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Participation in a US community-based cardiovascular health study: investigating non-random selection effects related to employment, perceived stress, work-related stress, and family caregiving

Leslie A. MacDonald[a,*], **Kaori Fujishiro**[a], **Virginia J. Howard**[b], **Paul Landsbergis**[c], and **Misty J. Hein**[a]

[a]National Institute for Occupational Safety and Health, Division of Surveillance, Hazard Evaluations and Field Studies, 1150 Tusculum Avenue, MS R-15, Cincinnati, Ohio 45226 USA

[b]University of Alabama at Birmingham, School of Public Health, Department of Epidemiology 1665 University Blvd. Ryals Public Health Building, Birmingham, Alabama 35294 USA

[c]State University of New York-Downstate School of Public Health, 450 Clarkson Avenue, MS 43 Brooklyn, New York 11203 USA

Abstract

Background—Participation in health studies may be inversely associated with employment and stress. We investigated whether employment, perceived stress, work-related stress, and family caregiving were related to participation in a longitudinal US community-based health study of black and white men and women aged ≥45 years.

Methods—Prevalence ratios and confidence intervals were estimated for completion of the second-stage (S2) of a two-stage enrollment process by employment (status, type), and stress (perceived stress, work-related stress, caregiving), adjusting for age, sex, race, region, income, and education. Eligibility and consent for a follow-up occupational survey was similarly evaluated.

Results—Wage- but not self-employed participants were less likely than the unemployed to complete S2. Among the employed, S2 completion did not vary by stress; however, family caregivers with a short time burden of care (<2-hours/day) were more likely to complete S2, compared to non-caregivers. Eligibility and participation in the follow-up occupational survey was higher among those employed (versus unemployed) at enrollment, but was not associated with enrollment stress levels.

[*]Corresponding author: Leslie A. MacDonald, ScD, National Institute for Occupational Safety and Health, 1090 Tusculum Avenue, MS R-15, Cincinnati, OH 45226-1998 USA. Phone: (513) 841-4529; fax: (513) 841-4486; lmacdonald@cdc.gov.

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Conclusions—Limited evidence of selection bias was seen by employment and stress within a large US community-based cohort, but findings suggest the need for enrollment procedures to consider possible barriers to participation among wage-employed individuals.

Keywords

selection bias; employment; psychological stress; caregivers

Introduction

Occupation is a major social determinant of adult health [1,2], a source of social and environmental exposures, a marker of socioeconomic position, and an important aspect of community life [3–5]. Given the important role occupation plays in community health, it is important for community-based epidemiologic studies to collect data on employment status and job characteristics [6]. However, few studies have examined empirically the challenges in recruiting employed individuals and collecting high-quality occupational data in a community-setting, an increasingly important issue since response rates appear to be declining [7,8].

Epidemiologic studies can be subject to selection bias if study participation or follow-up is incomplete and "selection probabilities are related both to exposure *and* health outcome [9]." Study participation may be influenced by socioeconomic status (SES), employment status, and working conditions. For example, a European study reported lower participation in a follow-up health examination survey among lower SES participants, unemployed or unskilled laborers, those working longer hours, and those in poor health [10]. Another European study found significantly lower rates of follow-up among those employed full-time, compared to those without paid work [11]. Two studies reported lower survey responses at follow-up among those with higher exposure to some work-related stressors (i.e., overload and job strain), but not others (i.e., role ambiguity and role conflict) [12,13]. In one of these studies the association of SES and survey response was mediated by job strain [13].

In longitudinal studies, non-participation can occur at both recruitment and follow-up. For example, an individual may agree to participate in a study but then fail to follow-through and complete all aspects of data collection, especially if it is conducted over multiple days. Other participants may not continue to participate at follow-up several years after study enrollment. Our objective was to examine participation in a large US community-based longitudinal study at two time points: at the second stage of two-stage enrollment process and at follow-up several years later. We hypothesized *a priori* that those less likely to complete enrollment would be employed, have family caregiving responsibilities, and experience higher stress (perceived stress, work-related stress, and family caregiver stress). We also hypothesized that employed individuals with any measured source of stress would be disproportionately underrepresented at follow-up.

Methods

Study design, settings, and participants

The REasons for Geographic And Racial Differences in Stroke (REGARDS) Study is a US national community-based longitudinal study of 30,239 black and white men and women aged ≥45 years [14]. Designed to investigate causes of regional and racial disparities in stroke, the study oversampled blacks and residents of the stroke belt and buckle, areas in the southeastern United States characterized by high stroke mortality [15,16]. The study was designed with a recruitment goal of 30,000 adults balanced on sex and race, with 30% from the Stroke Belt, 20% from the Stroke Buckle, and the remainder from elsewhere in the continental US. Eligible adults had a name, telephone number and address in a commercially available nationwide list of US households routinely updated from multiple sources (e.g., telephone directories, motor vehicle registrations, real estate listings, driver's license data), with an estimated coverage of 95% of community-dwelling US citizens [17]. Approximately two weeks prior to telephone contact, prospective participants were mailed a letter and brochure introducing the study. Further details about the study design and characteristics of the REGARDS cohort can be found elsewhere [14,18].

