and contributes to the social well-being of the population.[4] However, the worldwide average employment rate among people with SCI is approximately 35% to 37%.[3,5,6] Employment rates per continent were highest in Europe (average 51%) and lowest in North America (average 30%).[5,7] This variation between countries suggests that system-level, infrastructure, and policy differences may play a role in affecting work outcomes.[8] Further investigation of such differences requires studies that compare multiple countries, but with few exceptions,[9] studies on employment post-SCI are notably absent in the literature. Therefore, the best available evidence to date stems from comparisons of single-country studies. However, such comparisons are hampered by a lack of standardization of employment metrics, disparate inclusion and exclusion criteria, and an uneven geographical and perhaps resource distribution of SCI research across the world, with the majority of the research undertaken in North America (59%), followed by Europe (22%), Asia (10%), Australasia (10%), Africa (1%) and South America (0%).[6]

The overall goal of the International SCI (InSCI) community survey was to identify factors that explain the functioning and well-being of people living with SCI within and across countries.[10,11] A total of 22 countries representing all 6 World Health Organization regions participated in this project.[12] The objective of the current study is to describe the employment situation of people with SCI across the countries participating in InSCI with special attention given to sex as a determinant of employment.

List of abbreviations:

InSCI	**International Spinal Cord Injury community survey**
SCI	**spinal cord injury**
TSI	**time since onset of injury**

The evidence on this topic is inclusive.[8] Because these differences could be culture-dependent, this survey is an excellent setting to study sex-related differences in employment. The specific aims of this study are to (1) estimate and compare observed and predicted employment rates adjusted for sample composition across the 22 InSCI countries, (2) estimate gaps in employment rates among people with SCI and the national general population, and (3) examine the differences in employment rates and employment gaps between men and women.

Methods

The InSCI survey is a cross-sectional community survey conducted in 22 countries between January 2017 and May 2019. Swiss Paraplegic Research developed the questionnaire together with representatives from participating InSCI countries and provided standard operating procedures for data collection and data management. National study centers managed the deployment of the survey in their countries and approval of the study protocol by the Ethics Board according to national laws and regulations. The study was executed in compliance with the Declaration of Helsinki.

Participants

Based on a power analysis, a minimal sample size of 200 participants per country was determined in the InSCI study.[11] Included were individuals with traumatic or non-traumatic SCI (including cauda equina syndrome), who were at least 18 years of age at the time of the survey, living in the community, and able to respond to 1 of the available language versions of the questionnaire. For the current study, only InSCI participants of employable age as per Organisation for Economic Co-operation and Development (age, 18-64y) were considered.

Procedures

The study procedures are described in detail elsewhere.[11,12] Briefly, eligible participants were identified from multiple sources in most countries, including databases of acute hospitals (n = 12),

specialized rehabilitation facilities (n=17), patient organizations (n=14), government agencies (n=3), and previous study databases (n=2). Eight countries used predefined sampling frames. In 14 countries, convenience sampling techniques, such as inviting people with SCI who visited the outpatient clinic, were used to recruit some or all participants. The recruitment mode largely followed the sampling strategy, meaning that countries using predefined sampling frames sent written invitations or called potential participants, and most countries using convenience sampling used face-to-face invitations to individuals who visited the outpatient clinic or a patient organization event. In 16 countries, reminders were sent if applicable. In 6 countries, no reminders were sent because eligible individuals were invited face-to-face and either declined participation or completed the questionnaire on-site.

All but one of the countries offered multiple response modes, including paper-pencil questionnaires (n=20), personal or telephone interviews (n=18), and online questionnaires (n=15). Most countries offered online and paper-pencil versions as a cost-effective method of data collection. However, in countries with prevalent illiteracy (eg, Morocco, China), telephone and personal interviews were also offered to increase response. All participants provided informed consent.

Measures

The development and contents of the InSCI survey are described elsewhere.[13] The current study used data on employment, demographic characteristics, and lesion characteristics from the InSCI survey.

Employment was defined as having paid work for at least 1 hour a week[14] and was assessed by asking participants to indicate which of the following options applied to them (multiple answers possible): (1) work for an employer, (2) work for an employer but currently on sick leave, (3) self-employed, (4) unpaid work in family business, (5) housekeeping, (6) student, (7) unemployed, (8) retired because of health problems, (9) retired because of age, or (10) other. Following the International Labour Organization Department of Statistics definition and to be able to compare our data with general population figures, participants who indicated that they worked for an employer, worked for an employer but were currently on sick leave, and were self-employed were categorized as being employed regardless of the number of hours of paid work per week. If none of these options were selected, employment status was inferred from an additional question asking if people were currently engaged in paid work. If this question was also unanswered, information on employment was considered missing.

