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Cohort profile: the Spanish WORKing life Social Security (WORKss) cohort study

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ABSTRACT

Purpose: The global economy is changing the labour market and social protection systems in Europe. The effect of both changes on health needs to be monitored in view of an ageing population and the resulting increase in prevalence of chronic health conditions. The Spanish WORKing life Social Security (WORKss) cohort study provides unique longitudinal data to study the impact of labour trajectories and employment conditions on health, in terms of sickness absence, permanent disability and death.

Participants: The WORKss cohort originated from the Continuous Working Life Sample (CWLS) generated by the General Directorate for the Organization of the Social Security in Spain. The CWLS contains a 4% representative sample of all individuals in contact with the Social Security system. The WORKss cohort exclusively includes individuals with a labour trajectory from 1981 or later. In 2004, the cohort was initiated with 1 022 779 Social Security members: 840 770 (82.2%) contributors and 182 009 (17.8%) beneficiaries aged 16 and older.

Findings to date: The WORKss cohort includes demographic characteristics, chronological data about employment history, retirement, permanent disability and death. These data make possible the measurement of incidence of permanent disability, the number of potential years of working life lost, and the number of contracts and inactive periods with the Social Security system. The WORKss cohort was linked to temporary sickness absence registries to study medical diagnoses that lead to permanent disability and consequently to an earlier exit from the labour market in unhealthy conditions.

Future plans: Thanks to its administrative source, the WORKss cohort study will continue follow-up in the coming years, keeping the representativeness of the Spanish population affiliated to the Social Security system. The linkage between the WORKss cohort and temporary sickness absence registries is envisioned to continue. Future plans include the linkage of the cohort with mortality registries.

Strengths and limitations of this study

- The main strength of the Spanish Working life Social Security (WORKss) cohort study is the large sample size (n=1 022 779 in 2004) and its representativeness of the working population in Spain.
- The WORKss cohort offers longitudinal information based on administrative data dating as far back as 1981. Administrative data are reliable, rich in chronological data, prevent recall bias and are available at a lower cost.
- The main limitation of the cohort is the absence of specific health data.
- The WORKss cohort study does not contain information on informal employment because these data are not recorded by the Social Security system.

INTRODUCTION

Employment and working conditions are key determinants of health. A job is the source of financial security, social protection, social identity and one of the means to achieve better health and healthcare opportunities.[1] Nevertheless, employment security is challenged by a globalised economy that pushes labour markets to rely on different strategies to adapt employment conditions to economic growth.[2 3] One of these strategies is the adoption of labour flexibility, characterised by non-standard types of employment conditions. Flexibility entails temporary and part-time jobs, occupational mobility, outsourcing and insourcing, wage flexibility and working time flexibility.[2–5] These features are achieved in part by loosening employment protection legislation,[4] which in turn may risk job security. In this sense, flexibility promotes perceived job insecurity[6] and precarious employment if it is not coupled with adequate support from the Social Security system, especially in contexts where social insurance is work-related.[4 7 8] Furthermore, unstable employment, a common result of flexibility,[5] is also a risk factor for ill health.[9 10]

Various national and international organisations propose a 'flexicurity' configuration

that combines flexibility and security in order to break the vicious cycle where precarious employment produces low social benefits, obliging workers to stay in insecure jobs and adverse living conditions.[4 11] Flexicurity is an appealing solution that fuses non-standard employment arrangements and employment security by providing greater protection during unemployment and higher promotion of active labour market policies that ensure employability of all workers.[4 12] In theory, flexicurity should be the norm, but in practice it is a difficult system to apply because it depends on contextual factors such as the political tradition that drives a social protection system,[8 13] the current economic cycle and the demography of the country.

In Spain, life expectancy is 82 years of age, one of the highest in the world,[14] and it is expected that by 2050, one-third of Spaniards will be over age 65.[15] As a consequence, prevalence of chronic illness[16] increases with an ageing population. Thus, workers with chronic illness have a higher risk of sickness absence,[17] increasing the risk of permanent disability and, subsequently, premature mortality.[18–20] These demographic changes in Spain combined with negative consequences of flexibility may drive workers out of the labour force prematurely. This is evidence that recent changes in the labour market need to be coupled with appropriate social insurance and further studies need to be conducted on the relationship between employment conditions, social benefits and health.

