Differences in mortality between temporary and permanent workers: results from the Rome Longitudinal Study

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ABSTRACT

Objective Precarious employment is characterised by instability, lack of protection and economic vulnerability. The objective of this study was to assess the association between temporary contracts and mortality.

Design Cohort study.

Setting Rome, Italy.

Participants All employees, aged 25–65 years, from the Rome Longitudinal Study, followed from 21 October 2001 to the first date among death, migration from Rome, or 31 December 2015.

Primary and secondary outcome measures We investigated all-cause, cardiovascular and accidental mortality. We considered gender, age, place of birth, education, temporary versus permanent contract and sector of employment. We used Cox models to investigate the association between type of contract and total, cardiovascular and accidental mortality in men and women, overall and by employment sector.

Results We analysed 597 834 subjects. The proportion of temporary contracts varied by gender (9.6% in men and 13.3% in women) and by employment sector, ranging from 4.5% (public administration) to 27% (recreational, cultural, sports activities) in men. During the study period, 21 136 subjects died. Men with temporary contracts, compared with those with permanent positions, had greater overall mortality risk (HR=1.16, 95% CI 1.09 to 1.24), cardiovascular mortality (HR=1.29, 95% CI 1.14 to 1.45) and accidental mortality (HR=1.27, 95% CI 1.04 to 1.57). In men, the association varied widely among different economic sectors, with greater risks in the industry, building constructions and social services sectors. In women, there was no evidence of association between temporary contracts and mortality. A statistically significant association between temporary contracts and mortality in women was found in the sector of sales and transports only.

Conclusions Temporary work should be considered a determinant of health, particularly for specific economic sectors.

INTRODUCTION

During the last decades, increased flexibility in the labour market led to the spread of various forms of non-standard and precarious employment in Europe.1 Due to the growth of evidence on the potential implications on health status, precariousness has been suggested as an emerging social determinant of health.2 Some studies showed a social gradient in precarious contracts regarding the educational level and job type.3 4 In addition, a higher proportion of precarious contracts was reported among women,5 young adults1 and migrants.5

Despite the growing body of research, some concerns remain about the definition of precarious employment. According to the seminal work of Rodgers and Rodgers,7 precariousness is a complex construct that encompasses different dimensions involving employment instability and insecurity, lack of protection and economic vulnerability. Although some multidimensional methods have been developed to assess precariousness,8 9 in public health research, it is frequent to focus on a specific domain using a one-dimensional approach. Within these domains, temporary employment, an objective measure of precariousness, is one of the most investigated.10
In this study, we selected all employees aged 25–65 years at baseline (78% of the employed population).

**Patient and public involvement**

Patient involvement in the study was not possible, as individual contact information was unavailable because of privacy restrictions. However, due to the topic’s relevance, the purpose is to disseminate study results to both population and policy-makers, to implement health promotion and prevention strategies in temporary workers of specific economic sectors.

**Outcomes**

We analysed all-cause mortality, cardiovascular mortality (ICD-9 codes 390–459), and accidental mortality (ICD-9 codes 800–999).

**Temporary employment, sector of employment and other variables**

The census included a large amount of information regarding the occupation for the population aged 15 years or more: occupational status, a binary variable identifying employees and self-employed, the sector of employment, and for employees only, the distinction between temporary and permanent contracts.

The sector of employment was categorised in 28 categories grouped in 7 groups, named macrosectors. Sectors were classified as in the 2001 Italian census by the Italian National Institute of Statistics.18

Among other census variables, we selected gender, date of birth, level of education (coded as low for junior high school or less, medium for high school and high for university or more) and place of birth (Rome, Italy and abroad).

**Statistical analyses**

We computed sex-specific crude mortality rates by age class, type of contract, level of education and place of birth. We used Cox proportional hazard models to investigate the association between type of contact (temporary vs permanent employee) and total and cause-specific mortality in men and women, overall and by employment sector. We used time of follow-up as time axis and stratified the baseline hazard function by age. We tested for interaction between temporary contract and employment sector using the log-likelihood ratio test.

**Additional analyses**

As additional analyses, we performed the Cox regression stratifying the baseline hazard function by age, level of education and place of birth.

As a sensitivity analysis, we performed Cox proportional hazard models to investigate the association between type of contact and mortality until 31 December 2006, allowing only 5 years of follow-up, under the hypothesis that the information on temporary employment at 2001 census could be more reliable in the first years after the census.

Assuming that temporary workers are more likely to migrate in search of a better position, we used an inverse

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**METHODS**

**Study design**

We used the Rome Longitudinal Study, the administrative cohort of residents in Rome who filled in the 2001 population census. The study, which has been already described, included all subjects who were not living in institutions on the census reference day, 21 October 2001.15–17 We followed the subjects using record-linkage procedures with administrative databases, under strict control to protect individual privacy. We used the Municipal Registry for vital status and migration and Mortality Registry for the cause of death (coded according to the International Classification of Disease, 9th Revision, ICD-9). The follow-up started on the census reference day and ended on the day of death, of migration from Rome, or 31 December 2015, whichever came first. The Rome Longitudinal Study was part of the National Statistical Program 2019 and was approved by the Italian Data Protection Authority.

**Setting and participants**

Rome is the capital of Italy, and it is the largest Italian city with about 2.5 million inhabitants on a surface of 1290 km² at 2001 census.
probability weighting approach to handle missing information on deaths due to lost to follow-up due to migration. First, we estimated sex-stratified probability (P) of non-emigration as a function of age, education, type of contract and place of birth using logistic regression models. Then, we estimated the probability (P') of non-emigration as a function of age only to calculate stabilised weights (W) as P'/P. Finally, we performed weighted Cox regression models on non-migrants using the weights W.

Since the type of contract might partly reflect the well-known health differences in occupational classes, we further analysed the association between temporary employment and mortality for each occupational class, categorised as manual workers, sale or service workers, low-skill non-manual workers and high-skill non-manual workers.

RESULTS

The cohort included in the study was composed by 597 834 employees aged between 25 and 65 years (53.6% men and 46.4% women), followed for a mean of 12.9 years resulting in a total of 7 712 058 person years.

