

# Longest Held Job in U.S. Occupational Groups: The National Health Interview Survey

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**Objective:** We sought to assess the validity of using current or most recent occupation as surrogate for longest-held job (and its exposures).

**Methods:** The National Health Interview Survey (NHIS) is an annual, probability, cross-sectional U.S. population survey. The 1986 and 1988 NHIS occupational supplements provided information for more than 49,000 workers. Using Cohen's Kappa, concordance was assessed by occupational group and several subgroups. **Results:** Statistically significant results were observed for all occupational groups. More than 70% of 13 broad occupations had a Kappa of 50.0 or greater, with variable concordance by subpopulation. Among 206 occupational groups, there was more variability: Kappa ranged from 92.7 (dentists) to 9.2 (farm managers). **Conclusions:** Moderate-to-high levels of agreement was observed in this large, representative sample of US workers. Therefore, current occupation can be used as a surrogate for longest-held job for many occupational subgroups. (J Occup Environ Med. 2005;47:79-90)

In occupational epidemiologic research, databases such as death certificates, insurance and hospital records, cancer registries, employment and union records, and licensure records often are the only source of the subject's occupation and/or industry. Derived from these records, current or most recent occupation and industry have been used by researchers as a surrogate for longest held job (and its exposures).<sup>1</sup> Previous studies have raised the issue of the validity of using current or most recent occupation or industry to represent the longest held job, especially with rapidly changing employment patterns in the United States and elsewhere.<sup>2-8</sup>

In several studies, concordance between death certificate or cancer registry occupation and usual occupation derived from various sources ranged from 50% to 82%.<sup>4,9-13</sup> The concordance varied somewhat by gender and race subgroup and decreased with the increasing specificity of occupational category. To evaluate concordance between current and longest held occupation, the present analyses examined aggregated data from the 1986 National Health Interview Survey (NHIS) Supplement on Longest Held Job and from the 1988 NHIS Occupational Supplement in U.S. adults employed in occupations that numbered 100,000 or more persons.

## Materials and Methods

The NHIS, conducted annually by the National Center for Health Statistics (NCHS), is a continuous, multipurpose, and multistage area prob-

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ability cross-sectional survey of the U.S. civilian noninstitutionalized population living at addressed dwellings.<sup>14</sup> Each year approximately 50,000 households are selected to participate in the NHIS; approximately 120,000 persons are interviewed using a primary household respondent, with all adults at home participating in the interview. The response rate has ranged between 95% and 98%.<sup>14</sup> Informed consent is obtained from all participants; the database is available as an anonymous data set to all researchers through the NCHS.

The NHIS includes a core set of questions that remains virtually unchanged across years on a variety of sociodemographic and health-related issues. Information on the type of occupation and industry and working status during the 2 weeks prior to the interview is collected every year for all participants aged 18 years or older to determine the person's current employment status.

In addition, each year the NCHS administers supplemental surveys within households randomly chosen from those already selected to participate in the NHIS. One adult household member is chosen at random to participate in the supplemental surveys. Two occupational health-related supplements were administered to NHIS participants: the 1986 "Longest Job Worked" supplement ( $n = 37,917$ ),<sup>15</sup> and the 1988 "Occupational Health" supplement ( $n = 44,233$ ).<sup>16</sup> These two supplements provided information on current job, job during the previous 12 months, and longest held job, as well as some worker-associated health conditions, such as work-related injuries; back pain; hand discomfort; skin conditions; eye, nose, and throat irritations; health conditions; and smoking status. Proxy information on these conditions was obtained when the randomly chosen household members were unavailable for interview.

Data from the two supplements were combined for the purposes of

the present analyses that were restricted to data on more than 49,000 workers in those occupational groups, each with an estimated national employment of 100,000 persons or more. This restriction was necessary to ensure reasonably stable estimates and is an approach consistent with that taken in previous NHIS occupational analyses.<sup>4,13</sup>

Concordance was assessed between reported current and longest held occupation. Initially, 13 large category groupings, including all listed occupations, were used, which is consistent with the approach taken in previous publications analyzing occupational data from the NHIS.<sup>4,13</sup> Analyses were then performed for a more detailed, all inclusive, list of 41 occupations, and then for an even greater detailed list of more than 500 occupations; as with Brackbill et al<sup>17</sup> and Lee et al<sup>18</sup> of the more than 500 detailed list of occupations, only those 206 occupations with an average of 100,000 U.S. workers/year in the period 1986 to 1994 were evaluated for concordance because of sample size and representativeness considerations. Although labeled "SOC" codes in their documentation,<sup>19</sup> the NHIS actually uses the US Census Occupational Codes to classify workers into more than 500 different occupations. In 1992, the NHIS began using the 1990 version of the US Census Occupational codes;<sup>20</sup> prior to 1992, the 1980 US Census codes were used. In addition to occupational categories, within each occupation several subgroups were analyzed: two gender subgroups; three race subgroups (whites, blacks, others); two Hispanic subgroups (Hispanics and non-Hispanics).

Several measures of agreement were considered, including Burnett's approach (ie, sensitivity),<sup>4</sup> Dice's Coincidence Index,<sup>21</sup> and Cohen's Kappa.<sup>22</sup> However, Cohen's Kappa was found to be most appropriate for the current analysis because of its ease of interpretation, robustness, extensive use in the literature, and

availability of confidence intervals. Cohen's Kappa ( $\kappa$ ) is an index of concordance that corrects for chance agreement. Its value is 100% when there is perfect agreement.<sup>22</sup> If observed agreement is greater than or equal to chance agreement, then  $\kappa \geq 0$ ; and if observed agreement is less than or equal to chance agreement, then  $\kappa \leq 0$ . Fleiss et al<sup>23</sup> derived appropriate standard errors for the hypothesis that  $\kappa = 0$ , as well as the appropriate standard error for calculating confidence intervals and for testing the hypothesis that Kappa equals a given value other than zero. Within each occupation, different subgroups were compared by using their Kappa values and the corresponding 99% Confidence Intervals (CIs). Any two subgroups were considered significantly different with respect to agreement between current and longest held job if their 99% CIs for the corresponding kappa values did not overlap.