The Spanish WORKing life Social Security (WORKss) cohort study provides a unique source of data for research on the impact of labour market trajectories on workers' health in terms of sickness absence, permanent disability and premature death. The WORKss cohort study initiated in 2004 and stems from administrative data from the Spanish Social Security system. It contains information dating back to 1981 when registries of the Social Security system became systematic. It includes employment characteristics and types of pensions supported by the Social Security system. Some of the data in the cohort include type of contract, employment status, income, economic activity, date of pension uptake and date of death. The data are recorded annually and chronologically, allowing the detailed construction of labour trajectories.

COHORT DESCRIPTION

The WORKss cohort study originated from the Continuous Working Life Sample (CWLS), an annual sample derived from administrative data of the Social Security system in Spain and supplemented with data from the tax revenue agency and the population census. The CWLS consists of 4% of all persons affiliated with the Social Security system (1 098 165 persons in 2004). The representativeness of the sample is verified using four variables: sex, age, geographical regions and nationality. This sample is valuable because it allows international comparisons of aspects related to labour policies, social benefits and demographic changes. *The Joint Programming Initiative (JPI) 'More Years, Better Lives: The Potential and Challenges of Demographic Change'* features the CWLS as part of the *Data Mapping Project* which aims to localise European data sources that provide information relevant to an ageing population.[21]

The CWLS is set up as a repeated cross-sectional sample. Its annual extraction method follows a panel study methodology, allowing the construction of a dynamic cohort. The initial cross-sectional sample was extracted in 2004 using randomised sequences of numbers and matching these sequences to parts of the identification codes of members. In subsequent years, the same sequences of numbers from 2004 are used to extract the same individuals as long as they maintained an administrative relationship with the Social Security Administration during the year of extraction, regardless of its duration (eg, 1 vs 365 days). The dynamic nature of the cohort occurs when members are lost due to death or administrative inactivity. In this case, members from the target population are randomly selected until the sample again reaches 4% of the total number of active members during the year of extraction (figure 1). Sample representativeness is checked every time new individuals are added to the sample. Regarding confidentiality, the original identification codes of individuals are replaced with random codes in order to anonymise individuals in the cohort. As a result, there is no possible way to identify participants in the cohort. As a precaution, the postal codes in the cohort are truncated to two numbers if a city has less than 40 000 inhabitants and the birth dates only include the month and year. Researchers interested in using the CWLS are required to sign a confidentiality agreement which does not allow research to be conducted on fewer than 49 participants at a time.

The population in the WORKss cohort study consists of contributors and beneficiaries of the Social Security system who have a registered labour trajectory. Contributors consist of salaried and self-employed workers, early retirees (before age 65) and the unemployed receiving benefits. Beneficiaries consist of retirees, widow/widowers and orphans. It is estimated that 95% of workers in formal employment are registered in the Social Security system, making the cohort highly representative of the Spanish workforce.[22] The WORKss cohort also includes all pensioners in 2004–2013 who had a previous labour trajectory registered from 1981 and later.

The cohort began in 2004 and the last wave available is from 2013, thus completing a 10-year follow-up period. The initial cohort consisted of 1 022 779 individuals aged 16 and older: 607 509 (59.4%) men and 415 270 (40.6%) women (table 1). Most individuals are nationals of Spain (n=968 224, 94.7%) and most are contributors to the Social Security system (n=840 770, 82.2%). Most contributors in 2004 were employed