The study involved a two-stage enrollment process (Figure 1). In Stage 1 (S1), individuals provided verbal informed consent and completed a computer-assisted telephone interview (CATI). In Stage 2 (S2), individuals completed an in-home clinical exam, provided written informed consent, and became eligible for follow-up. As reported previously, "the telephone response rate, defined according to American Association for Public Opinion Research standards, was 33% and cooperation rate was 49%" [18,19]. Seventy percent of the proportion eligible and enrolled in stage 1 completed stage 2.

Clinical exams, which took 60–90 minutes to complete, included measures of height, weight, blood pressure, resting electrocardiogram, and phlebotomy and urine collection using a standard protocol [14]. Exams were conducted on weekday mornings so biological specimens could be processed for afternoon shipment to a central lab. Participants who completed both stages of enrollment, i.e., "complete participants," were provided $30 as compensation for their time and received a copy of their exam results; complete participants are followed biannually by CATI to identify hospitalizations and major health events.

S1 Enrollment CATI

During enrollment (2003–2007), the following data were collected by CATI: demographics, household income, education, health behaviors, medical history, depressive symptoms, perceived stress, and social environment information (social support, social network, and caregiving activities) [14]. Perceived stress was measured using a modified version of Cohen's perceived stress scale: 'in the last month how often have you' (1) 'felt that you were unable to control the important things in your life,' (2) 'felt confident about your ability to handle your personal problems' (reverse scored), (3) 'found that you could not cope with all the things that you had to do,' and (4) 'felt difficulties were piling up so high that you could not overcome them'. Items were scored on a 5-point scale (0–4: 'never,' 'almost never,' 'sometimes,' 'fairly often,' and 'very often'). Cronbach's alpha increased from 0.65 to 0.74

after omitting item (2), yielding a 3-item scale. Perceived stress was derived by summation, with classification based on approximate quartiles: highly (sum >4), moderately (3–4), low (1–2), and not (0) stressed [20].

Caregiving demands were assessed using items adapted from a study of spousal caregivers: 'are you currently providing care on an on-going basis to a family member with a chronic illness or disability,' and if yes, 'how many hours per week do you spend providing care to this person,' and 'how much of a mental or emotional strain is it on you to provide this care (none, some, or a lot).' Time burden of care was dichotomized at two hours/day (approximate median) [21].

During the second year of recruitment, the CATI was expanded to include employment status: employed for wages, self-employed, out of work >1 year, out of work < 1 year, homemaker, student, retired, or unable to work. Additionally, employed participants were asked three items from the 10-item Framingham Type A Scale (FTAS) [22], which were treated as proxy measures of work-related stress: (1) 'has your work often stayed with you so that you were thinking about work after working hours, or all day long,' (2) 'has your work or daily work activity often stretched you to the very limits of your energy and capacity,' and (3) 'have you often felt uncertain, uncomfortable, or dissatisfied with how well you were doing in your regular line of work or daily work activity.' Dichotomous responses ('yes' or 'no') were reported. Because internal reliability was low (Cronbach's alpha 0.56), these items were analyzed separately and combined (0 versus 1–3 items).

Follow-up occupational ancillary study

During routine follow-up (2011–2013), all active REGARDS study participants were invited to complete an occupational survey administered by CATI a median of 6.5 years after enrollment, with 87% consenting (Figure 1) [23]. The survey collected work history (job held at enrollment, longest-held job) and current job information: industry and occupation, and job characteristics.

Statistical analysis

Among those who completed the first stage of enrollment (i.e., enrollment CATI), the likelihood ratio chi-square test was used to compare completion of the second stage of enrollment (i.e., clinical exam) by age, sex, race, region, household income, education, perceived stress, family caregiver status, and employment status (and its availability, due to delayed collection). Similar analyses were performed to compare S2 completion among those employed. This also included an assessment of employment type (wage- and self-employed) and work-related stress. Among participants who completed S2, analysis of variance was used to compare the mean number of days necessary to schedule and conduct the clinical exam (S2) by employment status and type.

Prevalence ratios (PRs) for S2 completion by age, sex, race, region, income, education, and employment status were estimated from log-binomial regression models using robust variance estimation to account for potential model misspecification [24]. Similar analyses were performed to estimate PRs for S2 completion among employed participants, including employment type and the stress variables. Among participants who completed S2, similar

methods were used to examine eligibility and consent to complete the follow-up occupational survey.

Statistical analyses were performed using SAS Software (version 9.3, SAS Institute Inc., Cary, NC). Analyses excluded participants with unknown values, except for those missing income for which a separate category for missing values was used.

Results

Completion of S2 enrollment (clinical exam)

Among the full S1 sample (n=43,011), S2 completion was associated with all socio-demographic and stress variables evaluated (Table 1). Completion was higher for males, whites, and participants living within versus outside the stroke buckle. Completion increased with higher income, education, and age (<75 years); completion decreased with perceived stress. Completion was higher for family caregivers compared to non-caregivers; however, caregivers' completion was lower when caregiving was required ≥2 hours/day or was associated with mental or emotional strain.