Because of the complex sample survey design, analyses were completed using the Software for the Statistical Analysis of Correlated Data package (SUDAAN) to take into account sample weights and design effects.<sup>24</sup> Sample weights were adjusted to account for the aggregation of data over multiple survey years by dividing the original weight by two, the number of years combined.<sup>25,26</sup>

## Results

Complete data for the occupations with an estimated employment of 100,000 persons or more were available for 49,234 adult working participants of the 1986 and the 1988 NHIS Supplements combined. Included in the study database were 23,820 females (48.4%) and 25,414 males (51.6%); 41,556 whites (84.4%), 6,268 blacks (12.7%), and 1,410 "other" race (2.9%); 3,035 Hispanics (6.2%) and 46,199 non-Hispanics (93.8%).

## Analyses of 13 Broad Occupational Groups

Results of the analyses for 13 broad occupational categories, including all workers, are presented in Table 1; the occupations are ranked in descending order according to the corresponding overall kappa value. The overall highest agreement between current job and longest held job was observed for those in a "Professional specialty" ( $\kappa \pm \text{SE} = 71.2 \pm 0.4$ ), whereas the overall lowest  $\kappa$  was observed for "Handlers, equipment cleaners, helpers, laborers" ( $31.7 \pm 1.1$ ).

Persons in a "Professional specialty" showed the highest  $\kappa$  values for females ( $70.6 \pm 0.6$ ), males ( $71.8 \pm 0.6$ ), whites ( $71.6 \pm 0.5$ ), blacks ( $68.5 \pm 1.6$ ), and non-Hispanics ( $71.3 \pm 0.5$ ). For Hispanics, the highest concordance observed was  $72.5 \pm 3.0$  for those in "Farming, forestry, fishing"; for persons of "other" race, the highest value was  $68.8 \pm 2.8$  for those in "Service occupations, except protective/household."

The lowest  $\kappa$  value observed was  $20.6 \pm 10.1$  for males with occupation classified as "Private household." The remaining subgroup-specific lowest values occurred all for persons classified as "Handlers, equipment cleaners, helpers, laborers" as follows: females ( $27.8 \pm 2.0$ ); whites ( $29.7 \pm 1.2$ ); blacks ( $39.6 \pm 2.4$ ); "other" race ( $24.7 \pm 6.8$ ); Hispanics ( $33.4 \pm 3.6$ ); and non-Hispanics ( $31.5 \pm 1.1$ ).

Significant differences were noted between subgroups with respect to  $\kappa$  values (Table 1). For variables with just two subgroups, such as gender (males and females) and ethnicity (Hispanics and Non-Hispanics), subgroups with nonoverlapping 99% CIs were considered significantly different at the 1% nominal alpha level. However, to take into account the multiplicity of comparisons, for variables with three subgroups such as race (whites, blacks, "other" race), pairs of subgroups with nonoverlapping

99% CIs were considered significantly different at the 3% nominal alpha level. Thus, for example, among persons in "Farming, forestry, fishing" the agreement between current and longest held job was significantly higher,  $P < 0.03$ , for whites ( $\kappa \pm \text{SE}: 66.7 \pm 1.1$ ; 99% CI = 63.9–69.5) than for blacks ( $46.6 \pm 3.9$ ; 36.6–56.6). Similarly, among those in "Administrative support occupations, including clerical," the agreement between current and longest held job was significantly higher, at the 1% alpha level, for females ( $61.3 \pm 0.6$ ; 59.8–62.8) than for males ( $43.7 \pm 1.2$ ; 40.6–46.8). As seen in Table 1, significant differences between races were observed for 5 of the 13 occupations and between males and females for 6 of the 13 occupations. There were no significant differences between Hispanics and non-Hispanics for any of the 13 occupations.

## Analyses of 41 More Refined and 206 Detailed Occupational Groups

The above analyses were repeated for 41 more refined occupational groups, including more than 500 detailed categories, and also for 206 detailed occupational groups, each with an average of 100,000 U.S. workers/year in the period of 1986 to 1994. Results of these analyses in terms of tables similar to Table 1 of this publication can be obtained from the study Web page at <http://www.rsmas.miami.edu/groups/niehs/niosh/pubs.htm>.

Among the 41 more refined categories (Table 2), the three occupations with the highest  $\kappa$  values were: health-diagnosing occupations ( $85.6 \pm 1.4$ ; 95% CI = 82.0–89.2); health-assessment/treating occupations ( $74.9 \pm 1.0$ ; 72.3–77.5); and teachers, librarians, counselors ( $72.9 \pm 0.7$ ; 71.1–74.7). The three occupations with the lowest concordance were: officials and administrators, public administrators ( $33.7 \pm 2.9$ ; 26.2–41.2); freight, stock, mate-

rial handlers ( $31.3 \pm 1.2$ ; 28.2–34.4); and construction laborers ( $25.6 \pm 2.3$ ; 19.7–31.5).

Among the 206 detailed categories with an average of 100,000 workers/year in the period of 1986 to 1994 (Table 3), the three occupations with the highest  $\kappa$  values were: dentists ( $92.7 \pm 2.6$ ; 95% CI = 86.0–99.4); pharmacists ( $86.1 \pm 3.1$ ; 78.1–94.1); physicians ( $83.1 \pm 1.9$ ; 78.2–88.0). The three occupations with the lowest concordance were supervisors, related agricultural occupations ( $12.4 \pm 5$ ; 0.0–25.5); not specified mechanics and repairers ( $11.1 \pm 3.0$ ; 3.4–18.8); and managers, farms, except horticultural ( $9.2 \pm 3.1$ ; 1.2–17.2).

In both instances, for the 41 and also for the 206 occupational categories, statistically significant differences in  $\kappa$  values were observed between categories, as well as between gender and race subgroups within certain occupational categories (data shown at the study Web site).