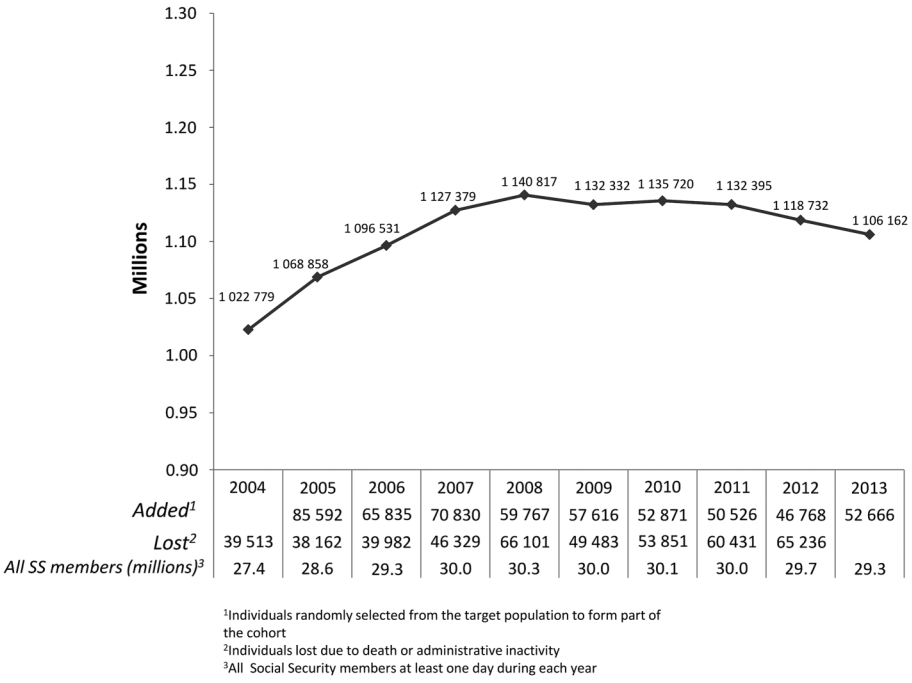

Figure 1 Dynamics of the Spanish WORKing life Social Security (WORKss) cohort study from 2004 to 2013.

(n=789 297, 93.9%), out of which 183 874 (23.3%) were under a self-employed Social Security plan (table 2). During 2004, the economic sector distribution shows that most employees work in commerce, manufacturing and in the sector covering education, health, community service and home care (table 2).

From 2004 to 2013, the number of individuals in the cohort has remained stable at around 1 million members (figure 1). From the initial cohort, approximately 80% have remained in the sample until 2013. Those lost due to inactivity in a given year will form part of the cohort in subsequent years if their administrative relationship is reinstated. This process happens because the sequences of identification numbers from 2004 are used each year. Hence, an individual may be part of the cohort in 2004 and 2005, lose contact 2 years and then return to the cohort in 2008 once the administrative relationship with the Social Security is recovered (eg, individual A in table 3). Loss of contact may occur when an individual stops receiving benefits (eg, enters long-term unemployment). Loss to follow-up is not an issue with persons receiving a retirement pension because they will receive this pension until they die.

Table 1 Baseline characteristics of the Spanish WORKing life Social Security (WORKss) Cohort in 2004

	n (%)
Sex	
Men	607 509 (59.4)
Women	415 270 (40.6)
Age groups (years)	
16–25	150 201 (14.9)
26–35	223 139 (22.1)
36–45	230 811 (22.9)
46–55	137 728 (13.7)
56–65	121 283 (12.0)
66–75	82 279 (8.2)
76–85	56 216 (5.6)
86–95	5689 (0.6)
>95	453 (0.0)
Nationality	
Spain	968 224 (94.7)
European Union (EU27)	18 828 (1.8)
Other countries	35 727 (3.5)
Relationship with the social security	
Contributor	840 770 (82.2)
Beneficiary	182 009 (17.8)
Total	1 022 779 (100.0)

The data from the cohort are extracted after the end of each year so that all registries from that year are included. If an individual changes jobs four times during the year, for example, then data at the end of the year will include four different registries for the same individual. Two registration processes allow an accurate and detailed account of all transitions in employment conditions and pensions of an individual in the cohort. Variables regarding employment such as type of contract, economic activity and revenue-based contribution regime are provided to the Social Security Administration by the employer. Data on uptake and changes in pensions are provided by the Social Security system because the employee has to request the pension directly from the administration.

