Original Report:
Population Health

Associations of Health Conditions and Health-Related Determinants with Disability among New York City Adult Residents

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Introduction: Population-based disability prevalence estimates are limited for New York City (NYC). We examined the association of several health and health-related measures with disability among NYC residents aged 20-64 years.

Methods: We used information from 1,314 adults who participated in the 2013-2014 NYC Health and Nutrition Examination Survey (HANES). We categorized survey participants as having a disability if they reported a physical, mental, and/or emotional problem preventing work or if they reported difficulty walking without special equipment because of a health problem. We used log-binomial regression to quantify the association of each exposure with disability before and after adjustment for select covariates.

Results: Overall, 12.4% of the study's NYC residents aged 20-64 years had a disability. After adjustment, disability prevalence was significantly greater among those who reported having unmet health care needs (prevalence ratio [PR] = 1.75, 95% CI: 1.18-2.57) and those who reported fair/poor general health (PR = 2.33, 95% CI: 1.68-3.24). The probability of disability was greater among NYC residents with arthritis (PR = 2.66, 95% CI: 1.85-3.98) and hypertension (PR = 1.48, 95% CI: 1.04-2.11) when compared with those without these conditions. Disability was also associated with depression (PR = 2.96, 95% CI: 2.06-4.25), anxiety (PR = 2.89, 95% CI: 2.15-3.88), and post-traumatic stress disorder (PR = 2.55, 95% CI: 1.66-3.91). Disability, however, was not associated with diabetes.

Conclusion: Disability is more prevalent among those with unmet health care needs, fair/poor general health, arthritis, hypertension, depression, anxiety, and PTSD in these NYC residents, aged 20-64 years. These findings have implications for NYC's strategic planning initiatives, which can be better targeted to groups disproportionately affected by disability. *Ethn Dis.* 2021;31(3):445-452; doi:10.18865/ed.31.3.445

Keywords: Disability; Community Health; Health Care Disparities; Chronic Conditions; Mental Health

Introduction

Persons with disabilities remain a disadvantaged population, consistently reporting worse health status than persons without disabilities because of inadequacies in the health care system and societal discrimination.[1] However, there is not a universal definition of disability. For example, the US Census-based American Community Survey (ACS) uses the term disability to encompass impairments, activity limitations, and participation restrictions a person may experience in their daily lives.[2] Using this definition, Erickson et al reported that the prevalence of disability among adults aged 21 to 64 years was 10.8% in the United States[3] and 9.1% in New York state in 2014.[4] In 2008, the prevalence of disability for those aged ≥5 years was 11.0% in New York City (NYC).[5] These population-based estimates show that disability disproportionately affects: women; older adults; those who identify as lesbian, gay, bisexual, questioning, or other (LGBQ+); Black and Latino individuals; those with less education and income; and those who are widowed, divorced, or separated.[3-5]

Several studies have also found that disability is more prevalent among those with unmet health care needs, self-reported fair or poor general health, and physical and/or mental health conditions.[1,3,4,6-13] Inaccessibility in the built environment, discrimination and stigma from health care and service providers, as well as other socioeconomic and structural barriers have been

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identified as possible sources of these disability disparities.[1] In addition, arthritis, hypertension, diabetes, and mental health conditions have been considered by medical professionals to cause long-term disabilities.[10,11,14]

To determine the burden of disability in NYC adult residents, we used data from the 2013-2014 NYC Health and Nutrition Examination Survey (NYC HANES), a local version of the national HANES, to examine the association of unmet health care needs, self-rated general health status, several chronic diseases, and common mental health disorders with self-reported disability among NYC residents aged 20-64 years. Although other studies have used a medical model for determining prevalence estimates of disability,[3, 4] we used a social model to define disability as a long-term physical, mental, or emotional problem that prevents an individual from working and/or walking without the use of special equipment.[15]

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Methods

Study Design

NYC HANES was a cross-sectional, population-representative survey conducted in 2013-2014 using three-stage cluster sampling.[16] The primary sampling units were randomly selected neighborhood segments based on 2010 US Census household counts. Randomly selected households within those segments were then approached to complete an eligibility interview. Using a computer-generated sampling flag and the number of household residents, one or two eligible adult residents were then chosen from each of the selected households.[16] NYC HANES included 1,527 non-institutionalized NYC household residents aged ≥20 years. Participants completed a computer-assisted personal interview (CAPI) and audio computer-assisted self-interview (ACASI); had height, weight, and blood pressure measured in a physical examination; and provided blood and urine samples. The protocol for this study was reviewed and approved by the institutional review boards at the CUNY School of Public Health and the NYC Department of Health and Mental Hygiene.

