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# Why Patients Visit Their Doctors: Assessing the Most Prevalent Conditions in a Defined American Population

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## Abstract

**Objective:** To describe the prevalence of nonacute conditions among patients seeking health care in a defined US population, emphasizing age, sex, and ethnic differences.

**Patients and Methods:** The Rochester Epidemiology Project (REP) medical records linkage system was used to identify all residents of Olmsted County, Minnesota, on April 1, 2009, who had consented to review of their medical records for research (142,377 patients). We then electronically extracted all *International Classification of Diseases, Ninth Revision* codes noted in the records of these patients by any health care institution between January 1, 2005, and December 31, 2009. We grouped *International Classification of Diseases, Ninth Revision* codes into clinical classification codes and then into 47 broader disease groups associated with health-related quality of life. Age- and sex-specific prevalence was estimated by dividing the number of individuals within each group by the corresponding age- and sex-specific population. Patients within a group who had multiple codes were counted only once.

**Results:** We included a total of 142,377 patients, 75,512 (53%) of whom were female. Skin disorders (42.7%), osteoarthritis and joint disorders (33.6%), back problems (23.9%), disorders of lipid metabolism (22.4%), and upper respiratory tract disease (22.1%, excluding asthma) were the most prevalent disease groups in this population. Ten of the 15 most prevalent disease groups were more common in women in almost all age groups, whereas disorders of lipid metabolism, hypertension, and diabetes were more common in men. Additionally, the prevalence of 7 of the 10 most common groups increased with advancing age. Prevalence also varied across ethnic groups (whites, blacks, and Asians).

**Conclusion:** Our findings suggest areas for focused research that may lead to better health care delivery and improved population health.

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Chronic diseases account for the majority of health care utilization and expenditures in middle-aged and older populations.[1-3] As the population ages, more individuals are living with multiple chronic medical conditions. One-fourth of Americans with chronic conditions account for almost two-thirds of the total US health care expenditures.[4] Research on chronic disease has largely focused on a specific group of conditions with high morbidity and mortality (including diabetes and chronic heart disease). However, other types of nonacute conditions, with less severe long-term outcomes, may affect large segments of the population and may account for a substantial amount of health care resource utilization. Recognition of these other conditions may suggest new areas for improving health care delivery and population health management.

Health care reform has intensified the need for information on health care resource utilization for nonacute conditions. The Patient Protection and Affordable Care Act allows the restructuring of Medicare reimbursements into "bundled payments."[5] This restructuring will require the rational deployment of treatment resources to ensure the financial solvency of medical institutions. Additionally, clinical decision support for chronic diseases has



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been identified as critical for the patient-centered medical home model.[6] However, development of these models requires quantification of prevalent chronic diseases across populations.

Unfortunately, the prevalence of diseases can be difficult to capture across all age groups because only a few databases in the United States include younger populations. Additionally, it can be difficult to consider the prevalence of multiple conditions concurrently in a single population. Failure to simultaneously consider all possible drivers of health care utilization can result in inefficient targeting of resources to improve population health.

To address these problems, we conducted a study to identify the prevalence of the most common nonacute conditions in a defined US population using the resources of the Rochester Epidemiology Project (REP). The REP medical records linkage system provides an ideal opportunity to quantify the prevalence of all medical conditions in an entire population, across age, sex, and ethnic groups, regardless of socioeconomic or insurance status.[7]

## PATIENTS AND METHODS

### Study Population

The REP links data on medical care delivered to the population of Olmsted County, Minnesota.[7-9] The vast majority of medical care in this community is currently provided by a few health care institutions: the Mayo Clinic and its 2 affiliated hospitals, Olmsted Medical Center and its affiliated hospital, and the Rochester Family Medicine Clinic. The health care records from these institutions are linked together through the REP records linkage system.[8,9] Patients are categorized as residents or nonresidents of Olmsted County at the time of each health care visit on the basis of their address. Over the years, this address information has been accumulated and is used in medical research to determine the number of residents in Olmsted County at any given point in time since 1966 (the REP Census). The population counts obtained by the REP Census are similar to those obtained by the US Census, indicating that virtually the entire population of the county is captured by the system.[8,9] For this study, we used the REP Census to identify all individuals who resided in Olmsted County on April 1, 2009, but we excluded those individuals who had not given permission to at least one health care institution for use of their medical records for research.[8]

### Definition of Disease Groups

The diagnostic indices of the REP were searched electronically to extract all *International Classification of Diseases, Ninth Revision* (*ICD-9*) codes in the medical records of members of the Olmsted County population assigned by any health care institution from January 1, 2005, through December 31, 2009. These *ICD-9* codes were first grouped into clinical classification codes (CCCs) proposed by the Agency for Healthcare Research and Quality-Healthcare Cost and Utilization Project.[10,11] For this study, we focused specifically on conditions that were not likely to resolve in a short period of time and that were likely to require multiple health care visits over several years for evaluation and treatment. However, these conditions were not confined to conditions typically considered chronic diseases, such as diabetes and heart disease. For example, we included conditions such as tuberculosis, back problems, and esophageal disorders. We excluded conditions related to dental or vision problems because the REP does not capture all data from local dentists or optometrists. These CCCs were then combined into broader disease groups that have been associated with health-related quality of life, such as cancer, diabetes, thyroid disorders, and heart failure, according to the classification system developed by Mukherjee et al.[11,12] We modified this system by using updated CCCs and by including breast, uterine, ovarian, and prostate cancer in the cancer category, but excluding benign neoplasms and neoplasms of uncertain malignancy.[12] The final CCCs used for this study and the modified disease groups are shown in Supplemental Table 1 (available online at http://www.mayoclinicproceedings.org).