MEASUREMENTS

As a public registry that manages public insurance, the Social Security system provides objective records that are

Table 2 Characteristics of contributors in the Spanish WORKing life Social Security (WORKss) Cohort in 2004

	n (%)
Employment status	
Employed	789 297 (93.9)
Unemployed	51 473 (6.1)
Social Security plan	
Employed	605 423 (76.7)
Self-employed	183 874 (23.3)
Type of contract	
Permanent	374 710 (61.9)
Temporary	230 713 (38.1)
Economic sector	
Agriculture, fisheries and extractive industries	27 715 (3.5)
Manufacturing	110 796 (14.0)
Production and distribution of energy	5789 (0.7)
Building trade	97 246 (12.3)
Commerce	136 743 (17.3)
Catering trade, transportation and telecommunications	109 707 (13.9)
Finance	16 073 (2.0)
Real estate	89 323 (11.3)
Public administration	41 716 (5.3)
Education, health, community service and home care	109 152 (13.8)
Not informed	62 (0.0)
Socio-occupational class	
Skilled non-manual	101 829 (16.8)
Skilled manual	201 720 (33.3)
Unskilled non-manual	195 230 (32.3)
Unskilled manual	106 543 (17.6)
Total	840 770 (100.0)

not affected by recall bias, since they are based on legal documents such as work contracts. Variables from the employment history include employment status, professional category, type of contract, type of workplace, type of employer, location of employer and economic activity, coded using the Spanish Classification of Economic Activities, following the International Statistical Classification of Economic Activities (CIIU 2009) (table 4). Health-related variables include date of permanent disability uptake, duration of pension, severity of permanent disability and the date of death without medical diagnosis. The date of death is available for those who receive a retirement pension or maintain their administrative relationship through employment or pension. Relevant administrative information includes income, tax withholdings, compensatory pensions and sociodemographic characteristics.

The records allow the calculation of duration of each administrative relationship, namely the time that each individual is exposed to different employment conditions or insurance schemes. For example, we can determine the exact duration of periods of permanent, temporary, part-time or full-time work and periods of receiving a pension. The pension system recognises three levels of severity for permanent disability: total, absolute and severe disability. Total disability pension is granted when the worker cannot perform his/her usual occupation due to a health problem, although the worker can perform a different job. Absolute disability pension is granted when the worker is not able to perform any occupation, and severe disability pension is granted when the person also needs assistance with everyday tasks such as moving and eating.

Labour trajectories are known to affect the risk of sickness absence, permanent disability and premature mortality.[17 23–25] Data from the national sickness absence registry from 2009 were linked to the WORKss cohort from the same year. This linkage provides diagnosis of sickness absence episodes taking place in 2009, their duration and whether they were work related or non-work related. A similar linkage was possible in 2012 and 2013 using the sickness absence registries of the Catalonia region. The linkage for the 2014 Catalonian registry has been approved and is underway. These countrywide and region-specific data linkages present an opportunity to calculate incidence rates of sickness absence and to study labour trajectories and the risk of sickness absence and subsequent permanent disability. The linkages also enable the follow-up of sickness absence episodes and work life of Catalonian residents in 2009 and from 2012 to 2013. The linkage between the WORKss cohort and sickness absence data is envisioned to take place for 2014 data and for the following years of follow-up. Furthermore, in 2015, data from the Spanish mortality registries will be linked to the entire WORKss cohort study (all individuals from 2004 to 2014), allowing the study of labour trajectories and cause-specific mortality.

Table 3 Examples of potential follow-up trajectories of individuals in the Spanish WORKss cohort study

Individuals	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
A	x	x	–	–	x	x	x	x	–	–
B	x	–	–	–	–	–	–	–	–	–
C	–	–	x	x	x	x	x	x	x	x
D	x	x	x	x	x	x	x	x	x	x
E	x	–	–	–	–	–	–	–	–	x

–, Not included in the cohort due to administrative inactivity; WORKss, WORKing life Social Security; x, Included in the WORKss cohort.

Table 4 Summary of measures collected for the Spanish WORKing life Social Security (WORKss) cohort study

Annual measurements		
Sociodemographics	Health outcomes	Occupational data
Sex	Start date of disability pension uptake	Income
Age	End date of disability pension uptake	Contribution regime
Birthplace	Grade of disability	Type of contract
Nationality		Economic activity
Home address		Workers collective
Age of death		Type of employer
Education level		Type of employment relationship
		Number of workers in same workplace
Benefits data	Tax revenue data	
Type of pension	Tax withholdings	
Pension regime	Revenues	
Monthly amount of pension	Deductible expenses	
Reason for end of pension	Number of dependants	
Type of retirement pension		
Grade of disability		
Date of uptake of disability pension		
Complementary data from sickness absence registries		
Start date of sickness absence episode		
End date of sickness absence episode		
Diagnosis of sickness absence		
Nature of sickness absence: work-related, non-work related		

FINDINGS TO DATE

Several studies focused on sickness absence and permanent disability have been conducted with the WORKss cohort. The date of initiation of permanent disability allows the calculation of potential years of working life lost (PYWLL) defined as the years between the age of permanent disability initiation and the age of retirement, which is currently 65 years of age in Spain. The PYWLL represent the social cost in terms of social protection benefits and the loss of quality of life of workers, especially in a context where working life is gradually increasing. In fact, the PYWLL of 11 812 cases of permanent disability in 2004–2009 amounted to 140 474 years. In this analysis, already published,[26] women, unskilled non-manual workers and workers with three or more job contracts during the period of study had significantly more PYWLL than their counterparts.

Another study looked at the labour trajectories of 14 972 permanent disability pensioners from the WORKss cohort. The study reported that male workers with 15 or more employment contracts or with 5 or more inactive periods with the Social Security during their labour trajectories had an earlier exit from the labour market (4.8 and 4.6 years, respectively) than male workers with less contracts and less inactive time.[27] The same trend was found among female workers: 5.8 years earlier for females with 15 or more contracts and 7.2 years earlier for females with 5 or more periods without being affiliated with the Social Security.[27]

At this time, the WORKss cohort does not include information on the medical diagnosis leading to disability. However, permanent disability pensions are generally granted after several episodes of temporary sickness absence.[17 19 20] The linkage between the WORKss cohort and the sickness absence registry of 2009 allowed the imputation of the most proximate sickness absence medical diagnosis as diagnosis of permanent disability for 3073 individuals who initiated a permanent disability at any time during the 2009–2012 follow-up period.[28] Two criteria were used for the imputation: long duration of sickness absence and short period between that episode and the permanent disability pension uptake. Results showed that musculoskeletal and mental disorders produced more PYWLL than any other diagnosis. The median age of permanent disability initiation for musculoskeletal and mental disorders was 54 and 49 years, respectively.

Finally, a study based on the cohort found that the sickness absence incidence rate was slightly higher in temporary workers (32.2 cases per workers-year) than in permanent workers (28.9 cases per workers-year). Higher incidence rates were observed in three groups: women, workers 16–25 years old and workers employed in firms of 50 or more employees (E Zaballa, JM Martínez, X Duran, *et al*. Incidence of sickness absence by type of employment contract. 2015. Manuscript submitted for publication).

The rich data on dates in the cohort allow the calculation of person-years, which allows to further explore permanent disability incidence and mortality rates. Table 5 shows the potential discoveries with the WORKss cohort. Permanent disability incidence was twice as high in those unemployed at baseline (9.6 per 1000 worker-years) than in those employed (4.4 per 1000 worker-years). Likewise, mortality rates for those

Table 5 Permanent disability incidence rates and mortality in the Spanish WORKing life Social Security (WORKss) Cohort in 2004 and followed up until 2013