After limiting our analysis to those aged 20-64 years to assess those of working age, 1,314 participants were included in our analytic sample.

Variables

Exposures

Consistent with previous studies,[9,12,13] we selected the following variables as exposures: health care needs; self-rated health status; arthritis; diabetes; hypertension; depression; anxiety; and post-traumatic stress disorder (PTSD). During the interview, participants were asked: *Was there a time when the survey participant needed health care but did not get it during the last 12 months?* Responses for this variable were collected as *yes* or *no*. Participants were also asked *Would you say your health in general is…* with responses from *excellent* to *poor*. In our analysis, self-reported general health was dichotomized either as fair/poor and as good/very good/excellent.

Data on arthritis, anxiety, and PTSD were collected via self-report using the following question: *Has a doctor or other health professional ever told you that you had [health condition]?* Respondents were limited to *yes* and *no* responses for these variables. In contrast, having moderate-to-severe depression over the past two weeks was defined by a score of ≥10 on the 9-item Patient Health Questionnaire (PHQ-9), which was administered as part of the CAPI.[17]

Combining results from blood samples and self-reported variables,

diabetes was defined by measured HbA1c ≥6.5% or fasting glucose levels >125mg/dL or by self-reported prior diagnosis by a provider.[18] Hypertension was defined by a calibrated measurement[19] of ≥140 mm Hg systolic blood pressure or ≥90 mm Hg diastolic blood pressure or by self-report of current anti-hypertensive medication use. If they met these criteria, participants were classified as having diabetes or hypertension, respectively.

Outcome

We categorized NYC HANES participants as having a disability if they responded *yes* to any of the following three survey questions, which were introduced as "limitations caused by any long-term" problems: *Does a physical problem now keep you from working at a job or business?*; *Does a mental or emotional problem now keep you from working at a job or business?*; and *Because of a health problem, do you have difficulty walking without using any special equipment?*

Covariates

Because disability is more prevalent among certain demographic groups,[1,3,4,6,9,20] we adjusted our analyses for age and sex as well as other demographic factors. Participants were asked in the ACASI to describe their sexual orientation using the following options: heterosexual; homosexual; bisexual; something else; or not sure. We dichotomized participants based on their responses: heterosexual or LGBQ+. Self-reported race and self-reported Latino ethnicity were collapsed into the following five groups: non-Latino (NL) White, NL Black, Latino, NL Asian, and NL Other. Education was categorized as: high school diploma or less; some college; and college graduate or more. Marital status was categorized as: never married or single; married or living with a partner; and widowed, divorced, or separated. Respondents provided their estimated annual household income; these were grouped into three categories: <$25,000; $25,000 to $74,999; and ≥$75,000. Participants were also categorized into those who were covered by health care insurance at the time of interview and those who were not.

Statistical Analysis

To quantify the burden of disability on NYC adult residents, we estimated disability prevalence city-wide and by socio-demographic characteristics. Significant associations between each characteristic and having a disabil-

Table 1. Prevalence of disability among New York City (NYC) residents, aged 20-64 years, by sociodemographic variables, NYC HANES 2013-2014

