



# Prevalence, Characteristics, and Risk Factors of Chronic Disease by Industry and Occupation in New Hampshire: 2013-2018



# Contributors

Peter Antal, PhD, Antal Consulting, LLC

Karla R. Armenti, MS, Sc.D., NH Occupational Health Surveillance Program, Institute on Disability, University of New Hampshire

Michael Laviolette, PhD, MPH, Division of Public Health Services, New Hampshire Department of Health and Human Services

Daniela Malagon, MPH, The Dartmouth Institute

Jessica Sagona, PhD, Division of Public Health Services, New Hampshire Department of Health and Human Services

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Marisa Lara, MPH, RD, Division of Public Health Services, New Hampshire Department of Health and Human Services

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# Executive Summary

In collaboration with the National Institute for Occupational Safety and Health (NIOSH) and the Council of State and Territorial Epidemiologists (CSTE), the NH Occupational Health Surveillance Program (OHSP) identifies priority health measures and risk factors to inform the development and implementation of occupational health standards and targeted health interventions in the workplace.

As a part of its mission, the OHSP sought to summarize the prevalence of cancer, diabetes, arthritis, and hypertension among New Hampshire workers to guide prevention and treatment strategies. Using the NH Behavioral Risk Factor Surveillance System (BRFSS) survey data from 2013-2018, we aimed to assess the prevalence of chronic conditions, the characterization of demographic factors and health behaviors, and how these varied by industry and occupation classifications. We looked at the incidence of arthritis, cancer, diabetes, and hypertension to better understand whether those working in certain jobs may be at increased exposure to environmental or work process factors that could contribute to these diseases. To provide context to the data, we also looked at distributions of chronic disease by age, gender, and ethnicity, as well as by health behaviors (currently smoking, heavy drinking, obesity, and lack of exercise) and fair/poor health status.

Findings demonstrate that BRFSS data can be a useful tool in documenting significant differences for disease prevalence by demographic as well as certain behavioral risk factors. However, due to limited sample sizes across the six-year period, as well as differences in the relationship between demographic factors and disease prevalence among the groups studied, there appears to be limited direct utility to using BRFSS data to assess the prevalence of chronic disease by industry and occupation, let alone to use this information to guide prevention efforts. Findings of significant differences were rare, and, when found, the magnitude of the differences were small.

However, a review of certain health behaviors—in particular, variables related to smoking status, obesity, and exercise history, as well as perceptions of health status—may, when combined with other sources of information, be useful for guiding outreach and prevention efforts among industry and occupation sectors. Multiple significant and meaningful differences were documented across these areas, suggesting a range of industry and occupation types which may benefit from further research and/or intervention strategies aimed at improving behaviors and/or work environments which can contribute to chronic disease.



# Introduction

Workers in a range of occupations are at risk of being negatively impacted in terms of their health status by their working conditions (Madrigal et al., 2016). The association between work-environment exposure and the incidence of chronic conditions is overlooked, partly due to the fact that exposure determination is variable and uncertain (Waters et al., 2015). However, increased surveillance warrants attention given the longevity of occupational exposure; approximately 50% of a U.S. civilian worker's life is spent at the workplace (U.S. Department of Health and Human Services, 2020).

The lack of in-depth information pertaining to occupational exposure by industry is a limitation in the development of interventions and initiatives for the improvement of the work environment (Madrigal et al., 2016). Identifying the association of occupational exposures could provide a platform for preventative efforts by policy development for workplace-specific safety protocols. The National Institute for Occupational Safety and Health

(NIOSH) collaborates with various partners to expand the knowledge of occupational safety and health and promote workers' environmental conditions (Centers for Disease Control and Prevention [CDC], 2018). By funding the incorporation of industry and occupation questions to the Behavioral Risk Factor Surveillance System (BRFSS), NIOSH has expanded opportunities to do national population-based studies based on reported health, preventive health practices, risk behaviors, and chronic conditions by industry and occupation (CDC, 2021).

The purpose of this research effort was to investigate the proportion of chronic conditions among New Hampshire workers. Primarily, the aim was to explore the prevalence of cancer, diabetes, hypertension, and arthritis across occupation and industry. Through data analysis, we identified and described the distribution of the population by sex, age, race/ethnicity, smoking status, alcohol consumption, obesity, physical activity, and health status.





# Methods

## Study Design and Setting

This retrospective cross-sectional study used the New Hampshire Behavioral Risk Factor Surveillance System (BRFSS) from 2013-2018. The BRFSS survey is a national telephone survey system established by the Centers for Disease Control and Prevention (CDC) to collect demographic data and health data information such as risk behaviors, chronic conditions, and preventive service usage (CDC, 2014).

## Study Population and Descriptive Variables

We combined multiple-year data to evaluate the prevalence of chronic conditions between 2013 and 2018 in New Hampshire. In comparison to arthritis, cancer, and diabetes, survey data for hypertension was only available for 2013, 2015, and 2017.

