Estimated Prevalence and Incidence of Dry Eye Disease Based on Coding Analysis of a Large, All-age United States Health Care System

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• PURPOSE: To assess overall prevalence, annual prevalence, and incidence of dry eye disease (DED) in a large, representative population in the United States.
• DESIGN: Prevalence and incidence study.
• METHODS: Retrospective analysis using the Department of Defense (DOD) Military Health System (MHS) data on beneficiary medical claims from United States DOD military and civilian facilities, January 1, 2003 through March 31, 2015. PATIENT POPULATION: Using an algorithm, medical diagnostic codes indicative of DED and prescriptions for cyclosporine ophthalmic emulsion identified a DED population from 9.7 million MHS beneficiaries (DOD service members, retirees, and dependents, aged 2-80+ years). MAIN OUTCOME MEASURES: DED overall prevalence (2003-2015), annual prevalence (2005-2012), and annual incidence (2008-2012) stratified by sex, age group, and International Statistical Classification of Diseases and Related Health Problems, Ninth Revision diagnosis code grouping.
• RESULTS: DED prevalence was 5.28% overall, 7.78% among female beneficiaries, 2.96% among male beneficiaries and increased with age from 0.20% for ages 2-17 years, to 11.66% for individuals aged 50+ years. Annual prevalence increased from 0.8% to 3.0% overall, from 1.4% to 4.5% in female beneficiaries, and from 0.3% to 1.6% in male beneficiaries. Annual prevalence increased across age groups starting at age 18-39, 0.1%-0.6%, to age 50+, 1.8%-6.0%. Annual incidence increased from 0.6% to 0.9% overall, from 0.8% to 1.2% in female beneficiaries, and from 0.3% to 0.6% in male beneficiaries. Across age groups, annual incidence increased starting at age 18-39 (0.2%-0.3%), to age 50+ (1.0%-1.6%).
• CONCLUSIONS: DED overall prevalence, annual prevalence, and incidence were found to increase over time for all demographics. These findings highlight the continued importance of research and therapeutic development for this common condition. (Am J Ophthalmol 2019;202:47–54. © 2019 The Authors. Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).)

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DRY EYE DISEASE (DED) IS A MULTIFACTORIAL ocular surface disease characterized by symptoms of discomfort, irritation, and visual disturbance.[1,2] DED imposes significant burdens on individuals, including impairment in social functioning, occupational functioning, and reduced quality of life.[3,4] Known risk factors for DED include female sex, increasing age, and certain comorbid conditions (eg, autoimmune diseases), and medications used to treat them.[5–11]

Prevalence estimates of DED range from 5% to 34% in individuals over 50 years old,[12] with much of this variation likely owing to differences in definition of dry eye and methodology among studies. Many of these estimates derive from relatively small geographically homogeneous populations, with fewer estimates based on US-wide samples or in populations less than 50 years old.[5,6,8,11,13,14] This study assessed prevalence and incidence of DED across a wide range of ages in the United States using data from the US Department of Defense (DOD) Military Health System (MHS) database containing comprehensive health-related data (inpatient and outpatient health-care service records, prescription records, and demographic information) on almost 10 million beneficiaries of all ages and backgrounds. The enrolled population in MHS has broad demographic and geographic similarities to the overall US population. Thus, the size and geographic/demographic diversity, and its substantial proportion of younger adults makes the MHS claims data a generalizable resource for prevalence and incidence estimates, and their stratification, for the US population.

TABLE 1. Indicators of Dry Eye Disease Used to Determine Prevalence and Incidence in the Study Population

Driving Indicators		Nondriving Indicators	
ICD-9 Diagnosis or Procedure Codes, CPT Codes, and Prescriptions	Indicator	ICD-9 Code	Indicator
370.33	Keratoconjunctivitis sicca	370.20	Superficial keratoconjunctivitis
370.34	Exposure keratoconjunctivitis	370.21	Punctate keratitis
372.53	Conjunctival xerosis	714.0	Rheumatoid arthritis
375.15	Tear film insufficiency, unspecified	695.4	Discoid lupus erythematosus
		710.0	Systemic lupus erythematosus
		373.34	Discoid lupus erythematosus of eyelid
710.20	Sicca syndrome, Sjögren	—	—
68760	Closure of the lacrimal punctum (by thermocauterization, ligation, or laser surgery)	—	—
68761	Punctal plugs	—	—
09.91	Obliteration of lacrimal punctum	—	—
Restasis	Prescription fill for cyclosporine ophthalmic emulsion	—	—

CPT = Current Procedural Terminology; ICD-9 = International Classification of Diseases and Related Health Problems, Ninth Revision.

METHODS

• **DATA SOURCE:** MHS claims data covering January 1, 2003 to March 31, 2015 were accessed for this study. The MHS claims database contains comprehensive health-related data (inpatient/outpatient health care service records, prescription records, demographic information) for ~10 million beneficiaries, including DOD service members, retirees, and their dependents. The claims data include information on medical services incurred in DOD military facilities (55 military hospitals and 373 clinics, constituting approximately 30% of claims records) and purchased care provided by civilian facilities from as many as 350 000 network providers that accept DOD insurance known as TRICARE (constituting approximately 70% of claims records). The database archives more than 30 billion records, 5 billion online records spanning over 12 years for electronic health records, 20 years of electronic prescribing, and decades of prescription, inpatient, and outpatient data. As a single-payer, fully budgeted $55 billion health care system, it provides uniform medical coverage and pharmacy benefits. Additionally, traditional socioeconomic disparities are minimized for this population owing to a common employer and a strong rank structure. The data source has the advantage of a large sample that is geographically and generally demographically representative of the US population. The research data were developed in cooperation with the Naval Medical Center in Portsmouth, Virginia, USA, and the study was approved by the Naval Medical Research Unit – Dayton, Institutional Review Board (IRB protocol NAMRUD.2015.0005).

• **STATISTICAL ANALYSIS:** The analysis estimated overall prevalence, annual prevalence, and annual incidence of DED using an algorithm constructed from selected International Statistical Classification of Diseases and Related Health Problems, Ninth Revision (ICD-9) and Current Procedural Terminology (CPT) codes for driving or nondriving indicators of DED, and prescriptions for cyclosporine ophthalmic emulsion (Restasis; Table 1). Because there is no universal diagnosis of DED, and therefore no unique diagnosis code to identify DED specifically, the present study used a combination of diagnoses, procedures, and/or prescription fills to identify patients with a high likelihood of having DED. The methodological requirement for a combination of indicators for estimating each beneficiary's likelihood of having DED minimizes the chance of inclusion of peripheral conditions that could lead to an inaccurate estimate of the prevalence and incidence of DED. Additionally, because some patients may not see an eye care provider or seek care for DED on a regular basis, a 5-year washout period before the first observed DED indicator was used in the analysis of estimated annual incidence. DED driving indicators were defined as those in which 2 independent records of the same diagnosis, procedure, or prescription fill were observed for a beneficiary, sufficient to assign a likely DED diagnosis. DED nondriving indicators were defined as those that had to be combined with a driving indicator to assign a likely DED diagnosis. An assignment of likely DED in this study was defined as 2 medical claims based on driving indicators alone or as a combination of driving and other driving/nondriving indicators.

Overall prevalence of DED was analyzed for the entire studied period (2003-2015) and calculated as follows: the denominator was the number of beneficiaries continuously enrolled over a 5-year period, at any time in the studied period, and the numerator was the number of beneficiaries

TABLE 2. Groupings of Indicators of Dry Eye Disease Used to Analyze Subgroups of Prevalence and Incidence in the Study Population

Group	ICD-9 Type	Description	Required	Restriction
Group 1 DED unspecified	375.15 Driving 370.33 Driving	Tear film insufficiency, unspecified Keratoconjunctivitis sicca	At least: (1) 1 of each, or (2) 2 of the same	No other driving/nondriving indicator is allowed
Group 2 DED specified	370.21 Nondriving 370.20 Nondriving	Punctate keratitis Superficial keratoconjunctivitis	At least: (1) 1 of 370.21 or 370.20 and (2) 1 driving indicator (375.15, or 370.33)	Only the specified 2 driving indicators, but could have other nondriving indicator(s)
Group 3 Sjögren-type DED	710.2 Driving	Sicca syndrome, Sjögren	At least: (1) 2 of 710.2, or (2) 1 of 710.2 and 1 driving indicator (375.15 or 370.33)	No other nondriving indicator is allowed

ICD-9 = International Classification of Diseases and Related Health Problems, Ninth Revision.

with a driving indicator and a second indicator at any time in the studied period. Overall prevalence data were projected to the entire US population (ie, 308 745 538 individuals based on latest US Census Bureau data[15]) using a direct age-sex–weighted adjustment method. Age-sex weights for the adjustment were computed based on the proportional representation of each age-sex stratum in the MHS database sample compared to the US Census Bureau data. For example, women 18-29 years old represent 9% of the population in the MHS database and 8% in the overall US population from the 2015 US Census Bureau data. Subsequently, age-sex weight-adjusted estimates for prevalence of DED in each specific age-sex stratum of the sample (eg, women 18-29 years old) were projected to the US population accordingly for each specific age-sex stratum in the population and further summed for computation of overall prevalence.

Annual prevalence of DED was analyzed by calendar year (2005-2012) and calculated as follows: the denominator was the number of beneficiaries continuously enrolled during the 5-year window surrounding the studied year (ie, 2 years before, studied year, 2 years after). The numerator was the number of beneficiaries with a driving indicator at some point during the 5-year window surrounding the studied year, 1 or more driving/nondriving indicators must have occurred during the 2 years before the studied year or during the studied year, and 1 or more driving/nondriving indicators must have occurred during the studied year or during the 2 years after the studied year (a total of 2 indicators were required).

The annual incidence of DED was analyzed by calendar year (2008-2012) and calculated as follows: the denominator was the number of beneficiaries with continuous health care plan enrollment (ie, no lapse or break in coverage) during the 5-year washout period (ie, 5 years preceding January 1 of studied year) and no diagnosis related to a driving indicator of DED during the 5-year washout period. The numerator was the number of beneficiaries from the denominator with the first DED indicator recorded in the studied year and the second indicator recorded either during the studied year or any time after.

The data for overall DED prevalence (2003-2012), annual DED prevalence (2005-2012), and incidence (2008-2012) were stratified by sex and age group (18-39, 40-49, and 50 or more years old). In lieu of specific ICD-9 diagnostic codes for aqueous-deficient dry eye and evaporative dry eye or other etiologies, data for overall prevalence (2003-2012), and 2012 annual prevalence and incidence were also stratified by ICD-9 diagnosis code grouping (Table 2): Group 1 (DED unspecified), Group 2 (DED specified), and Group 3 (DED with Sjögren syndrome).

RESULTS

• **DEMOGRAPHICS:** A total of 9 732 272 beneficiaries from the MHS were included in these analyses of DED prevalence and incidence. Female beneficiaries comprised 48.13% overall (n = 4 684 011); 20.80% were aged 2-17 (n = 2 024 134; 48.86% female), 34.61% were 18-39 (n = 3 368 308; 42.57% female), 11.15% were 40-49 (n = 1 085 304; 51.46% female), and 33.44% were aged 50 years or older (n = 3 254 526; 52.31% female).

• **OVERALL PREVALENCE OF DRY EYE DISEASE:** Overall prevalence of DED between 2003 and 2015, estimated among approximately 9.7 million MHS beneficiaries, was 5.28%. Overall prevalence was higher among female (7.78%) than male beneficiaries (2.96%) and increased with age (0.20%, 2.03%, 5.74%, and 11.66% in beneficiaries aged 2-17, 18-39, 40-49, and 50 or more years, respectively). Within each age group, overall prevalence in female beneficiaries was 2-3 times that in male beneficiaries: 0.27% vs 0.13% (aged 2-17 years), 3.07% vs 1.26% (18-39 years), 8.50% vs 2.80% (40-49 years), and 15.89% vs 7.02% (50 or more years).

The 4 most common indicators of DED, both nondriving and driving, included unspecified tear film insufficiency (ICD-9: 375.15), 88.04%; keratoconjunctivitis sicca (ICD-9: 370.33), 10.19%, rheumatoid arthritis (ICD-9: 714.0), 7.98%; and Sjögren sicca syndrome (ICD-9: 710.2), 6.58%. The most common indicator combination found was 2 diagnoses of unspecified tear film insufficiency (ICD-9: 375.15), 65.72%. Based on a matrix analysis of DED indicator combinations from the present study, the contribution of patients assigned as likely DED from combinations of DED indicators most distally related to DED, such as rheumatoid arthritis or systemic lupus erythematosus, combined with exposure keratoconjunctivitis or conjunctival xerosis, account for just 0.09% of the total DED indicator combinations.

Of the DED-prevalent population, 40.42% (n = 207 757) were in Group 1, 4.83% (n = 24 804) were in Group 2, and 3.39% (n = 17 403) were in Group 3 (Supplementary Table S1; Supplemental Material available at AJO.com). Overall prevalence of the 3 subgroups of DED between 2003 and 2015 was 2.13%, 0.25%, and 0.18%, respectively. Overall prevalence was higher among female than male beneficiaries in each group and this sex difference was particularly pronounced for Group 3. