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The Health Behaviors of the Older US Worker

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Background *As the US workforce ages, lifestyle factors will increasingly affect their health, yet little information is available on their prevalence in older working populations.*
Methods *Using the nationally representative 1997–2003 National Health Interview Survey (NHIS), reported current smoking, risky drinking and leisure-time physical activity behaviors of older workers (≥65 years) were compared with older non-workers. These behaviors were evaluated by age, gender, race, ethnicity, and occupation, as well as prototype "healthy" and "risky" persons.*
Results *The study population of 4,946 older US workers and 38,313 older non-workers represented an estimated 3.9 million older workers and 28.9 million older non-workers annually. Relative to older non-workers, older workers reported more current smoking and risky drinking, but higher levels of leisure-time physical activity with variations by subpopulations.*
Conclusions *Less than 4% of the older US worker population reported overall healthy behaviors. Certain occupations and other subpopulations can be targeted for age-appropriate behavioral interventions.* Am. J. Ind. Med. 50:427–437, 2007.

KEY WORDS: ethanol abuse; exercise; tobacco use; smoking; occupation

INTRODUCTION

Among US workers, as with all Americans, the impact of chronic diseases on both morbidity and mortality is substantial. The workplace is the direct cause of some of this morbidity and mortality. For example, using 1997 US mortality data, Steenland et al. [2003] demonstrated that the estimated burden from selected occupation-specific disease and injury was 55,200 (range 32,200–78,200) deaths/year of US workers. The authors estimated that occupational deaths were the eighth leading cause of death in the US. Additionally, the true extent of occupational morbidity and the associated burden of disease are very difficult to document on a nationwide level, but are significantly greater than occupational mortality [Drever, 1995; Wagener et al., 1997].

At the same time, lifestyle factors (such as smoking, tobacco, obesity, and lack of exercise) have been shown to be significant contributors to the development and worsening of chronic diseases and mortality [Thompson et al., 1998; Reeves and Rafferty, 2005]. These lifestyle factors can interact synergistically with occupational factors to increase the risk of morbidity and mortality of US workers from chronic diseases.

Recently, the US population age 65 and older has been growing twice as fast as the rest of the population; by 2030, 1 in 5 persons in the US will be over 65 years [Yntema, 1999; Wegman and McGee, 2004]. An increasing proportion of

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this aging population continues to work past traditional retirement age, thus contributing to a growing older workforce [Robertson and Tracy, 1998; Rix, 2001; Wegman and McGee, 2004]. Furthermore, this older workforce is increasingly diverse, in terms of both gender and racial/ethnic composition. In general, older workers are less likely to experience accidents, have acute conditions, and be absent from work [Wegman and McGee, 2004]. However, there are some data that indicate that older minority workers and older female workers may be at increased risk for occupational injury and death compared to other older workers [Wagener and Winn, 1991; Santiago and Muschkin, 1996; Richardson et al., 1997; Fernandez et al., 1998; Loomis and Richardson, 1998; Wegman and McGee, 2004; Gomez Marin et al., 2005]. These trends support recent solicitations by the National Academy of Sciences and others for additional research into the health status of the older worker [Wegman and McGee, 2004].

To date, there have been no nationally representative data on the health status and risk factors of older workers. In particular, research into the prevalence of alcohol use and abuse, smoking prevalence rates, and leisure-time physical activity levels in older worker groups are necessary in order to develop worksite prevention programs targeted at older workers [Zwerling et al., 1996; Wegman and McGee, 2004]. A better understanding of the prevalence of these health behaviors in older workers is essential since alcohol abuse alone costs US employers nearly 70 billion dollars in lost productivity on an annual basis [Roberts and Fallon, 2001]. Further, as additional older adults remain in or re-enter the workforce in the coming years, worksite-based health promotion will become an increasingly important venue for the reaching older adults with health promotion services. Although little research has been completed to date [Wegman and McGee, 2004], it is clear that such strategies will require modification to meet the unique needs of the older worker population [Minkler et al., 2000; King, 2001; Appel and Aldrich, 2003; Sattar et al., 2003].

The health behaviors of older workers 65 years and older compared to persons 65 and older not currently working were explored in the 1997–2003 National Health Interview Survey (NHIS), a large nationwide representative sample of the entire US civilian population.