The population of non-institutionalized adults 18 years or older in New Hampshire with a diagnosis of arthritis, cancer, diabetes, or hypertension was described in terms of baseline characteristics that included age, sex, and race/ethnicity. Additional information on New Hampshire adults was reviewed regarding smoking status, heavy alcohol consumption, reported physical activity, obesity, and health status. Age was post-stratified as "18-44," "45-64," and "65+" to match previously used categories in BRFSS CDC reports for prevalence estimates. We used the calculated variables by the BRFSS for reports of race and ethnicity (non-Hispanic white, Hispanic, or non-white), health status (good or better health, fair or poor health),

smoking status (current smoker, former smoker, and never smoked), heavy alcohol consumption (two drinks per day for men and one drink per day for women), physical activity (report of physical activity or exercise during the last 30 days other than from a regular job), and overweightness and obesity ( $BMI \geq 25$ ). For all variables, responses with missing, unknown, or refusal values were omitted from the analysis.

## Outcome Measure

The outcome measure was the presence of chronic disease described by a current or past diagnosis of arthritis, cancer, diabetes, or hypertension across industry and occupation categories. The secondary measure was the presence of health behaviors and health risk factors defined by reports of fair or poor health, current smoking (having smoked at least 100 cigarettes in addition to current daily or frequent weekly smoking), heavy alcohol drinking (having more than two drinks per day for adult men and having more than one drink a day for adult women), overweightness or obesity ( $BMI \geq 25$ ), and physical activity (physical activity or exercise such as running, calisthenics, golf, gardening, or walking during the last 30 days other than for a regular job). We used the guidelines provided by the CDC for suppression of the industry and occupation proportion data (Parker et al., 2017). Data stratification and weighting protocols for the BRFSS were followed to produce an adequate statewide population representation of the New Hampshire community (CDC, 2021).



## Statistical Analysis

R Version 3.6.2 was used as the primary statistical software (R Core Team, 2018). The tidyverse and srvyr R packages were used for the descriptive statistics and the bivariate analyses of the prevalence of chronic disease between 2013-2018 (Ellis, 2021; CDC, 2021). Microsoft Excel software was used for data visualization of prevalence of chronic disease by occupation and industry.

## Confidence Intervals

Estimates for confidence intervals for statewide disease prevalence range from +/- 0.3 to +/-0.9. Estimates for disease prevalence based on demographics range from +/- 0.3 to +/-3.6. Estimates for disease prevalence based on industry and occupation range from +/- 0.9 to +/-50 or more as response sizes were particularly small in two instances. Occupations for farming, fishing, and forestry had an N of 30 for hypertension related questions, whereas industry responses for management of companies and enterprises was only 8 for hypertension. Most other areas had responses ranging in the hundreds with several in the thousands.



# Results

## Prevalence of Chronic Disease

The overall prevalence of chronic disease among all populations in New Hampshire was 7.9% for cancer, 9% for diabetes, 29.8% for hypertension, and 27.4% for arthritis. Distribution of disease across the NH population varies by demographic characteristics. As shown in Table 1, multiple significant differences were identified by age, race, and ethnicity.

### Cancer

Among those living with cancer (7.9%), rates among females were significantly higher (9.3%) as were those ages 65+ (18.3%), though there were only minor differences between men and women aged 65+ (18.4% and 18.2% respectively). Women ages 45-64 also had a significantly higher rate (10%) than the state average. Among those responding to the BRFSS survey who were non-white or Hispanic, cancer prevalence was significantly lower at only 4%. (This is likely because minorities in NH tend to be younger). Men were significantly lower at 6.5%.

### Diabetes

Among those living with diabetes (9%), rates among males were significantly higher (10.1%) as were those ages 45-64 (10.8%) and 65+ (19.5%). While women age 65+ had significantly higher

prevalence than the state average (16.4%), men were significantly higher across the 45-64 and 65+ age groups (12.8% and 23.1%). No significant differences were observed among non-white or Hispanic populations.

### Hypertension

Those living with hypertension (29.8%) held a demographic pattern similar to those living with diabetes. Rates among males were significantly higher (32.8%) as were those ages 45-64 (33.9%) and 65+ (59.1%). While women age 65+ had significantly higher prevalence than the state average (57.3%), men were significantly higher across the 45-64 and 65+ age groups (39.6% and 61.3%). Non-white or Hispanic populations were significantly lower (23.4%).

### Arthritis

Among those living with arthritis (27.4%), rates among females were significantly higher (31%) as were those ages 45-64 (33.1%) and 65+ (52.5%), with women consistently showing higher prevalence across older age groups (57.4% vs. 46.8% among 65+, and 36.4% vs. 29.8% among women and men ages 45-64). Among those responding to the BRFSS survey who were non-white or Hispanic, arthritis prevalence was significantly lower at only 18.9%.



