Health conditions in retired manual labor miners and oil and gas extraction workers: National Health Interview Survey, 2007–2017

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Abstract

Background: Within the mining industrial sector, workers in the mining and oil and gas extraction (OGE) industries have demonstrated disparities in chronic health status compared with the general working population. However, we know much less about miner and OGE worker health once retired. This study separately compares chronic illnesses in retired miners and OGE workers with all other retirees.

Methods: National Health Interview Survey (NHIS) public data were analyzed for the years 2007–2017 to estimate weighted unadjusted and adjusted prevalence of selected health conditions (cancer, cardiovascular disease, high cholesterol, diabetes, hypertension, respiratory conditions, health status, and hearing loss) in retirees. Three retired worker groups (miners, OGE, and other retirees) were defined using the respondents' longest-held industry and occupation.

Results: Higher prevalence of a number of adverse health conditions was noted in miners and OGE workers when compared with all other retirees. A significantly higher adjusted prevalence of hypertension, hearing loss, functionally limiting lung problems, and fair or poor health was seen in

miners over other retirees. Retired OGE workers demonstrated a significantly higher adjusted prevalence of both hearing loss and poor health status.

Conclusions: Miners and OGE workers have higher morbidity during their working years, and this study demonstrates that poorer health appears to continue into retirement. These results suggest the need to expand occupational health and safety programs in the mining sector to improve the health of workers into retirement. Future studies that include more robust information on workplace exposures are needed to evaluate the long-term health of retired workers.

Keywords

chronic disease; epidemiology; mining; occupational health; retired workers

1 | INTRODUCTION

Mining and oil and gas extraction (OGE) are industries with chronically poorer health compared with the general working population.[1–8] Data from the National Institute for Occupational Safety and Health (NIOSH)National Occupational Mortality Surveillance (NOMS) system have demonstrated excessive mortality in miners from heart disease, renal disease, and several types of cancers, including laryngeal, prostate, bladder, and kidney[9]; and in OGE workers, from Parkinson's disease, heart disease, and cancers (mesothelioma, prostate, bladder, and kidney).[10]

Because the incidence or severity of many health conditions increases with aging, evaluating health disparities between retired workers in different industries is important to determine if work-related exposures affect workers' health in retirement. With the aging of the baby boom generation, the number of retirees has been rapidly increasing in the United States.[11] We know little about retired miner and OGE worker health in the United States. Although high rates of respiratory symptoms, lung disease, and hearing loss have been documented among retired and ex-miners,[4,12–15] less is known about the burden of other diseases or how the health of retired miners and OGE workers compares with other retirees. Our study examined the health of retired workers using the National Health Interview Survey (NHIS), a nationally representative survey of civilian, noninstitutionalized adults that collects information on this population's longest-held job, health status, and chronic diseases.

NHIS industry and occupation data allow for the grouping of workers in a given industry into manual and nonmanual labor occupations.[16] Of particular interest in the mining and OGE industries are health conditions in the manual labor occupations, as manual labor workers comprise the vast majority of mining industry workers.[17] Additionally, prior research with NHIS data has shown that morbidity and mortality differ significantly between occupational groups within industry sectors.[16,18]

Although many chronic diseases increase with age, comparing retired manual labor miners and OGE workers with all other retirees can elucidate an excess of chronic illnesses in the former. We hypothesized that, after adjusting for potential confounders, manual labor miners and OGE workers have an increased prevalence of selected chronic disorders compared with other retirees.

2 | MATERIALS AND METHODS

2.1 | Study population

The NHIS is an annual cross-sectional survey administered by the National Center for Health Statistics (NCHS) through the US Census Bureau (USCB). The USCB collects information on a broad range of health topics through personal household interviews of the civilian, noninstitutionalized US population. NHIS datasets for the years 2007–2017 were aggregated to ensure an adequate sample size for the mining industry, allow for maximal aggregation of variables across survey years, and to keep results relatively timely. The study was considered exempt from institutional review board approval because the data were deidentified and publicly available. During the years examined, the NHIS included four core modules: Household, Family, Sample Child, and Sample Adult. The Household and Family core modules collected health and sociodemographic information on each member of each family residing within the sample household. Industry and occupation data were obtained from the Sample Adult core module.