Table 1 shows the main sociodemographic characteristics, overall and cause-specific mortality of the study population. The percentage of temporary workers was higher in the youngest age class (20.2% in men and 24.6% in women), in the lower educational level (10.2% in men and 13.3% in women) and in people born abroad (14.0% in men and 18.4% in women). Women had a higher proportion of temporary contracts than men (13.3% vs 9.6%) and were more educated than men (26.5% vs 15.0%).

| Table 1 | Characteristics of the study population |
|---------|----------------------------------------|
|         | N          | %       | % Temporary workers | Number of deaths | % CV deaths | % AC deaths | CMR |
| Men     | Total      | 320 654 | 100.0       | 9.6              | 14 290      | 26.5        | 6.2  | 35.1 |
| Age class |           |          |              |                  |             |             |      |      |
|         | 25–34      | 83 837  | 26.1        | 20.2             | 725         | 20.6        | 34.3 | 7.0  |
|         | 35–44      | 102 024 | 31.8        | 6.9              | 2035        | 25.7        | 12.1 | 15.4 |
|         | 45–54      | 89 910  | 28.0        | 4.7              | 5195        | 27.3        | 4.3  | 44.6 |
|         | 55–65      | 44 883  | 14.0        | 6.0              | 6335        | 26.9        | 2.6  | 113.2|
| Education |           |          |              |                  |             |             |      |      |
|         | High       | 70 356  | 21.9        | 9.9              | 2585        | 26.7        | 5.5  | 28.5 |
|         | Medium     | 144 897 | 45.2        | 9.1              | 5017        | 26.5        | 7.1  | 27.2 |
|         | Low        | 105 401 | 32.9        | 10.2             | 6688        | 26.5        | 5.8  | 50.5 |
| Place of birth |       |          |              |                  |             |             |      |      |
|         | Rome       | 200 499 | 62.5        | 10.9             | 7671        | 26.1        | 7.1  | 29.9 |
|         | Italy      | 104 735 | 32.7        | 6.6              | 6180        | 27.0        | 4.8  | 46.8 |
|         | Abroad     | 15 420  | 4.8         | 14.0             | 439         | 28.0        | 9.1  | 23.6 |
| Women   | Total      | 277 180 | 100.0       | 13.3             | 6846        | 14.6        | 3.8  | 18.9 |
| Age class |           |          |              |                  |             |             |      |      |
|         | 25–34      | 80 257  | 29.0        | 24.6             | 421         | 11.4        | 15.4 | 4.1  |
|         | 35–44      | 93 520  | 33.7        | 11.3             | 1344        | 11.5        | 5.1  | 10.8 |
|         | 45–54      | 75 688  | 27.3        | 6.3              | 2816        | 13.2        | 3.1  | 28.0 |
|         | 55–65      | 27 715  | 10.0        | 6.9              | 2265        | 18.7        | 1.9  | 62.9 |
| Education |           |          |              |                  |             |             |      |      |
|         | High       | 73 511  | 26.5        | 15.0             | 1551        | 12.5        | 3.6  | 16.0 |
|         | Medium     | 140 773 | 50.8        | 12.4             | 2918        | 12.7        | 4.4  | 15.8 |
|         | Low        | 62 896  | 22.7        | 13.3             | 2377        | 18.1        | 3.3  | 29.2 |
| Place of birth |     |          |              |                  |             |             |      |      |
|         | Rome       | 176 768 | 63.8        | 14.4             | 3909        | 13.6        | 4.2  | 16.8 |
|         | Italy      | 83 400  | 30.1        | 10.2             | 2603        | 15.7        | 3.1  | 23.9 |
|         | Abroad     | 17 012  | 6.1         | 18.4             | 334         | 17.7        | 5.4  | 15.8 |

AC, accidental; CMR, crude mortality rate per 10 000 person-years; CV, cardiovascular.
21.9% high educational level). More than one-third of
the employees were born outside Rome, and 4.8% of men
and 6.1% of women were born abroad. In the period of
interest, there were 21 136 deaths (35.1 and 18.8 per 10
000 person years in men and women, respectively). In
men and women, cardiovascular deaths accounted for
26.5% and 14.6% of all deaths, respectively, whereas acci-
dental deaths for 6.2% in men and 3.8% in women. Acci-
dental mortality was almost twice as high for temporary
compared with permanent workers in both men (10.9% vs
5.8%) and women (6.7% vs 3.6%) (not shown in table).

Main characteristics by occupational sectors for men
and women are shown in online supplemental
material. In men (online supplemental table S1), the
macrosector with the highest percentage of tempo-
rary employees was fishing and agriculture (14.7%).
The sector with the highest proportion of temporary
workers was recreational, cultural and sports activities,
within the macrocategory of social services, with 27.1%.
Online supplemental table S1 highlights the differences
among sectors in terms of socioeconomic position and
origins. The education sector had the highest proportion
of highly educated employees (62.9%), followed by the
health and social assistance sector (45.7%), whereas the
sectors with the lowest proportion were hotels, bars
and restaurants (4.8%) and domestic services (4.9%). The
proportion of foreigners varied among sectors, with the
highest percentage in domestic services (32.1%) followed
by international organisations (20.6%). Women showed
higher percentages of temporary contracts than men
in all macrosectors (online supplemental table S2). In
women, the macrosectors with the highest rate of tempo-
rary employees were fishing and agriculture (20.4%),
international organisations (17.6%) and sales and trans-
port (14.6%). Conversely, the lowest proportion was in
social services (12.5%). However, in this macrosector,
there was great variability, with the percentage of tempo-
rary workers ranging between 31.2% of recreational,
cultural and sporting activities and 5.9% of local, national
and public administration.

Table 2 shows the association between temporary
employment and mortality overall and by employment
macrosector in men and women. Age-adjusted Cox
regression models showed greater overall mortality risk
for temporary workers in men (HR 1.16, 95% CI 1.09 to
1.24) but not in women (HR 1.03, 95% CI 0.95 to 1.12).
The likelihood ratio tests, comparing the models with and
without the interaction term between type of contract
and sector of employment, were statistically significant
in both men (p=0.04) and women (p=0.04). Among
macrosectors, industry (HR 1.26, 95% CI 1.07 to 1.49),
building constructions (HR 1.29, 95% CI 1.08 to 1.54)
and social services (HR 1.11, 95% CI 1.00 to 1.25) showed
higher overall mortality risks in men, whereas women
had higher mortality in sales and transports sector (HR
1.23, 95% CI 1.01 to 1.49). Overall, in men, temporary
workers had higher cardiovascular mortality than those
with permanent positions (HR 1.29, 95% CI 1.14 to 1.45),
particularly in the macrosectors of sales and transports
(HR 1.33, 95% CI 1.05 to 1.68) and social services (HR
1.26, 95% CI 1.03 to 1.55). In women, although the HRs
were greater than one in several macrosectors, there was
no evidence of an association between type of contract
and cardiovascular mortality. Temporary workers had a
higher risk of accidental mortality than workers in perma-

Table 3 shows the association between temporary
employment and overall, cardiovascular, and accidental
mortality in men by specific employment sector. There
was an association with overall mortality, with higher risks
in subjects with temporary compared with permanent
contracts, in the steel industry sector (HR 1.34, 95% CI
1.04 to 1.71) and in the public administration (HR 1.20,
95% CI 1.01 to 1.43). Higher cardiovascular mortality
risks were found in the sector of production and distribu-
tion of electricity, water and gas (HR 3.85, 95% CI 1.50
to 9.83), in the retail and trade sector (HR 1.72, 95% CI
1.07 to 2.77), in the sector which includes professional
consulting, real estate and rental (HR 1.98, 95% CI 1.13
to 3.49) and public administration (HR 1.56, 95% CI 1.15
to 2.11). There was a higher risk for accidental mortality
in two sectors: steel industry (HR 2.01, 95% CI 1.04 to
3.87) and wholesale trade and intermediaries of trade
(HR 4.48, 95% CI 1.52 to 13.25) with wide CIs due to
the small number of deaths. Since there was no evidence
of an association between type of contract and overall
mortality in women, we did not investigate the possible
association in specific sectors.

Online supplemental table S3 shows the results from
Cox regression models adjusted for age and level of
education, and then for age, level of education and place
of birth. Adjusting for the level of education and place of
birth slightly reduced the HR for all statistically signifi-
cant results except for public service in men and sales and
transport in women, which presented an increase.

The sensitivity analysis conducted with a follow-up from
2001 to 2006 confirmed the results on overall and cardio-
vascular mortality in men. Results on accidental mortality
were based on 345 cases and were not statistically signifi-
cant. Online supplemental table S4 shows the results of
the association between temporary employment and
overall mortality by macrosectors ending the follow-up in
December 2006. The results were similar, although the
scarcity of events in the first 5 years of follow-up did not
allow having statistically significant associations. There
were no differences in HRs for overall and cause-specific
mortality using the inverse probability approach: for
overall mortality the HRs of temporary contracts, in the
steel industry sector (HR 1.34, 95% CI 1.04 to 1.71) and
1.04 (95% CI 0.95 to 1.14) for men and women, respectively.

Online supplemental table S5 shows the results of the
association between temporary employment and overall
mortality by type of work. Manual and sale or service
workers with temporary contracts showed significantly
higher overall mortality than those with permanent
**Table 2** Association between temporary employment and mortality overall and by macrosector of employment

|                      | N      | N                     | Overall mortality | CV mortality | N                     | AC mortality |
|----------------------|--------|-----------------------|-------------------|--------------|-----------------------|--------------|
|                      | Deaths | HR 95% CI             | Deaths            | HR 95% CI    | Deaths                | HR 95% CI    |
| **Men**              |        |                       |                   |              |                       |              |
| Overall              | 320 654| 14 290                | 1.16              | 1.09 to 1.24 | 3793                  | 1.29         |
|                      |        |                       |                   |              |                       |              |
|                      | Deaths | HR 95% CI             | Deaths            | HR 95% CI    | Deaths                | HR 95% CI    |
| Fishing and agriculture | 3927  | 271                   | 0.83              | 0.56 to 1.22 | 67                    | 1.41         |
| Industry             | 44 568 | 1897                  | 1.26              | 1.07 to 1.49 | 502                   | 1.17         |
| Building constructions | 21 058| 1047                  | 1.29              | 1.08 to 1.54 | 290                   | 1.31         |
| Sales and transports | 79 626 | 3265                  | 1.12              | 0.98 to 1.27 | 859                   | 1.33         |
| Credit, insurances and other services | 51 771 | 1806 | 1.11 | 0.89 to 1.37 | 476 | 1.2 | 0.8 to 1.81 | 88 | 0.95 | 0.42 to 2.17 |
| Social services      | 117 812| 5910                  | 1.11              | 1 to 1.25    | 1573                  | 1.26         |
|                      |        |                       |                   |              |                       |              |
| **Women**            |        |                       |                   |              |                       |              |
| Overall              | 277 180| 6846                  | 1.03              | 0.95 to 1.12 | 997                   | 1.02         |
|                      |        |                       |                   |              |                       |              |
|                      | Deaths | HR 95% CI             | Deaths            | HR 95% CI    | Deaths                | HR 95% CI    |
| Fishing and agriculture | 3032 | 114                   | 0.71              | 0.41 to 1.23 | 27                    | 0.53         |
| Industry             | 19 721 | 423                   | 1.01              | 0.73 to 1.39 | 70                    | 1.61         |
| Building constructions | 3612 | 74                    | 0.89              | 0.38 to 2.1  | 12                    | 3.56         |
| Sales and transports | 51 334 | 980                   | 1.23              | 1.01 to 1.49 | 132                   | 1.31         |
| Credit, insurances and other services | 42 745 | 727 | 0.9 | 0.68 to 1.19 | 89 | 0.77 | 0.33 to 1.8 | 33 | 0.95 | 0.32 to 2.83 |
| Social services      | 154 755| 4493                  | 1.01              | 0.91 to 1.13 | 665                   | 0.85         |

HRs adjusted for age. Men and women, Rome 2001–2015.
*International organisations sector, contributing with 94 and 35 deaths for men and women respectively, was not shown.
AC, accidental; CV, cardiovascular.
### Table 3  Association between temporary employment and mortality by specific sector

| Sector of employment* | N Overall mortality | N CV mortality | N AC mortality |
|-----------------------|---------------------|----------------|----------------|
|                       | N                  | Deaths | HR  | 95% CI | Deaths | HR  | 95% CI | Deaths | HR  | 95% CI |
| Overall              | 320 654            | 14 290 | 1.16 | 1.08 to 1.24 | 3793   | 1.29 | 1.14 to 1.45 | 884    | 1.27 | 1.04 to 1.57 |
| Fishing and agriculture | 3927             | 271   | 0.83 | 0.56 to 1.22 | 67     | 1.41 | 0.73 to 2.71 | 19     | 0.92 | 0.26 to 3.29 |
| Agriculture, hunting, forestry | 3620             | 250   | 0.84 | 0.57 to 1.26 | 65     | 1.38 | 0.72 to 2.67 | 17     | 0.69 | 0.15 to 3.12 |
| Fishing, fish farming  | 307               | 21    | 0.68 | 0.08 to 5.97 | 2      | –    | –          | 2      | –    | –          |
| Industry              | 44 568            | 1887   | 1.26 | 1.07 to 1.49 | 502    | 1.17 | 0.84 to 1.62 | 130    | 1.58 | 0.96 to 2.61 |
| Coal mining, oil extraction | 1829           | 86    | 1.78 | 0.74 to 4.3 | 21     | 0.88 | 0.1 to 7.88 | 4      | –    | –          |
| Food industry         | 3979              | 171   | 1.28 | 0.76 to 2.16 | 46     | 1.86 | 0.78 to 4.47 | 13     | 0.68 | 0.08 to 5.44 |
| Textile, leather industry | 2035             | 107   | 0.72 | 0.35 to 1.5 | 36     | 1.3  | 0.45 to 3.8 | 5      | –    | –          |
| Wood, wood products industry, publishing | 5174         | 225   | 1.06 | 0.63 to 1.77 | 63     | 0.46 | 0.11 to 1.91 | 10     | 0.62 | 0.07 to 5.5 |
| Refinery, pharmaceutical, chemical industry | 5959        | 211   | 1.09 | 0.62 to 1.92 | 53     | 1.02 | 0.34 to 3.05 | 14     | 1.37 | 0.27 to 6.87 |
| Non-metal mineral industry | 1348           | 71    | 1.17 | 0.59 to 2.34 | 27     | 1.01 | 0.3 to 3.47 | 4      | –    | –          |
| Steel industry        | 17 755            | 728   | 1.34 | 1.04 to 1.71 | 187    | 0.85 | 0.48 to 1.52 | 64     | 2.01 | 1.04 to 3.87 |
| Furniture industry    | 1651              | 89    | 1.49 | 0.79 to 2.83 | 16     | 1.69 | 0.36 to 7.95 | 5      | –    | –          |
| Production, distribution of electricity, water and gas | 4838         | 209   | 0.89 | 0.39 to 2.02 | 53     | 3.85 | 1.5 to 9.83 | 11     | –    | –          |
| Building constructions | 21 058           | 1047  | 1.29 | 1.08 to 1.54 | 290    | 1.31 | 0.94 to 1.83 | 86     | 1.19 | 0.67 to 2.1  |
| Sales and transports  | 79 626            | 3265  | 1.12 | 0.98 to 1.27 | 859    | 1.33 | 1.05 to 1.68 | 225    | 1.1  | 0.74 to 1.64 |
| Sale, maintenance, repair of motor vehicles, sale of fuel | 8449         | 345   | 0.91 | 0.61 to 1.37 | 77     | 1.76 | 0.89 to 3.48 | 20     | 1.31 | 0.37 to 4.61 |
| Wholesale trade, intermediaries of trade | 7795          | 261   | 1.1  | 0.71 to 1.7 | 66     | 0.85 | 0.34 to 2.15 | 16     | 4.48 | 1.52 to 13.25 |
| Retail trade          | 13 546            | 547   | 1.1  | 0.84 to 1.44 | 130    | 1.72 | 1.07 to 2.77 | 40     | 0.62 | 0.22 to 1.79 |
| Hotels, camping, bars, restaurants | 13 147         | 561   | 1.12 | 0.86 to 1.46 | 154    | 1.09 | 0.65 to 1.84 | 51     | 1.66 | 0.85 to 3.25 |
| Transport             | 36 689            | 1551  | 1.14 | 0.92 to 1.43 | 432    | 1.31 | 0.87 to 1.97 | 98     | 0.59 | 0.26 to 1.33 |
| Credit, insurance and other services | 51 771        | 1806  | 1.11 | 0.89 to 1.37 | 476    | 1.2  | 0.8 to 1.81 | 88     | 0.95 | 0.42 to 2.17 |
| Credit, insurance, monetary, financial intermediation | 23 179         | 1059  | 1.17 | 0.83 to 1.65 | 265    | 1.05 | 0.51 to 2.16 | 49     | 1.19 | 0.32 to 4.37 |
| IT, research, development | 18 870         | 383   | 0.57 | 0.33 to 1 | 114    | 0.34 | 0.08 to 1.37 | 22     | 0.47 | 0.06 to 3.74 |
| Professional consulting, real estate, rental | 9722          | 364   | 1.33 | 0.96 to 1.84 | 97     | 1.98 | 1.13 to 3.49 | 17     | 1.05 | 0.28 to 3.94 |
| Social services       | 117 812           | 5910  | 1.11 | 1.00 to 1.25 | 1573   | 1.26 | 1.03 to 1.55 | 329    | 1.36 | 0.94 to 1.97 |
| Local, national, public administration | 66 677        | 3245  | 1.2  | 1.01 to 1.43 | 879    | 1.56 | 1.15 to 2.11 | 174    | 1.68 | 0.95 to 3 |
| Public, private education | 15 276         | 897   | 1.27 | 0.97 to 1.67 | 230    | 1.54 | 0.93 to 2.55 | 43     | 0.87 | 0.3 to 2.52 |
| Health, social assistance | 19 331         | 1003  | 0.88 | 0.66 to 1.17 | 277    | 0.91 | 0.53 to 1.57 | 62     | 0.67 | 0.21 to 2.21 |
| Political, trade union organisations | 2404         | 111   | 1.01 | 0.52 to 1.95 | 33     | 0.77 | 0.18 to 3.36 | 3      | –    | –          |
| Recreational, cultural, sports activities | 5143          | 217   | 1.17 | 0.84 to 1.64 | 49     | 1.48 | 0.75 to 2.95 | 21     | 1.25 | 0.48 to 3.24 |

Continued
contracts (manual: HR 1.16; 95% CI 1.05 to 1.28; sale or service: HR 1.22; 95% CI 1.02 to 1.46). However, it should be noted that HRs > 1 were found in all occupational classes, although without reaching statistical significance.

Furthermore, high-skill non-manual workers with temporary contracts showed significantly higher cardiovascular mortality compared with high-skill non-manual workers with permanent contracts (HR 1.34; 95% CI 1.06 to 1.70).

DISCUSSION

Our results, based on a cohort of 597,834 employees, showed that having temporary contracts, compared with permanent ones, was associated with greater overall mortality risk in men but not in women. Mortality risks for temporary employees compared with permanent ones varied widely among different economic sectors. In men, we found higher risks in the industry, building constructions and social services sectors. In women, we found a higher risk in temporary compared with permanent workers only in sales and transports, mainly due to the strong association in the retail sector.

Our results are consistent with findings from previous studies that showed stronger associations in men than in women. The risk for temporary employment was generally higher in sectors where less-skilled employees were more represented, particularly in men, mortality was higher in sectors where manual workers are predominantly represented, such as industry and building constructions. One possible explanation could be that temporary workers employed in these sectors might be exposed to specific hazards and risks. Indeed, it is well known that employees working in specific economic sectors may be exposed to hazards and behavioural risks. Furthermore, it is well established that compared with permanent workers, temporary workers experience worse job quality, and less use of personal protective equipment, as well as less training and information about the work environment and occupational risks. Therefore, it is likely that temporary workers employed in these sectors might be exposed to specific occupational risks.

For both men and women, the analysis of the association between temporary contracts and mortality by sector showed that most HRs were greater than one. The risk for temporary employment was generally lower in sectors where less-skilled employees were more represented, particularly in men. Mortality was higher in sectors where manual workers are predominantly represented, such as industry and building constructions. One possible explanation could be that temporary workers employed in these sectors might be exposed to specific hazards and risks. Indeed, it is well known that employees working in specific economic sectors may be exposed to hazards and behavioural risks. Furthermore, it is well established that compared with permanent workers, temporary workers experience worse job quality, and less use of personal protective equipment, as well as less training and information about the work environment and occupational risks.

Our results, based on a cohort of 597,834 employees, showed that having temporary contracts, compared with permanent ones, was associated with greater overall mortality risk in men but not in women. Mortality risks for temporary employees compared with permanent ones varied widely among different economic sectors. In men, we found higher risks in the industry, building constructions and social services sectors. In women, we found a higher risk in temporary compared with permanent workers only in sales and transports, mainly due to the strong association in the retail sector.

It has to be considered that, due to the high number of comparisons, it could be possible that some of the associations found between occupational status and mortality could be due to chance. A study conducted in Rome that analysed the association between temporary contracts and mortality found higher overall mortality in women, cardiovascular mortality in men, and accidental mortality in women. However, it should be noted that HRs > 1 were found in all occupational classes, although without reaching statistical significance.
mortality for cardiovascular disease and accidental causes in unemployed compared with employees.\textsuperscript{17} Possible explanations provided by the authors are the prevalence of risky behaviours and habits (smoking or unhealthy diet) among the unemployed and the ‘status syndrome’ theory that hypothesises a link between lack of control and low social participation and disease risk. Temporary workers may share some of the same risky conditions of unemployed. A study found higher mortality in temporary compared with permanent workers for smoking and alcohol-related cancers.\textsuperscript{13} Furthermore, temporary workers can frequently experience periods of unemployment. Therefore, some of the risk factors of unemployment may have an impact also on temporary employment regarding cardiovascular and accidental mortality.

In general, temporary employment includes all forms of no open-ended contracts, such as fixed-term, temporary-agency, apprenticeship, seasonal and casual works. Most of these forms of contracts may share different dimensions of precariousness, such as job insecurity, low wages and social protection. These factors are proposed as possible pathways linking temporary employment to adverse health outcomes.\textsuperscript{30} Nevertheless, a negative impact was generally found on self-reported health,\textsuperscript{2} although some studies are not consistent with this result.\textsuperscript{38} There is a large consensus regarding the negative impact on mental health,\textsuperscript{10} while for occupational injuries, a recent meta-analysis showed no conclusive results.\textsuperscript{19} Studies on mortality showed that the strength of the association varies with the type of temporary contract,\textsuperscript{11} and that the risk is higher only for involuntary and not satisfied temporary workers.\textsuperscript{14} It should be considered that type of contract might partly reflect the well-known health differences in occupational class. However, the additional analysis showed differences for both manual and high-skill non-manual workers. Therefore, temporary contacts and job type seem to assess distinct socioeconomic job-related domains, with temporary contacts showing different impacts on mortality risk among the occupational classes.

Globally, the studies on the association between temporary employment and mortality are limited, and they were all conducted in North European countries. It is noteworthy that the impact of precariousness on health outcomes could also depend on contextual factors, such as the percentage of precarious employment and the social policies in the country.\textsuperscript{33} Our study was the first to analyse the association between mortality and type of contract in Italy. According to the Italian Institute of Statistics, the percentage of temporary employment in Italy has increased in the last decades, ranging from a mean of 11.8\% of the total dependent employee in 2004 to a mean of 17.0\% in 2019.\textsuperscript{31} Rising in temporary contracts was mainly explained by the structural reforms that increased flexibility in the labour market over the last decades,\textsuperscript{32} as well as the Great Recession in 2008. Regarding gender differences in contracts type, our data based on Rome population agree with national data, with a higher rate of temporary workers in women than in men. In the population of Rome, the higher percentage of women with temporary contracts in our study can be added to previous results showing that women had a higher rate of unemployment than men.\textsuperscript{17}

Our study had some limitations. First, the type of contract was evaluated only at the beginning of the follow-up, that is, 2001. However, there is substantial agreement between the principal and the sensitivity analyses, although the smaller number of deaths in the latter reduced the significance of the associations. Second, there was a lack of information on employees’ health and behavioural risk factors. In particular, it is possible that the health status influenced the probability of having permanent employment, determining a selection bias. Another potential selection bias could be the differential migration from Rome in temporary versus permanent workers. However, assuming the absence of unmeasured confounders, we used an inverse probability weighting approach to handle missing information on deaths due to lost to follow-up due to migration, obtaining weighted HRs similar to those presented. Finally, since the cohort was followed from 2001 to 2015, the data could be considered dated. However, the 2001 census was the last census that collected information on jobs and type of contracts for the whole population. Therefore, it is the last census that allows analysing different economic sectors separately.

In conclusion, our results point out that temporary contracts should be considered as an important determinant of health, in particular for workers employed in specific economic sectors. At the health and work policy level, this means that major efforts should be made to reduce precariousness. As a determinant of health, temporary work should be taken into account also in the development of national and local prevention plans, providing specific sector recommendations for both employers and occupational medicine professionals. Prevention strategies, such as information and training, should also be implemented.

The well-known heterogeneity in the temporary employees was confirmed by our study throughout the different economic sectors. These results highlight the importance of performing studies on health outcomes in temporary workers focusing on various economic sectors to understand better individual, work-related and contextual factors linking temporary contracts and mortality risk. Future research should confirm these results and evaluate differences among countries with different labour market settings.

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Supplemental Material

Differences in mortality between temporary and permanent workers: results from the Rome Longitudinal Study.

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| Men                                      | N             | Contract (% Temporary) | Education (% High) | Place of birth (% Abroad) | Age mean (sd) | Number of deaths | % CV deaths | % AC deaths |
|-----------------------------------------|---------------|------------------------|--------------------|---------------------------|---------------|------------------|-------------|-------------|
| Fishing and agriculture                 | 3,927         | 14.7                   | 7.6                | 9.8                       | 43.7 (10.9)   | 271              | 24.7        | 7.0         |
| Agriculture, haunting, forestry         | 3,620         | 14.9                   | 7.5                | 9.6                       | 44.0 (10.9)   | 250              | 26.0        | 6.8         |
| Fishing, fish farming                   | 307           | 12.4                   | 8.1                | 11.4                      | 40.9 (10.6)   | 21               | 9.5*        | 9.5*        |
| Industry                                | 44,568        | 9.7                    | 18.2               | 4.8                       | 42 (9.9)      | 1,897            | 26.5        | 6.9         |
| Coal mining, oil extraction             | 1,829         | 6.2                    | 29.3               | 4.6                       | 45.7 (10)     | 86               | 24.4        | 4.7*        |
| Food industry                           | 3,979         | 10.0                   | 12.0               | 5.2                       | 41.7 (9.9)    | 171              | 26.9        | 7.6         |
| Textile, leather industry               | 2,035         | 14.3                   | 9.0                | 7.4                       | 41.3 (10.5)   | 107              | 33.6        | 4.7*        |
| Wood, wood products industry. publishing | 5,174         | 9.5                    | 9.2                | 3.6                       | 42.2 (9.5)    | 225              | 28.0        | 4.4         |
| Refinery, pharmaceutical, chemical industry | 5,959       | 8.8                    | 35.1               | 4.9                       | 42.5 (9.8)    | 211              | 25.1        | 6.6         |
| Non-metal mineral industry              | 1,348         | 13.8                   | 7.8                | 7.6                       | 41.5 (10.2)   | 71               | 38.0        | 5.6*        |
| Steel industry                          | 17,755        | 10.6                   | 17.8               | 4.8                       | 41.1 (9.8)    | 728              | 25.7        | 8.8         |
| Furniture industry                      | 1,651         | 13.3                   | 6.8                | 7.6                       | 41.1 (10.8)   | 89               | 18.0        | 5.6*        |
| Production, distribution of electricity, water and gas | 4,838       | 4.9                    | 19.6               | 2.6                       | 44 (9)        | 209              | 25.4        | 5.3         |
| Building Constructions                  | 21,058        | 14.2                   | 10.2               | 7.1                       | 41.5 (10.7)   | 1,047            | 27.7        | 8.2         |
| Sales and Transport                     | 79,626        | 11.0                   | 9.4                | 5.6                       | 41.1 (10.1)   | 3,265            | 26.3        | 6.9         |
| Sale, maintenance, repair of motor vehicles, sale of fuel | 8,449       | 11.6                   | 6.1                | 4.8                       | 40.3 (10.3)   | 345              | 22.3        | 5.8         |
| Wholesale trade, intermediaries of trade | 7,795        | 11.4                   | 8.4                | 5.2                       | 39.9 (10)     | 261              | 25.3        | 6.1         |
| Retail trade                            | 13,546        | 13.0                   | 5.9                | 5.1                       | 39.4 (10.4)   | 547              | 23.8        | 7.3         |
| Hotels, camping, bars, restaurants      | 13,147        | 13.8                   | 4.8                | 13.5                      | 39.5 (10.2)   | 561              | 27.5        | 9.1         |
| Transport                               | 36,689        | 9.1                    | 13.4               | 3.2                       | 42.7 (9.8)    | 1,551            | 27.9        | 6.3         |
| Credit, insurances and other services   | 51,771        | 9.2                    | 32.4               | 3.1                       | 41 (9.9)      | 1,806            | 26.4        | 4.9         |
| Credit, insurance, monetary, financial intermediation | 23,179    | 4.6                    | 29.5               | 2.6                       | 45 (9.3)      | 1,059            | 25.0        | 4.6         |
| IT, research, development               | 18,870        | 11.4                   | 35.0               | 3.0                       | 36.9 (8.6)    | 383              | 29.8        | 5.7         |
| Professional consulting, real estate, rental | 9,722      | 15.6                   | 34.1               | 4.4                       | 39.1 (10.1)   | 364              | 26.6        | 4.7         |
| Social services                         | 117,812       | 7.8                    | 29.7               | 4.2                       | 44.2 (9.9)    | 5,910            | 26.6        | 5.6         |
| Category                                      | N        | Contract (% Temporary) | Education (% High) | Place of birth (% Abroad) | Age mean (sd) | Number of deaths | % CV deaths | % AC deaths |
|----------------------------------------------|----------|------------------------|--------------------|---------------------------|---------------|-----------------|-------------|-------------|
| Local, national, public administration       | 66,677   | 4.5                    | 21.0               | 2.7                       | 44 (9.8)      | 3,245           | 27.1        | 5.4         |
| Public, private education                    | 15,276   | 11.6                   | 62.9               | 4.3                       | 47.3 (9.6)    | 897             | 25.6        | 4.8         |
| Health, social assistance                    | 19,331   | 8.5                    | 45.7               | 3.3                       | 44.7 (9.4)    | 1,003           | 27.6        | 6.2         |
| Political, trade union organizations         | 2,404    | 11.9                   | 35.9               | 3.0                       | 43.9 (10)     | 111             | 29.7        | 2.7*        |
| Recreational, cultural, sports activities    | 5,143    | 27.1                   | 22.8               | 5.5                       | 41 (10)       | 217             | 22.6        | 9.7         |
| Other service activities                     | 4,939    | 12.2                   | 5.5                | 4.9                       | 40.3 (9.8)    | 211             | 21.8        | 8.5         |
| Domestic services                            | 4,042    | 11.5                   | 4.9                | 32.1                      | 42.9 (10.1)   | 226             | 26.1        | 3.5*        |
| International organizations                 | 1,892    | 12.2                   | 32.2               | 20.6                      | 44.7 (9.9)    | 94              | 27.7        | 7.4*        |

* Less than 10 deaths

CV cardiovascular
AC accidental
### Supplementary Table 2. Characteristics by occupational sector in women, Rome 2001.

| Women                                    | N      | Contract (% Temporary) | Education (% High) | Place of birth (% Abroad) | Age mean (sd) | Number of deaths | % CV deaths | % AC deaths |
|------------------------------------------|--------|-------------------------|--------------------|---------------------------|---------------|------------------|-------------|-------------|
| **Fishing and agriculture**              | 3,032  | 20.4                    | 8.4                | 12.0                      | 43.7 (10.3)   | 114              | 23.7        | 0.9*        |
| Agriculture, haunting, forestry          | 2,917  | 20.3                    | 7.9                | 12.2                      | 43.9 (10.2)   | 113              | 24.0        | 0.9*        |
| Fishing, fish farming                    | 115    | 25.2                    | 20.9               | 6.1                       | 40.1 (10.9)   | 1                | 0.0         | 0.0         |
| **Industry**                            |        |                         |                    |                           |               |                  |             |             |
| Coal mining, oil extraction              | 964    | 9.2                     | 20.4               | 4.9                       | 43 (9)        | 19               | 5.3         | 0.0         |
| Food industry                            | 1,797  | 15.2                    | 13.5               | 9.1                       | 39.4 (9.9)    | 36               | 25.0*       | 11.1*       |
| Textile, leather industry                | 3,553  | 18.7                    | 6.3                | 9.8                       | 40.1 (10.1)   | 96               | 16.7        | 4.2*        |
| Wood, wood products industry, publishing | 2,313  | 13.1                    | 17.8               | 4.5                       | 40.2 (9)      | 47               | 12.8*       | 4.3*        |
| Refinery, pharmaceutical, chemical industry | 3,360  | 13.0                    | 37.6               | 7.2                       | 38.6 (8.7)    | 61               | 21.3        | 9.8*        |
| Non-metal mineral industry               | 393    | 16.5                    | 13.0               | 11.2                      | 39.3 (9.7)    | 13               | 0.0         | 15.4*       |
| Steel industry                           | 5,137  | 14.0                    | 17.9               | 7.3                       | 39.5 (9.3)    | 105              | 15.2        | 3.8*        |
| Furniture industry                       | 583    | 17.5                    | 10.5               | 9.3                       | 38.2 (9.6)    | 12               | 16.7*       | 8.3*        |
| Production, distribution of electricity, water and gas | 1,621  | 5.6                     | 22.2               | 3.8                       | 41.6 (8.6)    | 34               | 20.6*       | 2.9*        |
| **Building Constructions**               | 3,612  | 14.3                    | 15.9               | 4.1                       | 38 (9)        | 74               | 16.2        | 4.1*        |
| Sales and Transport                      | 51,334 | 14.6                    | 11.9               | 5.7                       | 38.3 (9.5)    | 980              | 13.5        | 4.7         |
| Sale, maintenance, repair of motor vehicles, sale of fuel | 3,241  | 14.9                    | 10.9               | 4.4                       | 38.2 (9.5)    | 68               | 7.4*        | 5.9*        |
| Wholesale trade, intermediaries of trade | 5,755  | 13.3                    | 9.6                | 5.3                       | 37.7 (9.1)    | 105              | 16.2        | 5.7*        |
| Retail trade                             | 16,323 | 15.9                    | 6.8                | 5.3                       | 37.8 (9.9)    | 317              | 14.2        | 4.4         |
| Hotels, camping, bars, restaurants       | 10,361 | 16.8                    | 5.5                | 8.6                       | 38.4 (9.8)    | 215              | 15.3        | 5.1         |
| transport                                | 15,654 | 12.0                    | 22.6               | 4.7                       | 39 (9.1)      | 275              | 11.6        | 4.0         |
| **Credit, insurances and other services**|        |                         |                    |                           |               |                  |             |             |
| Credit, insurance, monetary, financial intermediation | 16,469 | 8.3                     | 23.2               | 3.6                       | 40.4 (8.8)    | 359              | 13.1        | 3.1         |
| IT, research, development                | 10,517 | 16.5                    | 37.6               | 3.5                       | 35.2 (7.5)    | 134              | 8.2         | 6.0*        |
| Professional consulting, real estate, rental | 15,759 | 18.2                    | 20.1               | 4.4                       | 36.4 (8.7)    | 234              | 13.2        | 6.0         |
| Social services                          | 154,755| 12.5                    | 33.0               | 6.3                       | 43.3 (9.3)    | 4,493            | 14.8        | 3.4         |
Supplementary Table 1. Continued

| Category                          | N       | Contract (% Temporary) | Education (% High) | Place of birth (% Abroad) | Age mean (sd) | Number of deaths | % CV deaths | % AC deaths |
|----------------------------------|---------|------------------------|--------------------|---------------------------|---------------|------------------|-------------|-------------|
| Local, national, public administration | 54,091  | 5.9                    | 25.3               | 3.1                       | 44.3 (8.6)    | 1.676            | 15.0        | 4.3         |
| Public, private education        | 45,229  | 16.7                   | 50.8               | 4.6                       | 45.2 (9.2)    | 1.416            | 13.4        | 2.5         |
| Health, social assistance        | 31,890  | 11.7                   | 34.2               | 4.8                       | 41.3 (9.3)    | 832              | 14.9        | 3.7         |
| Political, trade union organizations | 3,618   | 12.9                   | 25.4               | 3.9                       | 40.9 (9)      | 87               | 17.2        | 1.1*        |
| Recreational, cultural, sports activities | 5,433    | 31.2                   | 31.9               | 6.0                       | 38.8 (9.4)    | 117              | 9.4         | 4.3*        |
| Other service activities         | 5,473   | 17.3                   | 6.4                | 5.4                       | 37.9 (9.9)    | 127              | 18.1        | 2.4*        |
| Domestic services                | 9,021   | 18.8                   | 5.5                | 40.4                      | 42.4 (10.1)   | 238              | 21.0        | 3.4*        |
| International organizations      | 1,981   | 17.6                   | 41.5               | 39.0                      | 43.6 (9.4)    | 35               | 5.7*        | 0.0         |

* Less than 10 deaths
CV cardiovascular
AC accidental
Table S3. Association between temporary employment and mortality in men and women. Rome 2001-2015

| Sector of employment*          | Men                      | Women                      |
|-------------------------------|--------------------------|----------------------------|
|                               | HR adjusted for age and level of education | HR adjusted for age, level of education, and place of birth |
| Overall                       | 1.13 (1.06, 1.20)        | 1.01 (0.93, 1.10)          |
| Fishing and agriculture       | 0.85 (0.57, 1.25)        | 0.67 (0.39, 1.18)          |
| Industry                      | 1.21 (1.02, 1.42)        | 0.98 (0.71, 1.36)          |
| Building Constructions        | 1.23 (1.03, 1.46)        | 0.91 (0.37, 2.22)          |
| Sales and Transport           | 1.08 (0.95, 1.23)        | 1.23 (1.01, 1.50)          |
| Credit, insurances and other services | 1.09 (0.88, 1.35) | 0.88 (0.67, 1.17) |
| Social services               | 1.13 (1.01, 1.26)        | 0.99 (0.89, 1.11)          |