MATERIALS AND METHODS

Given the anonymous publicly available dataset, this study was considered ''Exempt'' and approved as such by the University of Miami Human Subjects Committee (IRB).

The National Health Interview Survey (NHIS) is a continuous multipurpose and multistage probability area survey of the US civilian non-institutionalized population living at addressed dwellings since 1954. Each week, a probability sample of households is interviewed by trained personnel to obtain information about the characteristics of each member of the household. Starting with year 1997, the NHIS underwent a major revision which featured annual assessment of occupational and health behavior status obtained directly from one randomly selected adult household member. Annual response rates to the 1997–2003 adult core interview ranged from 70% to 80% [Blackwell et al., 1997; Pleis and Coles, 2002, 2003; Pleis et al., 2003; Lethbridge-Cejku et al., 2004; Lucas et al., 2004; Lethbridge-Cejku and Vickerie, 2005; NCHS, 2005].

Occupational Assessment and Definition

Employment in the 1997–2003 NHIS has been defined as all subjects aged 18 years and older who worked or reported having paid or unpaid jobs during the 1 week prior to the survey administration [Botman and Jack, 1995]. A list of forty one (41) Standardized Occupational Codes derived from the US Census occupational codes were provided in the NHIS database from 1997–2003 [NCHS, 1989, 2001; Lee et al., 2004; Gomez Marin et al., 2005].

Health Behaviors

Self-report of current smoking and risky drinking (as defined below) were used to define unhealthy or risky behaviors, while self report of leisure-time physical activity based on a variation of the Health People 2010 leisure-time exercise recommendation (as defined below) was used to document the prevalence of healthy exercise behaviors. Complete alcohol use, smoking and exercise data were available for 4,946 workers age 65+, and 3,313 non-working participants of the 1997–2003 NHIS (Table I). Respondents with missing information for a particular variable were excluded from the particular analysis.

Smoking Assessment and Definition

Adult core respondents were asked a series of tobacco use questions, including: ''Have you smoked at least 100 cigarettes in your entire life?'', followed by questions allowing the differentiation into the categories: never, current, and former smokers. In this study, we documented the prevalence of current smoking (yes/no).

Alcohol Use Assessment and Definition

Every adult individual interviewed was also asked a series of ethanol use questions. These questions included: ''In any 1 year, have you had at least 12 drinks of any type of alcoholic beverage?'', followed by questions allowing the differentiation into: never, current, and former drinkers.

TABLE I. Individual Risky Behaviors: Older Workers Versus Older Non-Workers (NHIS 1997–2003)