**TABLE 1***Disease Prevalence by Age, Gender, and Race/Ethnicity for the General Population*

<b>CHARACTERISTIC</b>	<b>ARTHRITIS</b>	<b>CANCER</b>	<b>DIABETES</b>	<b>HYPERTENSION</b>
All	27.4	7.9	9.0	29.8
Age				
18-44	9.5*	2.6*	2.2*	11.4*
45-64	33.1*	8.0	10.8*	33.9*
65+	52.5*	18.3*	19.5*	59.1*
Gender				
Male	23.7*	6.5*	10.1*	32.8*
Female	31.0*	9.3*	8.0*	26.9*
Male by Age				
Male 18-44	7.7*	1.6*	1.8*	13.9*
Male 45-64	29.8	5.9*	12.8*	39.6*
Male 65+	46.8*	18.4*	23.1*	61.3*
Female by Age				
Female 18-44	11.4*	3.5*	2.5*	8.8*
Female 45-64	36.4*	10.0*	8.8	28.2
Female 65+	57.4*	18.2*	16.4*	57.3*
Race				
Non-Hispanic white	28.1	8.2	9.0	30.3
Non-white or Hispanic	18.9*	4.0*	8.6	23.4*

\* Cells marked with an '\*' indicate significant difference at the .05 level from All populations surveyed.



## **Distribution of Chronic Disease by Risk Behaviors**

Table 2 provides an overview of disease prevalence by behavioral risk factors including whether the individual had exercised, previously smoked, was obese, or a heavy drinker.

### **Cancer**

Among those living with cancer (7.9%), prevalence was significantly higher among those who had not exercised in the past 30 days (10.8%), who were former smokers (11.4%), and who were overweight or obese (8.6%). Prevalence was significantly lower among those who had never smoked (6.2%) and heavy drinkers (6.5%).

### **Diabetes**

Among those living with diabetes (9%), prevalence was significantly higher among those who had not exercised in the past 30 days (15.2%), who were former smokers (13.2%), and who were overweight or obese (12.1%). Prevalence was significantly lower among those who were normal or underweight (3.3%) and heavy drinkers (4.4%).

### **Hypertension**

Among those living with hypertension (29.8%), prevalence was significantly higher among those who had not exercised in the past 30 days (39.7%), who were former smokers (40.5%), and who were overweight or obese (37.1%). Prevalence was significantly lower among those who had exercised in the past 30 days (27.2%), never smoked (24.7%), or were normal or underweight (17%). No significant differences were observed based on drinking history.

### **Arthritis**

Among those living with arthritis (27.4%), prevalence was significantly higher among those who had not exercised in the past 30 days (39%), who were former smokers (36.7%), and who were overweight or obese (31.7%). Prevalence was significantly lower among those who had exercised in the past 30 days (24.5%), never smoked (22%), were normal or underweight (19.7%), and were heavy drinkers (23.6%).

**TABLE 2***Disease Prevalence by Risk Factors for the General Population*

<b>CHARACTERISTIC</b>	<b>ARTHRITIS</b>	<b>CANCER</b>	<b>DIABETES</b>	<b>HYPERTENSION</b>
All	27.4	7.9	9.0	29.8
Exercise				
Exercise past 30 days	24.5*	7.2	7.4	27.2*
No exercise past 30 days	39.0*	10.8*	15.2*	39.7*
Smoking Status				
Current	29.1	7.3	7.5	27.2
Former	36.7*	11.4*	13.2*	40.5*
Never	22.0*	6.2*	7.2	24.7*
Weight				
Normal weight or underweight	19.7*	7.0	3.3*	17*
Overweight or obese	31.7*	8.6*	12.1*	37.1*
Alcohol Consumption				
Not heavy drinker	28	8.1	9.5	30.1
Heavy drinker	23.6*	6.5*	4.4*	29.8

\* Cells marked with an '\*' indicate significant difference at the .05 level from All populations surveyed.



## **Prevalence of Chronic Disease by Industry and Occupation**

The next stage of our analysis looked at whether significant differences in prevalence for chronic disease existed based on the various industries and occupations in New Hampshire. To help control for the higher prevalence of diseases among older populations, we first calculated the prevalence of chronic disease only for New Hampshire's working population (ages 18+, currently employed or out of work less than one year). Prevalence by industry and occupation was then compared against this statistic to determine whether differences were significant. Table 3 provides a detailed breakdown on prevalence for each area.

### **Cancer - prevalence of 5.1% among New Hampshire's working population**

Across the areas reviewed, only two areas showed a significant difference from the state's results—both lower. These were found in our review of occupations, including those working in construction and extraction (3.1%), and those working in protective service (1.3%).

### **Diabetes - prevalence of 5.7% among New Hampshire's working population**

Five areas showed a significant difference from the state's results. Within industry types, those working in manufacturing were significantly

higher (7.9%) whereas those working in educational services was significantly lower (4.2%). Within occupation, three areas were significantly lower—building grounds cleaning and maintenance (2.7%), and education, training, and library (4%). One area, office and administrative support, was significantly higher (7.5%).

### **Hypertension - prevalence of 23% among New Hampshire's working population**

Two areas showed a significant difference from the state's results. Within industry types, those working in construction and manufacturing were significantly higher (30.1% and 28% respectively). Within occupation, no areas were significantly different from the state.

### **Arthritis - prevalence of 19.3% among New Hampshire's working population**

Three areas showed a significant difference from the state's results—all lower. Within industry types, 14.6% of those working in accommodation and food services and 16.6% of those working in information/finance/insurance/science/technology reported arthritis. Within occupation, 14.1% of those working across life/physical/social sciences/computer/math/architecture/engineering reported arthritis.

**TABLE 3***Prevalence of Chronic Disease by Industry and Occupation – Comparison*

	<b>ARTHRITIS (%, 95% CI)</b>	<b>CANCER (%,95% CI)</b>	<b>DIABETES (%, 95% CI)</b>	<b>HYPERTENSION (%, 95% CI)</b>
New Hampshire				
All	27.4+/-0.6	7.9+/-0.3	9.0+/-0.4	29.8+/-0.9
Working Population	19.3+/-0.7	5.1+/-0.4	5.7+/-0.4	23.0+/-1.1
Industry				
Accommodation and food services	14.6+/-3.3*	5.0+/-2.6	4.1+/-2.0	18.8+/-5.5
Adm. and support, waste management and remediation services	16.4+/-3.9	3.8+/-2.0	7.7+/-3.4	23.9+/-7.9
Agriculture, forestry, fishing, and hunting	17.7+/-6.5	4.8+/-3.5	3.8+/-3.3	13.5+/-7.7
Construction	20.4+/-2.9	3.9+/-1.2	4.1+/-1.4	30.1+/-5.1*
Educational services	19.7+/-2.0	5.4+/-1.2	4.2+/-0.9*	19.6+/-2.9
Health care and social assistance	20.8+/-1.7	5.7+/-0.9	5.2+/-0.9	22.0+/-2.4
Information/finance/ins/science/tech	16.6+/-1.8*	5.1+/-1.0	5.8+/-1.1	20.4+/-2.8
Management of companies and enterprises	3.7+/-9.5	NA	13.6+/-30.7	35.4+/-50
Manufacturing (all)	19.3+/-2.2	4.4+/-1.1	7.9+/-1.4*	28.0+/-3.8*

\* Cells marked with an '\*' indicate significant difference at the .05 level from Working Population respondents.



	<b>ARTHRITIS (%, 95% CI)</b>	<b>CANCER (%,95% CI)</b>	<b>DIABETES (%, 95% CI)</b>	<b>HYPERTENSION (%, 95% CI)</b>
Mining/utilities	27.4+/-8.9	4.4+/-3.8	7.8+/-5.4	28.7+/-3.8
Other services (except public administration)	23.5+/-3.6	4.7+/-1.5	4.3+/-1.5	23.4+/-5.2
Postal service	22.9+/-8.3	4.4+/-4.1	5.8+/-4.1	21.0+/-10.7
Public administration	21.9+/-3.0	5.6+/-1.6	5.3+/-1.5	23+/-4.2
Real estate rental and leasing	20.8+/-5.5	6.9+/-3.1	7.5+/-4.1	29.1+/-8.6
Sporting goods/music/hobby stores + arts/entertainment	16.4+/-3.7	5.6+/-1.9	7.6+/-2.7	23.2+/-6.5
Transportation and warehousing	24.7+/-6.1	5.9+/-3.0	6.7+/-2.9	25.3+/-9.0
Wholesale and retail trade	19.1+/-2.4	5.2+/-1.4	6.5+/-1.4	20.5+/-3.0
Occupation				
Arts, design, entertainment, sports, and media	23.0+/-5.4	6.3+/-3.0	4.9+/-2.5	20.4+/-8.0
Building grounds cleaning and maintenance	18.7+/-4.2	5.0+/-2.3	2.7+/-1.5*	23.3+/-7.2
Business/financial/legal/management	18.6+/-1.8	5.3+/-1.0	5.3+/-1.0	23.4+/-3.0
Community and social service	16.8+/-4.1	5.3+/-2.5	7.8+/-3.8	20.3+/-7.2
Construction and extraction	20.4+/-3.4	3.1+/-1.2*	4.4+/-1.7	27.8+/-5.9

\* Cells marked with an *\*\** indicate significant difference at the .05 level from Working Population respondents.

	<b>ARTHRITIS (%, 95% CI)</b>	<b>CANCER (%,95% CI)</b>	<b>DIABETES (%, 95% CI)</b>	<b>HYPERTENSION (%, 95% CI)</b>
Education, training and library	20.3+/-2.4	5.5+/-1.4	4.0+/-1.0*	19.4+/-3.5
Farming, fishing and forestry	19.3+/-11.9	0.9+/-2.4	8.0+/-9.1	16.2+/-16.2
Food preparation and serving-related	17.4+/-4.2	4.6+/-3.2	3.9+/-2.2	19.8+/-6.7
Health care practice/tech/support	20.3+/-2.2	5.6+/-1.1	4.6+/-1.0	19.9+/-2.9
Installation, maintenance, and repair	17.9+/-4.0	3.5+/-1.8	4.9+/-2.1	27.0+/-7.3
Life/physical/social science/computer/math/architecture/engineering	14.1+/-1.9*	4.8+/-1.2	6.4+/-1.4	25.0+/-3.5
Office and administrative support	21.7+/-2.3	6.6+/-1.3	7.5+/-1.5*	23.6+/-3.3
Personal care and service	24.8+/-4.9	5.1+/-2.5	4.9+/-2.0	19.0+/-5.4
Production	21.8+/-3.6	4.3+/-1.8	7.6+/-2.0	28.6+/-5.8
Protective service	14.4+/-4.8	1.3+/-1.3*	4.9+/-3.4	23.6+/-10.0
Sales and related	18.3+/-2.3	5.5+/-1.3	6.7+/-1.4	19.9+/-3.3
Transportation and material moving	22.7+/-3.9	6.6+/-2.2	8.2+/-2.3	26.1+/-5.8

*Industry and Occupation followed the Standard Occupational Classification and the North American Industrial Classification System Data Source: Behavioral Risk Factor Surveillance System (BRFSS), 2013-2018*

*\* Cells marked with an '\*' indicate significant difference at the .05 level from Working Population respondents.*



## Health Risk Behaviors by Industry and Occupation

The next stage of our analysis looked at whether significant differences existed across industries and occupations in New Hampshire based on different high-risk health behaviors. As with the review of chronic diseases, we first calculated rates based on New Hampshire's working population. Prevalence by industry and occupation was then compared against this statistic to determine whether differences were significant. Table 4 provides a detailed breakdown on prevalence for each area.

### Currently Smoking - prevalence of 16.7% among New Hampshire's working population

The analysis identified multiple significant differences by industry and occupation. Within industry, the following three areas were significantly lower than those of the state: educational services (6.2%), information/finance/science/tech (9%), and public administration (9.6%). The following three areas were significantly higher: accommodation and food services (38.8%), construction (29.6%), and wholesale and retail trade (20.5%). Within occupation, the following four areas were significantly lower: education/training/library (5.5%), life/physical/social science/computer/math/architecture/engineering (6.9%), business/financial/legal/management (11.4%), and health care practice/tech/support (12.7%). The following five occupations were significantly higher: food preparation and serving-related (34.6%), construction and extraction (32.2%), building grounds cleaning and maintenance (28.7%), transportation

and material moving (25.6%), and installation/maintenance/repair (22.8%).

### Heavy Alcohol Consumption – prevalence of 7.9% among New Hampshire's working population

Only one area was significantly different from the state average. Those working in food preparation and serving-related occupations reported a significantly higher likelihood of heavy alcohol consumption (13%).

### Overweightness or Obesity – prevalence of 65.1% among New Hampshire's working population

The analysis identified multiple significant differences by industry and occupation. Within industry, the following four areas were significantly lower than those of the state: accommodation and food services (54.1%), sporting goods/music/hobby stores + arts/entertainment (55%), educational services (59.5%), and health care and social assistance (60.2%). The following six areas were significantly higher: mining/utilities (84.6%), postal service (76.6%), transportation and warehousing (76.4%), construction (74.8%), public administration (73.1%), and manufacturing (71.7%). Within occupation, the following four areas were significantly lower: arts, design, entertainment, sports, and media (50.4%), food preparation and serving-related (54.2%), health care practice/tech/support (57.3%), and education/training/library (58.4%). The following six occupations were significantly higher: protective service (75.2%), construction and extraction (74.1%), transportation and material moving (74%), installation/maintenance/repair



(72.8%), production (72%), and life/physical/social science/computer/math/architecture/engineering (69.4%).

### **Exercise in Past 30 Days – prevalence of 81.7% among New Hampshire’s working population**

The analysis identified multiple significant differences by industry and occupation. Within industry, the following three areas were significantly better than those of the state: educational services (88.4%), public administration (87.6%), and info/finance/ins/science/tech (86.4%). The following four areas were significantly worse than the state: other services (76.7%), construction (76.4%), accommodation and food services (74.4%), and postal service (72.2%). Within occupation, the following six areas were significantly higher: education, training, and library (88.6%), arts, design, entertainment, sports, and media (88.4%), protective service (88.1%), business/financial/legal/management (86.7%), life/physical/social science/computer/math/architecture/engineering (86.1%), and health care practice/tech/ support (85.1%). The following three areas were significantly lower: office and administrative support (77.4%), production (74.6%), and transportation and material moving (73.7%).

### **Perception of Own Health by Industry and Occupation**

An additional topic that helps provide insight into the well-being of employees in New Hampshire is their perceived health status. When all BRFSS respondents were asked whether their health was fair or poor, 13.3% of the population agreed. When responses were limited to those of the working population, the result was nearly cut in half, down to 7.1%. As with our other variables, we looked across different industry and occupation types to identify those with significantly different values from the statewide average of current workers.

As shown in Table 5, six industry types were significantly different from the statewide average. Areas with a significantly higher level of fair or poor health were accommodation and food services (14.3%) and wholesale and retail trade (9.5%). Industries with significantly lower values included information/finance/ins/science/tech (4.8%), health care and social assistance (4.9%), public administration (4.7%), educational services (4.4%). Within occupation, five areas were significantly different. Areas with significantly higher values included food preparation and serving-related (13.8%) and production (11.4%). Occupations with significantly better ratings were education, training, and library (4.2%), business/financial/legal/management (4.1%), and health care practice/tech/support (3.8%).

**TABLE 4**  
*Health Behavior by Industry and Occupation*

	<b>CURRENTLY SMOKING (%, 95% CI)</b>	<b>HEAVY ALCOHOL CONSUMPTION (%,95% CI)</b>	<b>OBESITY / OVERWEIGHT- NESS (%,95% CI)</b>	<b>EXERCISE (%,95% CI)</b>
New Hampshire				
All	16.5+/-0.6	7.1+/-0.4	63.7+/-0.8	78.6+/-0.6
Working Population	16.7+/-0.8	7.9+/-0.6	65.1+/-1.0	81.7+/-0.8
Industry				
Accommodation and food services	38.8+/-5.8*	10.4+/-3.4	54.1+/-6.0*	74.4+/-4.9*
Administration and support, waste management and remediation services	20.6+/-5.2	10.7+/-4.1	66.8+/-6.2	78.7+/-5.4
Agriculture, forestry, fishing and hunting	24.8+/-11.1	13.0+/-11.1	57.6+/-11.0	75.9+/-7.8
Construction	29.6+/-3.8*	10.1+/-2.3	74.8+/-3.5*	76.4+/-3.4*
Educational services	6.2+/-1.6*	7.3+/-1.5	59.5+/-2.8*	88.4+/-1.7*
Health care and social assistance	14.8+/-1.9	6.6+/-1.1	60.2+/-2.4*	83.0+/-1.8
Info/finance/ins/science/tech	9.0+/-1.7*	8.0+/-1.6	62.1+/-2.7	86.4+/-2.0*
Management of companies and enterprises	27.6+/-38.5	27.6+/-38.5	75.0+/-38.2	56.4+/-41
Manufacturing (all)	17.6+/-2.5	7.7+/-1.7	71.7+/-2.9*	79.5+/-2.5

\* Cells marked with an '\*' indicate significant difference at the .05 level from Working Population respondents.



	<b>CURRENTLY SMOKING (%, 95% CI)</b>	<b>HEAVY ALCOHOL CONSUMPTION (%,95% CI)</b>	<b>OBESITY / OVERWEIGHT- NESS (%,95% CI)</b>	<b>EXERCISE (%,95% CI)</b>
Mining/utilities	10.0+/-5.7	5.9+/-4.6	84.6+/-6.7*	82.8+/-7.4
Other services (except public administration)	16.1+/-3.6	8.8+/-2.8	62.5+/-4.7	76.7+/-4.1*
Postal service	17.1+/-8.4	7.4+/-8.0	76.6+/-9.2*	72.2+/-9.2*
Public administration	9.6+/-2.5*	7.0+/-2.2	73.1+/-3.9*	87.6+/-2.5*
Real estate, rental and leasing	17.9+/-6.6	8.7+/-4.0	65.3+/-7.4	78.8+/-6.5
Sporting goods/music/hobby stores + arts/entertainment	13.9+/-5.6	5.8+/-3.9	55.0+/-6.8*	84.7+/-4.4
Transportation and warehousing	22.6+/-7.1	6.4+/-3.8	76.4+/-7.3*	78.0+/-6.6
Wholesale and retail trade	20.53+/-2.9*	7.4+/-1.7	67.4+/-3.3	79.6+/-2.6
Occupation				
Arts, design, entertainment, sports, and media	11.1+/-7.0	11.6+/-7.1	50.4+/-7.8*	88.4+/-4.8*
Building grounds cleaning and maintenance	28.7+/-5.9*	10.0+/-4.0	60.9+/-6.6	76.0+/-5.4
Business/financial/legal/management	11.4+/-1.8*	8.1+/-1.6	65.1+/-2.5	86.7+/-1.7*
Community and social service	14.9+/-6.1	7.4+/-3.7	68.9+/-6.6	82.7+/-6.6
Construction and extraction	32.2+/-4.3*	10.1+/-2.6	74.1+/-4.0*	77.5+/-3.6

\* Cells marked with an '\*' indicate significant difference at the .05 level from Working Population respondents.