### Statistical Analyses

The point prevalence of each CCC was measured using April 1, 2009, as the prevalence day.[13] The history of a given disease on the prevalence day was derived from a 5-year capture time frame (the 5 years preceding the prevalence day). In general, for nonacute

conditions, our findings should be comparable to point prevalence figures derived from a population survey.[13] The crude age- and sex-specific prevalence of each of the 47 disease groups was estimated by dividing the number of individuals in a group by the corresponding age- and sex-specific Olmsted County population on the prevalence day. These prevalence figures were directly standardized to the 2000 total US population by age and by sex when appropriate to make comparisons of aggregated data (2000 US Census). This study covered the target population completely, and no sampling was involved. For this reason, statistical tests may not be appropriate, and confidence intervals were not included in the tables.[14-16]

## RESULTS

### Description of the Olmsted County Population

Overall, the REP infrastructure captured 146,687 Olmsted County residents in 2009 compared with 143,962 individuals predicted by the US Census.[17] Therefore, the REP captured slightly more people than the US Census (101.9%). These results are consistent with a previous study that examined REP capture rates between 1970 and 2000.[8]

Of 146,687 residents, 142,377 gave permission for use of their medical records for research (97.1%). The population included 75,512 females (53%). Age and sex distributions were virtually identical to US Census estimates.[18] However, the proportion of people in the white category was lower, and the proportion in the other/unknown ethnic category was higher compared with US Census estimates. Because we presume that most of the patients in the other/unknown category were white (85.7% of the population self-reported white race in the 2010 census), we grouped the other/unknown category with the white category.

### Results by Broad Disease Groups

Table 1 shows the 20 most prevalent conditions. Data for the remaining 27 disease groups are shown in Supplemental Table 2 (available online at http://www.mayoclinicproceedings.org). Skin disorders were the most prevalent disease group in this population. Almost half of the population (42.7%) had at least one *ICD-9* code for a skin condition within approximately 5 years. Skin disorders were followed in frequency by osteoarthritis and joint disorders (33.6%), back problems (23.9%), disorders of lipid metabolism (22.4%), and upper respiratory tract disease (22.1%). By contrast, systemic lupus erythematosus and connective tissue disorders, tuberculosis, human immunodeficiency virus infection, sickle cell anemia, and cystic fibrosis were the least prevalent conditions (Supplemental Table 2). Seven of the 10 most prevalent disease groups increased with advancing age (Table 1). However, the prevalence of upper respiratory tract disease remained relatively consistent across all age groups. The prevalence of anxiety, depression, and bipolar disorders was low in 0- to 18-year-olds, increased dramatically in 19- to 29-year-olds, and remained constant across the older age groups. Headaches, including migraine, also increased in the 19- to 29-year-olds but declined after age 50 years.

The most prevalent disease groups differed by age. For example, skin disorders were the most prevalent condition in 0 to 18-year-olds, followed by upper respiratory tract disease and osteoarthritis and joint disorders. By contrast, hypertension was the most prevalent condition in patients who were 65 years or older, followed by disorders of lipid metabolism and skin disorders (Figure 1). Ten of the 15 most prevalent disease groups were more common in women in almost all age groups, whereas disorders of lipid metabolism, hypertension, and diabetes were more common in men (Figure 2).

The prevalence of the top 10 disease groups also differed by ethnic group (Figure 3). Blacks had a higher prevalence for 7 of the top 10 disease groups. The biggest differences in blacks vs whites were a higher prevalence of back problems and headaches, including migraine, in blacks. In contrast, whites had a higher prevalence of skin disorders compared with both blacks and Asians. Asians had a higher prevalence of diabetes than whites.

### Results for Specific *ICD-9* Codes

Although our primary analyses considered a high-level grouping of diseases, we also examined the individual *ICD-9* codes within the groups. The prevalence estimates of selected


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**TABLE 1. Age- and Sex-Specific Prevalence (per 100 Population) of the 20 Most Common Chronic Disease Groups in the 2009 Olmsted County, Minnesota, Population (N=142,377)[a]**