Age, age at onset of SCI, and time since onset of SCI (TSI) were calculated from the years of birth, years since the onset of SCI, and year of completing the questionnaire. Response options for sex were male and female. Years of education was measured in line with the International Standard Classification of Education as the total years of formal education before and after onset of SCI, including school and vocational training.[15]

Participants were asked to indicate whether movement or feelings were absent or abnormal only in the lower limbs or in the upper and the lower limbs, and whether they had complete or incomplete loss of movement and sensation below the level of SCI. From this, a variable type of injury was created with 4 groups: complete tetraplegia, incomplete tetraplegia, complete paraplegia, and incomplete paraplegia. Finally, cause of SCI was asked through a list of 7 traumatic and 6 non-traumatic causes, allowing for multiple responses. A dichotomous variable traumatic and non-traumatic etiology was created. If a participant chose both traumatic and non-traumatic causes, the etiology was coded as traumatic.

Statistical analyses

For descriptive purposes, age was categorized into 5 groups (18-29y, 30-39y, 40-49y, 50-59y, and 60-64y), years since onset of SCI was categorized into 4 groups (0-4y, 5-14y, 15-24y, and ≥25y), and years of education was categorized into 3 groups (0-9y, 10-16y, and ≥17y).

There were marked differences in sample composition between the country samples (table 1), and these characteristics were associated with employment (supplemental tables S1 and S2, available online only at http://www.archives-pmr.org/), limiting comparability of the observed employment rates across countries. Therefore, predicted country-specific employment rates were calculated from mixed effects logistic regression with a random intercept for country with sex, age, education, etiology, type of SCI, and TSI as covariates. Two types of country-specific predicted employment rates at country means of covariates were provided: (1) predictions from the fixed effects parts of the model, and (2) predictions from the fixed and random effects part of the model. The first type of predicted rate represents the employment rate that we would expect only because of composition of a sample in terms of the distribution of SCI and demographic characteristics. For example, in a country with a higher proportion of people with complete tetraplegia compared with other countries, we would expect a lower employment rate. This type of prediction uses information from the fixed part of the model only and thus assumes the random effects to be zero (ie, it assumes that there are no other differences between countries than in sample composition). The differences between these expected rates and crude rates show how much better or worse the employment rate in a country is compared with what would be expected based on the composition of the sample. The second type of predicted rate considers the empirical Bayes predictions of the random effects in addition to the fixed effects part in which the model considers unobserved heterogeneity between countries represented by the random intercept. Differences between the observed employment rates and the predicted rates resulting from this second model were very small (range, 0.0%-1.7%, data not shown), demonstrating the model's robustness to represent the observed data.

Gaps in employment rates between people with SCI and the national general population were calculated as the difference between the observed employment rates per country sample and figures from the International Labour Organization Department of Statistics on the general employment rates (2017-2018) among people of employable age in the respective countries.[14]

Differences in observed employment rates, predicted employment rates and employment gaps between males and females were analyzed in the same way. Predicted employment rates were calculated from the fixed part of mixed effect logistic regression with a random intercept for country with age, education, etiology, type of SCI, and TSI as covariates.

Results

Sample characteristics

A total of 9875 InSCI participants of employable age were included in the study and 9760 were included in the mixed

Table 1 Sample characteristics (N = 9875)