## Discussion

The present study found moderate concordance between current and longest held job in a large, population-based, representative sample of U.S. workers, with variations in this concordance by gender, race-ethnicity, and occupational subgroups. The majority of the 13 and 41 occupational grouping categories had moderate concordance (with a Kappa  $\geq 50.0$ ). In addition, some occupational categories and subgroups reached levels as high as  $71.2 \pm 0.4$  when 13 broad occupational groups were considered;  $85.6 \pm 1.4$  for 41 more detailed occupational categories; and  $92.7 \pm 2.6$  for 206 detailed occupational categories with an average of 100,000 US workers/year in the period from 1986 to 1994. There was a clear pattern of increased concordance for higher-paying jobs (such as professional specialties) and decreased concordance for low-paying jobs (such as laborers), as seen previously in other stud-

TABLE 1

Concordance of NHIS Longest Held Job and Current Job by 13 Occupations and Gender-Race-Ethnicity Subgroups

Occupation	Group	US Worker Estimated Population Size	Cohen's Kappa ± SE	99% CI for Kappa	Sig‡
Professional specialty	All	14,518,579	71.2 ± 0.4	[70.2, 72.2]	
	Male	7,289,939	71.8 ± 0.6	[70.3, 73.3]	
	Female	7,228,640	70.6 ± 0.6	[69.1, 72.1]	
	White	12,944,756	71.6 ± 0.5	[70.3, 72.9]	
	Black	1,019,836	68.5 ± 1.6	[64.4, 72.6]	
	Other	553,987	65.7 ± 2.6	[59.0, 72.4]	
	Hispanic	556,776	67.9 ± 2.3	[62.0, 73.8]	
	Non Hispanic	13,961,803	71.3 ± 0.5	[70.0, 72.6]	
Farming, forestry, fishing	All	3,015,631	64.7 ± 1.0	[62.1, 67.3]	
	Male	2,485,975	65.7 ± 1.1	[62.9, 68.5]	
	Female	529,656	58.4 ± 2.5	[52.0, 64.8]	
	White	2,753,846	66.7 ± 1.1	[63.9, 69.5]	##
	Black	226,850	46.6 ± 3.9	[36.6, 56.6]	#
	Other	34,935	45.5 ± 10.0	[19.7, 71.3]	
	Hispanic	309,189	72.5 ± 3.0	[64.8, 80.2]	
	Non Hispanic	2,706,442	63.9 ± 1.1	[61.1, 66.7]	
Transportation/material moving	All	4,313,801	62.6 ± 0.9	[60.3, 64.9]	
	Male	3,882,619	62.5 ± 1.0	[59.9, 65.1]	
	Female	431,182	54.1 ± 3.0	[46.4, 61.8]	
	White	3,564,520	62.1 ± 1.0	[59.5, 64.7]	
	Black	669,093	64.9 ± 2.1	[59.5, 70.3]	
	Other	80,188	59.7 ± 7.2	[41.2, 78.2]	
	Hispanic	246,084	60.7 ± 4.0	[50.4, 71.0]	
	Non Hispanic	4,067,717	62.7 ± 0.9	[60.4, 65.0]	
Administrative support occupations, including clerical	All	15,451,620	61.2 ± 0.5	[59.9, 62.5]	
	Male	3,130,347	43.7 ± 1.2	[40.6, 46.8]	*
	Female	12,321,273	61.3 ± 0.6	[59.8, 62.8]	**
	White	13,462,243	61.1 ± 0.5	[59.8, 62.4]	
	Black	1,545,201	62.3 ± 1.3	[59.0, 65.6]	
	Other	444,176	57.8 ± 3.1	[49.8, 65.8]	
	Hispanic	954,651	60.4 ± 2.1	[55.0, 65.8]	
	Non Hispanic	14,496,969	61.2 ± 0.5	[59.9, 62.5]	
Precision production, craft, repair	All	12,040,262	60.1 ± 0.6	[58.6, 61.6]	**
	Male	10,908,379	59.9 ± 0.6	[58.4, 61.4]	*
	Female	1,131,883	35.8 ± 1.8	[31.2, 40.4]	
	White	10,769,378	60.9 ± 0.6	[59.4, 62.4]	##
	Black	945,907	52.4 ± 2.0	[47.2, 57.6]	#
	Other	324,977	60.9 ± 3.6	[51.6, 70.2]	
	Hispanic	907,908	61.3 ± 2.1	[55.9, 66.7]	
	Non Hispanic	11,132,354	60.0 ± 0.6	[58.5, 61.5]	
Protective service	All	1,701,185	59.9 ± 1.5	[56.0, 63.8]	
	Male	1,438,693	63.3 ± 1.6	[59.2, 67.4]	**
	Female	262,492	41.5 ± 4.0	[31.2, 51.8]	*
	White	1,392,916	60.2 ± 1.7	[55.8, 64.6]	
	Black	283,020	58.4 ± 3.5	[49.4, 67.4]	
	Other	25,249	63.4 ± 12.0	[32.5, 94.3]	
	Hispanic	88,310	61.4 ± 6.3	[45.2, 77.6]	
	Non Hispanic	1,612,875	59.8 ± 1.6	[55.7, 63.9]	
Service occs, except protective/household	All	9,510,001	58.6 ± 0.6	[57.1, 60.1]	
	Male	3,108,606	52.4 ± 1.2	[49.3, 55.5]	*
	Female	6,401,395	59.8 ± 0.7	[58.0, 61.6]	**
	White	7,333,994	56.4 ± 0.7	[54.6, 58.2]	
	Black	1,707,527	62.6 ± 1.3	[59.3, 65.9]	
	Other	468,480	68.8 ± 2.8	[61.6, 76.0]	
	Hispanic	912,786	61.4 ± 2.1	[56.0, 66.8]	
	Non Hispanic	8,597,215	58.3 ± 0.6	[56.8, 59.8]	