Among 9863 participants employed at S1, similar results were found for sex, race, income, education, and perceived stress (Table 1); however completion more clearly increased with age and was higher for the stroke buckle and other areas of the continental US, compared to the stroke belt. S2 completion among the employed was not associated with caregiving status/strain, but was once again lower when care was required ≥2 hours/day. Completion was higher for self-employed (77.5%) compared to wage-employed (67.2%) participants, and among employed participants thinking 'about work after work hours.' Completion status did not differ for those feeling 'stretched to the very limits by work' or 'dissatisfied with daily work activity.'

In multivariable models (Table 2), PRs for S2 completion were attenuated for associations with age, sex, race, region, income, and education, compared with bivariate results. Compared to unemployed participants, wage-employed but not self-employed participants had lower completion. On average, unemployed participants completed S2 in less time (39 days), compared with self-employed participants (mean 4 additional days) and wage-employed (mean 7 additional days). Among the employed, self-employed participants were 11% more likely to complete S2 of enrollment, compared to wage-employed.

Associations between stress and S2 completion among employed participants are shown in Table 3. Completion did not vary by perceived stress or work-related stress; however, completion was higher among family caregivers who were employed and providing <2 hours/day of care.

Eligibility and consent to the occupational survey

Those employed at enrollment were more likely than the unemployed to still be an active study participant (i.e., alive and participating) and thus eligible to participate in the occupational survey at follow-up (Table 4). Among those employed at S1, eligibility and consent at follow-up was not associated with any S1 stress; additionally, wage-employed

participants were slightly more likely to consent to the occupational survey, compared with unemployed and self-employed individuals.

Discussion

The magnitude and direction of non-participation bias was investigated in a large national longitudinal community-based cohort of adults aged ≥45 years. We examined employment status and type (wage versus self-employed), perceived stress, work-related stress, and family caregiving as potential determinants of participation at stage two of a 2-stage enrollment process, and at follow-up when an occupational survey was administered. The hypothesis that enrollment completion would be lower among employed individuals was partially supported; wage but not self-employed individuals were 10% less likely to complete the S2 clinical exam, compared to the unemployed. In contrast to expectation, wage-employed participants were more likely to be eligible for the follow-up survey (compared with unemployed) and to consent (compared with unemployed and self-employed). So while wage employed individuals were less likely to complete enrollment, those who did were more likely to remain active in the study and consent to an optional 10 minute occupational module during routine follow-up.

It appears that this is the first study to identify differences in participation by type of paid employment. Wage-employed individuals may face more practical barriers to participation in community-based health research than self-employed individuals due to schedule constraints. This interpretation is consistent with the following observation by investigators of the Coronary Artery Risk Development in Young Adults Study: “it was particularly challenging to recruit enough persons with a high school education or less, because they were relatively infrequent in the population and often found it difficult to arrange time off from their blue-collar jobs” [25]. Similarly, enrollment completion was inversely associated with education in the Atherosclerosis Risk in Communities Study [26], which may be partly explained by unmeasured differences in employment-related barriers.

Within the REGARDS study, reasons for delays in scheduling exams were not collected, so we could not directly examine the potential for work schedules to impede S2 completion; however, we found that wage-employed individuals required more time to complete the exam, compared to both self-employed (4 additional days) and unemployed (7 additional days) individuals. These results are congruent with prior research suggesting that late responders exhibit characteristics of non-responders [27], and highlights the importance of repeat scheduling efforts to mitigate differentials in participation by employment type. Wage employment may additionally inhibit study participation if these individuals experience greater physical workload, low job control and chemical exposures [28,29]. Additionally, work overload was associated with non-response in one study due to “cognitive and information-processing loads required in survey completion” [12].

Additional evidence that work schedule flexibility may influence participation among employed individuals includes the finding that self-employed individuals were more likely than wage-employed to complete enrollment. Nearly one quarter of REGARDS participants were self-employed at enrollment, versus 15% of workers in the US labor market, after age-

and sex-adjustment (Appendix A). Self-employment among the older REGARDS cohort may be indicative of bridge employment – i.e., the span between a career job and full retirement [30], which has been found to be associated with greater job control and schedule flexibility [31]. Because there may be qualitatitively different job characteristics associated with self-employment for individuals age <45 years, our findings may not generalize to younger self-employed individuals. While slight over-representation of self-employed individuals in REGARDS improves that opportunity to examine this under-studied segment of the laborforce, knowledge that participation in the study varied by employment type will aid interpretation and future decisions about statistical adjustment to account for differential participation [27,32].

This investigation follows a previous report identifing longitudinal community-based cohort studies as a potential means to study vulnerable and hard-to-reach workers [4, 33] and established the feasibility of supplementing the REGARDS Study cohort with occupational data [23]. While the magnitude of non-response bias appears limited within the REGARDS cohort, it is important to note that general population samples may exhibit greater nonresponse than population-specific samples (e.g., industrial or worksite-specific) [34]. Because prior investigations of non-participation among employed samples have been performed primarily within organizational research studies [12], our findings address an important gap within the broader public health literature; the findings additionally highlight the need for community-based health researchers to consider and accommodate employment-related barriers to study participation and to effectively communicate the benefits of participation within the most economically active segment of the population [35,36]. It is noteworthy, however, that mounting evidence suggests that participation rates and non-response biases often do not substantially impact exposure-response investigations [37], including investigations examining associations between occupational class and health [38].