From 2007 to 2017, over 300,000 Sample Adult core module observations were available for analysis. We used the Integrated Public Use Microdata Series (IPUMS) tool, funded by the National Institutes of Health (NIH), to aggregate the NHIS data and harmonize variables to create the 11-year data set.[19] We followed guidelines for pooling data across multiple years as recommended by the NCHS and made adjustments for variance calculations, annual stratifications, clusters, and sample weights.[20,21]

2.2 | Health conditions of interest

NHIS asks sample adults if they had worked in the past week before the interview. Participants who responded "no" were asked their main reason for not working, and participants who responded "retired" were asked what job they held the longest. Verbatim responses regarding industry and occupation were obtained from each eligible sample adult. [22] The industry and occupation text data were subsequently reviewed by USCB coding specialists, who assigned the appropriate four-digit Census Bureau codes for industry and occupation. Census codes are based on the 2004 North American Industry Classification System (NAICS) and the US Bureau of Labor Statistics 2000 Standard Occupational Classification System.[23] We used the publicly available NHIS two-digit recodes of the four-digit census codes for our analyses; both simple (i.e., fewer, collapsed groups) and detailed recodes were used.

Three retired worker groups were defined using a combination of industry and occupation codes. Miners and OGE workers are in the same NAICS sector (21: "Mining, Quarrying, and Oil and Gas Extraction"). We defined "miners" as being in NHIS detailed industry code 7 ("mining, except oil and gas") and in a manual labor occupation (NHIS simple recodes 18–22 comprising the following occupation groups: farming, fishing, and forestry; construction and extraction; installation, maintenance, and repair; production; and transportation and material moving). We defined OGE workers as being in NHIS detailed industry code 6 ("oil and gas extraction") or 8 ("support activities for mining") and in a manual labor occupation (NHIS simple recode 18–22). According to the US Bureau of

Labor Statistics,[23] NHIS detailed industry recode 8 predominately contains OGE workers, so we included these workers in the OGE category. A third group, "all other retirees," was defined as retired workers with non-missing values in all other industries and occupations. We focused on manual labor workers for mining and OGE, as these workers have different occupational exposures than those with office-based positions, many of which are located in urban headquarters.

Only health conditions noted in the dataset that had a large enough sample size to result in a coefficient of variation (CV) of <50% were analyzed. All health conditions were self-reported by participants. From the Sample Adult core module, these included: cancer (ever told by a doctor or other health professional had cancer, any kind); cardiovascular disease (ever told had heart attack, or ever told had coronary heart disease, or ever told had a heart condition, or ever told had angina); high cholesterol (ever told had high cholesterol; question only available for years 2007–2008, 2012, 2015–2017); diabetes or prediabetes (ever told had diabetes/prediabetes); hypertension (ever told had hypertension on 2+ separate visits); any lung condition (ever told had emphysema, or still have asthma, or told had chronic bronchitis in past 12 months); and hearing quality without a hearing aid. Hearing quality was reported in five categories, and the answers "a lot of trouble" and "deaf" were lumped together. From the Family core module, we abstracted data on self-reported health status and functional or activity limitation from a lung or breathing problem. Functional or activity limitation from a lung or breathing problem was defined with any "yes" response to questions on difficulties with specific activities (e.g., "By yourself, and without any special equipment, how difficult is it for you to…"), followed by indicating "a lung/breathing problem" on the follow-up question on the condition or health problem causing the limitation.

2.3 | Covariates

Demographics and potential confounders (obtained from the participant via the Family core module or added by the interviewer during processing) included age, sex, race/ethnicity, interview language, geographic region, education, and smoking status. Age was collapsed into the categories 18–54, 55–64, and 65 due to the age distribution of the retired subsample. Race and ethnicity were separate variables that collapsed into "white, non-Hispanic," "black, non-Hispanic," "other, non-Hispanic," and "Hispanic." Education was collapsed into the categories "less than high school," "high school graduate or GED," "some college or technical school," and "college graduate or more." Smoking status was categorized as "current or former" and "never."

2.4 | Statistical analyses

Analyses were conducted using Stata/SE 16.0 svy (survey) commands to account for the complex sampling design of the NHIS and post-survey weighting. All prevalence estimates were weighted using the NHIS sample adult record weight, representing the US civilian, noninstitutionalized population age 18 years and older, adjusted for the multiyear sample and change in sampling scheme. Using NHIS precision criteria, weighted point estimates with a CV 30% are reported without qualification; those with a CV > 30% but <50% are

noted in the text and tables (as *interpret with caution*), while estimates with a CV > 50% are not reported.