	<b>CURRENTLY SMOKING (%, 95% CI)</b>	<b>HEAVY ALCOHOL CONSUMPTION (%,95% CI)</b>	<b>OBESITY / OVERWEIGHT- NESS (%,95% CI)</b>	<b>EXERCISE (%,95% CI)</b>
Education, training and library	5.5+/-2.2*	7.1+/-1.7	58.4+/-3.4*	88.6+/-2.2*
Farming, fishing and forestry	31.9+/-22.0	3.4+/-6.2	46.1+/-19.3	72.0+/-15.2
Food preparation and serving-related	34.6+/-6.6*	13.0+/-4.7*	54.2+/-7.2*	75.7+/-5.6
Health care practice/tech/support	12.7+/-2.2*	7.2+/-1.6	57.3+/-3.1*	85.1+/-2.1*
Installation, maintenance, and repair	22.8+/-5.3*	9.3+/-3.8	72.8+/-5.3*	76.3+/-5.4
Life/physical/social science/computer/math/architecture/ engineering	6.9+/-1.5*	6.2+/-1.5	69.4+/-3.1*	86.1+/-2.2*
Office and administrative support	14.0+/-2.3	6.8+/-1.5	65.7+/-3.2	77.4+/-2.7*
Personal care and service	18.1+/-5.5	6.6+/-3.1	57.7+/-6.7	81.5+/-4.4
Production	20.5+/-4.1	6.6+/-2.6	72.0+/-4.6*	74.6+/-4.1*
Protective service	12.6+/-5.7	7.0+/-4.1	75.2+/-8.2*	88.1+/-5.0*
Sales and related	20.2+/-3.0	7.0+/-1.7	65.1+/-3.4	80.2+/-2.7
Transportation and material moving	25.6+/-5.0*	8.5+/-3.3	74.0+/-5.2*	73.7+/-4.7*

\* Cells marked with an '\*' indicate significant difference at the .05 level from Working Population respondents.



**TABLE 5**  
*Health Status of the Working Population*

	<i>n</i>	<b>FAIR/POOR HEALTH STATUS</b> (%, 95% CI)
New Hampshire Population		
All	37,585	13.3+/-0.5
Working Population	18,427	7.1+/-0.5
By Industry		
Accommodation and food services	694	14.3*+/-4.3
Adm. and support, waste management and remediation services	453	8.8+/-3.6
Agriculture, forestry, fishing, and hunting	210	7.7+/-4.9
Construction	1185	8.5+/-2.1
Educational services	2342	4.4*+/-1.2
Health care and social assistance	3320	4.9*+/-0.9
Info/finance/ins/science/tech	2548	4.8*+/-1.2
Management of companies and enterprises	15	12.7+/-31
Manufacturing (all)	1875	7.9+/-1.6
Mining/utilities	159	7.5+/-7.1
Other services (except public administration)	883	8.3+/-2.4
Postal service	190	12.4+/-8.1
Public administration	1064	4.7*+/-1.6
Real estate, rental, and leasing	343	8.1+/-5.4
Sporting goods/music/hobby stores + arts/entertainment	573	6.0+/-3.3
Transportation and warehousing	335	6.7+/-3.2
Wholesale and retail trade	1726	9.5+/-1.9*

\* Cells marked with an '\*' indicate significant difference at the .05 level from Working Population respondents.



### By Occupation

Arts, design, entertainment, sports, and media	360	7.0+/-4.8
Building grounds cleaning and maintenance	513	9.2+/-3.9
Business/financial/legal/management	2824	4.1+/-1*
Community and social service	409	6.1+/-2.7
Construction and extraction	889	10.0+/-2.6
Education, training and library	1590	4.2+/-1.4*
Farming, fishing and forestry	61	15.9+/-12.9
Food preparation and serving-related	475	13.8+/-5.2*
Health care practice, tech, support	2051	3.8+/-1*
Installation, maintenance, and repair	509	10.2+/-3.2
Life, physical, social science, computer, math, architecture, engineering	1651	5.2+/-1.4
Office and administrative support	1987	7.5+/-1.7
Personal care and service	525	9.1+/-3
Production	791	11.4+/-3.1*
Protective service	251	5.0+/-3.7
Sales and related	1872	9.2+/-2
Transportation and material moving	674	10.4+/-3.5

\* Cells marked with an '\*' indicate significant difference at the .05 level from Working Population respondents.



# Discussion

As a leading cause of death and disability, chronic diseases are a driving factor of health care costs. The Centers for Disease Control and Prevention report that 6 in 10 adults in the United States have a chronic disease and that tobacco use, lack of physical activity, poor nutrition, and excessive alcohol abuse are key contributing lifestyle risks (CDC, 2021).

Analysis of the prevalence of arthritis, cancer, diabetes, and hypertension in New Hampshire demonstrates minimal statistical variations across industry and occupation. Where significant differences do exist, these are generally minor in size—typically a difference of five percentage points from the statewide average for the working population. This may, in large part, be driven by factors of age and gender in New Hampshire. As documented in Table 1, rates for arthritis, cancer, diabetes, and hypertension were significantly and meaningfully (five percentage points or more) better among populations under 45, fall close to the statewide average among those 45-64, and were significantly and meaningfully higher among those ages 65+. Additionally, based on the review of arthritis and diabetes, the respondent's sex can result in further variation in prevalence. Table 3 appears to bear out the impact of age on prevalence as statewide rates for the diseases studied are significantly lower among the working population compared to the full population. The resultant findings documenting minimal variation among the working population for chronic disease is therefore not surprising given the higher

incidence of these conditions among populations 65 and over.