**TABLE 1**  
Continued

Occupation	Group	US Worker Estimated Population Size	Cohen's Kappa ± SE	99% CI for Kappa	Sig‡
Machine operators, assemblers, inspectors	All	7,372,244	57.1 ± 0.7	[55.3, 58.9]	
	Male	4,283,559	54.4 ± 1.0	[51.8, 57.0]	*
	Female	3,088,685	60.3 ± 1.0	[57.7, 62.9]	*
	White	5,984,780	56.1 ± 0.8	[54.0, 58.2]	
	Black	1,133,488	60.9 ± 1.6	[56.8, 65.0]	
	Other	253,976	58.5 ± 4.1	[47.9, 69.1]	
	Hispanic	770,825	58.9 ± 2.3	[53.0, 64.8]	
	Non Hispanic	6,601,419	56.9 ± 0.7	[55.1, 58.7]	
Sales	All	11,306,985	54.5 ± 0.6	[53.0, 56.0]	
	Male	5,869,594	56.9 ± 0.9	[54.6, 59.2]	**
	Female	5,437,391	52.1 ± 0.9	[49.8, 54.4]	*
	White	10,151,747	54.7 ± 0.7	[52.9, 56.5]	
	Black	793,244	51.0 ± 2.2	[45.3, 56.7]	
	Other	361,994	56.4 ± 3.7	[46.9, 65.9]	
	Hispanic	598,029	53.8 ± 2.8	[46.6, 61.0]	
	Non Hispanic	10,708,956	54.5 ± 0.6	[53.0, 56.0]	
Technicians/related support	All	3,430,826	53.0 ± 1.0	[50.4, 55.6]	
	Male	1,733,096	50.4 ± 1.5	[46.5, 54.3]	
	Female	1,697,730	55.7 ± 1.5	[51.8, 59.6]	
	White	2,900,529	52.9 ± 1.1	[50.1, 55.7]	
	Black	329,338	56.2 ± 3.0	[48.5, 63.9]	
	Other	200,959	47.4 ± 4.9	[34.8, 60.0]	
	Hispanic	190,302	57.4 ± 4.4	[46.1, 68.7]	
	Non Hispanic	3,240,524	52.8 ± 1.1	[50.0, 55.6]	
Private household	All	807,870	50.6 ± 2.0	[45.4, 55.8]	
	Male	32,623	20.6 ± 10.1	[-5.4, 46.6]	
	Female	775,247	51.2 ± 2.1	[45.8, 56.6]	
	White	533,961	40.6 ± 2.7	[33.6, 47.6]	#
	Black	258,870	64.0 ± 2.9	[56.5, 71.5]	##
	Other	15,039	41.7 ± 14.3	[4.9, 78.5]	
	Hispanic	122,252	60.8 ± 5.4	[46.9, 74.7]	
	Non Hispanic	807,870	49.1 ± 2.2	[43.4, 54.8]	
Executive, administrative managerial	All	13,918,450	47.3 ± 0.6	[45.8, 48.8]	
	Male	8,656,177	48.8 ± 0.8	[46.7, 50.9]	
	Female	5,262,273	44.9 ± 0.9	[42.6, 47.2]	
	White	12,753,423	47.2 ± 0.6	[45.7, 48.7]	
	Black	827,871	43.7 ± 2.2	[38.0, 49.4]	
	Other	337,156	53.8 ± 3.8	[44.0, 63.6]	
	Hispanic	706,038	45.0 ± 2.8	[37.8, 52.2]	
	Non Hispanic	13,212,412	47.4 ± 0.6	[45.9, 48.9]	
Handlers, equipment cleaners, helpers, laborers	All	3,372,974	31.7 ± 1.1	[28.9, 34.5]	
	Male	2,671,782	32.3 ± 1.2	[29.2, 35.4]	
	Female	701,192	27.8 ± 2.0	[22.6, 33.0]	
	White	2,665,993	29.7 ± 1.2	[26.6, 32.8]	#
	Black	612,983	39.6 ± 2.4	[33.4, 45.8]	##
	Other	93,998	24.7 ± 6.8	[7.2, 42.2]	
	Hispanic	330,818	33.4 ± 3.6	[24.1, 42.7]	
	Non Hispanic	3,042,156	31.5 ± 1.1	[28.7, 34.3]	

‡ Sig = Significance.

Significant differences were noted between sub-groups with respect to Kappa values: \* vs \*\* for gender comparisons ( $P < 0.01$ ); # vs ## for race comparisons ( $P < 0.03$ ).

TABLE 2

Concordance of NHIS Longest Held Job and Current Job by 41 Occupations<sup>∇</sup>

Occupation	US Worker Estimated Population Size	Cohen's Kappa ± SE	99% CI for Kappa
Health diagnosing occupations	829,443	85.6 ± 1.4	[82.0, 89.2]
Health assessment/treating occupations	2,482,299	74.9 ± 1.0	[72.3, 77.5]
Teachers, librarians, counselors	5,231,152	72.9 ± 0.7	[71.1, 74.7]
Engineers	2,009,300	66.4 ± 1.3	[63.1, 69.7]
Other professional specialty occupations	2,227,360	64.7 ± 1.3	[61.4, 68.0]
Secretaries, stenographers and typists	4,413,986	63.6 ± 0.8	[61.5, 65.7]
Motor vehicle operators	3,529,824	63.5 ± 1.1	[60.7, 66.3]
Police and firefighters	1,157,796	63.5 ± 1.8	[58.9, 68.1]
Architects and surveyors	201,731	61.6 ± 4.4	[50.3, 72.9]
Construction and extractive trades	4,960,923	60.3 ± 0.9	[58.0, 62.6]
Health technologists/technicians	1,357,639	60.0 ± 1.7	[55.6, 64.4]
Farm operators and managers	1,399,369	59.8 ± 1.5	[55.9, 63.7]
Mechanics and repairers	4,203,192	58.1 ± 1.0	[55.5, 60.7]
Writers, artists, entertainers, athletes	1,971,725	58.1 ± 1.4	[54.5, 61.7]
Food service	4,570,186	56.3 ± 1.0	[53.7, 58.9]
Mail and message distributing	914,844	56.0 ± 2.2	[50.3, 61.7]
Health service	1,986,806	55.4 ± 1.4	[51.8, 59.0]
Machine operators/tenderers, except precision	5,221,401	54.8 ± 0.9	[52.5, 57.1]
Other transportation, except motor vehicles	176,360	54.1 ± 5.0	[41.2, 67.0]
Personal service	2,356,169	52.1 ± 1.4	[48.5, 55.7]
Material moving equipment operators	1,094,233	51.0 ± 2.0	[45.8, 56.2]
Private household occupations	761,954	50.6 ± 2.0	[45.4, 55.8]
Sales representatives, commodities and finance	3,603,720	50.6 ± 1.1	[47.8, 53.4]
Natural mathematical/computer scientists	1,330,325	50.2 ± 2.0	[45.0, 55.4]
Management related occupations	3,975,190	49.9 ± 1.1	[47.1, 52.7]
Financial records processing occupations	2,245,512	48.4 ± 1.3	[45.1, 51.7]
Cleaning and building service	2,836,111	48.3 ± 1.3	[45.0, 51.6]
Fabricators, assemblers, inspectors, samplers	2,566,964	47.9 ± 1.3	[44.6, 51.2]
Technologists, technicians except health	2,658,590	47.7 ± 1.3	[44.4, 51.0]
Forestry and fishing occupations	199,857	47.2 ± 4.5	[35.6, 58.8]
Precision production occupations	3,766,588	46.0 ± 1.1	[43.2, 48.8]
Other administrative support	9,296,535	43.4 ± 0.8	[41.3, 45.5]
Other sales	5,892,896	43.0 ± 0.9	[40.7, 45.3]
Farm workers and other agricultural workers	1,616,443	40.2 ± 1.7	[35.8, 44.6]
Managers administrators, except public administration	11,337,987	38.8 ± 0.7	[37.0, 40.6]
Supervisors and proprietors	3,596,023	36.8 ± 1.3	[33.5, 40.1]
Computer equipment operators	670,109	36.4 ± 2.5	[30.0, 42.8]
Other protective service occupations	793,111	35.2 ± 2.6	[28.5, 41.9]
Officials and administrators public administration	542,174	33.7 ± 2.9	[26.2, 41.2]
Freight, stock, material handlers	3,410,507	31.3 ± 1.2	[28.2, 34.4]
Construction laborers	697,191	25.6 ± 2.3	[19.7, 31.5]