	N	%	95% CI	P[a]
Total	1314	12.4	10.5-14.3	-
Age (years)				<.01
20-34	552	6.4	4.1-8.6	
35-64	762	16.3	13.6-19.0	
Sex				<.01
Male	548	8.7	6.4-11.1	
Female	766	15.5	12.7-18.3	
Sexual orientation				<.01
Heterosexual	971	10.8	8.8-12.8	
LGBTQ+	127	20.3	11.8-28.9	
Race/ethnicity[c]				<.01
Non-Latino White	425	6.6	3.7-9.4	
Non-Latino Black	296	16.3	11.8-20.9	
Latino	329	17.7	13.5-21.9	
Non-Latino Asian	191	8.2	4.3-12.0	
Education				<.01
High school diploma or less	450	19.2	15.5-22.9	
Some college or associate's degree	295	11.9	8.2-15.6	
College graduate or more	568	5.3	3.4-7.2	
Marital status				<.01
Never married or single	484	15.1	11.7-18.5	
Married or living with partner	643	7.5	5.4-9.6	
Widowed, divorced, or separated	187	24.7	18.1-31.4	
Household income				<.01
<$25,000	369	24.0	19.5-28.4	
$25,000 to $74,999	411	7.7	5.0-10.4	
≥$75,000	364	3.7[b]	1.5-5.9	
Health insurance				<.01
Covered	1062	14.2	12.0-16.4	
Not covered	248	4.8	2.1-7.6	

a. Ps are derived from chi-square tests of independence within each category.
b. Estimate is potentially unreliable and should be interpreted with caution. Estimate's relative standard error is greater than 30%, the 95% CI half-width is >10, or the sample size is too small.
c. Those identifying as non-Latino Other were included in this analysis, but the results were potentially unreliable and are not reported.

ity were tested using chi-square tests for independence. We also quantified the association of unmet health care needs, self-rated general health status, several chronic diseases, and common mental health disorders with disability using prevalence ratios obtained from log-binomial regression before and after adjusting for selected demographic characteristics. These characteristics were age, sex, sexual orientation, race/ethnicity, education, marital status, estimated annual household income, and health care insurance coverage.

We used NYC HANES survey weights to account for complex survey design, clustering, and survey non-response. The weights had been adjusted to represent marginal population counts based on age, sex, race/ethnicity, education, borough of residence, and marital status using 2013 ACS data.[21] Data were managed and analyzed using SAS Enterprise Guide version 7.1 and SUDAAN version 11.0.1 (Research Triangle Institute, Research Triangle Park, NC).

Results

In our study population, 12.4% (95% CI: 10.5-14.3%) of NYC residents aged 20-64 years had a disability using our definition. Specifically, 9.4% reported a physical problem preventing work, 5.3% reported a mental or emotional problem preventing work, and 4.6% needed special equipment for walking. Among those we had categorized as having a disability, 56.9% met only one criterion, 31.1% met two criteria, and 12.0% met all three criteria (data not shown in tables).

Disability and Sociodemographics

Table 1 displays the population prevalence of disabilities by sociodemographic variables. When compared with NYC adults without disabilities, adults living with disabilities were significantly more likely to be female, 35-64 years old, and LGBQ+ (all Ps<.01). Disability related to mental and/or emotional problems limiting work and the inability to walk without the use of special equipment were significantly greater among LGBQ+ adults when compared with heterosexual adults (all Ps<.05); disability related to a physical problem preventing work was not statistically different between these two groups (P=.09; data not shown in tables). NL Black and Latino NYC adult residents had a greater prevalence of disability than NL White NYC adult residents (P<.01). Adults with one or more disabilities were also more likely than those without to be widowed, divorced, or separated; to have a high school diploma or less; to have an estimated annual household income <$25,000; and have health insurance (all Ps<.001).

Disability and Health Conditions

Table 2 shows unadjusted and adjusted prevalence ratios (PR) and 95% CIs for disability among adults reporting physical and mental health conditions. Before adjusting for demographic characteristics, the probability of having disability was 93% greater among NYC adult residents with unmet health care needs than their counterparts without such needs (PR = 1.93, 95% CI: 1.31-2.84). NYC adult residents reporting fair or poor general health were more than four times more likely to have a disability than those reporting good-to-excellent health (PR = 4.53, 95% CI: 3.41-6.02). The probability of having a disability was 4.17 (95% CI: 3.13-5.55) times greater among those with arthritis than those without arthritis. Unadjusted analyses also showed that NYC adult residents with diabetes were more than twice as likely to have a disability (PR = 2.57, 95% CI 1.81-3.64) than NYC adult residents without diabetes. The probability of having a disability was also greater among those with hypertension (PR = 2.18, 95% CI: 1.60-2.97). Before controlling for demographic characteristics, those with moderate-to-severe depression were 4.81 (95% CI 3.54-6.54) times more likely to have a disability than those without depression; those with anxiety were 3.77 (95% CI 2.82-5.06) times more likely than those without anxiety; and those with PTSD were 3.51 (95% CI: 2.40-5.15) times more likely than those without PTSD.