Unadjusted, weighted prevalence estimates of the selected health conditions were calculated for the three groups of retired workers. Adjusted and unadjusted prevalence ratio (APR and PR) estimates were calculated for retired miners and OGE workers with the "all other retirees" group as the reference group. Hearing quality and health status prevalence ratios focused on "fair" or "poor" health and moderate hearing loss-to-deafness to quantify the degree of poor health and hearing loss in retired miners and OGE workers. Covariates included in the adjusted models were age (continuous), sex, race/ethnicity, education, and smoking status.

3 | RESULTS

For the years 2007–2017, 332,297 adults participated in the Sample Adult core module. Of those, 306,083 (92.1%) adults reported having ever worked and provided valid industry and occupation information. Of those who had ever worked, 58,844 (19%) were retired. Among the retired workers in the 11-year sample, 207 miners (0.4%), 124 OGE workers (0.2%), and 58,513 other retirees (99.4%) were identified (Table 1, unweighted).

The three groups of retirees in the sample differed in sociodemographic composition (Table 1). Similar proportions of miners, OGE workers, and all other retirees were 65 years of age. Nearly all retired miners and OGE workers were males (98%) compared with less than half of all other retirees (44.6%). Most miners, OGE workers, and all other retirees were white and non-Hispanic, while the highest percentage of Hispanic workers (14.3%) was seen in OGE retirees. Additionally, the majority of retired OGE workers lived in the US South region (74.7%), while less than half of miners (43.4%) and all other retirees (35.3%) resided in the South. A plurality of miners and OGE workers reported having attained less than a high school degree (44.9% and 33.7%, respectively), compared with only 16.2% among all other retirees. Time on the job was largely consistent between groups; OGE workers had the highest proportion of retirees working at their job for 35 years (17.6%), with miners reporting similar proportions to all other retirees (13.7% vs. 14.8%, respectively).

Retired miners, OGE workers, and all other retirees had similar prevalence estimates of ever being diagnosed with any type of cancer (Tables 2 and 3). The prevalence of ever having any cardiovascular disease was the highest in miners at 41.6% (Table 2). However, after adjustment for demographics and smoking status, miners' prevalence of ever having a cardiovascular disease was not significantly elevated (APR, 1.2; 95% confidence interval [CI], 1.0–1.5; Table 3) compared with all other retirees. Similarly, the unadjusted prevalence of ever having high cholesterol or diabetes/prediabetes was also the highest for miners but the contrast with other retirees was likewise reduced after adjustment.

Retired miners had a significantly higher prevalence of ever having hypertension than all other retirees (APR, 1.2; 95% CI, 1.04–1.3). Miners and OGE workers both had a higher prevalence of hearing loss compared with all other retirees, with 17.6% of miners and 14.7% of OGE workers reporting a lot of trouble or deafness, compared with 7.1% of all other

retirees. Miners and OGE workers were both 50% more likely to report moderate-to-deaf hearing loss compared with all retirees (APR, 1.5; 95% CI, 1.1–2.0 for both). However, only miners were significantly more likely to report a lot of trouble/deaf hearing compared with all other retirees (APR, 1.7; 95% CI, 1.1–2.5).

Retired miners had the highest prevalence estimate of self-reported fair health (27.5%) compared with retired OGE workers (19.4%) and all other retirees (15.9%); OGE workers had the highest unadjusted prevalence estimate of self-reported poor health (although this estimate was less stable) and were over twice as likely to report poor health status (APR, 2.1; 95% CI, 1.2–3.9) than all other retirees. Miners were significantly more likely to report fair or poor health (APR, 1.4; 95% CI, 1.1–1.7) compared with all other retirees.

Retired miners and OGE workers had a similar prevalence of functionally limiting lung or breathing problems, and miners were significantly more likely to report a functionally limiting lung or breathing problem compared with all other retirees (APR, 1.8; 95% CI, 1.1–2.9). Although miners and OGE workers reported a higher prevalence of ever having any lung condition (18.8% and 19.4%, respectively), this was not significantly different than all other retirees.