		Male Sex	Age at Onset		Age at Study		Time Since Onset		Years of Education		Type of SCI		
Country	n	%	Median	IQR	Median	IQR	Median	IQR	Median	IQR	Tetraplegia, %	Complete, %	Traumatic, %
Missing, n	-	12	241	-	0	-	240	-	587	-	184	234	105
Total sample	9875	73.8	31	22-44	47	37-55	10	4-19	12	9-16	36.2	41.3	83.8
Australia	1035	74.5	31	22-44	52	43-59	13	7-24	13	10-16	42.4	36.2	87.2
Brazil	172	80.8	37	24-47	39	28-51	2	1-3	11	8-15	39.5	22.7	76.2
China	1144	71.4	44	34-50	48	39-54	4	2-5	9	6-12	31.5	26.7	70.0
France	328	74.9	26	20-40	48	38-56	15	6-25	14	11-17	33.7	45.2	84.9
Germany	1174	73.0	35	23-48	52	41-58	10	4-19	13	12-16	46.9	36.9	81.6
Greece	178	74.5	27	20-36	45	37-52	14	7-23	12	12-16	31.6	46.0	87.5
Indonesia	182	65.4	30	22-39	43	34-50	12	4-12	9	6-12	9.0	42.8	87.8
Italy	167	75.4	32	24-44	47	37-54	10	5-17	13	8-13	24.5	42.0	76.7
Japan	202	84.6	27	20-41	49	41-56	14	7-26	12	12-16	54	66.8	91.0
Lithuania	213	62.4	25	20-33	42	35-48	16	7-22	13	12-16	30.7	75.9	93.8
Malaysia	281	79.0	27	20-37	36	29-49	5	3-13	11	8-13	29	41.4	86.4
Morocco	369	72.9	27	22-38	35	28-46	4	2-9	9	4-12	26.6	44.4	79.4
Netherlands	165	69.7	37	27-48	54	44-59	10	4-22	15	12-18	36.4	28.0	62.0
Norway	369	68.0	40	27-50	49	37-58	8	4-13	13	11-16	37.8	22.7	74.7
Poland	873	83.6	28	21-38	43	36-53	11	7-19	13	11-15	45.3	47.3	90.8
Romania	209	72.2	27	21-37	36	30-45	6	3-14	12	10-14	30.3	33.2	85.1
South Africa	193	76.2	25	20-31	36	28-47	7	4-14	12	10-14	39.7	53.1	92.2
South Korea	809	76.7	30	23-40	48	39-56	15	7-21	12	12-15	40.9	58.4	92.7
Spain	334	70.7	28	20-39	48	39-55	14	6-24	13	8-18	36.3	49.5	81.6
Switzerland	1022	71.6	29	21-39	51	42-58	17	9-27	14	12-17	30.8	42.4	84.9
Thailand	276	72.8	31	22-43	40	32-54	5	2-12	11	6-14	25.2	45.3	88.0
United States	173	57.8	24	19-41	40	30-53	10	4-19	16	12-18	40.1	30.6	100

regression models. The number of participants per country of employable age varied between 165 (the Netherlands) to 1174 (Germany). Only 8 countries were able to provide response rates, ranging from 23% in China to 54% in South Africa. The characteristics of the study participants are displayed in table 1. Considerable differences in sample composition were found for most characteristics, such as median age at onset (range, 22-44y), median age at the time of the study (range, 35-54y), median years of education (range, 9-15y), proportion of participants with tetraplegia (range, 9%-54%), proportion of participants with complete SCI (range, 22.7%-75.9%), and TSI (range, 2-17y).

Observed employment rates

Employment rates and their 95% confidence intervals are displayed in table 2. The overall employment rate was 38%. A large variation was found across countries, with the lowest employment rates in Morocco (10.3%) and the highest in Switzerland (61.4%). Working hours per week were reported by 70.3% of those employed. Of this subgroup, 10.3% worked 1 to 10 hours per week, 15.8% worked 11 to 20 hours per week, 18.4% worked 21 to 30 hours per week, 42.3% worked 31 to 40 hours per week, and 13.3% worked 41 or more hours per week.

Predicted employment rates

The predicted employment rates from the fixed effects part of the mixed model and their 95% confidence intervals are also displayed in table 2. These predicted employment rates showed a range from 34.4% for China to 51% for the Netherlands, which was narrower than that of the crude employment rates. Some countries showed substantially higher or lower employment rates than expected based on the composition of their sample. For example, the observed employment rate in Brazil was 25.9% lower than expected based on sample composition, whereas the rate in Norway was 11.5% higher than expected. Many countries, including Australia, France, Germany, Lithuania, Malaysia, Netherlands, Thailand, and the United States, showed minimal differences (<3%) between the observed and expected employment rates (see table 2, fig 1).

Employment gaps

Gaps between the observed employment rates among participants with SCI and the national general population varied between 14.8% (South Africa) and 54.8% (China) (see table 2). Employment gaps greater than 40% were evident for Brazil (49.2%), Romania (43.1%), and Spain (40.7%).

Sex-related differences

The difference in overall observed employment rate among men was 38.7%, which was only 3% higher compared with the overall observed employment rate among women (35.7%). Sex-specific observed employment rates per country are displayed in tables 3 and 4 and figure 2. In 9 country samples, the observed employment rates were higher among women compared with men.

Table 2 Observed and predicted employment rates and employment gaps per country

Country	Observed Employment Rate	95% Confidence Interval	Predicted Employment Rate	95% Confidence Interval	Difference Observed −Predicted	Employment Rate Population (ILOSTAT)	Difference Observed Rate SCI−Population
Australia	42.0	39.0-45.1	40.6	37.6-43.5	1.4	73.0	31.0
Brazil	14.0	8.8-19.1	39.8	36.6-43.0	−25.9	63.2	49.2
China*	23.0	20.6-25.4	34.4	31.4-37.4	−11.4	77.8	54.8
France	44.4	39.0-49.8	45.0	42.0-48.1	−0.6	65.4	21.0
Germany	43.0	40.2-45.8	42.2	39.3-45.1	0.8	75.9	32.9
Greece	19.2	13.3-25.1	46.8	43.7-49.9	−27.6	54.9	35.7
Indonesia	44.7	37.4-52.0	40.5	37.3-43.8	4.1	66.1	21.4
Italy	29.5	22.3-36.6	41.8	38.8-44.8	−12.3	58.5	29.0
Japan	50.5	43.6-57.4	43.2	40.1-46.2	7.3	76.8	26.3
Lithuania	44.8	38.1-51.5	46.3	43.1-49.5	−1.5	72.4	27.6
Malaysia	36.3	30.6-42.0	38.6	35.4-41.8	−2.3	65.4	29.1
Morocco	10.3	7.2-13.4	37.5	34.2-40.8	−27.2	43.9	33.6
Netherlands	53.7	46.0-61.3	51.0	47.8-54.2	2.7	77.2	23.5
Norway	51.9	46.8-57.0	40.4	37.4-43.4	11.5	74.8	22.9
Poland	39.3	36.0-42.6	44.2	41.2-47.2	−4.9	67.4	28.1
Romania	21.7	16.1-27.4	44.7	41.5-48.0	−23.0	64.8	43.1
South Africa	28.5	22.1-34.9	44.1	40.8-47.3	−15.6	43.3	14.8
South Korea	30.6	27.4-33.8	40.4	37.4-43.4	−9.8	66.6	36.0
Spain	21.7	17.3-26.1	42.8	39.8-45.8	−21.1	62.4	40.7
Switzerland	61.4	58.4-64.4	48.0	44.9-51.1	13.4	80.1	18.7
Thailand	39.5	33.7-45.3	39.0	35.9-42.1	0.5	74.2	34.7
United States	50.6	43.1-58.1	48.6	45.4-51.8	2.0	70.7	20.1

NOTE. Observed: Labor market rates with 95% confidence intervals from logistic regression without covariates. Predicted: From fixed effects part of mixed effects logistic regression with random intercept for country, random effects are supposed to be 0, 95% confidence intervals are based on standard errors of fixed effects. Covariates: sex, age, education, etiology, type of SCI, and time since onset of SCI (N=9248).
Abbreviation: ILOSTAT, International Labour Organization Department of Statistics.
* Figure for China is the average for the provinces in which the InSCI survey was performed (Jiangsu and Sichuan).

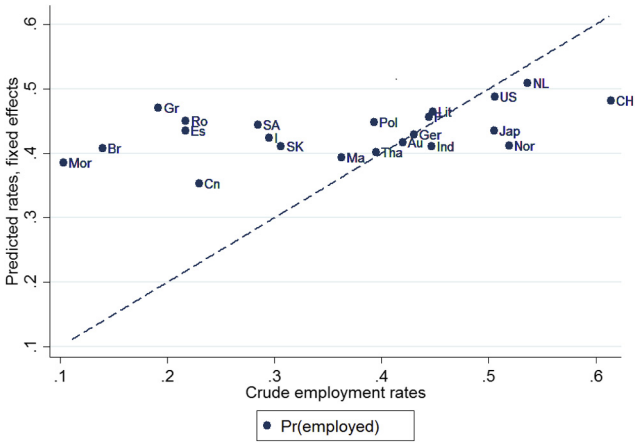

Fig 1 Association between crude (observed) and predicted employment rates for 22 countries participating in the InSCI study (N=9248). Predicted: From fixed effects part of mixed effects logistic regression with random intercept for country, random effects are supposed to be 0, 95% CI based on standard errors of fixed effects. Covariates: sex, age, education, etiology, type of SCI, time since onset of SCI. Abbreviations: Au, Australia; Br, Brazil; CH, Switzerland; Cn, China; Es, Spain; Fr, France; Ger, Germany; Gr, Greece; Ind, Indonesia; I, Italy; Jap, Japan; Lit, Lithuania; Ma, Malaysia; Mor, Morocco; NL, Netherlands; Nor, Norway; Pol, Poland; Ro, Romania; SA, South Africa; SK, South Korea; CH, Switzerland; Tha, Thailand; US, United States.

All countries showed higher predicted employment rates among men compared with women, but these differences were mostly small, with a narrow range from 4.7% in Indonesia to 8.7% in Lithuania (see tables 3 and 4). Comparison of employment gaps between men and women showed larger employment gaps among men compared with women in most countries. The largest difference in employment gaps between men and women was found for Morocco (men, 54.5%; women, 16.7%). Three countries showed smaller employment gaps among men compared with women, namely Japan, Norway, and Switzerland.