| Chronic disease group | Age (y) | | | | | | | | | | All ages | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0-18 | | 19-29 | | 30-49 | | 50-64 | | ≥65 | | Crude[b] | | Standardized[c] | |
| | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % |
| Skin disorders | | | | | | | | | | | | | | |
| Both sexes | 12,703 | 32.95 | 9170 | 38.26 | 15,652 | 41.27 | 12,390 | 50.39 | 11,398 | 65.75 | 61,313 | 43.06 | 61,313 | 42.67 |
| Men | 6232 | 31.78 | 3247 | 31.41 | 5923 | 33.11 | 5221 | 45.42 | 4980 | 66.11 | 25,603 | 38.29 | 25,603 | 38.43 |
| Women | 6471 | 34.15 | 5923 | 43.45 | 9729 | 48.55 | 7169 | 54.76 | 6418 | 65.47 | 35,710 | 47.29 | 35,710 | 46.90 |
| Osteoarthritis and joint disorders | | | | | | | | | | | | | | |
| Both sexes | 5580 | 14.47 | 6044 | 25.22 | 13,122 | 34.60 | 12,275 | 49.92 | 10,971 | 63.28 | 47,992 | 33.71 | 47,992 | 33.58 |
| Men | 2859 | 14.58 | 2752 | 26.62 | 5832 | 32.60 | 5223 | 45.43 | 4273 | 56.72 | 20,939 | 31.32 | 20,939 | 31.72 |
| Women | 2721 | 14.36 | 3292 | 24.15 | 7290 | 36.38 | 7052 | 53.87 | 6698 | 68.33 | 27,053 | 35.83 | 27,053 | 35.13 |
| Back problems | | | | | | | | | | | | | | |
| Both sexes | 2193 | 5.69 | 4890 | 20.40 | 11,054 | 29.15 | 8287 | 33.70 | 7692 | 44.37 | 34,116 | 23.96 | 34,116 | 23.90 |
| Men | 1050 | 5.35 | 1653 | 15.99 | 4588 | 25.65 | 3508 | 30.52 | 2966 | 39.37 | 13,765 | 20.59 | 13,765 | 21.12 |
| Women | 1143 | 6.03 | 3237 | 23.75 | 6466 | 32.27 | 4779 | 36.50 | 4726 | 48.21 | 20,351 | 26.95 | 20,351 | 26.48 |
| Disorders of lipid metabolism | | | | | | | | | | | | | | |
| Both sexes | 135 | 0.35 | 704 | 2.94 | 7261 | 19.15 | 11,948 | 48.59 | 12,143 | 70.05 | 32,191 | 22.61 | 32,191 | 22.39 |
| Men | 75 | 0.38 | 330 | 3.19 | 4247 | 23.74 | 6110 | 53.15 | 5463 | 72.52 | 16,225 | 24.27 | 16,225 | 24.74 |
| Women | 60 | 0.32 | 374 | 2.74 | 3014 | 15.04 | 5838 | 44.59 | 6680 | 68.14 | 15,966 | 21.14 | 15,966 | 20.19 |
| Other upper respiratory tract disease | | | | | | | | | | | | | | |
| Both sexes | 9184 | 23.82 | 4597 | 19.18 | 8436 | 22.24 | 5339 | 21.71 | 3941 | 22.73 | 31,497 | 22.12 | 31,497 | 22.10 |
| Men | 5033 | 25.66 | 1765 | 17.08 | 3470 | 19.40 | 2221 | 19.32 | 1717 | 22.79 | 14,206 | 21.25 | 14,206 | 21.16 |
| Women | 4151 | 21.91 | 2832 | 20.78 | 4966 | 24.78 | 3118 | 23.82 | 2224 | 22.69 | 17,291 | 22.90 | 17,291 | 22.99 |
| Anxiety, depression, and bipolar disorders | | | | | | | | | | | | | | |
| Both sexes | 2559 | 6.64 | 5577 | 23.27 | 9927 | 26.17 | 6127 | 24.92 | 4156 | 23.97 | 28,346 | 19.91 | 28,346 | 19.75 |
| Men | 1179 | 6.01 | 1775 | 17.17 | 3453 | 19.30 | 2139 | 18.61 | 1346 | 17.87 | 9892 | 14.79 | 9892 | 15.09 |
| Women | 1380 | 7.28 | 3802 | 27.89 | 6474 | 32.31 | 3988 | 30.46 | 2810 | 28.67 | 18,454 | 24.44 | 18,454 | 24.13 |
| Chronic neurologic disorders | | | | | | | | | | | | | | |
| Both sexes | 2774 | 7.19 | 2812 | 11.73 | 7482 | 19.73 | 6829 | 27.77 | 8324 | 48.02 | 28,221 | 19.82 | 28,221 | 19.75 |
| Men | 1519 | 7.75 | 995 | 9.63 | 2929 | 16.37 | 2894 | 25.17 | 3412 | 45.29 | 11,749 | 17.57 | 11,749 | 17.92 |
| Women | 1255 | 6.62 | 1817 | 13.33 | 4553 | 22.72 | 3935 | 30.06 | 4912 | 50.11 | 16,472 | 21.81 | 16,472 | 21.43 |
| Hypertension | | | | | | | | | | | | | | |
| Both sexes | 108 | 0.28 | 513 | 2.14 | 4450 | 11.73 | 8918 | 36.27 | 12,251 | 70.67 | 26,240 | 18.43 | 26,240 | 18.21 |
| Men | 64 | 0.33 | 269 | 2.60 | 2444 | 13.66 | 4514 | 39.27 | 5290 | 70.22 | 12,581 | 18.82 | 12,581 | 19.22 |
| Women | 44 | 0.23 | 244 | 1.79 | 2006 | 10.01 | 4404 | 33.64 | 6961 | 71.01 | 13,659 | 18.09 | 13,659 | 17.22 |
| Headaches, including migraines | | | | | | | | | | | | | | |
| Both sexes | 3286 | 8.52 | 4135 | 17.25 | 6753 | 17.81 | 3745 | 15.23 | 2302 | 13.28 | 20,221 | 14.20 | 20,221 | 13.99 |
| Men | 1446 | 7.37 | 1020 | 9.87 | 1918 | 10.72 | 1162 | 10.11 | 766 | 10.17 | 6312 | 9.44 | 6312 | 9.53 |
| Women | 1840 | 9.71 | 3115 | 22.85 | 4835 | 24.13 | 2583 | 19.73 | 1536 | 15.67 | 13,909 | 18.42 | 13,909 | 18.32 |
| Diabetes | | | | | | | | | | | | | | |
| Both sexes | 221 | 0.57 | 724 | 3.02 | 4181 | 11.02 | 6897 | 28.05 | 7872 | 45.41 | 19,895 | 13.97 | 19,895 | 13.78 |
| Men | 108 | 0.55 | 241 | 2.33 | 2091 | 11.69 | 3658 | 31.82 | 3723 | 49.42 | 9821 | 14.69 | 9821 | 14.94 |
| Women | 113 | 0.60 | 483 | 3.54 | 2090 | 10.43 | 3239 | 24.74 | 4149 | 42.32 | 10,074 | 13.34 | 10,074 | 12.82 |
| Arrhythmias | | | | | | | | | | | | | | |
| Both sexes | 750 | 1.95 | 1689 | 7.05 | 3874 | 10.21 | 4403 | 17.91 | 7988 | 46.08 | 18,704 | 13.14 | 18,704 | 13.03 |
| Men | 348 | 1.78 | 584 | 5.65 | 1574 | 8.80 | 2227 | 19.37 | 3826 | 50.79 | 8559 | 12.80 | 8559 | 13.21 |
| Women | 402 | 2.12 | 1105 | 8.11 | 2300 | 11.48 | 2176 | 16.62 | 4162 | 42.46 | 10,145 | 13.43 | 10,145 | 13.05 |
| Esophageal disorders | | | | | | | | | | | | | | |
| Both sexes | 1462 | 3.79 | 1260 | 5.26 | 3973 | 10.48 | 3973 | 16.16 | 4117 | 23.75 | 14,785 | 10.38 | 14,785 | 10.36 |
| Men | 792 | 4.04 | 499 | 4.83 | 1860 | 10.40 | 1765 | 15.35 | 1700 | 22.57 | 6616 | 9.89 | 6616 | 10.08 |
| Women | 670 | 3.54 | 761 | 5.58 | 2113 | 10.54 | 2208 | 16.87 | 2417 | 24.66 | 8169 | 10.82 | 8169 | 10.59 |
| Asthma | | | | | | | | | | | | | | |
| Both sexes | 4141 | 10.74 | 2108 | 8.80 | 3125 | 8.24 | 1951 | 7.94 | 1424 | 8.21 | 12,749 | 8.95 | 12,749 | 8.88 |
| Men | 2382 | 12.15 | 716 | 6.93 | 1043 | 5.83 | 630 | 5.48 | 493 | 6.55 | 5264 | 7.87 | 5264 | 7.75 |

*Continued on next page*

**TABLE 1. Continued**

| Chronic disease group | Age (y) | | | | | | | | | | All ages | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0-18 | | 19-29 | | 30-49 | | 50-64 | | ≥65 | | Crude[b] | | Standardized[c] | |
| | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % |
| Asthma, continued | | | | | | | | | | | | | | |
| Women | 1759 | 9.28 | 1392 | 10.21 | 2082 | 10.39 | 1321 | 10.09 | 931 | 9.50 | 7485 | 9.91 | 7485 | 9.91 |
| Thyroid disorders | | | | | | | | | | | | | | |
| Both sexes | 305 | 0.79 | 963 | 4.02 | 3546 | 9.35 | 3732 | 15.18 | 4283 | 24.71 | 12,829 | 9.01 | 12,829 | 8.87 |
| Men | 106 | 0.54 | 150 | 1.45 | 638 | 3.57 | 789 | 6.86 | 1091 | 14.48 | 2774 | 4.15 | 2774 | 4.27 |
| Women | 199 | 1.05 | 813 | 5.96 | 2908 | 14.51 | 2943 | 22.48 | 3192 | 32.56 | 10,055 | 13.32 | 10,055 | 13.00 |
| Deficiency and other anemia | | | | | | | | | | | | | | |
| Both sexes | 868 | 2.25 | 1040 | 4.34 | 2803 | 7.39 | 2751 | 11.19 | 5148 | 29.70 | 12,610 | 8.86 | 12,610 | 8.75 |
| Men | 406 | 2.07 | 163 | 1.58 | 582 | 3.25 | 997 | 8.67 | 2161 | 28.69 | 4309 | 6.44 | 4309 | 6.65 |
| Women | 462 | 2.44 | 877 | 6.43 | 2221 | 11.08 | 1754 | 13.40 | 2987 | 30.47 | 8301 | 10.99 | 8301 | 10.79 |
| Bowel disorders | | | | | | | | | | | | | | |
| Both sexes | 481 | 1.25 | 630 | 2.63 | 1843 | 4.86 | 4525 | 18.40 | 5195 | 29.97 | 12,674 | 8.90 | 12,674 | 8.68 |
| Men | 253 | 1.29 | 243 | 2.35 | 937 | 5.24 | 2338 | 20.34 | 2459 | 32.64 | 6230 | 9.32 | 6230 | 9.39 |
| Women | 228 | 1.20 | 387 | 2.84 | 906 | 4.52 | 2187 | 16.71 | 2736 | 27.91 | 6444 | 8.53 | 6444 | 8.09 |
| Cancer[d] | | | | | | | | | | | | | | |
| Both sexes | 94 | 0.24 | 397 | 1.66 | 1887 | 4.98 | 3272 | 13.31 | 6334 | 36.54 | 11,984 | 8.42 | 11,984 | 8.28 |
| Men | 52 | 0.27 | 85 | 0.82 | 630 | 3.52 | 1483 | 12.90 | 3202 | 42.51 | 5452 | 8.15 | 5452 | 7.62 |
| Women | 42 | 0.22 | 312 | 2.29 | 1257 | 6.27 | 1789 | 13.67 | 3132 | 31.95 | 6532 | 8.65 | 6532 | 8.92 |
| Biliary and liver disorders | | | | | | | | | | | | | | |
| Both sexes | 1141 | 2.96 | 795 | 3.32 | 3207 | 8.46 | 3392 | 13.80 | 3243 | 18.71 | 11,778 | 8.27 | 11,778 | 8.23 |
| Men | 599 | 3.05 | 242 | 2.34 | 1456 | 8.14 | 1459 | 12.69 | 1443 | 19.16 | 5199 | 7.78 | 5199 | 7.93 |
| Women | 542 | 2.86 | 553 | 4.06 | 1751 | 8.74 | 1933 | 14.77 | 1800 | 18.36 | 6579 | 8.71 | 6579 | 8.53 |
| Obstructive pulmonary disorders | | | | | | | | | | | | | | |
| Both sexes | 1738 | 4.51 | 1132 | 4.72 | 2816 | 7.43 | 2506 | 10.19 | 3263 | 18.82 | 11,455 | 8.05 | 11,455 | 8.00 |
| Men | 910 | 4.64 | 352 | 3.41 | 1089 | 6.09 | 1097 | 9.54 | 1466 | 19.46 | 4914 | 7.35 | 4914 | 7.47 |
| Women | 828 | 4.37 | 780 | 5.72 | 1727 | 8.62 | 1409 | 10.76 | 1797 | 18.33 | 6541 | 8.66 | 6541 | 8.56 |
| Ischemic heart disease | | | | | | | | | | | | | | |
| Both sexes | 164 | 0.43 | 156 | 0.65 | 1107 | 2.92 | 3084 | 12.54 | 6833 | 39.42 | 11,344 | 7.97 | 11,344 | 7.87 |
| Men | 88 | 0.45 | 102 | 0.99 | 631 | 3.53 | 1895 | 16.48 | 3513 | 46.64 | 6229 | 9.32 | 6229 | 9.60 |
| Women | 76 | 0.40 | 54 | 0.40 | 476 | 2.38 | 1189 | 9.08 | 3320 | 33.87 | 5115 | 6.77 | 5115 | 6.45 |

[a]Numbers to the left of the prevalence figure indicate the actual number of cases observed. Prevalence can be computed by dividing the number of cases by the following corresponding denominators (and multiplying by 100); Denominators for men and women combined: 0-18 = 38,558; 19-29 = 23,968; 30-49 = 37,927; 50-64 = 24,588; ≥65 = 17,336. Denominators for men: 0-18 = 19,611; 19-29 = 10,337; 30-49 = 17,888; 50-64 = 11,496; ≥65 = 7533. Denominators for women: 0-18 = 18,947; 19-29 = 13,631; 30-49 = 20,039; 50-64 = 13,092; ≥65 = 9803.

[b]A crude prevalence was computed by dividing cases observed across all ages by the total population.

[c]Overall prevalence for men and women combined was standardized by age and sex; overall prevalence for men and women separately was standardized only by age (direct standardization using the 2000 US Census population).

[d]Prevalence for men excluded female cancers (eg, ovarian, uterine), and prevalence for women excluded male cancers (eg, prostate, testicular).

single conditions observed in Olmsted County were generally in agreement with US statistics (Table 2). For example, national prevalence estimates indicate that approximately 30% of the adult population is affected by hypertension, increasing from 29.9% in persons 18 years or older to 70.3% in persons 65 years or older.[19] These numbers were similar to the estimated prevalence of hypertension among the adult Olmsted County population (24.7% in those 18 years or older and 70.7% in those 65 years or older). However, there were greater differences for some other diseases. For example, the prevalence of osteoarthritis in people 65 years or older was 44.4% in Olmsted County compared to 33.6% in the total US population of the same age.[20]

## DISCUSSION

### Principal Findings

Using the REP medical records linkage system, we described the prevalence of the most common medical conditions in a defined US



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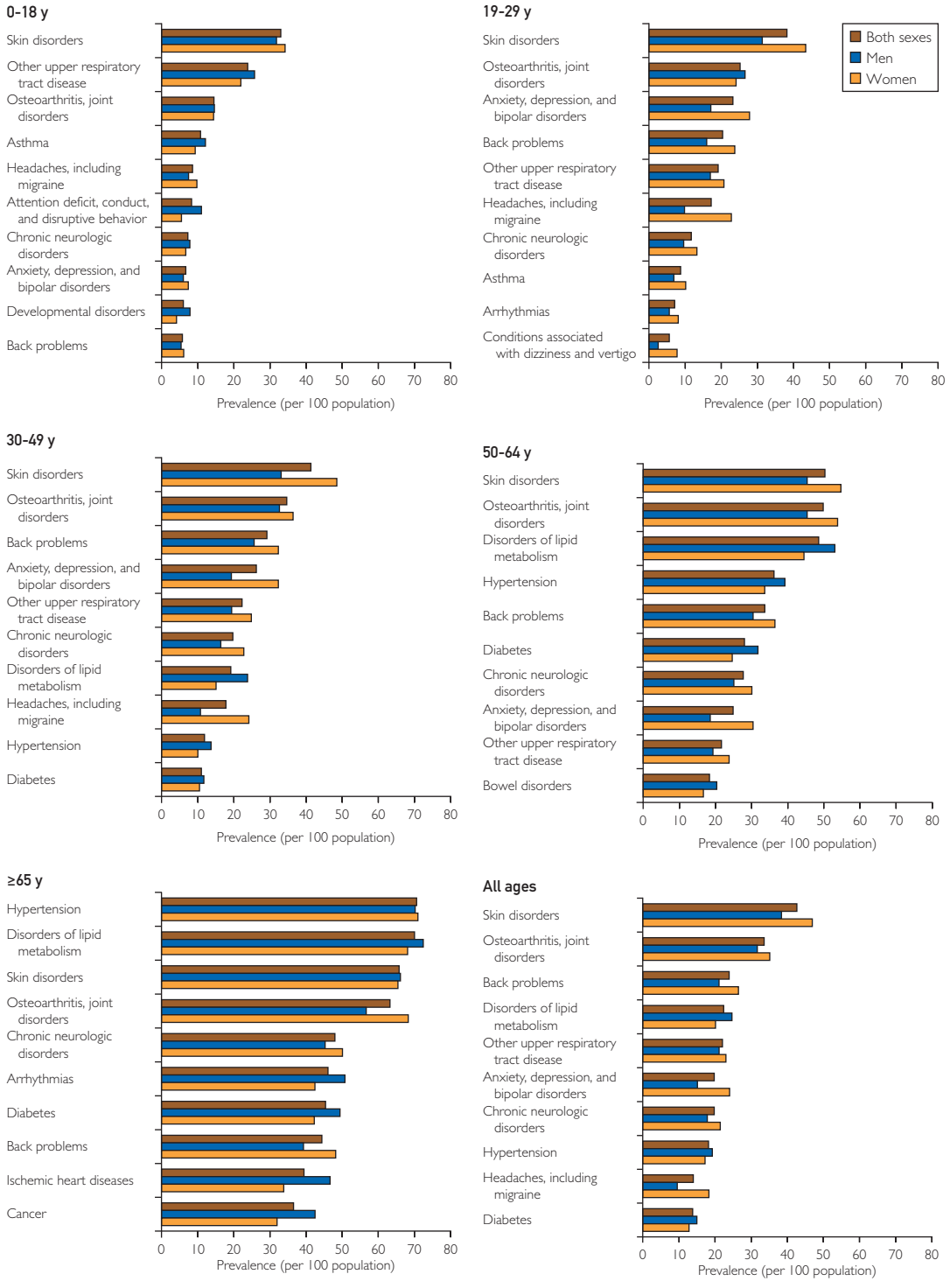