Based solely on the workforce data, there may not be sufficient justification for policy makers to invest in prevention/intervention strategies among certain types of industry and occupation. Prevalence of chronic disease by industry and occupation is fairly uniform and provides limited opportunity to focus resources into targeted areas.

The review of high-risk behavior and health status responses proved more fruitful towards identifying industries and occupations that may employ workers at higher risk for long term chronic disease. As shown in Table 2, significant differences in chronic disease were consistently higher among three of the four health behaviors reviewed (past exercise, former smoker, and overweight/obese)<sup>1</sup> suggesting that these variables may be helpful as proxy indicators for long-term risk of chronic disease.

The documentation of industries and occupations whose workforce reported significantly different health behaviors from the statewide average shown in Table 4 may be of value to research further. Among those who report currently smoking, three industries and five occupation areas were identified with significantly higher percentages than the state average with one in four to one in three respondents from these groups falling into this category. Among those reporting obesity or being overweight, respondents from six industries and six occupation areas reported significantly higher amounts. Concerning those who have had limited exercise,

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<sup>1</sup> The significantly lower incidence of heavy drinkers by chronic disease may be linked to a higher proportion of younger populations making up this group.





employees from four industries and three occupation areas reported significantly lower proportions from the state average. Regarding heavy alcohol consumption, only one group—those involved in occupations for food preparation and serving—documented a significantly higher proportion of respondents from the statewide average.

Given the increased likelihood that members of each of the above groups will have a higher risk of long-term health problems, both targeted and broad-based health interventions among certain industry and occupational groups may be warranted. For example, the fact that 39% of those working in accommodation and food service industries are current smokers should be a red flag to many in the health care field, as 40% of all cancers diagnosed in the United States can be linked to tobacco use (<https://www.cdc.gov/media/releases/2016/p1110-vital-signs-cancer-tobacco.html>). Concerning a potential call for more broad-based health interventions, it is also important to note that several of the industries and occupations studied showed high-risk behaviors or fair/poor health status in multiple areas.

### Two Health Concern Areas Identified

- Industry
  - Postal service (obesity and limited exercise)
  - Wholesale and retail trade (fair/poor health, smoking)
- Occupation
  - Construction and extraction (smoking and obesity)
  - Installation, maintenance, and repair (smoking and obesity)

### Three Health Concern Areas Identified

- Industry
  - Accommodations and food services (fair/poor health, smoking, and limited exercise)
  - Construction (smoking, obesity, limited exercise)
- Occupation
  - Food preparation and serving (fair/poor health, smoking, and heavy alcohol consumption)
  - Transportation and material moving (smoking, obesity, limited exercise)
  - Production (fair/poor health, obesity, and limited exercise)



# Conclusions and Next Steps

Of note, there are multiple limitations which constrain the generalizability of this study. In terms of race and ethnicity—as New Hampshire has a predominantly white population base—the ability to look at differences by race and ethnicity was severely restricted for this study. Second, the ability to document significant and meaningful differences in diseases by industry and occupation is, in part, limited by the available sample sizes within BRFSS, even when summarizing data over six years. In particular, the limited sample size meant that we were unable to further subdivide the analysis by age, gender, and industry/occupation in order to better control for some of the impacts of these factors on the chronic diseases reviewed. Results around the heavy drinking data provide an example of this challenge in interpretation where younger populations may be more likely to binge drink but also be less likely to be suffering from chronic disease. Third, the data provide insights into the possible correlative nature of some of the variables, but our analysis is insufficient to provide indications of a causative nature. To this end, we must rely on the extensive literature base which better documents the links between various risk behaviors and long-term health outcomes. Lastly, the use of proxy indicators in the form of various health behaviors and self-assessments to assess the risk of long-term poor health outcomes by industry and occupation may have limited value without the benefit of additional information to help guide decision making.

While there are constraints to the generalizability of the study, our findings

concerning disparities in prevalent health behaviors and risk factors by industry and occupation are in line with continued efforts by the CDC supporting workplace health promotion. Strategies around the CDC Worksite ScoreCard effort, in particular, emphasize the value of supporting a healthy workforce, not only in the areas of smoking, alcohol use, obesity, and exercise, but also in factors shaping blood pressure, cholesterol, nutrition, heart attack, stroke, diabetes, depression, stress management, sleep, musculoskeletal disorders, occupational health, preventable disease, maternal health, and cancer (<https://www.cdc.gov/workplacehealthpromotion/initiatives/healthscorecard/worksite-scorecard.html>).

When combined with additional information, this work can be used as a launching point to guide further research and intervention initiatives for health promotion within certain work environments in New Hampshire. To have the greatest potential of disease burden reduction, it is important to consider the industries and occupations where the risk of chronic disease is the greatest. Additional disease and risk pattern identification is needed to promote protective changes within the New Hampshire workforce. As a part of this effort, it would be helpful for future studies to look beyond the behaviors reviewed and consider other topics included in the BRFSS, particularly a focus on nutrition, health care access, and cholesterol and hypertension awareness, as well as other chronic health conditions such as asthma, depression, heart attack, or stroke.



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