	Mean age ± SD	Weighted N in US population	Sample N	Sample N (current smokers)	% Current smokers	Age adjusted[a] (% current smokers)	Sample N (risky drinkers)	% Risky drinkers	Age adjusted[a] (% risky drinkers)	Sample N not following recommended exercise	% Not following recommended exercise	Age adjusted[a] (% not following recommended exercise)
65+ total	74.9 ± 6.9	32,797,244	43,259	4,665	10.9	9.9	3,457	20.7	20.6	33,789	79.9	78.9
Male	74.1 ±6.7	13,917,204	16,198	1,979	12.4	10.1	2,027	25.8	23.7	11,739	74.4	74.2
Female	75.4 ± 6.9	18,880,040	27,061	2,686	10.0	9.8	1,430	16.1	17.2	22,050	83.2	82.4
White	75.0 ± 6.9	29,051,585	37,066	3,853	10.5	9.7	3,182	20.8	20.9	28,588	78.9	78.1
Black	74.1 ±6.9	2,707,342	4,838	676	14.2	12.9	194	18.2	16.5	4,181	88.1	88.2
Other	73.3 ± 6.4	1,038,317	1,355	136	10.1	8.2	81	22.6	19.4	1,020	77.6	76.0
Hispanic	73.5 ± 6.5	1,891,248	3,843	392	10.3	8.7	234	21.4	18.2	3,192	84.0	84.1
Non-Hispanic	75.0 ± 6.9	30,905,997	39,416	4,273	11.0	10.1	3,223	20.6	20.7	30,597	79.5	78.6
65+ workers total	70.5 ± 4.9	3,917,960	4,946	601	12.2	8.5	552	21.1	19.7	3,622	74.7[b]	76.7[b]
Male	70.5 ± 5.1	2,198,570	2,454	319	13.0	8.7	382	26.6	22.3	1,750	72.5	75.0
Female	70.4 ± 4.9	1,719,390	2,492	282	11.4	8.3	170	14.4	15.8	1,872	76.9	78.7
White	70.6 ± 5.0	3,493,899	4,273	504	11.8	8.3	504	21.1	19.8	3,075	73.5	75.8
Black	69.8 ± 4.7	317,508	535	77	14.5	10.7	34	19.7	18.7	437	83.1	86.0
Other	69.7 ± 4.2	106,553	138	20	14.6[c]	8.5[c]	14	24.1[c]	26.5[c]	110	80.9[c]	84.0[c]
Hispanic	69.6 ± 4.4	205,968	379	43	11.4[c]	6.0[c]	43	23.4[c]	16.7[c]	303	80.4[c]	82.7[c]
Non-Hispanic	70.5 ± 5.0	3,711,992	4,567	558	12.3	8.6	509	20.9	19.7	3,319	74.2	76.5
65+ non-workers total	75.5 ± 6.9	28,879,284	38,313	4,064	10.7	10.1	2,905	20.6	20.8	30,167	80.6[b]	79.1[b]
Male	74.7 ± 6.7	11,718,634	13,744	1,660	12.2	10.4	1,645	25.6	24.0	9,989	74.7	73.9
Female	75.9 ± 6.9	17,160,650	24,569	2,404	9.9	9.9	1,260	16.4	17.5	20,178	83.9	82.6
White	75.6 ± 6.9	25,557,687	32,793	3,349	10.3	9.9	2,678	20.7	21.1	25,513	79.6	78.3
Black	74.7 ± 6.9	2,389,834	4,303	599	14.2	13.1	160	17.9	16.2	3,744	88.8	88.6
Other	73.8 ± 6.5	931,763	1,217	116	9.6	8.3	67	22.3	19.7	910	77.2	75.5
Hispanic	73.9 ± 6.5	1,685,280	3,464	349	10.1	8.8	191	21.0	18.4	2,889	84.4	84.4
Non-Hispanic	75.6 ± 6.9	27,194,005	34,849	3,715	10.8	10.2	2,714	20.6	20.9	27,278	80.2	78.7

Note: Percents of smokers, risky drinkers, and exercisers are based on the number or survey respondents who have provided data relevant to that measure.

[a]Age adjustments made using 2000 US population.

[b]Comparing worker versus non-worker; $P < 0.05$.

[c]Prevalence rate considered unstable since based on the sample size <45 or the standard error $>30\%$ of the prevalence estimate.

Moderate ethanol intake may be a health-enhancing behavior, with the amount varying by age and gender. Based on work specifically in older populations [Breslow and Smothers, 2004; Coups et al., 2004; Fine et al., 2004], ''risky drinking'' was defined as the report of $\geq$10 drinks/week in men and $\geq$7 drinks/week in women, or $\geq$5 drinks/at one sitting (a ''binge''), one or more times in a year.

Physical Activity Assessment and Definition

Leisure-time physical activity questions included assessment for the frequency and duration of light or moderate activity (defined as ''activity lasting at least 10 min that caused light sweating or a slight to moderate increase in breathing or heart rate''), and the frequency and duration of vigorous activity (defined as ''activity lasting at least 10 min that caused heavy sweating or large increases in breathing or heart rate''). Responses to these questions were used to determine if participants met Healthy People (HP) 2010 specific adult recommendations for physical activity which include engaging in regular, preferably daily, moderate physical activity for at least 30 min per day [US DHHS, 2000]. Participants met the HP 2010 guideline if they reported engaging in: either light-moderate activity classified as >30 min >5 times per week, vigorous activity >20 min >3 times per week, or qualified for both activity categories [Schoenborn et al., 2004; Caban-Martinez et al., in press].

"Healthy" and "Risky" Person Definitions

Finally, similar to Reeves and Rafferty [2005], prototype ''healthy persons'' (i.e. reports all three of the following healthy behaviors: meeting regular leisure-time physical activity recommendations, as well as no current smoking or risky drinking) and ''risky persons'' (i.e. reports all three of the following risky/unhealthy behaviors: does not follow the regular leisure-time physical activity recommendations, and currently smokes and reports risky drinking behavior) were created to evaluate these clustered behaviors by occupation and among older workers and non-workers.