4 | DISCUSSION

This analysis revealed that retired manual labor miners and OGE workers had a higher unadjusted burden than other retirees of every adverse health condition reported in NHIS except for any cancer. After adjustment for potential confounders, retired miners had a significantly higher prevalence of hypertension, hearing loss, functionally limiting lung or breathing problems, and fair or poor health than all other retirees. Retired OGE workers had a significantly higher prevalence of hearing loss and poor health status than all other retirees.

These results are consistent with previous research. In our analyses, one of the greatest health differentials between retired miners and OGE workers and other retirees was hearing loss. It is well-documented that miners and OGE workers are exposed to high noise levels. [2,7,14] Despite efforts by government, industry, and manufacturers to improve the design of equipment and promote hearing protection programs, an analysis of workers in 2014 showed that the mining and OGE sector and production occupations (manual labor occupations) both had the highest prevalence of self-reported occupational noise exposure (61% and 55%, respectively), with workers in the mining and OGE sector reporting a 2.5 times higher likelihood of having hearing difficulty compared with all other workers.[24]

Similar to hearing loss, miners also have a well-documented history of respiratory disease compared with the general population, particularly progressive and potentially fatal work-related lung diseases such as coal workers' pneumoconiosis. Retired underground ore miners in Sweden displayed increased chronic bronchitis and chronic productive cough compared with the general population, even several years after the end of the exposure.[4] Therefore, the significantly higher prevalence of a functionally limiting lung or breathing problem in retired miners compared with all other retirees was expected. However, somewhat paradoxically, miners in our sample did not show an increased likelihood of reporting any

lung condition. The "any lung condition variable" included the following conditions: functionally limiting lung/breathing problem, activity-limiting lung/breathing problem, current asthma, ever diagnosed with emphysema, and diagnosed with chronic bronchitis in the past 12 months. The similar prevalence between miners and other retirees may be due to the limitations of this aggregated variable, which was necessary because of the small sample size of each individual condition. Additionally, the chronic bronchitis question only asked about new diagnoses in the last 12 months. If a retiree had chronic bronchitis diagnosed before the previous year, they would not be included.

Hypertension was another condition where prevalence varied by industry in our study. Retired miners showed an increased prevalence of hypertension compared with the general population of retirees, complementing previous NHIS research that found current miners also had increased hypertension compared with workers in other industries.[25] Production occupations and high noise exposure (both characteristics of the mining industry) have also been linked to hypertension.[26]

Self-reported health status was also significantly different among the groups in our study. Retired miners and OGE workers reported fair or poor health significantly more than all other retirees. In the European Union (EU) countries, no association has been found in self-reported health by manual versus nonmanual labor status for retirees in all industries.[27–30] However, a previous study using NHIS data is consistent with our results, showing that the US mining and OGE sector had one of the highest percentages of self-reported fair or poor health, especially among those currently in manual labor occupations.[18] A systematic review of retirement studies in the EU showed conflicting results on whether retirement is linked to self-reported general health status.[28] However, a Netherlands study found that those who involuntarily retired (as perceived by the worker, involuntarily for any reason) were more likely to report poorer health post-retirement.[30] The cyclical nature (boom and bust) of extraction industries lends itself to potential involuntary retirements for workers. Additionally, miners and OGE workers in the United States do not have a required age of retirement and may continue working until they can no longer physically keep up with job demands. If a miner or OGE worker is more likely to have poor health and retires as a result of these health reasons, they may be more likely to report poor health post-retirement as well.

In contrast to hearing loss, functionally limiting lung or breathing problems, hypertension, and self-reported health status, we did not find differences in the adjusted prevalence of diabetes, cardiovascular disease, and cholesterol between the retirement groups. Our results are similar to previous NIOSH research using NHIS data for current workers, which did not find that the mining and OGE sector (NAICS 21) has a particularly high burden of diabetes. [25] However, the same report showed that this sector had one of the highest burdens of cardiovascular disease. The small sample size of mining and OGE sector workers in our NHIS aggregate sample potentially obscured differences for cardiovascular disease. Additionally, previous studies have demonstrated excessive mortality from heart conditions in mining and OGE workers[9,10]; however, those studies adjusted for age alone, while in this study we adjusted for several covariates that could influence the association. Although previous research has found an association between high cholesterol in current workers and

high noise exposure,[24] high cholesterol data were only available in NHIS for 6 of the 11 years of our analyses. Additionally, the prevalence of both cardiovascular disease and high cholesterol risk increase with age,[31] which may obscure differences between groups of retired workers.