**FIGURE 1.** Prevalence (per 100 population) of the 10 most prevalent disease groups in 5 broad age categories and for all ages combined (lower right panel). Prevalence figures were age and sex standardized (when applicable). Prevalence in both sexes is shown with brown bars, prevalence in men is shown with blue bars, and prevalence in women is shown with orange bars.

population across all ages, for men and women separately, and across ethnic groups. Surprisingly, the most prevalent nonacute conditions in our community were not chronic conditions related to aging such as diabetes and heart disease but rather conditions that affect both sexes and all age groups: skin disorders, osteoarthritis and joint disorders, back problems, disorders of lipid metabolism, and upper respiratory tract disease (excluding asthma). The broad disease groups that we examined in this study are useful for describing important drivers of health care utilization that might otherwise be overlooked.

Unexpectedly, almost half of the Olmsted County population of all ages received a diagnosis of skin disorders within approximately 5 years. The skin disorders category was broad and included 19 different *ICD-9* groupings (including actinic keratosis, acne, and sebaceous cysts). No single skin disorder was highly prevalent, but skin disorders in combination affected a considerable proportion of all age groups in our population. Skin disorders are not typically major drivers of disability or death but may be important determinants of health care utilization and cost. For example, many of the actinic skin issues require continued observation and therapy.[21] New models of dermatological care delivery, such as teledermatology, should be critically explored within US health care systems to increase care efficiency and reduce health care expenditures.[22] Our data suggest that such efficiencies could affect a substantial proportion of the population.

The osteoarthritis and joint disorders group was also common in our population. The ICD-9 code 719 "Other and unspecified joint disorders" was assigned 216,153 times in the study time frame. The ICD-9 code 719.4 (joint pain) accounted for most of these diagnoses (176,546; 82%). Our data suggest that resources to diagnose, treat, and prevent joint pain may be required; however, joint pain occurs for multiple reasons. Overuse and activity injuries can cause short-term pain, whereas chronic conditions such as osteoarthritis and obesity may cause long-term pain.[23,24] The underlying etiology of the joint pain cannot be determined from the *ICD-9* codes, and it will be necessary to acquire additional information to determine the exact health care burden and needs for these patients. Our data point to the need for further study of this common problem and its causes to identify areas for intervention.

Back problems were the third most prevalent disease group. Back problems and back pain are highly prevalent in the US[25] and have been previously classified as the eighth most costly chronic condition in patients aged 18 to 64 years.[2] Management of back problems can be challenging, and Carey et al[26] noted that patients experience similar outcomes despite a wide variation in health care professional, type of treatment, and cost of treatment. The implementation of protocols to stratify the management of patients with back pain in the primary care setting has been shown to improve health and decrease costs.[27] The availability of detailed information from a complete population will allow us to study current treatments for back problems and to evaluate how these treatments compare with evidence-based guidelines.[28] Additionally, as with skin conditions, improved management of patients with back problems could affect a substantial proportion of the population.

Disorders of lipid metabolism was the fourth most prevalent disease group. Consistent with our observation in Olmsted County, hyperlipidemia is highly prevalent in many populations throughout the US.[29] Hyperlipidemia contributes to multiple chronic conditions but also offers a potential target for intervention. Current guidelines for the treatment of hyperlipidemia clearly identify groups of patients most likely to benefit from treatment.[30] Among patients with diabetes, telephonic management of hyperlipidemia by nurses may hold promise for improving lipid control and reducing costs.[31]

Finally, other upper respiratory tract disease (excluding asthma) was the fifth most common category in our population. Similar to skin problems, the conditions included in other upper respiratory tract disease are not considered major causes of morbidity or mortality. However, these conditions are extremely common and affect all age groups. Allergic rhinitis accounted for over half of the diagnoses in this category. Allergic rhinitis alone has been estimated to affect up to 40 million Americans, and symptoms are present for more than 4 months of each year in more than half of the affected patients.[32] Additionally, direct and


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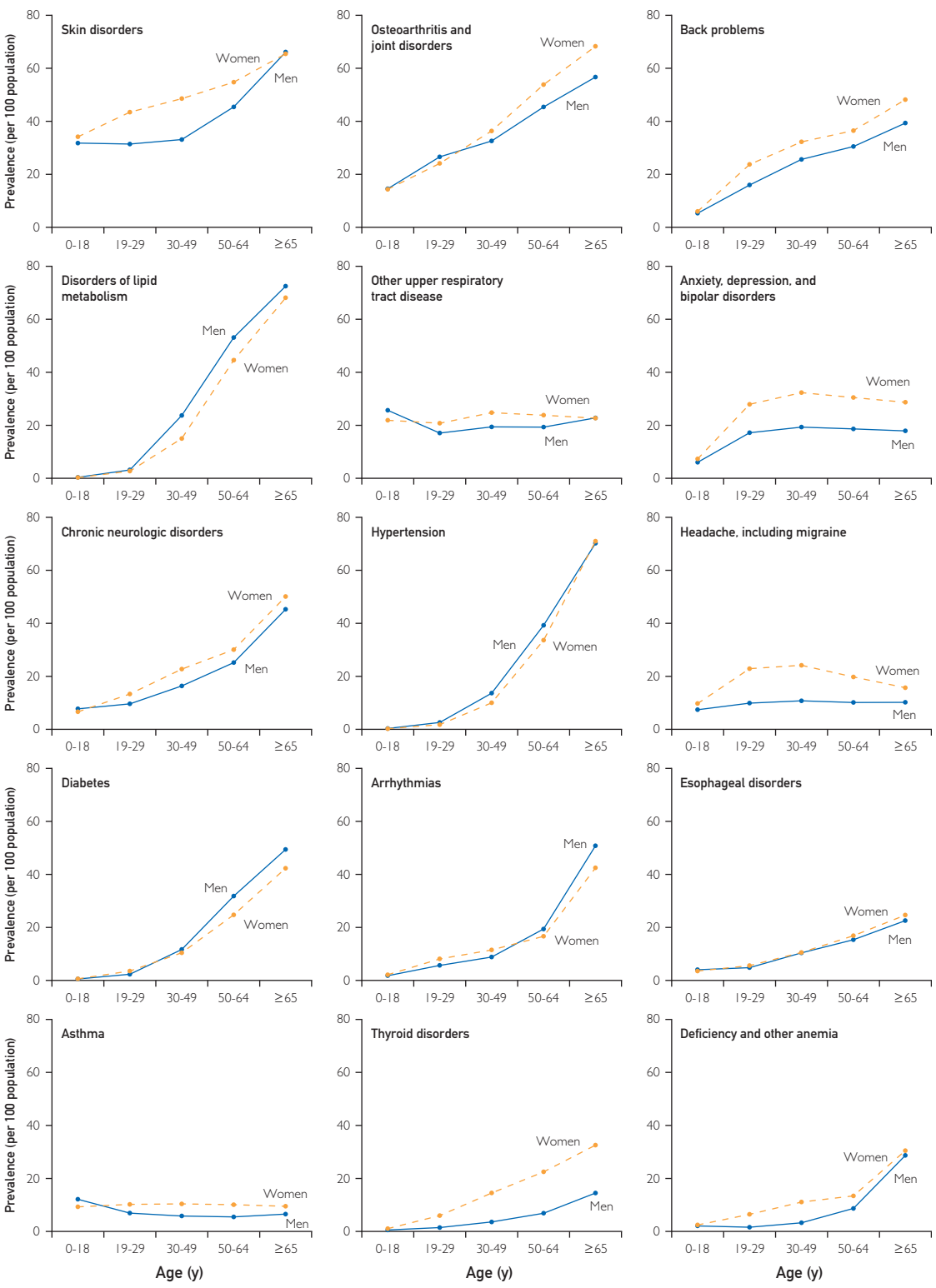


**FIGURE 2.** Age-specific prevalence (per 100 population) of the 15 most prevalent disease groups in men (blue line) compared with women (orange line). The 15 panels are presented in decreasing order of overall age- and sex-adjusted prevalence (see Table 1).

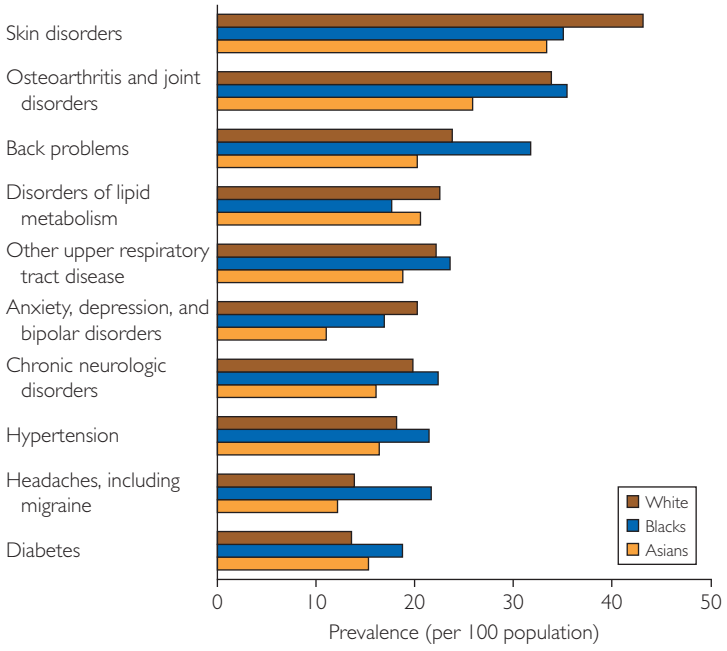


**FIGURE 3.** Prevalence (per 100 population) of the 10 most prevalent disease groups by ethnic group. Prevalence figures were standardized by age and sex (when applicable). Prevalence in whites is shown with brown bars, prevalence in blacks is shown with blue bars, and prevalence in Asians is shown with orange bars.

indirect health care expenditures related to allergic rhinitis were approximately $11.2 billion in 2005.[33] Patients with allergic rhinitis often have multiple comorbid conditions including eczema, asthma, chronic sinusitis, and nasal polyps.[32,34] Effective treatment of the conditions included in other upper respiratory tract disease may represent an ideal opportunity to improve the health care management of a considerable proportion of the community.

## Strengths and Limitations

The strengths of our study include access to data on all conditions for an entire population, across age, sex, and ethnic groups. Such data are often difficult to obtain in the US because we lack a centralized health care surveillance system. For example, Medicare data contain similar diagnosis information, but the data are largely limited to elderly persons (aged 65 years and older). Data from health insurers contain similar diagnostic information, but the populations are limited to subjects who are insured, and insured patients may be healthier than the general population.[7]

The main limitation of our study is the inability to verify the validity of *ICD-9* codes. We know from previous REP studies that codes may be assigned in error, and manual review of the medical records is often needed to ascertain whether an individual truly has the disease or condition of interest.[35-39] Additionally, we may have missed patients who should have been assigned a code of interest but were not. However, because many of the diagnoses represent chronic conditions, it is likely that affected patients would be seen at least once within the 5-year period. Despite these limitations, and despite differences in the methodology used for calculating prevalence, our prevalence estimates for 10 common chronic conditions were similar to published US population estimates (Table 2). These data suggest that using *ICD-9* codes stored electronically for administrative purposes may be useful to estimate prevalence rates for broad groups of diseases and to monitor the health of a given population over time at relatively low cost.

Many *ICD-9* codes are nonspecific, and it is unclear whether some of these code notations (eg, for joint pain) are the first indication of an underlying pathology that might be diagnosed with additional follow-up. Therefore, these data are useful to understand why people were visiting their doctors but may not be useful to understand the etiology of specific underlying diseases.

Olmsted County, Minnesota, is home to Mayo Clinic, a tertiary referral center with an international reputation. It is possible that patients might move to the area for treatment and remain as residents of the community. It is also possible that the access to a large number of medical specialists and subspecialists could result in an increased likelihood of diagnosis of specific conditions. Finally, a larger proportion of the Olmsted County population (22%) is employed by a health care institution compared with the rest of the US (9%).[46,47] If health care employees are more likely to visit a health care professional than those who are not employed by a health care institution, our prevalence data could be substantially higher than in the rest of the US. However, we compared the prevalence of 10 common


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**TABLE 2. Comparison of the Prevalence (per 100 Population) of Selected Diseases and Conditions in the Total US Population vs the Olmsted County Population[a]**

| Disease or condition | Age stratum | US population | | Olmsted County population prevalence (%)[b] |
|---|---|---|---|---|
| | | Reference | Prevalence (%) | |
| Hypertension | | Keenan et al, 2011[19] | | |
| | ≥18 y | | 29.9 | 24.7 |
| | ≥65 y | | 70.3 | 70.7 |
| Mood disorders | | Kessler et al, 2005[40] | | |
| | 18-29 y | | 21.4 | 23.2 |
| | ≥60 y | | 11.9 | 23.9 |
| Diabetes | | CDC, 2011[41] | | |
| | ≥20 y | | 11.3 | 9.0[c] |
| | ≥65 y | | 26.9 | 23.9[c] |
| Osteoarthritis | | Lawrence et al, 2008[20] | | |
| | ≥25 y | | 13.9 | 18.5 |
| | ≥65 y | | 33.6 | 44.4 |
| Asthma | | Akinbami et al, 2011[42] | | |
| | 0-17 y | | 9.6 | 10.6 |
| | ≥18 y | | 7.7 | 8.4 |
| Osteoporosis | | Cheng et al, 2009[43] | | |
| | ≥65 y | | 29.7 | 21.4 |
| Prostate cancer | | ACS, 2011[44] | | |
| | All ages | | 1.6[d] | 2.3 |
| Breast cancer | | ACS, 2011[44] | | |
| | All ages | | 1.7[d] | 2.2 |
| Colon cancer | | ACS, 2011[44] | | |
| | All ages | | 0.4[d] | 0.4 |
| HIV infection | | Minnesota DOH, 2012[45] | | |
| | All ages | | 0.1 | 0.1 |

[a]ACS = American Cancer Society; CDC = Centers for Disease Control and Prevention; DOH = Department of Health; HIV = human immunodeficiency virus; *ICD-9 = International Classification of Diseases, Ninth Revision.*

[b]Age and sex standardized using the 2000 US Census population (direct standardization).

[c]Prevalence estimates include only *ICD-9* codes for diabetes, not for abnormal glucose tests.

[d]Prevalence calculated using the estimated US population on July 1, 2008 (men: 149,924,604; women: 154,135,120; both sexes: 304,059,724).

conditions in Olmsted County to national prevalence figures and found similar frequencies (Table 2). These comparisons suggest that the in-migration for health care, the higher probability of diagnosis associated with a tertiary care center, and the higher frequency of health care employees in Olmsted County did not artificially inflate the prevalence of the conditions that were studied.

## CONCLUSION

In this article, we report the prevalence of 47 broad categories of nonacute conditions across all age groups, in men and women separately, and across ethnic groups in the Olmsted County population. The data provide insight into current health care use in a defined US population and may predict future health care service and work force needs as well as opportunities for prevention. Finding that skin and back problems are major drivers of health care utilization affirms the importance of moving beyond the commonly recognized health care priorities such as diabetes, heart disease, or cancer. Our findings highlight opportunities to improve health care and decrease costs related to common nonacute conditions as we move forward through the changing health care landscape.

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## SUPPLEMENTAL ONLINE MATERIAL

Supplemental material can be found online at http://www.mayoclinicproceedings.org.

**Abbreviations and Acronyms:** **CCC** = clinical classification code; ***ICD-9*** = *International Classification of Diseases, Ninth Revision*; **REP** = Rochester Epidemiology Project

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