<sup>∇</sup> Additional Tables with Kappa values for subgroups such as sex and race can be obtained from the Study Website at <http://www.rsmas.miami.edu/groups/niehs/niosh/pubs.htm>.

ies.<sup>4,9-13</sup> Statistically significant differences were observed between occupational groups and between gender and race-specific Kappa values within certain occupational groups. Thus, these concordance differences between occupations, as well as between gender and race-ethnicity occupational subgroups, should be taken into account for specific occupations and subgroups when using current job as a surrogate of longest held job and its exposures

in occupational epidemiologic research.

As noted above, in several studies concordance between usual occupation and current occupation derived from various sources ranged from 50% to 82%.<sup>4,9-13</sup> The concordance varied somewhat by gender and race subgroup and decreased with the increasing specificity of occupational category. Burnett and Crouse<sup>4</sup> used the earlier National Health Interview Survey (NHIS) 1980 Occupational

Supplement to evaluate the effectiveness of using the latest occupation and industry instead of the longest held occupation and industry in studies of chronic disease. For men, there was 69.9% agreement for occupation and 68.1% for industry, whereas for women there was 70.5% for occupation and 70.3% for industry. Although the percent agreement varied by age, sex, race, respondent, and length of latest job, the authors concluded that it was sufficient to allow

**TABLE 3**  
Concordance of NHIS Longest Held Job and Current Job by 206 Occupations<sub>∞</sub>

Occupation	US Worker Estimated Population Size	Cohen's Kappa ± SE	99% CI for Kappa
Dentists	116,824	92.7 ± 2.6	[86.0, 99.4]
Pharmacists	142,394	86.1 ± 3.1	[78.1, 94.1]
Physicians	498,219	83.1 ± 1.9	[78.2, 88.0]
Lawyers	646,603	82.1 ± 1.7	[77.7, 86.5]
Registered nurses	1,569,956	75.1 ± 1.1	[72.3, 77.9]
Clergy	314,899	74.8 ± 2.8	[67.6, 82.0]
Hairdressers and cosmetologists	671,020	71.3 ± 1.9	[66.4, 76.2]
Brick masons and stonemasons	173,251	69.3 ± 4.0	[59.0, 79.6]
Tool and die makers	145,345	68.0 ± 4.4	[56.7, 79.3]
Airplane pilots and navigators	94,954	66.6 ± 5.6	[52.2, 81.0]
Radiologic technicians	106,519	66.0 ± 5.1	[52.9, 79.1]
Bus drivers	402,057	64.9 ± 2.9	[57.4, 72.4]
Secretaries	3,659,867	63.6 ± 0.9	[61.3, 65.9]
Chemists, except biochemists	130,390	63.4 ± 5.1	[50.3, 76.5]
Architects	156,876	63.0 ± 4.6	[51.2, 74.8]
Welders and cutters	500,401	62.6 ± 2.4	[56.4, 68.8]
Truck drivers	2,318,317	62.5 ± 1.2	[59.4, 65.6]
Electricians	523,462	62.3 ± 2.5	[55.9, 68.7]
Drywall installers	96,014	61.5 ± 6.0	[46.0, 77.0]
Civil	274,072	61.1 ± 3.5	[52.1, 70.1]
Accountants and auditors	1,332,744	61.0 ± 1.6	[56.9, 65.1]
Licensed practical nurses	493,890	61.0 ± 2.7	[54.0, 68.0]
Mail carriers, postal service	274,170	60.9 ± 3.7	[51.4, 70.4]
Plumbers, pipe fitters, and steamfitters	375,470	60.5 ± 2.9	[53.0, 68.0]
Dental assistants	130,903	60.1 ± 4.5	[48.5, 71.7]
Teachers, elementary school	1,410,234	59.2 ± 1.4	[55.6, 62.8]
Firefighting occupations	172,427	59.1 ± 4.4	[47.8, 70.4]
Textile sewing machine operators	625,459	59.0 ± 2.1	[53.6, 64.4]
Carpenters	1,293,003	58.5 ± 1.7	[54.1, 62.9]
Farmers, except horticultural	1,304,700	58.2 ± 1.6	[54.1, 62.9]
Drafting occupations	284,894	57.9 ± 3.5	[48.9, 66.9]
Police and detectives, public service	440,287	57.9 ± 2.7	[50.9, 64.9]
Insurance sales occupations	613,946	57.7 ± 2.5	[51.3, 64.1]
Musicians and composers	192,884	57.5 ± 4.1	[46.9, 68.1]
Editors and reporters	240,642	56.9 ± 3.6	[47.6, 66.2]
Postal clerks, except mail carriers	332,242	56.8 ± 3.3	[48.3, 65.3]
Electrical and electronic	574,637	56.3 ± 2.5	[49.9, 62.7]
Printing press operators	370,907	56.0 ± 3.2	[47.8, 64.2]
Telephone installers and repairers	188,825	55.6 ± 4.5	[44.0, 67.2]
Automobile mechanics	828,851	55.5 ± 2.0	[50.3, 60.7]
Painters/sculptors/craft-artists/artist printmakers	199,152	55.4 ± 4.3	[44.3, 66.5]
Nursing aides, orderlies, and attendants	1,217,522	55.3 ± 1.6	[51.2, 59.4]
Aerospace	112,968	55.0 ± 5.7	[40.3, 69.7]
Mechanical	362,336	54.5 ± 3.3	[46.0, 63.0]
Clinical lab technologists and technicians	219,938	54.4 ± 3.7	[44.9, 63.9]
Real estate sales occupations	784,554	54.4 ± 2.3	[48.5, 60.3]
Social workers	435,209	53.5 ± 2.7	[46.5, 60.5]
Psychologists	159,096	53.3 ± 4.7	[41.2, 65.4]
Photographers	114,004	53.2 ± 5.4	[39.3, 67.1]
Machinists	483,719	52.9 ± 2.5	[46.5, 59.3]
Dietitians	77,719	52.7 ± 7.1	[34.4, 71.0]
Sheet metal workers	154,164	52.3 ± 5.0	[39.4, 65.2]
Cooks	1,199,464	52.2 ± 1.7	[47.8, 56.6]
Automobile body and related repairers	171,202	50.8 ± 4.6	[39.0, 62.6]
Legal assistants	201,278	50.5 ± 4.6	[38.7, 62.3]
Private household cleaners and servants	590,887	50.5 ± 2.4	[44.3, 56.7]
Taxicab drivers and chauffeurs	163,520	50.3 ± 5.0	[37.4, 63.2]
Butchers and meat cutters	191,854	50.2 ± 4.3	[39.1, 61.3]
Designers	481,725	50.1 ± 2.9	[42.6, 57.6]
Purchasing agents and buyers	266,983	50.1 ± 3.8	[40.3, 59.9]
Painters, construction and maintenance	399,310	49.7 ± 3.3	[41.2, 58.2]