Discussion

This first large-scale international survey on employment among people with SCI showed an average worldwide employment rate of 38% and a wide variation in employment rates between countries. The predicted employment rates (adjusted for covariates) showed a smaller but still substantial range between countries, and positive as well as negative differences between observed and predicted rates were found. Gaps between the observed employment rates among participants with SCI and the respective general populations were substantial. The overall difference in employment rates between men and women was small, but with substantial variation across countries. Employment gaps were mostly larger among men compared with women.

Table 3 Observed and predicted employment rates, and employment gaps per country for men

Country	Observed Employment Rate, N = 7198	95% Confidence Interval		Predicted Employment Rate, N = 6836	95% Confidence Interval		Population (ILOSTAT)	Difference Observed—Predicted	Difference Observed—General Population
Australia	43.5	40.0	47.1	35.0	28.6	42.0	77.9	8.5	−34.4
Brazil	15.1	10.1	22.1	33.0	26.6	39.9	74.4	−17.9	−59.3
China	24.6	21.8	27.7	29.2	23.3	35.9	82.6	−4.6	−58.0
France	43.4	37.3	49.7	38.4	31.6	45.6	68.9	5.0	−25.5
Germany	44.0	40.7	47.3	36.2	29.5	43.4	79.7	7.8	−35.7
Greece	16.4	10.9	23.9	38.7	31.9	46.0	64.7	−22.3	−48.3
Indonesia	48.7	39.8	57.7	35.8	29.2	42.9	80.0	12.9	−31.3
Italy	28.4	21.0	37.3	35.2	28.7	42.2	67.6	−6.7	−39.2
Japan	54.2	46.6	61.6	35.1	28.4	42.4	83.9	19.1	−29.7
Lithuania	38.6	30.7	47.2	37.6	30.8	45.0	73.3	1.0	−34.7
Malaysia	33.8	27.8	40.4	32.5	26.3	39.3	77.7	1.3	−43.9
Morocco	11.9	8.5	16.3	31.2	25.0	38.1	66.4	−19.3	−54.5
Netherlands	56.1	46.9	64.9	44.5	37.2	51.9	81.6	11.7	−25.5
Norway	56.0	49.8	62.1	33.9	27.5	40.9	76.9	22.1	−20.9
Poland	39.9	36.4	43.5	36.9	30.2	44.0	74.0	3.0	−34.1
Romania	21.2	15.4	28.4	36.6	30.0	43.7	73.2	−15.4	−52.0
South Africa	25.9	19.4	33.5	36.6	29.9	43.9	49.0	−10.8	−23.1
South Korea	31.4	27.8	35.2	33.8	27.4	40.8	76.1	−2.4	−44.7
Spain	20.1	15.4	25.7	36.0	29.5	43.0	67.9	−15.9	−47.8
Switzerland	64.8	61.2	68.2	40.9	33.8	48.4	84.5	23.9	−19.7
Thailand	37.3	30.9	44.2	33.1	26.9	39.8	82.0	4.2	−44.7
United States	54.1	44.2	63.7	42.4	35.6	49.5	76.1	11.6	−22.0

NOTE. All figures are percentages. Observed: Labor market rates with 95% confidence intervals from logistic regression without covariates. Predicted: From fixed effects part of mixed effects logistic regression with random intercept for country, random effects are supposed to be 0, 95% confidence intervals are based on standard errors of fixed effects. Covariates: age, education, etiology, type of SCI, and time since onset of SCI.
Abbreviation: ILOSTAT, International Labour Organization Department of Statistics.

The worldwide employment rate of 38% in this study is similar to the employment rates ranging from 36% to 38% reported in available literature reviews.[3,5,6] Except for 1 study in 4 Western European countries,[9] no previous studies included samples from multiple countries. Therefore, comparisons with the literature are only possible on a country-by-country basis.