Statistical Methods

The healthy and risky behaviors and the prototype ''healthy workers'' and ''risky workers'' were examined by comparing two NHIS subpopulations: older workers (age $\geq$65), and older non-worker participants (age $\geq$65). Age adjustment in Table I was made using the 2000 population; otherwise unadjusted prevalences were presented to demonstrate the actual risk burden in the various subpopulations. Within each subpopulation, several subgroups were analyzed: females and males; three ethnic groups (whites, blacks, others); and two Hispanic subgroups (Hispanics and non-Hispanics). As stated above, for the older workers, healthy and risky behaviors were also evaluated by a 41 category occupational grouping consistent with the approach taken in previous publications analyzing occupational data from the NHIS [NCHS, 1989, 2001; Lee et al., 2004; Gomez Marin et al., 2005]. Because of the complex sample survey design, analyses were completed using the Software for the Statistical Analysis of Correlated Data (SUDAAN) package to take into account sample weights and design effects [SUDAAN, 2001]. For pooled prevalence estimates, sample weights were adjusted to account for the aggregation of data over multiple survey years by dividing the original weight by 7 (the number of years combined in survey years 1997 through 2003) [Fowler, 1996]. Frequencies and chi square analyses were performed with statistical significance set at $P < 0.05$.

RESULTS

Risky Behaviors by Subpopulation

The randomly selected US population represented an estimated 3,917,960 older workers and 28,879,284 older non-workers each year at the time of the NHIS interview between 1997 and 2003 (Table I). The older workers were younger (70.5 ± 4.9 years) than the non-workers (75.5 ± 6.9 years). Overall, using unadjusted prevalence, the older workers were somewhat more likely than the non-workers to be current smokers (12.2% vs. 10.7%) and slightly more likely to report risky drinking (21.1% vs. 20.6%), but they were also significantly more likely to follow the Healthy People 2010 leisure-time physical exercise recommendations (24.3% vs. 19.4%; $P < 0.05$). Age adjustment reversed the risky relationships such that the non-workers were more likely to report risky drinking and current smoking, but the elderly workers continued to be more likely to follow exercise recommendations.

Overall, men were more likely to participate in current smoking and risky drinking, but also in recommended leisure physical exercise, compared to women. Among older workers, white workers were less likely to report smoking compared to black and other race workers (11.8% vs. 14.5% and 14.3%, respectively), but non-Hispanic workers were slightly more likely to currently smoke compared to Hispanic workers (12.3% vs. 11.3%). Among older non-workers, blacks were more likely to currently smoke (14.2% blacks vs. 10.3% whites and 9.6% other races) and non-Hispanic workers slightly more than Hispanic workers (10.8% vs. 10.1%). In both subpopulations, risky drinking was uniformly higher among other races compared to black and whites, and among Hispanics compared to non-Hispanics. Among older workers, whites (26.5%) reported the highest

recommended leisure-time physical activity, while among older non-workers, other races (22.8%) reported the highest prevalence of leisure-time physical activity. Among both subpopulations, recommended leisure-time exercise was more common among non-Hispanic compared to Hispanic workers. Although the age adjustment in general decreased the magnitude of the prevalence, the relationships remained the same.

Risky Behaviors by Occupation

The older workers were compared by the 41 occupational categories for their self-reported healthy and risky behaviors by gender. The estimated number of US workers for each occupation is given in Table II for the older worker groups. For older workers, the full range of possible participation in current smoking, risky drinking and inadequate leisure-time physical exercise was reported (ranging from 0 to 100%).

Report of smoking was highly variable by occupation and gender. The highest prevalence among the older female workers was reported for the older female. Other protective service workers (27.8%) and Technologists, technicians except health workers (25.0%), while the highest prevalence reported by older male workers was among Health service workers (25.0%), Private household workers (25.0%), and Food service workers (23%).

Overall, older male workers were more likely to report risky drinking behavior than the older female workers, with sometimes 2–3 times the prevalence. Important exceptions were older female Farmworkers and other agricultural workers (37.5%), Construction and extractive trade workers (50%), and Fabricators, assemblers, inspectors and samplers (42.9%). The highest reported risky drinking prevalence was reported by older male Health service workers (100%) and Other transportation except moving vehicles workers (100%).