**TABLE 3**  
Continued

Occupation	US Worker Estimated Population Size	Cohen's Kappa ± SE	99% CI for Kappa
Pressing machine operators	111,018	49.6 ± 5.2	[36.2, 63.0]
Punching and stamping press machine operators	156,353	49.6 ± 5.2	[36.2, 63.0]
Bookkeepers, accounting, and auditing clerks	1,913,893	49.3 ± 1.4	[45.7, 52.9]
Industrial	220,459	48.9 ± 4.3	[37.8, 60.0]
Maids and housemen	533,824	48.3 ± 2.7	[41.3, 55.3]
Securities and financial services sales occupations	264,281	48.0 ± 4.3	[36.9, 59.1]
Teachers, secondary school	1,138,231	47.8 ± 1.8	[43.2, 52.4]
Computer programmers	475,688	47.7 ± 2.8	[40.5, 54.9]
Correctional institution officers	179,869	47.7 ± 5.3	[34.0, 61.4]
Industrial truck and tractor equipment operators	400,924	47.7 ± 3.2	[39.5, 55.9]
Laundering and dry cleaning machine operators	133,413	47.7 ± 4.9	[35.1, 60.3]
Roofers	123,201	47.4 ± 5.7	[32.7, 62.1]
Timber cutting and logging occupations	125,004	46.9 ± 5.8	[32.0, 61.8]
Insurance adjusters, examiners, and investigators	212,829	46.7 ± 4.2	[35.9, 57.5]
Bakers	116,587	46.6 ± 5.6	[32.2, 61.0]
Teachers, pre-K and K	356,134	46.2 ± 3.5	[37.2, 55.2]
Aircraft engine mechanics	110,840	46.1 ± 5.4	[32.2, 60.0]
Health technologists and technicians	186,744	45.8 ± 4.2	[35.0, 56.6]
Waiters and waitresses	955,220	45.3 ± 1.8	[40.7, 49.9]
Bank tellers	428,399	45.0 ± 3.1	[37.0, 53.0]
Production inspectors, checkers, and examiners	613,972	45.0 ± 2.6	[38.3, 51.7]
Cashiers	1,555,405	44.9 ± 1.6	[40.8, 49.0]
Transportation ticket and reservation agents	111,600	44.2 ± 6.1	[28.5, 59.9]
Bus, truck, and stationary engine mechanics	259,412	44.1 ± 4.2	[33.3, 54.9]
Mixing and blending machine operators	158,821	43.8 ± 5.1	[30.7, 56.9]
Traffic, shipping, and receiving clerks	440,077	43.8 ± 3.1	[35.8, 51.8]
Molding and casting machine operators	108,388	43.7 ± 6.1	[28.0, 59.4]
Grinding/abrading/buffing/polishing machine operators	95,444	43.5 ± 6.2	[27.5, 59.5]
Electrical and electronic technicians	315,499	43.0 ± 3.5	[34.0, 52.0]
Janitors and cleaners	1,730,418	41.9 ± 1.6	[37.8, 46.0]
Other financial officers	664,598	41.5 ± 2.6	[34.8, 48.2]
Sales reps, mining/manufact/wholesale	1,209,282	41.5 ± 1.9	[36.6, 46.4]
Bartenders	256,259	40.8 ± 3.6	[31.5, 50.1]
Telephone operators	145,717	40.6 ± 4.3	[29.5, 51.7]
Teachers aides	334,694	40.5 ± 3.7	[31.0, 50.0]
Counselors, Educational and Vocational	243,135	40.4 ± 4.2	[29.6, 51.2]
Operating engineers	236,458	40.4 ± 4.1	[29.8, 51.0]
Assemblers	915,805	40.2 ± 2.0	[35.0, 45.4]
Health aides, except nursing	320,300	40.1 ± 3.4	[31.3, 48.9]
Packaging and filling machine operators	356,454	39.6 ± 3.3	[31.1, 48.1]
Public relations specialists	166,297	39.1 ± 4.9	[26.5, 51.7]
Inspectors/compliance officers, except construction	183,282	38.9 ± 4.8	[26.5, 51.3]
Expeditors	146,018	38.6 ± 5.6	[24.2, 53.0]
Data-entry keyers	312,924	38.0 ± 3.2	[29.8, 46.2]
Sales workers, motor vehicles and boats	212,983	37.9 ± 4.0	[27.6, 48.2]
Actors and directors	81,185	37.8 ± 6.3	[21.6, 54.0]
Painting and paint spraying machine operators	149,989	37.4 ± 5.1	[24.3, 50.5]
Miscellaneous machine operators	783,575	37.0 ± 2.1	[31.6, 42.4]
Typists	497,764	37.0 ± 2.5	[30.6, 43.4]
Supervisors/Proprietors, Sales Occupations	3,134,293	36.8 ± 1.3	[33.5, 40.1]
Heating air conditioning, and refrigeration mechanics	176,068	36.7 ± 5.0	[23.8, 49.6]
Managers, properties and real estate	392,053	36.6 ± 3.6	[27.3, 45.9]
Miscellaneous food preparation occupations	427,508	36.6 ± 3.0	[28.9, 44.3]
Supervisors, production occupations	1,041,708	36.6 ± 2.1	[31.2, 42.0]
Computer operators	672,403	36.3 ± 2.5	[29.9, 42.7]
Buyers, wholesale/retail trade except farm products	193,489	36.2 ± 4.6	[24.4, 48.0]
Engineers	263,160	36.0 ± 4.0	[25.7, 46.3]
Receptionists	488,334	36.0 ± 3.0	[28.3, 43.7]
Computer systems analysts and scientists	351,976	35.9 ± 3.4	[27.1, 44.7]
Electrical/electronic equipment assemblers	215,167	35.9 ± 3.9	[25.9, 45.9]
Payroll and timekeeping clerks	102,484	35.8 ± 6.0	[20.3, 51.3]