For Europe, this study showed considerable differences between higher employment rates (43%-61.4%) in North, West, and Middle European samples (Norway, the Netherlands, France, Germany, Switzerland) and lower figures (19.2%-29.5%) in Southern European samples (Spain, Italy, Greece). This difference can also be found in the literature. Employment rates reported in the literature are 35% to 48.1% for Norway,[9,16,17] 50.8% to 60% for the Netherlands,[9,18,19] and 54.4% to 63.8% for Switzerland.[20,21] The only figures from Southern Europe we could find were 12.4% for Spain[22] and 34.7% for Italy.[23]

For the United States, the 50.6% employment rate found in this study is much higher than the 30% to 35% derived from the Models Systems database,[24] but is similar to the average of 49% calculated from multiple studies of a large cohort in the Midwest part of the United States.[5] For Australia, the 42% employment rate found in this study is within the range of results reported in other studies (39%-53%).[25-27]

The 3 countries in South-East Asia (Indonesia, Thailand, Malaysia) demonstrated similar employment rates (36.3%-44.7%). Previous studies showed employment rates of 25.6% to 47% for Thailand,[28,29] and a higher rate (57.1%) in a small study in Malaysia.[30]

For the far East, the low employment rate (23%) in China found in this study is in line with a return-to-work rate of 31% found in the only other available study.[31] For South Korea, the 28.4% employment rate found in this study is similar to the 27.5% reported in an earlier study.[32] For Japan, in contrast, the 50.5% found in this study is much higher than the 28% employment rate found in a study performed more than 30 years ago, with perhaps different employment profiles and opportunities for people with SCI then.[33]

Substantial gaps between the employment rates among the participants with SCI and the general population were found for all countries, even in high-income countries such as Germany and South Korea. For some countries (Morocco, South Africa), the observed employment rates were low but the high unemployment rates in the general population led to relatively low employment gaps. Furthermore, although the observed employment rates came quite close to the predicted rates in some countries, there were substantial differences for other countries. The largest negative differences were found for Brazil, Greece, Morocco, Romania, and Spain. The largest positive differences were found for Switzerland and Norway. This variation across countries could perhaps be explained by unobserved differences in sample

Table 4 Observed and predicted employment rates, and employment gaps per country for women

Country	Observed Employment Rate N = 2558	95% Confidence Interval		Predicted Employment Rate N = 2412	95% Confidence Interval		Population (ILOSTAT)	Difference Observed − Predicted	Difference Observed − General Population
Australia	37.5	31.8	43.6	31.2	24.5	38.7	68.2	6.3	−30.7
Brazil	9.1	3.0	24.7	32.6	25.7	40.2	52.6	−23.5	−43.5
China	19.0	15.1	23.6	25.4	19.7	32.0	73.0	−6.4	−54.0
France	46.8	36.2	57.8	35.2	28.3	42.8	62.0	11.6	−15.2
Germany	40.7	35.4	46.2	31.6	24.9	39.1	72.1	9.1	−31.4
Greece	27.3	16.2	42.1	39.4	32.0	47.2	45.3	−12.1	−18.0
Indonesia	37.1	26.1	49.7	29.6	23.5	36.5	52.1	7.5	−15.0
Italy	32.5	19.9	48.3	34.0	27.2	41.6	49.5	−1.5	−17.0
Japan	29.0	15.9	47.0	34.7	27.5	42.7	69.6	−5.7	−40.6
Lithuania	55.0	44.0	65.5	40.3	32.7	48.3	71.6	14.7	−16.6
Malaysia	46.3	33.6	59.5	29.2	22.7	36.6	52.2	17.1	−5.9
Morocco	6.0	2.7	12.7	30.2	23.7	37.6	22.7	−24.2	−16.7
Netherlands	48.0	34.6	61.7	39.5	31.8	47.6	72.8	8.5	−24.8
Norway	43.2	34.6	52.3	32.4	25.7	39.8	72.6	10.8	−29.4
Poland	36.4	28.9	44.5	36.7	29.6	44.3	60.8	−0.3	−24.4
Romania	23.2	14.0	36.0	37.8	30.5	45.6	56.2	−14.6	−33.0
South Africa	37.0	24.4	51.6	36.8	29.6	44.5	37.6	0.2	−0.6
South Korea	28.2	22.2	35.0	32.2	25.5	39.6	56.9	−4.0	−28.7
Spain	25.5	17.9	35.0	36.3	29.3	43.8	56.9	−10.8	−31.4
Switzerland	52.9	47.2	58.6	37.3	29.9	45.4	75.7	15.6	−22.8
Thailand	45.3	34.5	56.6	31.5	25.0	38.8	66.7	13.8	−21.4
United States	45.8	34.7	57.4	38.9	31.6	46.7	65.6	6.9	−19.8

NOTE. All figures are percentages. Observed: Labor market rates with 95% confidence intervals from logistic regression without covariates. Predicted: From fixed effects part of mixed effects logistic regression with random intercept for country, random effects are supposed to be 0, 95% confidence intervals are based on standard errors of fixed effects. Covariates: age, education, etiology, type of SCI, and time since onset of SCI.
Abbreviation. ILOSTAT, International Labour Organization Department of Statistics.