In the models adjusted for age, sex, sexual orientation, race/ethnicity, education, marital status, annual income, and health care insurance coverage, almost all of the associations between health conditions and disability remained statistically significant but with attenuated magnitude. However, the relationship between diabetes and disability, was no longer statistically significant (PR = 1.40, 95% CI .93-2.11).

Table 2. Disability prevalence and unadjusted and adjusted prevalence ratios for health conditions among New York City (NYC) residents, aged 20-64 years, NYC HANES 2013-2014

	Disability Prevalence		Unadjusted		Adjusted[a]	
	%	95% CI	Prevalence Ratio	95% CI	Prevalence Ratio	95% CI
Unmet health care needs						
Yes	21.7	14.0-29.5	1.93	1.31-2.84	1.75	1.18-2.57
No	11.3	9.4-13.1	1.00		1.00	
General health						
Fair or poor health	33.8	27.5-39.9	4.53	3.41-6.02	2.33	1.68-3.24
Good or better health	7.4	5.8-9.1	1.00		1.00	
Arthritis						
Yes	35.7	28.5-42.8	4.17	3.13-5.55	2.66	1.85-3.83
No	8.6	6.8-10.3	1.00		1.00	
Diabetes						
Yes	27.6	19.6-35.6	2.57	1.81-3.64	1.40	.93-2.11
No	10.7	8.6-12.8	1.00		1.00	
Hypertension						
Yes	10.2	8.2-12.2	2.18	1.60-2.97	1.48	1.04-2.11
No	22.2	17.0-27.3	1.00		1.00	
Depression (moderate to severe)						
Yes	36.1	26.3-45.9	4.81	3.54-6.54	2.96	2.06-4.25
No	8.3	6.6-10.0	1.00		1.00	
Anxiety						
Yes	27.5	21.2-33.8	3.77	2.82-5.06	2.89	2.15-3.88
No	7.6	6.0-9.3	1.00		1.00	
Post-traumatic stress disorder						
Yes	37.5	23.2-51.8	3.51	2.40-5.15	2.55	1.66-3.91
No	10.1	8.3-11.8	1.00		1.00	

a. Estimates were adjusted for age, sex, sexual orientation, race/ethnicity, education, marital status, estimated annual income, and health care coverage.

Discussion

Our study showed that the prevalence of disability (12.4%) in our study population of NYC adult residents was slightly higher than the prevalence estimates of disability in NYC, New York State, and the United States reported in previous studies.[3-5] However, it is worth noting that a direct comparison between these prevalence estimates cannot be made because they were based on different criteria for defining disability. We also found that, even after controlling for demographic characteristics, disability was more prevalent among persons who had unmet health care needs, self-reported fair or poor general health, arthritis, hypertension, moderate-to-severe depression, anxiety, and PTSD when compared with their respective counterparts without these needs or conditions. However, there was no relationship between diabetes and disability after adjustment.

While previous studies have estimated disability prevalence in the United States (10.8%),[3] New York State (9.1%),[4] and NYC (11.0%),[5] we expected a similar estimate, since the age range of our population (persons aged 20-64 years), was almost the same as the ones included in two of these studies.[3,4] However, differences in prevalence estimates among populations in NYC, New York State, and the United States are likely due to the use of different definitions of disability; some disability surveys employ a medical model of disability[3,4] while others employ a social model of disability.[15] Previously reported prevalence estimates were calculated using data from the US Census Bureau's ACS, which employed the medical model. The ACS identified individuals with disabilities as those who reported having serious difficulty hearing,

seeing, thinking, walking, taking care of themselves, and/or living alone.[3-5] In contrast, our study used a social model. Specifically, we identified individuals with disabilities as those who reported long-term limitations in activities of daily living and the ability to work due to physical, mental, and/or emotional issues, as well as those who reported a long-term difficulty walking without the use of special equipment.