The hypotheses that enrollment completion would be lower among those with high perceived stress or high work-related stress were not supported after adjustment. Moreover, employed family caregivers providing <2 hours/day of care were more likely than employed non-caregivers to complete enrollment, which is inconsistent with evidence from one study suggesting that employed caregivers experience role overload, making it difficult for them to participate in health studies [39]. Several factors may explain this incongruence: first, higher participation was only identified among employed caregivers with less than 2 hours of daily caregiving, so role overload may not have been triggered; second, caregivers may be more likely to participate in health studies due to topic salience [40]. Neither high stress nor family caregiving responsibilities were predictive of reduced eligibility or consent at follow-up.

Our study has several strengths and limitations. The large sample size allowed us to evaluate multivariable models; however, these may have produced statistically significant differences when absolute differences were small. Because data were not collected on participants who declined at initial contact (S1), our investigation of the determinants of non-response is limited to those who consented at S1. Although analyses used robust variance estimation, the possibility of measurement error remains due to the two-stage sampling design [41].

Employment status was missing for some enrollees; however, because completion did not vary according to employment status, these missing data did not impact our results. We could not directly examine whether completion varied by job characteristics because occupational data were not collected at S1. Finally, while we considered several measures of stress, some had modest reliability in our sample. We used proxy measures of job stress based on three items from the FTAS designed to measure the Type-A personality trait. These items were used in our analysis to represent stress stemming from the spill-over of work into non-work life, excessive work demands, and work dissatisfaction; however, their use complicates comparisons of our results to other studies of job stress and study participation where standard measures of job stressors were used.

Conclusion

This study examined empirically the magnitude and direction of several employment and stress-related determinants of non-response in a national longitudinal community-based health study of adults aged ≥45 years. Despite the broad scope of our inquiry and adequate statistical power, we did not observe strong selection effects. Enrollment completion was slightly lower among wage employed, and slightly higher among self-employed individuals and employed caregivers with time-limited caregiving demands. Wage employed individuals were slightly more likely to participate in an optional occupation survey at follow-up. While response biases due to these factors in the REGARDS cohort are expected to be small, the findings highlight the need to identify employment-related barriers to study participation by wage-employed individuals who may require greater schedule accomodations.

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List of abbreviations and acronyms

CATI	computer-assisted telephone interview
CI	Confidence Interval
FTAS	Framingham Type A Scale
FU	Follow-up
PR	Prevalence ratios

REGARDS	REasons for Geographic And Racial Differences in Stroke
S1	Stage 1
S2	Stage 2
SES	Socioeconomic Status
US	United States

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Appendix A

The purpose of this analysis was to compare the fraction of REGARDS participants who were self-employed at enrollment to the fraction of the US population who were self-employed at enrollment.

For REGARDS stage 1, of 26,730 with known employment status, 16,867 were not employed and 9,863 were employed: 7,623 wage and 2,240 self. Thus 2,240/9,863 = 22.7% of those employed at Stage 1 were self-employed.

For the US population, we used estimates provided by the US Bureau of Labor Statistics. To account for differences between the REGARDS sample and the US population, we considered two methods of estimating the fraction who were self-employed. The first method used age-specific estimates from 2005 (the midpoint of the duration of data collection) and adjusted for age. Because sex- and age-specific estimates are not available in 2005, the second method adjusted for sex and age using the average of sex- and age-specific estimates from 2003 and 2009.

Method 1: Compare to the US population, adjusting for age

Table A1

For REGARDS stage 1, the distribution of age, among the employed:

Age category	Count
45–54	3,557
55–64	4,514
65+	1,473+319=1,792

Table A2

Percent self-employed for these age categories in the United States in 2005:

	Percent self-employed[a]		
Age category	Unincorporated	Incorporated	Total
45–54	7.9	4.9	12.8
55–64	10.3	5.9	16.2
65+	15.9	8.5	24.4

[a]Source: http://www.bls.gov/opub/mlr/2010/09/art2full.pdf (date last accessed 15 March 2017).

Equation A1. Percent self-employed in the United States in 2005, age standardized to the REGARDS stage 1 sample:

$$\frac{3557 \times 12.8\% + 4514 \times 16.2\% + 1792 \times 24.4\%}{3557 + 4514 + 1792} = 16.5\%$$

Method 2: Compare to the US population, adjusting for age and sex

Table A3

For REGARDS stage 1, the distribution of age and sex, among the employed:

	Count	
Age category	**Male**	**Female**
45–54	1,336	2,221
55–64	1,586	2,928
65+	589+150=739	884+169=1,053

Table A4

Percent self-employed for these age and sex categories in the United States in 2003 and 2009:

		Percent self-employed					
		Male			Female		
Year	**Age category**	**Unincorporated**	**Incorporated**	**Total**	**Unincorporated**	**Incorporated**	**Total**
2003[a]	45–54	10.5	4.8	15.3	6.8	2.7	9.5
	55–64	14.1	6.1	20.2	9.0	3.7	12.7
	65+	22.8	7.8	30.6	14.3	3.7	18.0
2009[b]	45–54	9.9	5.3	15.2	6.3	3.1	9.4
	55–64	11.9	6.2	18.1	8.0	3.5	11.5
	65+	21.4	7.7	29.1	14.0	4.4	18.4
Average	45–54			15.25			9.45
	55–64			19.15			12.10
	65+			29.85			18.20

[a] Hipple SF. Self-employment in the United States: an Update. Monthly Labor Review July 2004; 13–23.