We did not find a higher prevalence of cancer in retired mining and OGE workers. Current workers in the mining and OGE sector overall have not been shown to have a higher burden of cancer compared with other sectors.[25] Although we found a relatively high burden of cancer in all retired workers in general, most likely because advancing age is the single most important risk factor for cancer overall,[32] we did not find a difference in burden among the three groups. Due to small sample sizes for mining and OGE, we could not examine types of cancer individually.

4.1 | Limitations

Several limitations are inherent to self-reported population survey data. Because NHIS data are cross-sectional, causal inferences are not possible. Self-reported outcomes in NHIS may be subject to both recall and social desirability bias. In addition, misclassification of industry or occupation may occur during the coding of usual work.

The sample size was perhaps the biggest limitation of this study. Retired workers only composed 19% of the total 11-year NHIS data set, and manual labor miners and OGE workers only 0.6% of the retired workers (unweighted figures). These small samples led to large confidence intervals and limited statistical power in this study, particularly for less common outcomes. The NHIS sampling design does not consider industry and occupation in their sampling scheme, so while the NHIS is representative of the US population as a whole, small industries such as mining and OGE may still have few participants overall. The mining and OGE sector only employs 0.7% of working adults and an unknown percentage of retired workers in the United States.[33]

Additionally, as indicated in Table 1, these samples of miners and OGE workers were overwhelmingly male (98%). As such, the adjustment for potential confounding of certain health conditions by sex may be incomplete.

5 | CONCLUSION

Despite limitations, to our knowledge, this is the first study examining the health of retired manual labor miners and OGE workers compared with all other retirees in the United States. Workers in the mining and OGE sector have been found to have higher morbidity for certain disorders and health conditions during their working years, and we found that these findings appear to continue into retirement. Additionally, their self-reported health in retirement was significantly worse than all other retired workers. These results suggest that improvement of worker health and safety by continuing to reduce workplace exposures to prevalent hazards (noise, silica, diesel exhaust) and using approaches that integrate illness prevention efforts with the traditional focus on safety may be beneficial in this sector. These results also highlight the importance of better characterization of occupational exposures that may

contribute to the observed differences in health outcomes. These approaches could improve the overall health of mining and OGE workers into retirement.

Future studies of morbidity are needed with more retirees, both in general and within the mining and OGE sector, along with better information on workplace exposures. These studies will be an essential step in understanding commonalities and differences in the interaction of work experiences and health outcomes among workers and how these health effects can persist into retirement.

ACKNOWLEDGMENTS

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TABLE 1

Distribution of retired adults by selected characteristics and occupational group for the longest-held job—from the National Health Interview Survey (NHIS), 2007−2017

Characteristic	Miners N^a, %^{b} (95% CI)	OGE workers N^a, %^{b} (95% CI)	All other retirees N^a, %^{b} (95% CI)
Age group (years)			
18–54	1, –	1, –	532, 1.2 (1.0–1.3)
55–64	32, 15.0 (10.1–21.7)	18, 16.0 (9.2–26.3)	7478, 15.5 (15.1–16.0)
>65	174, 84.0 (77.1–89.1)	105, 82.6 (72.1–89.7)	50,503, 83.3 (82.8–83.7)
Sex			
Male	199, 97.5 (93.9–99.0)	121, 97.9 (91.6–99.5)	24,125, 44.6 (44.1–45.1)
Female	8, 2.5^c (1.0–6.1)	3, –	34,388, 55.4 (54.9–55.9)
Race/ethnicity			
White, non–Hispanic	166, 84.7 (77.4–90.0)	91, 77.8 (68.0–85.3)	44,589, 81.3 (80.7–81.9)
Black, non–Hispanic	18, 5.5 (3.1–9.8)	6, –	6976, 8.6 (8.1–9.0)
Other, non–Hispanic	7, –	8, 4.9^c (2.0–11.4)	2688, 4.0 (3.7–4.2)
Hispanic	16, 7.5^c (3.9–13.7)	19, 14.3^c (8.3–23.5)	4260, 6.2 (5.8–6.5)
Interview language			
English	201, 98.6 (96.4–99.5)	115, 89.6 (79.0–95.2)	56,514, 97.2 (96.9–97.4)
Spanish	1, –	4, 4.6 (2.9–7.3)	1095, 1.4 (1.3–1.6)
Other	5, –	5, –	897, 1.4 (1.2–1.6)
Region of residence			
Northeast	13, 9.3^c (4.9–17.1)	4, –	10,444, 18.8 (18.0–19.6)
North Central/midwest	33, 24.9 (14.8–38.7)	13, 7.7^c (3.6–15.8)	13,844, 24.3 (23.5–25.2)
South	93, 43.4 (32.2–55.4)	78, 74.7 (64.5–82.7)	20,173, 35.3 (34.2–36.5)
West	68, 22.3 (15.3–31.5)	29, 14.9 (9.1–23.3)	14,052, 21.6 (20.7–22.5)
Education			
Less than high school	92, 44.9 (36.1–54.1)	44, 33.7 (23.7–45.4)	10,648, 16.2 (15.7–16.7)
High school graduateb or GED	74, 33.2 (25.2–42.3)	42, 29.7 (21.5–39.4)	17,844, 31.1 (30.5–31.6)
Some college or technical school	24, 13.0 (7.7–21.0)	17, 15.2 (9.4–23.6)	9965, 16.9 (16.4–17.3)