CV cardiovascular
AC accidental

*Sum of macro-sectors differs from the overall population because the international organizations sector, contributing with 94 and 35 deaths for men and women respectively, was not showed.
### Table S4. Association between temporary employment and mortality in men and women. Rome, 2001-2006

|                      | N deaths | Overall mortality | N deaths | CV mortality | N deaths | AC mortality |
|----------------------|----------|-------------------|----------|--------------|----------|--------------|
|                      |          | HR                | 95% CI   | HR           | 95% CI   | HR           | 95% CI   |
| **Men**              |          |                   |          |              |          |              |          |
| Overall              | 3,657    | 1.13              | 1.00     | 1.28         | 1.00     | 1.31         | 1.04     | 1.65     | 345      | 1.11     | 0.79     | 1.56     |
| Sector of employment*|          |                   |          |              |          |              |          |          |          |          |          |          |
| Fishing and agriculture | 66      | 1.40              | 0.72     | 2.69         | 14       | 3.25         | 1.00     | 10.6    | 6        | 1.12     | 0.13     | 10.03    |
| Industry             | 477      | 1.18              | 0.85     | 1.63         | 161      | 1.40         | 0.82     | 2.37    | 52       | 1.12     | 0.48     | 2.61     |
| Building Constructions | 297     | 1.14              | 0.81     | 1.61         | 90       | 1.31         | 0.73     | 2.38    | 36       | 1.13     | 0.46     | 2.75     |
| Sales and Transport  | 836      | 1.16              | 0.90     | 1.48         | 230      | 1.25         | 0.79     | 2.00    | 91       | 0.90     | 0.47     | 1.75     |
| Credit, insurances and other services | 439     | 1.42              | 0.96     | 2.09         | 110      | 2.07         | 1.03     | 4.14    | 37       | 1.41     | 0.50     | 4.00     |
| Social services      | 1,517    | 0.92              | 0.73     | 1.17         | 391      | 0.85         | 0.52     | 1.39    | 122      | 1.01     | 0.52     | 1.97     |
| **Women**            |          |                   |          |              |          |              |          |          |          |          |          |          |
| Overall              | 1,638    | 1.01              | 0.84     | 1.20         | 222      | 1.16         | 0.74     | 1.83    | 94       | 1.61     | 0.93     | 2.77     |
| Sector of employment*|          |                   |          |              |          |              |          |          |          |          |          |          |
| Fishing and agriculture | 33      | 0.95              | 0.39     | 2.35         | 5        | -            | -        | -      | 1        | -        | -        | -        |
| Industry             | 100      | 0.86              | 0.43     | 1.71         | 14       | 1.70         | 0.37     | 7.68    | 12       | 0.70     | 0.09     | 5.52     |
| Building Constructions | 19      | 1.31              | 0.29     | 5.94         | 2        | 16.8         | 1.03     | 274.5   | -        | -        | -        | -        |
| Sales and Transport  | 245      | 1.38              | 0.95     | 2.00         | 36       | 1.05         | 0.37     | 3.02    | 14       | 2.31     | 0.63     | 8.43     |
| Credit, insurances and other services | 175     | 0.82              | 0.46     | 1.46         | 20       | 1.84         | 0.51     | 6.63    | 16       | 0.48     | 0.06     | 3.83     |
| Social services      | 1,060    | 0.93              | 0.73     | 1.18         | 145      | 1.02         | 0.55     | 1.91    | 51       | 1.93     | 0.95     | 3.95     |

HR adjusted for age
CV cardiovascular
AC accidental

*Sum of macro-sectors differs from the overall population because the international organizations sector, contributing with 94 and 35 deaths for men and women respectively, was not showed.
| Men          |          |            |            |          |            |            |
|--------------|----------|------------|------------|----------|------------|------------|
| Overall      | 320,654  | 14,290     | 1.16       | 1.09     | 1.24       | 3,793      | 1.29       | 1.14       | 1.45       | 884        | 1.27       | 1.04       | 1.57       |
| High-skill non manual | 86,759   | 3,826      | 1.05       | 0.92     | 1.20       | 1,019      | 1.34       | 1.06       | 1.70       | 197        | 1.19       | 0.73       | 1.94       |
| Low-skill non manual | 94,764   | 3,989      | 1.14       | 0.99     | 1.31       | 1,037      | 1.15       | 0.88       | 1.51       | 244        | 1.37       | 0.89       | 2.11       |
| Sales        | 37,183   | 1,452      | 1.22       | 1.02     | 1.46       | 367        | 1.33       | 0.94       | 1.89       | 115        | 1.75       | 1.07       | 2.87       |
| Manual       | 86,555   | 4,646      | 1.16       | 1.05     | 1.28       | 1,273      | 1.24       | 1.03       | 1.50       | 296        | 1.22       | 0.88       | 1.69       |
|             |          |            |            |          |            |            |
| Women        |          |            |            |          |            |            |
| Overall      | 277,180  | 6,846      | 1.03       | 0.95     | 1.12       | 997        | 1.02       | 0.81       | 1.28       | 262        | 1.34       | 0.94       | 1.91       |
| High-skill non manual | 61,000   | 1,502      | 0.97       | 0.80     | 1.19       | 188        | 1.22       | 0.72       | 2.10       | 45         | 1.72       | 0.75       | 3.97       |
| Low-skill non manual | 142,773  | 3,358      | 1.07       | 0.94     | 1.22       | 455        | 0.82       | 0.55       | 1.24       | 127        | 1.04       | 0.57       | 1.87       |
| Sales        | 35,679   | 757        | 1.03       | 0.82     | 1.30       | 124        | 0.97       | 0.54       | 1.72       | 41         | 1.75       | 0.82       | 3.75       |
| Manual       | 37,668   | 1,228      | 0.95       | 0.80     | 1.13       | 230        | 1.04       | 0.70       | 1.54       | 49         | 1.28       | 0.62       | 2.65       |

HR adjusted for age
CV cardiovascular
AC accidental