characteristic, such as preinjury employment status or the presence of an employed partner. However, it is likely that system factors also play a role, such as income per capita, socioeconomic inequality, national labor market and policies, health care systems, and policies including financial (dis-)incentives, and attitudes towards participation of people with disabilities in the labor market.[5,8]

Diverging results have been reported regarding the impact of sex on obtaining employment.[5,8] Diverging results were also found for the association between sex and observed employment rate per country in the current study. However, results for the expected employment rates showed small but consistently higher employment rates in men compared with women. The diverging results in previous studies are therefore likely attributable to differences in sample composition across studies. Notably, this study showed smaller employment gaps for women compared with men in all countries. It is possible that the employment situation of men, who work more often in physically oriented jobs, is more strongly affected by an SCI. Previous studies have shown that having a manual labor job before SCI is associated with a lower return-to-work rate.[34]

The results of this study highlight the importance of return to work as a rehabilitation goal and vocational rehabilitation programs after the completion of functional rehabilitation.[35] There is also a need for more inclusive labor market policies and practices and national strategies to mitigate the effects of work disability and provide active work-related opportunities in most of the countries investigated. Countries with large employment gaps may learn from measures taken by countries in which differences between SCI and general population are smaller.

Differences in employment rates between countries are large and could only partly be explained by differences in basic demographic and SCI characteristics in this study. The possible impact of country-level factors, such as systems and policies with respect to health care, rehabilitation, and employment warrants further investigation. Forthcoming papers from the InSCI study will analyze modifiable personal factors, as well as environment and system-level characteristics, to explain differences in employment rates between countries to develop a work-centric approach that would improve employment rate of people with SCI.

Study limitations

This InSCI study is the first worldwide SCI survey. It provides the first employment rates for Greece, Indonesia, Morocco, Romania, and South Africa, as well as recent figures for countries for which only older data were available previously, namely Germany,[36] France,[37] and Japan.[33] Other strengths of the study are that the same questionnaire was used in all countries and that employment gaps were calculated compared with the national general