[b] Hipple SF. Self-employment in the United States. Monthly Labor Review September 2010; 17–32.

Equation A2. Percent self-employed in the United States in 2006, sex- and age-standardized to the REGARDS stage 1 sample:

$$\frac{1336 \times 15.25\% + 1586 \times 19.15\% + 739 \times 29.85\% + 2221 \times 9.45\% + 2928 \times 12.10\% + 1053 \times 18.20\%}{1336 + 1586 + 739 + 2221 + 2928 + 1053} = 15.0\%$$

Summary

The fraction of REGARDS participants who reported being self-employed at enrollment (22.7%) is higher than the US population (15.0%, sex- and age-adjusted; 16.5%, age-adjusted).

Highlights

- Wage but not self-employed were less likely to complete stage 2 of enrollment.
- Employment and multiple sources of stress had no adverse impact on study follow-up.
- Protocols should address potential participation barriers among wage-employed.

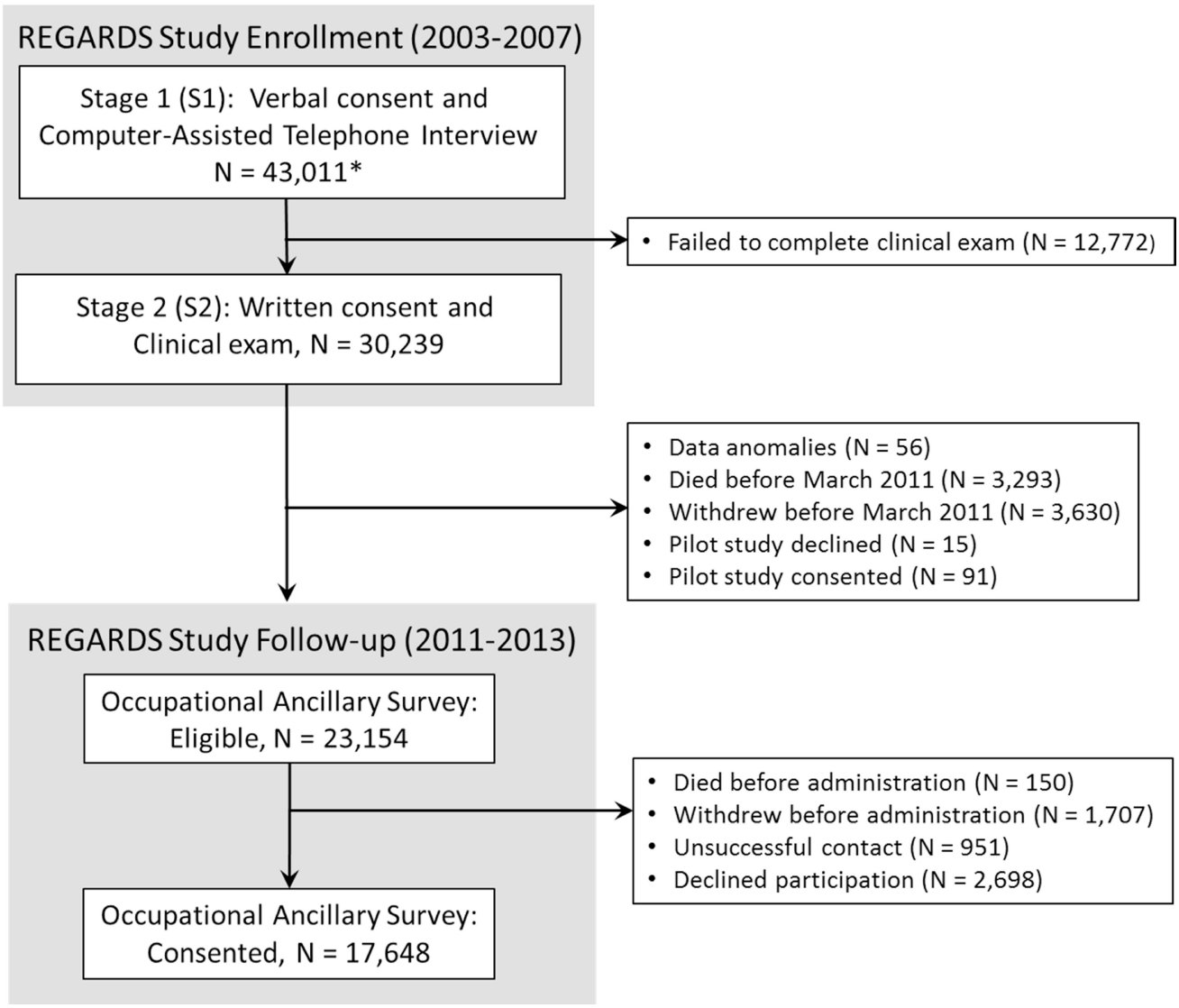

Figure 1.