In general, compared to older male workers, the older female workers were less likely to report following the leisure-time physical activity recommendations, excepting the Health diagnosing and Health service occupations, and traditionally male dominated professions such as Construction and extractive trade, Machine operators, and Motor vehicle operators. The lowest prevalence of adequate leisure-time physical activity reported by older female workers was among Engineers (0%) and Computer equipment operators (0%), while the lowest prevalence for older male workers was among Police and firefighters (7.7%) and Machine operators/tenderers except precision (10.0%).

Prototype "Healthy and Risky Persons"

Overall, older workers were slightly more likely to be classified as ''risky persons'' than older non-workers

TABLE II. Individual Risky Behaviors by Occupation: Older US Workers by Gender (NHIS 1997–2003)

	Gender							
	Females				Males			
41 occupations	Estimated population	% Current smokers	% Risky drinkers	% Not following recommended exercise	Estimated population	% Current smokers	% Risky drinkers	% Not following recommended exercise
Officials and administrators, including public administrators	12,337	5.3[a]	12.5[a]	52.6[a]	19,571	4.5[a]	0.0[a]	68.2[a]
Managers administrators, except public administration	114,204	15.2	13.3	74.1	238,962	13.5	28.0	67.9
Management related occupations	53,214	16.0	17.3	76.0	98,032	10.0	33.8	59.0
Engineers	1,138	0.0[a]	0.0[a]	100.0[a]	34,386	2.7[a]	35.5[a]	70.3[a]
Architects and surveyors	0	0.0[a]	0.0[a]	0.0[a]	8,400	0.0[a]	33.3[a]	62.5[a]
Natural mathematical/computer scientists	3,782	0.0[a]	33.3[a]	66.7[a]	20,597	0.0[a]	28.6[a]	62.5[a]
Health diagnosing occupations	2,795	0.0[a]	0.0[a]	50.0[a]	59,554	3.6	29.8	69.6
Health assessment/treating occupations	47,411	7.4[a]	13.2[a]	69.2[a]	8,893	0.0[a]	50.0[a]	66.7[a]
Teachers, librarians, counselors	98,657	6.3	16.3	58.9	72,319	8.8	25.9	58.8
Writers, artists, entertainers, athletes	39,884	13.6[a]	26.7[a]	66.7[a]	50,743	10.5[a]	23.8[a]	56.1[a]
Other professional specialty occupations	37,419	5.1[a]	6.1[a]	69.1[a]	102,713	6.5	22.1	60.2
Health technologists/technicians	15,028	8.0[a]	0.0[a]	83.3[a]	5,871	0.0[a]	0.0[a]	42.9[a]

(*Continued*)

TABLE II. (*Continued*)