	Permanent disability			Mortality		
	Cases (%)	Person-time (years)	Incidence rate (CI 95%)*	Cases (%)	Person-time (years)	Mortality rate (CI 95%)*
Sex						
Men	21 980 (66.6)	3 928 863	5.6 (5.5–5.7)	13 098 (80.8)	3 940 089	3.3 (3.2–3.3)
Women	11 031 (33.4)	2 747 410	4.2 (3.4–4.9)	3105 (19.2)	2 751 407	1.1 (1.0–1.1)
Birth cohort (in 2004)						
1904–1937 (>65)	44 (0.1)	12 146	3.6 (2.6–4.8)	530 (3.3)	12 148	43.6 (39.9–47.5)
1938–1947 (56–65)	5793 (17.6)	335 457	17.2 (16.8–17.7)	5721 (35.3)	336 184	17.0 (16.5–17.4)
1948–1957 (46–55)	13 674 (41.4)	1 220 884	11.2 (11.0–11.3)	5375 (33.2)	1 224 543	4.3 (4.2–4.5)
1958–1967 (36–45)	8200 (24.8)	1 818 715	4.5 (4.4–4.6)	2953 (18.2)	1 824 389	1.6 (1.5–1.6)
1968–1977 (26–35)	4113 (12.4)	2 141 537	1.9 (1.8–1.9)	1205 (7.4)	2 145 438	0.5 (0.5–0.5)
1978–1989 (16–25)	1187 (3.6)	1 147 535	1.0 (0.9–1.1)	419 (2.6)	1 148 794	0.3 (0.3–0.4)
Employment status (in 2004)						
Employed	26 587 (80.5)	6 011 435	4.4 (4.3–4.4)	12 871 (79.4)	6 023 770	2.1 (2.1–2.2)
Unemployed	6424 (19.4)	664 838	9.6 (9.4–9.9)	3332 (20.6)	667 726	4.9 (4.8–5.1)
Total	33 011 (100.0)	6 676 273	4.9 (4.8–5.0)	16 203 (100.0)	6 691 496	2.4 (2.3–2.4)

*Per 1000 person-years.
CI, confidence interval.

unemployed at baseline were twice as high as in those employed (4.9 per 1000 worker-years vs 2.1 per 1000 worker-years). The birth cohorts of 1938–1947 and 1948–1957 showed higher incidence rates of permanent disability, most likely due to their older age at time of follow-up. They were more likely to have had a longer labour trajectory and qualified to receive a disability pension and/or were older and more likely to suffer from a chronic illness.

STRENGTHS AND LIMITATIONS

The main strengths of the WORKss cohort study are its administrative nature and its large sample size based on a representative working population. Administrative data provide reliable information that has been properly verified through documents and employers' reports before being recorded, thereby avoiding recall bias. They are available at a lower cost because they do not require survey structures such as interviewers, new questionnaires and/or data entry staff. Another advantage is that, even though the cohort was first compiled in 2004, information is available from 1981 or from the first contact with the Social Security Administration after that year. There is no loss to follow-up for individuals who remain in formal employment and then transition to retirement. The advantage of the sampling strategy used in this case is that those who lose contact with the Social Security system may regain the contact once they enter formal employment again or begin perceiving retirement benefits. Retirees will not be lost from the cohort unless they die.

The main weakness of the cohort is that it does not include specific health data, although agreements with the health administrations are underway and will allow access to medical diagnoses of sickness absence and causes of death. Another weakness of the cohort is that it does not include information on workers in the informal sector, the long-term unemployed or individuals subscribed to a different social protection system (some types of civil servants). Lastly, researchers must take into account the healthy worker effect when interpreting results from the WORKss cohort study because the sample studied is healthier than the general population.[29 30]

COLLABORATION

Given that the source of the CWLS consists of administrative data, the cohort is envisioned to continue each year for as long as the Social Security system makes the administrative data available for researchers. The CWLS has been available since 2004 and is publicly available from the Social Security Administration on request, free of charge (http://www.seg-social.es). The codebook of variables is available on the Social Security Administration website: http://www.seg-social.es/Internet_1/Estadistica/Est/Muestra_Continua_de_Vidas_Laborales/index.htm. In order to obtain information on the methodology to build the WORKss cohort, we invite researchers to contact us at salutlaboral@upf.edu.

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Contributors MAL, XD, EZ, AS-N, GLD and FGB participated in the study design. XD, MAL and EZ performed the editing and analysis of data. MAL and FGB drafted the manuscript. All the authors revised the article and agree with the final version and the findings.

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Competing interests None declared.

Ethics approval This study was approved by the Parc Salut Mar Ethical Committee.

Provenance and peer review Not commissioned; externally peer reviewed.

Data sharing statement Researchers can apply to obtain raw data from the General Directorate for the Organization of the Social Security. Information to apply on the following Web site: http://www.seg-social.es/Internet_1/Estadistica/Est/Muestra_Continua_de_Vidas_Laborales/SolicitarM/index.htm. Researchers may obtain the methodology to build the WORKss cohort from the Center for Research in Occupational Health by sending an e-mail to salutlaboral@upf.edu.

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