**TABLE 3**  
Continued

Occupation	US Worker Estimated Population Size	Cohen's Kappa $\pm$ SE	99% CI for Kappa
Sales counter clerks	155,780	35.4 $\pm$ 5.2	[22.0, 48.8]
Sales workers, furniture and home furnishings	86,962	35.4 $\pm$ 6.3	[19.2, 51.6]
Administrators/officials, public administration	395,102	35.3 $\pm$ 3.2	[27.1, 43.5]
Farm workers	617,274	35.1 $\pm$ 2.4	[28.9, 41.3]
Economists	140,864	34.9 $\pm$ 5.1	[21.8, 48.0]
Production coordinators	178,358	34.9 $\pm$ 4.5	[23.3, 46.5]
Managers and administrators	7,457,245	34.4 $\pm$ 0.8	[32.3, 36.5]
Personnel and labor relations managers	179,226	34.1 $\pm$ 5.0	[21.2, 47.0]
Purchasing managers	108,213	33.9 $\pm$ 6.1	[18.2, 49.6]
Child care workers	672,444	33.7 $\pm$ 2.5	[27.3, 40.1]
Hand packers and packagers	236,995	33.6 $\pm$ 3.9	[23.6, 43.6]
Vehicle washers and equipment cleaners	157,205	33.6 $\pm$ 5.9	[18.4, 48.8]
Heavy equipment mechanics	143,671	33.2 $\pm$ 5.4	[19.3, 47.1]
Administrators, education and related fields	499,282	33.1 $\pm$ 3.1	[25.1, 41.1]
Driver-sales workers	144,311	33.0 $\pm$ 5.1	[19.9, 46.1]
Electronic repairers, communication/industrial equipment	177,549	32.8 $\pm$ 4.5	[21.2, 44.4]
Groundskeepers and gardeners, except farm	435,403	32.7 $\pm$ 3.1	[24.7, 40.7]
Library clerks	111,990	32.6 $\pm$ 6.0	[17.1, 48.1]
Billing clerks	107,432	32.4 $\pm$ 7.0	[14.4, 50.4]
Teachers	446,782	32.3 $\pm$ 2.8	[25.1, 39.5]
Industrial machinery repairers	407,414	32.2 $\pm$ 3.3	[23.7, 40.7]
Freight, stock, and material handlers, n.e.c.	447,731	32.1 $\pm$ 3.0	[24.4, 39.8]
Advertising and related sales occupations	105,162	31.9 $\pm$ 5.5	[17.7, 46.1]
Slicing and cutting machine operators	186,767	31.6 $\pm$ 4.7	[19.5, 43.7]
Sheriffs/bailiffs/other law enforcement officers	123,806	31.4 $\pm$ 6.4	[14.9, 47.9]
Guards and police, except public service	532,726	31.1 $\pm$ 2.9	[23.6, 38.6]
Management related occupations	282,061	31.0 $\pm$ 3.7	[21.5, 40.5]
Supervisors, food preparation and service occupations	203,025	30.8 $\pm$ 4.5	[19.2, 42.4]
Financial managers	449,751	30.7 $\pm$ 3.1	[22.7, 38.7]
File clerks	162,173	30.6 $\pm$ 5.1	[17.5, 43.7]
Records clerks	114,823	29.8 $\pm$ 5.8	[14.9, 44.7]
Miscellaneous material moving equipment operators	120,414	29.7 $\pm$ 5.6	[15.3, 44.1]
Order clerks	139,449	29.6 $\pm$ 5.3	[15.9, 43.3]
Engineering technicians	196,714	29.1 $\pm$ 4.4	[17.8, 40.4]
Garage and service station related occupations	154,501	28.9 $\pm$ 5.2	[15.5, 42.3]
Investigators and adjusters, except insurance	413,469	28.9 $\pm$ 2.9	[21.4, 36.4]
Sales workers, hardware and building supplies	89,714	28.8 $\pm$ 5.8	[13.9, 43.7]
Teachers, special education	203,439	28.7 $\pm$ 4.3	[17.6, 39.8]
Attendants, amusement and recreation facilities	92,726	28.5 $\pm$ 7.5	[9.2, 47.8]
Stock and inventory clerks	521,924	28.4 $\pm$ 2.8	[21.2, 35.6]
Construction trades, n.e.c.	129,547	28.2 $\pm$ 5.4	[14.3, 42.1]
Sales workers, other commodities	1,838,370	28.2 $\pm$ 1.4	[24.6, 31.8]
Inspectors, testers, and graders	155,613	28.1 $\pm$ 5.1	[15.0, 41.2]
Sales workers, parts	112,717	27.2 $\pm$ 5.6	[12.8, 41.6]
Waiters/waitresses assistants	141,992	27.2 $\pm$ 4.7	[15.1, 39.3]
Child care workers, private household	157,063	26.8 $\pm$ 4.5	[15.2, 38.4]
Personnel/training/labor relations specialists	349,317	26.6 $\pm$ 3.1	[18.6, 34.6]
General office clerks	1,014,521	26.4 $\pm$ 1.6	[22.3, 30.5]
Personal service occupations, n.e.c.	144,924	26.2 $\pm$ 4.7	[14.1, 38.3]
Operations/systems researchers and analysts	234,803	26.1 $\pm$ 4.3	[15.0, 37.2]
Managers/marketing/advertising/PR	559,732	26.0 $\pm$ 2.8	[18.8, 33.2]
Construction laborers	533,823	25.6 $\pm$ 2.3	[19.7, 31.5]
Laborers, except construction	1,113,198	25.6 $\pm$ 1.7	[21.2, 30.0]
Stationary engineers	127,634	25.6 $\pm$ 4.9	[13.0, 38.2]
Technicians	379,201	25.6 $\pm$ 3.0	[17.9, 33.3]
Supervisors, mechanics and repairers	313,576	24.3 $\pm$ 3.8	[14.5, 34.1]
Street and door-to-door sales workers	260,792	24.0 $\pm$ 4.1	[13.4, 34.6]
Sales workers, apparel	238,207	23.8 $\pm$ 3.3	[15.3, 32.3]
Supervisors, construction	497,756	23.8 $\pm$ 2.8	[16.6, 31.0]
Graders and sorters, except agricultural	98,128	23.1 $\pm$ 5.8	[8.2, 38.0]
Bill and account collectors	93,085	22.4 $\pm$ 5.9	[7.2, 37.6]