Sample size tracing for REGARDS Enrollment Stages 1 and 2 and follow-up.

* Of 43,011, employment status was known for only 26,730 (9,863 of these were employed) because employment status was not available for participants who enrolled before this variable was added to the computer-assisted telephone interview in about July 2004.

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Table 1

Predictors of S2 “complete” status among all who verbally consented to the S1 CATI (n=43,011) and further limited to those known to be employed at S1 (n=9,863)[a]

	S1 Full Sample (n=43,011)			S1 Employed Sample (n=9,863)		
S1 enrollment characteristic	**No.**	**% complete**	**P-value[b]**	**No.**	**% complete**	**P-value**
Age at enrollment (years)[c]						
45–54	5,635	67.2%	<0.001	3,557	66.6%	<0.001
55–64	16,213	71.2%		4,514	70.8%	
65–74	13,291	72.9%		1,473	71.9%	
75+	7,872	65.7%		319	73.7%	
Sex						
Female	24,422	68.1%	<0.001	6,202	68.3%	<0.001
Male	18,589	72.9%		3,661	71.7%	
Race						
Black	20,091	62.3%	<0.001	4,274	61.7%	<0.001
White	22,920	77.1%		5,589	75.6%	
Region[d]						
Stroke buckle	8,658	72.8%	<0.001	2,441	71.0%	0.002
Other stroke belt	15083	69.3%		3,562	67.4%	
Other contiguous United States	19,238	69.8%		3,855	70.8%	
Income						
Refused	6,084	61.3%	<0.001	959	62.3%	<0.001
<$20,000	8,448	64.8%		832	62.9%	
$20,000–<$35,000	10,336	70.7%		1,873	66.0%	
$35,000–<$75,000	11,988	74.4%		3,540	70.3%	
$75,000+	6,155	77.2%		2,659	75.8%	
Education						
Less than high school	6,590	57.5%	<0.001	677	55.4%	<0.001
High school	11,541	67.6%		2,263	65.1%	
Some college	11,189	72.3%		2,871	69.9%	

S1 enrollment characteristic	S1 Full Sample (n=43,011) No.	% complete	P-value[b]	S1 Employed Sample (n=9,863) No.	% complete	P-value
College graduate and higher	13,639	76.8%		4,050	74.2%	
Perceived stress						
None	12,406	70.9%	<0.001	2,364	69.5%	0.006
Low	11,651	72.9%		2,897	71.8%	
Moderate	9,555	70.5%		2,555	69.0%	
High	8,699	66.3%		1,942	67.2%	
Family caregiver status						
No	37,802	70.0%	0.004	8,640	69.4%	0.41
Yes	5,157	71.9%		1,218	70.6%	
Caregiving time burden[e]						
<2 hours/day	2,240	75.4%	<0.001	608	75.3%	<0.001
<2 hours/day	2,288	69.6%		500	65.2%	
Caregiving strain						
None	1,714	72.3%	0.034	356	70.2%	0.95
Some strain	2,508	73.1%		639	71.0%	
A lot of strain	910	68.6%		218	70.2%	
Employment status availability[f]						
Not available	16,281	70.0%	0.47			
Available	26,730	70.3%				
Employment status						
Not employed	16,867	70.7%	0.044			
Employed	9,863	69.9%				
Type of employment						
Wage-employed				7,623	67.2%	<0.001
Self-employed				2,240	77.5%	
Work-related stress:						
Think about work						
No				4,911	67.4%	<0.001
Yes				4,878	71.8%	

S1 enrollment characteristic	S1 Full Sample (n=43,011)			S1 Employed Sample (n=9,863)		
	No.	% complete	P-value[b]	No.	% complete	P-value
Stretched to the very limits by work						
No				6,041	69.4%	0.47
Yes				3,736	70.1%	
Dissatisfied with daily work activity						
No				7,019	69.4%	0.34
Yes				2,710	70.4%	
Number of job stressors						
0				3,287	67.4%	<0.001
1–3				6,455	70.8%	

[a] All verbal consenters completed the enrollment CATI (S1); “complete” enrollees scheduled and subsequently completed a clinical exam (S2).

[b] P-value based on the likelihood ratio test of the bivariate association between participation and each enrollment characteristic (not adjusted for any other factors), excluding participants with unknown region (n=32), education (n=52), perceived stress (n=700), family caregiver status (n=52), caregiver hours (n=629), caregiver strain (n=25), or job stressors (n=74–134, among the employed).

[c] At inception of the study, age of 50 years or older was the threshold for participation in the study, but this threshold was lowered to 45 years in April 2004.

[d] The stroke belt included the states of North Carolina, South Carolina, Georgia, Alabama, Mississippi, Tennessee, Arkansas, and Louisiana; the stroke buckle consisted of 153 counties along the eastern seaboard of North Carolina, South Carolina and Georgia.

[e] Two hours/day was the approximate median number of hours reported among those providing care. Those with more than two hours/day on average include n=396 that reported 24-7 care (i.e., 24 hours/day × 7 days/week = 168 hours/week) and a small number (n=17) who reported more than 168 hours/week.

[f] Due to a lag in the collection of employment status (added to the enrollment CATI about July 2004), this variable was available at S1 for 26,730 of the full sample.

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Table 2

Prevalence ratios for S2 enrollment completion according to the sociodemographic variables and employment type among those with known employment status (n=26,686) and those employed at enrollment (n=9,856)

	S1 Employment Status Known[a]				S1 Employed[b]			
	Bivariate models		Multivariable model		Bivariate models		Multivariable model	
S1 enrollment characteristic	**PR**	**95% CI**	**PR**	**95% CI**	**PR**	**95% CI**	**PR**	**95% CI**
Age at enrollment (years)								
45–54 (referent)	1.00		1.00		1.00		1.00	
55–64	1.07	1.05–1.10	1.06	1.04–1.08	1.06	1.03–1.10	1.06	1.03–1.09
65–74	1.08	1.06–1.11	1.08	1.05–1.10	1.08	1.04–1.12	1.08	1.04–1.12
75+	0.97	0.94–0.99	0.97	0.94–1.00	1.11	1.03–1.19	1.09	1.02–1.16
Sex								
Female (referent)	1.00		1.00		1.00		1.00	
Male	1.06	1.04–1.08	1.03	1.02–1.05	1.05	1.02–1.08	1.01	0.98–1.03
Race								
Black (referent)	1.00		1.00		1.00		1.00	
White	1.23	1.21–1.25	1.17	1.15–1.19	1.22	1.19–1.26	1.16	1.13–1.20
Region								
Stroke buckle	1.06	1.04–1.08	1.04	1.02–1.06	1.05	1.02–1.09	1.03	0.99–1.06
Other stroke belt (referent)	1.00		1.00		1.00		1.00	
Other contiguous United States	1.02	1.00–1.04	1.00	0.98–1.02	1.05	1.02–1.08	1.01	0.98–1.04
Income								
Refused	0.98	0.95–1.01	0.95	0.92–0.98	0.99	0.92–1.06	0.92	0.86–0.99
<$20,000 (referent)	1.00		1.00		1.00		1.00	
$20,000–<$35,000	1.09	1.06–1.12	1.03	1.00–1.06	1.05	0.99–1.12	1.00	0.94–1.06
$35,000–<$75,000	1.16	1.13–1.19	1.06	1.03–1.08	1.12	1.06–1.18	1.03	0.97–1.09
$75,000+	1.22	1.18–1.25	1.08	1.05–1.11	1.20	1.14–1.27	1.06	1.00–1.12
Education								
Less than high school (referent)	1.00		1.00		1.00		1.00	
High school	1.19	1.15–1.22	1.13	1.09–1.17	1.18	1.09–1.27	1.13	1.05–1.21

	S1 Employment Status Known[a]				S1 Employed[b]			
	Bivariate models		Multivariable model		Bivariate models		Multivariable model	
S1 enrollment characteristic	PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI
Some college	1.27	1.23–1.31	1.20	1.16–1.23	1.26	1.18–1.36	1.19	1.11–1.27
College graduate and higher	1.34	1.30–1.38	1.23	1.20–1.27	1.34	1.25–1.44	1.23	1.14–1.32
Employment status								
Not employed[c]	1.00		1.00					
Wage-employed[d]	0.95	0.93–0.97	0.90	0.89–0.92	1.00		1.00	
Self-employed	1.09	1.07–1.12	1.00	0.98–1.03	1.15	1.12–1.18	1.11	1.08–1.14

PR, prevalence ratio; CI, confidence interval.

[a] Log-binomial regression models included 26,686 participants with known employment status (26,730 participants with known employment status at S1 CATI less 22 participants with unknown region and 22 participants with unknown education). Seven bivariate models evaluated one variable at-a-time; one multivariable model evaluated all seven variables simultaneously.

[b] Log-binomial regression models generally included 9856 employed participants (9,863 employed participants less 5 participants with unknown region and 2 participants with unknown education). Seven bivariate models evaluated one variable at-a-time; one multivariable model evaluated all seven variables simultaneously.

[c] Referent category for regression models of S1 participants with known employment status.

[d] Referent category for regression models of S1 participants employed at enrollment.

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Table 3

Prevalence ratios for S2 enrollment completion by type of stress among employed participants[a]

	Crude[b]		Adjusted[c]	
S1 enrollment characteristic	**PR**	**95% CI**	**PR**	**95% CI**
Perceived stress				
None (referent)	1.00		1.00	
Low	1.03	1.00–1.07	1.01	0.98–1.05
Moderate	0.99	0.96–1.03	0.99	0.95–1.02
High	0.97	0.93–1.01	0.99	0.95–1.03
Caregiver status/time burden				
No care (referent)	1.00		1.00	
Yes, <2 hours/day	**1.08**	**1.03–1.14**	**1.07**	**1.02–1.12**
Yes, ≥2 hours/day	0.94	0.88–1.00	0.97	0.91–1.03
Caregiver status/strain				
No care (referent)	1.00		1.00	
Yes, no strain	1.01	0.94–1.08	1.06	1.00–1.12
Yes, some strain	1.02	0.97–1.08	1.03	0.98–1.08
Yes, a lot of strain	1.01	0.93–1.10	0.99	0.90–1.08
Work-related stress:				
Think about work				
No (referent)	1.00		1.00	
Yes	**1.07**	**1.04–1.09**	1.02	0.99–1.05
Stretched to very limits by work				
No (referent)	1.00		1.00	
Yes	1.01	0.98–1.04	1.00	0.97–1.02
Dissatisfied with daily work activity				
No (referent)	1.00		1.00	
Yes	1.01	0.99–1.04	1.02	0.99–1.05
Number of job stressors				
0 (referent)	1.00		1.00	
1–3	**1.05**	**1.02–1.08**	1.01	0.98–1.04

PR, prevalence ratio; CI, confidence interval.