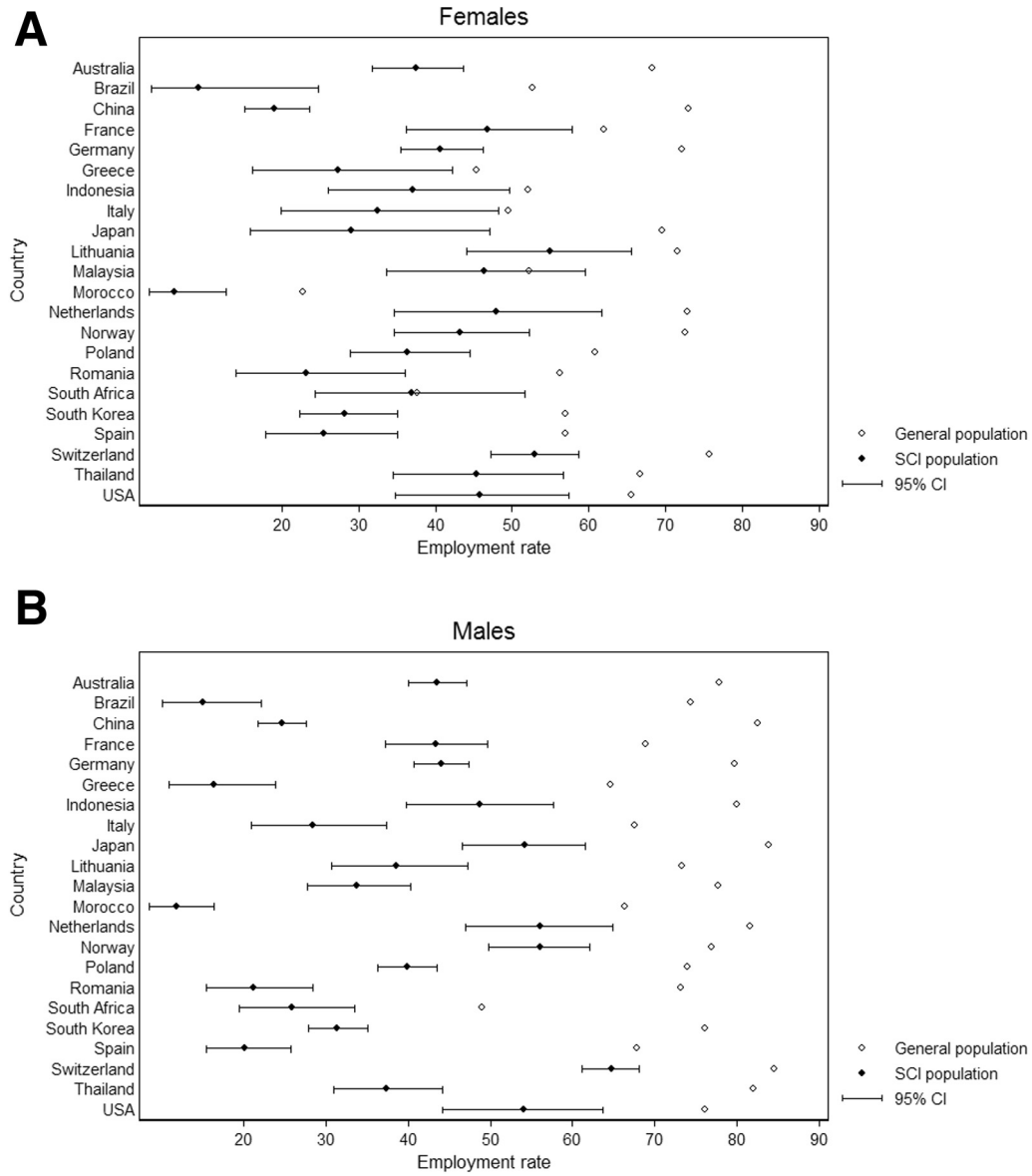

Fig 2 Observed employment rates with 95% confidence intervals and employment rates among the general population per country for women (A) and men (B).

populations. Only a few earlier studies compared their results with work rates in the general population.[9,16,17,21]

The main weakness of the InSCI study is the variation in sampling frames and the use of convenience samples in most countries. In addition, basic characteristics of non-respondents were unknown in most countries, making it impossible to account for response bias. As a result, the employment rates reported in this study are not unbiased estimates of the employment rates among people with SCI in the respective countries. Nevertheless, the overall employment rate found in this study was very similar to results from earlier reviews.[3,5,6] Furthermore, there was a wide variation in sample sizes across countries, so that countries with large samples weighted more in the total scores. Also, all data were self-reported, leading to some missing values and to potential inaccuracies or recall bias, including the reporting of SCI characteristics. Because this analysis included only individuals younger than 65 years of age, the sample size is below the a priori calculated minimum of 200 for the whole InSCI study in some countries. Finally, the age ranges of this study (18-64y) and International Labour Organization figures used as reference (15-64y) did not fully correspond. Assuming that employment rates are low among those 15 to 17 years old, this means that the real employment gaps will be somewhat larger than reported in this study, although the differences will most likely be small.

Conclusions

Employment figures among people with SCI vary across countries but are well below the general population figures. Differences between the observed and predicted employment rates, based on sample composition, in many countries suggest that health care, rehabilitation, and employment systems and policies impact employment rates.

Keywords

Employment; Rehabilitation; Spinal cord diseases; Spinal cord injuries

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Acknowledgements

This study is part of the InSCI community survey. InSCI provides the evidence for the Learning Health System for Spinal Cord Injury (see also Am J Phys Med Rehabil 2017;96(Suppl):S23-34). InSCI and the Learning Health System for Spinal Cord Injury are efforts to implement the recommendations of International Perspectives on Spinal Cord Injury (Bickenbach JE, Officer A, Shakespeare T, von Groote P. Geneva: World Health Organization Press; 2013).

The members of the InSCI Steering Committee are: Julia Patrick Engkasan (International Society of Physical Rehabilitation and Medicine representative), James W. Middleton (International Spinal Cord Society representative, Member Scientific Committee; Australia), Gerold Stucki (Chair Scientific Committee), Mirjam Brach (Representative Coordinating Institute), Jerome Bickenbach (Member Scientific Committee), Christine Fekete (Member Scientific Committee), Christine Thyrian (Representative Study Center), Linamara Battistella (Brazil), Jianan Li (China), Brigitte Perrouin-Verbe (France), Christoph Gutenbrunner (Member Scientific Committee; Germany), Christina-Anastasia Rapidi (Greece), Luh Karunia Wahyuni (Indonesia), Mauro Zampolini (Italy), Eiichi Saitoh (Japan), Bum Suk Lee (Korea), Alvydas Juocevicius (Lithuania), Nazirah Hasnan (Malaysia), Abderrazak Hajjioui (Morocco), Marcel W.M. Post (Member Scientific Committee; The Netherlands), Johan K. Stanghelle (Norway), Piotr Tederko (Poland), Daiana Popa (Romania), Conran Joseph (South Africa), Mercè Avellanet (Spain), Michael Baumberger (Switzerland), Apichana Kovindha (Thailand), Reuben Escorpizo (Member Scientific Committee; United States).

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