41 occupations	Gender							
	Females				Males			
	Estimated population	% Current smokers	% Risky drinkers	% Not following recommended exercise	Estimated population	% Current smokers	% Risky drinkers	% Not following recommended exercise
Technologists, technicians except health	10,559	25.0[a]	0.0[a]	75.0[a]	21,281	14.3[a]	9.1[a]	61.1[a]
Supervisors and proprietors	39,127	15.3[a]	20.7[a]	82.8[a]	80,612	4.7	16.4	78.6
Sales representatives, commodities and finance	61,173	12.9	17.7	66.7	125,133	10.1	26.4	66.1
Other sales	189,909	12.9	12.2	80.6	113,431	18.5	27.8	76.2
Computer equipment operators	911	0.0[a]	0.0[a]	100.0[a]	0	0.0[a]	0.0[a]	0.0[a]
Secretaries, stenographers and typists	98,477	9.4	13.7	78.7	4,710	0.0[a]	0.0[a]	71.4[a]
Financial records processing occupations	88,216	11.7	18.5	81.4	12,861	11.8[a]	10.0[a]	82.4[a]
Mail and message distributing	11,944	0.0[a]	0.0[a]	86.7[a]	19,664	12.5[a]	7.1[a]	78.3[a]
Other administrative support	239,827	12.7	13.4	75.7	80,417	15.6	31.6	71.9
Private household occupations	54,017	5.6[a]	13.0[a]	91.1[a]	4,414	25.0[a]	0.0[a]	50.0[a]
Police and firefighters	500	0.0[a]	0.0[a]	0.0[a]	12,095	15.4[a]	0.0[a]	92.3[a]
Other protective service occupations	14,922	27.8[a]	30.0[a]	77.8[a]	74,074	22.4	29.8	72.6
Food service	99,793	14.7	18.2	81.4	23,734	23.3[a]	47.8[a]	76.7[a]
Health service	77,585	13.1	7.0	78.7	5,460	25.0[a]	100.0[a]	87.5[a]
Cleaning and building service	49,596	8.0[a]	5.3[a]	80.0[a]	89,030	18.3	34.0	76.0
Personal service	97,041	4.8	9.6	86.0	35,477	4.7[a]	20.0[a]	69.0[a]
Farm operators and managers	24,383	14.8[a]	14.3[a]	64.0[a]	101,572	6.3	15.6	79.3
Farm workers and other agricultural workers	12,688	5.3[a]	37.5[a]	78.9[a]	60,056	18.8	28.9	82.9
Forestry and fishing occupations	0	0.0[a]	0.0[a]	0.0[a]	11,059	20.0[a]	42.9[a]	70.0[a]
Mechanics and repairers	2,711	20.0[a]	0.0[a]	80.0[a]	78,009	14.1	20.3	77.3
Construction and extractive trades	3,742	0.0[a]	50.0[a]	80.0[a]	90,537	9.3	26.8	87.4
Precision production occupations	22,867	21.4[a]	0.0[a]	84.6[a]	52,190	19.6[a]	25.0[a]	74.0[a]
Machine operators/tenderers, except precision	33,197	12.5[a]	7.7[a]	83.3[a]	38,384	17.1[a]	27.8[a]	90.0[a]
Fabricators, assemblers, inspectors, samplers	15,644	11.5[a]	42.9[a]	88.5[a]	24,670	10.7[a]	21.4[a]	71.4[a]
Motor vehicle operators	14,639	9.5[a]	12.5[a]	71.4[a]	208,767	19.7	31.0	79.3
Other transportation, except motor vehicles	0	0.0[a]	0.0[a]	0.0[a]	625	100.0[a]	100.0[a]	0.0[a]
Material moving equipment operators	0	0.0[a]	0.0[a]	0.0[a]	16,436	10.5[a]	16.7[a]	68.4[a]
Construction laborers	0	0.0[a]	0.0[a]	0.0[a]	21,438	20.0[a]	33.3[a]	88.0[a]
Freight, stock, material handlers	30,051	14.6[a]	20.0[a]	79.5[a]	72,396	16.5	26.8	75.0

[a]Prevalence rate considered unstable since based on the sample size <45 or the standard error $>30\%$ of the prevalence estimate.

TABLE III. Prototype "Healthy and Risky Persons": Older Workers versus Older Non-Workers (NHIS 1997–2003)

	Risky elderly[a]			Healthy elderly[b]		
	US estimated worker/persons	Sample N	% Prevalence	US estimated worker/persons	Sample N	% Prevalence
Older workers total	447,659	536	20.9	75,476	104	4.0
Male	275,916	286	20.2	58,319	79	5.6
Female	171,743	250	21.7	17,157	25	2.2[c]
White	425,190	506	21.7	68,061	89	3.8
Black	9,734	17	10.1[c]	6,493	12	7.1[c]
Other	12,734	13	20.3[c]	922	3	4.7[c]
Hispanic	16,188	29	15.8[c]	1,284	6	3.3[c]
Non-Hispanic	431,471	507	21.3	74,191	98	4.1
Older non-workers total	2,314,308	2,756	19.9	358,796	503	3.6
Male	1,315,859	1,412	22.4**	197,092	279	4.4
Female	998,450	1,344	17.9**	161,703	224	3.0
White	2,198,137	2,588	20.5**	322,373	434	3.4
Black	59,680	102	11.5**	25,982	54	6.1
Other	56,491	66	21.2	10,441	15	4.8[c]
Hispanic	87,080	154	17.1	20,912	45	5.0
Non-Hispanic	2,227,228	2,602	20.1	337,884	458	3.5

[a]Prototype "Risky Person" = current smoking, current risky drinking, and no exercise.
[b]Prototype "Healthy Person" = no smoking, no risky drinking, and leisure-time exercise.
[c]Prevalence rate considered unstable since based on the sample size <45 or the standard error $>30\%$ of the prevalence estimate.
**Comparisons within subpopulations; $P < 0.05$.

(Table III). The highest prevalence of ''risky persons'' was among the older male non-workers (22.4%), significantly greater than older female non-workers (17.9%) ($P < 0.05$). Among older workers, there was a higher prevalence of female compared to male ''risky persons''. In both older workers and older non-workers, blacks (11.5%) were significantly less likely than whites (20.5%) to be ''risky persons'' ($P < 0.05$) and non-Hispanics had higher prevalence of ''risky persons''.

Older workers had a slightly higher prevalence of ''healthy persons'' than older non-workers. Males had a higher prevalence of ''healthy persons'' for both groups. Blacks were more likely to be ''healthy persons'' among both the older workers and older non-workers. Older Hispanic workers were less likely to be ''healthy persons'' (3.3%) while older non-worker Hispanics were more likely to be ''healthy persons'' (5%).

In Table IV, the distribution of ''healthy and risky persons'' among older workers is shown by the 41 occupations. Among older workers, 43% of Forestry and fishing occupations were ''healthy persons''; 42% of Officials and administrative public administration; and 42% of Health technologists/technicians. Of interest, the highest percentages of risky persons among older workers were found among the Construction laborers (17%) and Freight, stock, material handlers (17%).

DISCUSSION

As seen in previous studies (both US and international) using a range of datasets [Sulander et al., 2004; Reeves and Rafferty, 2005], less than 1:20 of the older US worker and non-worker population can be described as actively healthy in terms of their combined current smoking, risky drinking, and leisure-time physical activity behaviors. Given that these are rapidly growing proportions of the population, these findings have profound implications for the current and US healthcare system, the labor market and the national economy.

Concerns regarding the healthy and unhealthy behaviors highlighted in this study are well documented. Ethanol abuse has been associated with increased risk of workplace injury and absenteeism, as well as its implications for chronic disease [Henderson et al., 1996; Zwerling et al., 1996; Conrad et al., 1999; Watkins et al., 2000; Mangili, 2004]. Primary and secondary smoking has also been linked with workplace absenteeism and stress, as well as a range of chronic diseases from cardiovascular disease to cancer [McGhee et al., 2000; Max, 2001; Ng and Jeffery, 2003; Tsai et al., 2005]. The growing obesity epidemic, recently documented to affect all worker groups [Caban et al., 2005], is associated with decreased workplace and leisure-time physical activity [Leino-Arjas et al., 2004; Mummery

TABLE IV. Prototype "Healthy and Risky Persons": Older US Worker by Occupation (NHIS 1997–2003)

Occupation	Sample N	"Healthy workers"[a] (%)	"Risky workers"[b] (%)
Officials and administrators including public administrators	24	42[c]	0[c]
Managers administrators, except public administration	261	22	4
Management related occupations	123	28	4
Engineers	32	9[c]	3[c]
Architects and surveyors	6	17[c]	0[c]
Natural mathematical/computer scientists	24	21[c]	0[c]
Health diagnosing occupations	50	24	2
Health assessment/treating occupations	44	20[c]	0[c]
Teachers, librarians, counselors	140	36	4
Writers, artists, entertainers, athletes	72	29	1
Other professional specialty occupations	99	33	3
Health technologists/technicians	12	42[c]	0[c]
Technologists, technicians except health	17	41[c]	0[c]
Supervisors and proprietors	88	18	3
Sales representatives, commodities and finance	151	23	3
Other sales	190	15	3
Computer equipment operators	0	[c]	[c]
Secretaries, stenographers and typists	76	17	3
Financial records processing occupations	73	16	4
Mail and message distributing	17	35[c]	0[c]
Other administrative support	211	22	4
Private household occupations	23	4[c]	0[c]
Police and firefighters	10	10[c]	0[c]
Other protective service occupations	57	16	11
Food service	86	12	3
Health service	44	7[c]	2[c]
Cleaning and building service	64	13	8
Personal service	69	22	1
Farm operators and managers	58	22	2
Farm workers and other agricultural workers	44	14[c]	9[c]
Forestry and fishing occupations	7	43[c]	14[c]
Mechanics and repairers	60	13	5
Construction and extractive trades	42	10[c]	7[c]
Precision production occupations	41	17[c]	7[c]
Machine operators/tenderers, except precision	31	16[c]	6[c]
Fabricators, assemblers, inspectors, samplers	21	19[c]	10[c]
Motor vehicle operators	129	14	9
Other transportation, except motor vehicles	0	[c]	[c]
Material moving equipment operators	6	33[c]	17[c]
Construction laborers	12	0[c]	17[c]

[a]Prototype "Healthy Person" = No smoking, No risky drinking, and leisure-time exercise.
[b]Prototype "Risky Person" = current smoking, current risky drinking, and no exercise.
[c]Prevalence rate considered unstable since based on the sample size <45 or the standard error $>30\%$ of the prevalence estimate.

et al., 2005; Caban-Martinez et al., in press]. Obesity is clearly linked with significant morbidity and mortality, as well as a range of economic costs to workers, their families and society [Thompson et al., 1998]. Finally, increased workplace and/or leisure time physical activity has been associated with better health, including decreased stress, morbidity, long term disability, workplace absenteeism, and other healthy behaviors [Hildebrandt et al., 2000; Jacobson and Aldana, 2001; Eriksen and Bruusgaard, 2002].

Strengths and Limitations

The NHIS data are cross-sectional data that permit only inferences of association of the health risk behaviors in the 41 occupations and other subpopulations analyzed here. Furthermore, cross-sectional studies traditionally underestimate the impact of occupational factors due to the healthy worker effect (i.e. only relatively healthy people can work). This is particularly true with regards to the older non-workers who may represent a mixed population of very healthy and wealthy retirees (as seen in the highest prevalence of ''healthy people'' being older non-working males) and those who are actually too disabled to work (as seen, for example, in the relatively high prevalence of black older non-workers who were the prototype ''risky persons''). Furthermore, it cannot be assumed that the report of healthy behaviors necessarily translates into an actually healthier person; for example, it is possible that a sick elderly person would report no ethanol or tobacco abuse/use because they are already sick and unable to engage in such risky behaviors.

The present analysis suffers from many of the limitations seen in large population-based studies. The data are self-reported with diminishing survey participation over time, and the degree of under- and over-reporting may vary as a function of age, gender, race, ethnicity, and social class [Engstrom et al., 2003]. However, to the extent that social stigma against reporting current smoking, risky drinking and/or inadequate leisure-time physical activity, the NHIS data may actually underestimate the rates of these risky behaviors in the older US workers and older non-workers. Of note, it was not possible to examine the amount of physical activity associated with workplace rather than leisure-time activity. Thus, it is possible that workers in more physically active ''blue collar'' occupations would have less physiologic need for leisure-time physical activity. However, as seen in other studies [Perbellini, 2004; Caban et al., 2005], there is increasing obesity among many blue collar occupations (such as Motor vehicle operators) possibly associated with decreased occupational as well as leisure time physical activity [Caban-Martinez et al., in press].

Some of the sample sizes, particularly among older women workers by occupation, were too small to draw meaningful conclusions. With the rapid increase in the number of US older workers, in the future, these associations can be re-examined.

The strength of this study lies in the use of the NHIS, a nationally representative sample of the entire US population, including older workers and older non-workers, as well as by occupation, gender, race and ethnic subpopulation.

The three behaviors described in this study represent potentially modifiable behaviors that can have significant impacts on the morbidity and mortality of US workers, their families and the economy [Wang et al., 2004]. Interventions can begin early in the worker's career with lasting impact on their lifestyle as they age [Capodaglio, 2000]. The workplace can provide an unique venue to deliver targeted heath education and prevention interventions. For example, the elimination of smoking in most US workplaces as well as workplace tobacco cessation interventions has contributed to the general decrease in tobacco use in the US adult population as well as substantial cost savings for employers [Parrott et al., 2000; Janer et al., 2002; McAfee et al., 2004; Osinubi et al., 2004]. It is well established in the ethanol abuse literature that effective workplace resources (such as Employee Assistance Programs) can reduce worker ethanol abuse [Zarkin et al., 2000, 2001]. Therefore, the information provided in this and other studies can serve as a ''road map'' to identify the most at risk occupational subpopulations and target appropriate intervention or prevention programs in the workplace and beyond for older workers and their families [Emmons et al., 1999; Minkler et al., 2000; King, 2001; Janer et al., 2002; Appel and Aldrich, 2003; Sattar et al., 2003; Marshall, 2004].

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