[a] Log-binomial regression models generally included 9,856 employed participants (9,863 employed participants less 5 participants with unknown region and 2 participants with unknown education). Models evaluating global perceived stress excluded 105 participants with an unknown value; caregiver status/time excluded 115 participants with an unknown value; caregiver status/strain excluded 10 participants with an unknown value; and the job stressors excluded 10, 88, 74, 86, and 134 participants with unknown values, respectively.

[b] Prevalence ratios are unadjusted. Results in bold-face are statistically significant at a 5% level of significance.

[c] Prevalence ratios are adjusted for age at enrollment, sex, race, region, income, and education.

Table 4

Prevalence ratios for eligibility and consent for the follow-up (FU) occupational survey by employment status and stress

	Follow-up Eligible[a]				Follow-up Consented[b]			
	Crude[c]		Adjusted[d]		Crude[c]		Adjusted[d]	
S1 characteristic	**PR**	**95% CI**	**PR**	**95% CI**	**PR**	**95% CI**	**PR**	**95% CI**
Among 23,730 with S1 employment status								
Not employed (referent)	1.00		1.00		1.00		1.00	
Wage-employed	**1.13**	**1.11–1.14**	**1.05**	**1.03–1.06**	**1.06**	**1.05–1.08**	**1.03**	**1.01–1.05**
Self-employed	**1.11**	**1.09–1.14**	**1.05**	**1.03–1.07**	**1.04**	**1.01–1.07**	1.00	0.97–1.03
Among 9863 employed at stage 1:								
Perceived stress								
None, low, moderate (referent)	1.00		1.00		1.00		1.00	
High	0.99	0.97–1.01	1.00	0.97–1.02	0.96	0.93–1.00	0.98	0.94–1.01
Caregiver status/time burden								
No care (referent)	1.00		1.00		1.00		1.00	
Yes, <2 hours/day	**1.05**	**1.02–1.08**	1.02	1.00–1.05	1.02	0.98–1.07	1.00	0.96–1.05
Yes, ≥2 hours/day	1.00	0.96–1.04	1.01	0.97–1.05	0.95	0.89–1.02	0.97	0.91–1.03
Caregiver status/strain								
No care (referent)	1.00		1.00		1.00		1.00	
Yes, no strain	1.03	0.99–1.07	1.04	1.03–1.06	0.99	0.92–1.06	1.00	0.93–1.06
Yes, some strain	1.02	0.99–1.05	1.01	0.98–1.04	0.98	0.93–1.03	0.98	0.93–1.03
Yes, a lot of strain	0.98	0.91–1.04	0.97	0.91–1.03	1.00	0.92–1.09	1.00	0.93–1.09
Work-related stress:								
Think about work								
No (referent)	1.00		1.00		1.00		1.00	
Yes	**1.03**	**1.01–1.05**	1.01	0.99–1.02	1.03	1.00–1.06	1.01	0.98–1.03
Stretched to very limits by work								
No (referent)	1.00		1.00		1.00		1.00	
Yes	1.02	1.00–1.04	1.01	0.99–1.03	0.98	0.96–1.01	0.98	0.96–1.00
Dissatisfied with daily work activity								

	Follow-up Eligible[a]				Follow-up Consented[b]			
	Crude[c]		Adjusted[d]		Crude[c]		Adjusted[d]	
S1 characteristic	**PR**	**95% CI**	**PR**	**95% CI**	**PR**	**95% CI**	**PR**	**95% CI**
No (referent)	1.00		1.00		1.00		1.00	
Yes	1.01	0.99–1.03	1.00	0.99–1.02	**0.96**	**0.93–0.98**	0.97	0.94–1.00
Number of job stressors								
0 (referent)	1.00		1.00		1.00		1.00	
1–3	1.03	1.00–1.05	1.01	0.99–1.04	1.00	0.97–1.03	0.99	0.97–1.02

PR, prevalence ratio; CI, confidence interval.

[a] Eligible participants included all active study participants at the inception of administration of the occupational survey (March 2011).

[b] Eligible participants who consented to the occupational survey during a two-year administration period (March 2011 to March 2013). Eligible participants who died or withdrew before the occupational supplement could be administered, or who were otherwise not contacted despite repeated call attempts, could not be consented (n=2,808).

[c] Prevalence ratios are unadjusted. Results in bold-face are statistically significant at a 5% level of significance.

[d] Prevalence ratios are adjusted for age at S1, sex, race, region, income, and education.