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While we found that persons with disabilities were more likely to have health insurance compared with the general population, we also found that unmet health care needs and fair or poor general health status were associated with having a disability. These findings are consistent with previous studies suggesting that, despite having greater access to health care, persons with disabilities may face greater physical, economic, and social barriers in accessing health care than persons without disabilities.[1,3,4,7-9,12,22] For example, the costs associated with health services and transportation may present a barrier to accessing care and result in unmet health care needs.[12] Furthermore, greater societal discrimination, low education, low social support, and lower household income have also been cited as potential barriers to maintaining optimal health and have been associated with negative health outcomes like disability.[6,23,24]

Because socio-demographic factors influence the development of health conditions and disability, we adjusted for the factors when examining the associations of chronic diseases and mental health disorders with disability. As chronic physical and mental health conditions have been identified as causes of disability, we expected to find a higher prevalence of disability, both before and after adjustment, among persons with arthritis, diabetes, hypertension, moderate-to-severe depression, anxiety, and PTSD, when compared with persons without these health conditions.[11] More specifically, arthritis has been identified as the most common single cause of disability because of its impact on a person's physical ability to work.[10] Persons with diabetes and heart conditions may also face serious and permanent physical limitations that prevent work and/or mobility.[10] Moreover, mental health disorders like depression and PTSD can make it difficult or impossible to work and can be as disabling as physical illness.[10] Poor disease management and social perceptions about chronic diseases and disabilities increasing with age have been implicated as external factors related to the development of disability among persons with physical and mental health conditions.[25] In our study, the prevalence of disability was significantly higher among persons with the health conditions examined before and after controlling for selected demographic characteristics, except for those with diabetes. However, diabetes has a relatively low prevalence in those aged 20-44 years, and the limited age range of our study population may have contributed to the lack of association in the adjusted model.[18]

Study Limitations and Strengths

The present study is limited by the cross-sectional design of NYC HANES, which prevents us from establishing temporal order between our exposures of interest and disability. Moreover, because most variables were self-reported, social desirability bias and recall bias may have led to inaccurate responses. These biases could have resulted in an underestimation of the true association between our exposures and disability, especially for mental health conditions. Since our study population was relatively small for some stratifications, some estimates may not accurately capture prevalence in the NYC population. We were unable to explore the differences in prevalence by type of disability or by neighborhoods or boroughs in NYC, which have shown to be heterogeneous with regard to disability.[5] Finally, because the NYC HANES survey

included only non-institutionalized adults, those living in group homes were not included in this analysis. A substantial portion of young persons with severe disabilities may reside in group homes. Therefore, our estimates may again underestimate the burden of disability on younger NYC residents. However, some strengths of our study include the use of a population-based representative sample with objectively measured blood pressure and laboratory testing, and the ability to minimize confounding by adjustment of age and other socio-demographics in our analyses.

Conclusion

Based on our findings, we conclude that disability is more prevalent among those with unmet health care needs, low self-rated general health status, arthritis and hypertension, and common mental health disorders (ie, depression, anxiety, and PTSD) in NYC residents aged 20-64 years. These findings have implications for medical practitioners who treat young and middle-aged adults, as well as policymakers and public health professionals targeting adults with or at risk for disabilities. Greater emphasis on health education, physical and mental disease management, and promoting perspectives and practices surrounding healthy aging in NYC could help prevent the development of disabilities from chronic physical and mental health conditions. Future studies could be conducted using a longitudinal study design to describe the temporal relationship between health conditions and disability as well as to capture how confounding variables affect this relationship.

Conflict of Interest

No conflicts of interest to report.

Author Contributions

Research concept and design: Wetmore, Borrell; Acquisition of data: Chernov, Perlman; Data analysis and interpretation: Wetmore, Chernov, Perlman, Borrell; Manuscript draft: Wetmore, Chernov, Perlman, Borrell; Statistical expertise: Wetmore, Perlman, Borrell; Acquisition of funding: Perlman; Administrative: Wetmore; Supervision: Chernov, Borrell

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