**TABLE 3**  
Continued

Occupation	US Worker Estimated Population Size	Cohen's Kappa $\pm$ SE	99% CI for Kappa
Supervisors, distribution, scheduling, and adjusting clerks	171,642	22.4 $\pm$ 4.7	[10.3, 34.5]
Postsecondary teachers, subject unspecified	198,433	22.0 $\pm$ 3.4	[13.2, 30.8]
Sales occupations, other business services	327,893	22.0 $\pm$ 3.2	[13.8, 30.2]
Interviewers	131,426	21.7 $\pm$ 5.3	[8.0, 35.4]
Mail clerks, except postal service	144,492	21.7 $\pm$ 5.5	[7.5, 35.9]
Supervisors, general office	438,127	21.7 $\pm$ 2.9	[14.2, 29.2]
Administrative support occupations	557,575	21.4 $\pm$ 2.5	[15.0, 27.8]
Management analysts	137,707	21.1 $\pm$ 5.4	[7.2, 35.0]
Specified mechanics and repairers	232,263	21.0 $\pm$ 4.0	[10.7, 31.3]
Kitchen workers, food preparation	118,498	20.7 $\pm$ 5.3	[7.0, 34.4]
Stock handlers and baggers	446,403	20.7 $\pm$ 2.6	[14.0, 27.4]
Dressmakers	116,990	20.2 $\pm$ 4.8	[7.8, 32.6]
Machine operators, not specified	455,502	18.1 $\pm$ 2.2	[12.4, 23.8]
Dispatchers	140,790	17.9 $\pm$ 4.9	[5.3, 30.5]
Messengers	90,269	17.6 $\pm$ 6.2	[1.6, 33.6]
Sales workers, radio, TV, hi-fi and appliances	113,113	17.5 $\pm$ 5.4	[3.6, 31.4]
Food counter/fountain/related occupations	110,444	16.1 $\pm$ 4.0	[5.8, 26.4]
Managers, medicine and health	167,045	14.1 $\pm$ 4.0	[3.8, 24.4]
Supervisors, cleaning and building service workers	168,570	13.5 $\pm$ 4.3	[2.4, 24.6]
Supervisors, related agricultural occupations	98,017	12.4 $\pm$ 5.1	[-0.7, 25.5]
Not specified mechanics and repairers	185,480	11.1 $\pm$ 3.0	[3.4, 18.8]
Managers, farms, except horticultural	146,133	9.2 $\pm$ 3.1	[1.2, 17.2]

n.e.c. = not elsewhere classified.

$\underline{\text{u}}$  Additional Tables with Kappa values for subgroups such as sex and race can be obtained from the Study Website at <http://www.rsmas.miami.edu/groups/niehs/niosh/pubs.htm>.

for the use of latest occupation and industry as a surrogate for longest occupation and industry in analyzing the NHIS annual cross sectional data even for chronic disease. Cooper et al. (1993) further analyzed the NHIS 1980 Occupational Supplement.<sup>13</sup> They found that, overall, 42.9% of the workers surveyed were in their longest held job and industry for 5 years or less compared to 15% of workers who were in their longest held job and industry for 20 years and longer.

Data from the present study and others suggest a gradually decreasing trend of concordance between current and longest held job among U.S. workers during the past few decades as workers, particularly women and those of lower socioeconomic class and race-ethnic minorities, are forced to seek multiple jobs over their working life.<sup>4,13,27-32</sup> For example, based on a 1989 Harris and Associates survey on employment and job stopping behavior of US workers approaching retirement age, Ruhm

(1994) found out that, because of health problems, U.S. workers who are nonwhite, female, less educated and in poorly paid occupations have significant problems with either retaining their longest held jobs or obtaining acceptable bridge employment, and frequently change jobs and are forced to leave the labor force early.<sup>27</sup> More optimistically, Gabriel<sup>29</sup> proposed that this apparent increase in labor market mobility might provide increased opportunity for low wagedworkers to move into higher-paying occupations.

### Strengths

There are several advantages to the use of the NHIS to examine concordance between current and longest-held job for different occupations and industries and for different sex, race, and ethnic subgroups, as well as other issues. The NHIS is designed to be representative of the US population; only institutionalized and military groups have been omitted from direct sampling. Survey

participation rates have been excellent (ie, 95% to 98%).<sup>14</sup> Furthermore, in this study, the ability to aggregate data during a period of the 2 years when information on longest held job was collected allowed for the examination of concordance in occupational groups with national employment levels as low as 100,000 persons, and among gender and race-ethnicity subpopulations.

### Limitations

There are several study limitations that should be addressed. The NHIS supplements used in this study collected cross-sectional data from currently working adults in the mid- to late 1980s. With the rapidly changing global economy, it is possible that the concordance between current and longest-held job may have decreased still further in recent years.

These data are based entirely on self-report (by the individual or proxy). The proxy reports of current and longest held job also may have led to systematic errors. To address

this issue, a comparison of self-reported versus proxy data was evaluated for each occupation, and showed no significant differences (data not shown). We concluded that there was no evidence of systematic bias introduced by the inclusion of proxy reports of current and longest held status in the present analysis.

Thus, the present findings represent the best and most recent information on the concordance between current and longest held job among U.S. adults employed in over 200 occupations with annual employment as low as 100,000 US workers.

## Conclusions

In general, moderate-to-high levels of agreement between current and longest-held occupation were observed using data from a large, population-based, representative sample of U.S. workers. The levels of agreement observed in the present analyses indicate that current occupation often can be used as a surrogate for longest-held job (and its exposures) when analyzing the NHIS data as well as other occupational databases. However, specific occupational subgroups, including gender and race-ethnicity occupational subpopulations, may have substantially decreased concordance, particularly among the less skilled and lower paying occupations. Finally, given the rapidly changing employment patterns in the US and elsewhere, confirmatory analyses using more current data are warranted.

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