Characteristic	Miners	OGE workers	All other retirees
	N^a, %^{b} (95% CI)	N^a, %^{b} (95% CI)	N^a, %^{b} (95% CI)
College graduate or more	17, 8.9^c (4.8–15.9)	21, 21.4 (13.6–32.0)	19,820, 35.9 (35.2–36.5)
Years on job			
<1–14 years	44, 24.6 (17.4–33.5)	36, 28.0 (18.9–39.5)	18,823, 31.6 (31.1–32.2)
15–25 years	73, 33.0 (26.5–40.2)	40, 34.5 (25.9–44.2)	15,826, 27.2 (26.8–27.7)
25–34 years	61, 28.7 (20.7–28.4)	26, 19.9 (13.5–28.3)	14,844, 26.3 (25.8–26.8)
35 years	27, 13.7 (8.9–20.5)	21, 17.6 (9.9–29.3)	8266, 14.8 (14.4–15.2)
Total	207	124	58,513
Weighted total	111,376	76,955	34,463,912

Note: "–" Coefficient of variation >50%; cannot be reported.

Abbreviations: CI, confidence interval (weighted); GED, General Educational Development: OGE, oil and gas extraction.

[a] Unweighted.

[b] weighted.

[c] Coefficient of variation >30%; interpret with caution.

TABLE 2

Unadjusted, weighted prevalence estimates of selected outcomes for retired adults by occupational group—from the National Health Interview Survey (NHIS), 2007–2017

Outcome	Miners % (95% CI)	OGE workers % (95% CI)	All other retirees % (95% CI)
Any cancer	24.0 (17.9–31.3)	23.2 (13.7–36.3)	24.5 (24.0–24.9)
Cardiovascular disease [a]	41.6 (32.2–51.7)	34.5 (24.0–46.8)	28.6 (28.1–29.1)
High cholesterol [b]	61.8 (48.5–73.5)	51.9 (36.8–66.7)	53.0 (52.2–53.7)
Diabetes/prediabetes	34.2 (25.0–44.7)	28.4 (19.5–39.3)	22.3 (21.9–22.8)
Hypertension in 2+ visits	66.6 (58.9–73.4)	50.6 (38.8–62.4)	54.9 (54.3–55.4)
Hearing			
Excellent	11.8 (6.8–19.7)	14.0 (7.9–23.6)	26.1 (25.5–26.6)
Good	31.5 (22.6–42.1)	23.1 (15.8–32.4)	37.9 (37.4–38.4)
A little trouble	21.2 (14.3–30.1)	28.1 (20.2–37.7)	19.1 (18.7–19.5)
Moderate trouble	18.0 (11.4–27.2)	20.1 (12.7–30.5)	9.8 (9.5–10.1)
A lot of trouble/deaf	17.6 (11.3–26.3)	14.7 (8.3–24.7)	7.1 (6.9–7.4)
Health			
Excellent	8.1 [c] (4.3–14.6)	16.5 (9.5–27.2)	15.4 (15.0–15.8)
Very good	20.8 (14.2–29.5)	24.3 (15.2–36.6)	30.4 (29.9–30.9)
Good	34.3 (26.4–43.2)	26.6 (18.0–37.3)	33.9 (33.4–34.5)
Fair	27.5 (21.0–35.1)	19.4 (12.1–29.6)	15.9 (15.5–16.3)
Poor	9.3 [c] (4.4–18.7)	13.1 [c] (7.0–23.2)	4.4 (4.1–4.6)
Any lung condition [d]	18.8 (13.4–25.7)	19.4 (11.8–30.2)	15.2 (14.8–15.6)
Functionally limiting lung/breathing problem	10.2 (6.2–16.1)	9.6 [c] (4.8–18.2)	4.5 (4.3–4.8)

Abbreviation: OGE, oil and gas extraction.

[a] Cardiovascular disease variable aggregated from "ever told had heart attack," "ever told had coronary heart disease," "ever told had heart condition," and "ever told had angina."

[b] Only available for years 2007–2008, 2012, 2015–2017.

[c] Coefficient of variation >30%; interpret with caution.

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[d]Any lung condition variable aggregated from "functionally limiting lung/breathing problem," "activity limiting lung/breathing problem," "still has asthma," "ever told had emphysema," and "told had chronic bronchitis, past 12 months."

TABLE 3

Unadjusted and adjusted[a] weighted prevalence ratios of selected outcomes for retired adults by occupational group, compared with all other retired workers—from the National Health Interview Survey (NHIS), 2007−2017

Outcome	All other retirees PR (95% CI)	Miners PR (95% CI)	Miners APR[a] (95% CI)	OGE workers PR (95% CI)	OGE workers APR[a] (95% CI)
Any cancer	1.0 (ref)	1.0 (0.7–1.3)	0.9 (0.7–1.2)	0.9 (0.6–1.5)	0.9 (0.6–1.5)
Cardiovascular disease[b]	1.0 (ref)	1.5*(1.1–1.8)	1.2 (1.0–1.5)	1.2 (0.9–1.7)	1.0 (0.7–1.4)
High cholesterol[c]	1.0 (ref)	1.2 (0.9–1.4)	1.1 (0.9–1.4)	1.0 (0.7–1.3)	0.9 (0.7–1.3)
Diabetes/pre–diabetes	1.0 (ref)	1.5*(1.1–2.1)	1.2 (0.9–1.6)	1.3 (0.9–1.8)	1.0 (0.7–1.4)
Hypertension in 2 + visits	1.0 (ref)	1.2*(1.1–1.4)	1.2*(1.04–1.3)	0.9 (0.7–1.2)	0.9 (0.7–1.1)
Hearing					
Moderate loss to deaf	1.0 (ref)	2.1 (1.6–2.8)	1.5*(1.1–2.0)	2.1*(1.5–2.8)	1.5*(1.1–2.0)
A lot of trouble/deaf	1.0 (ref)	2.5*(1.6–3.8)	1.7*(1.1–2.5)	2.1*(1.2–3.6)	1.4 (0.8–2.5)
Health status					
Fair or poor	1.0 (ref)	1.8*(1.4–2.3)	1.4*(1.1–1.7)	1.6*(1.1–2.3)	1.2 (0.8–1.8)
Poor	1.0 (ref)	2.1*(1.0–4.4)	1.5 (0.7–3.0)	3.0*(1.6–5.5)	2.1*(1.2–3.9)
Any lung condition[d]	1.0 (ref)	1.2 (0.9–1.7)	1.2 (0.9–1.7)	1.3 (0.8–2.0)	1.3 (0.8–2.0)
Functionally limiting lung/breathing problem	1.0 (ref)	2.2*(1.4–3.6)	1.8*(1.1–2.9)	2.1*(1.1–4.1)	1.8 (0.9–3.4)

Abbreviations: APR, adjusted prevalence ratio; CI, confidence interval; OGE, oil and gas extraction; PR, prevalence ratio.

[a] Adjusted for race/ethnicity, sex, age, education, and smoking status.

[b] Cardiovascular disease variable aggregated from "ever told had heart attack," "ever told had coronary heart disease," "ever told had heart condition," and "ever told had angina."

[c] Only available for years 2007−2008, 2012, 2015−2017.

[d] Any lung condition variable aggregated from "functionally limiting lung/breathing problem," "activity limiting lung/breathing problem," "still has asthma," "ever told had emphysema," and "told had chronic bronchitis, past 12 months."

* p < 0.05.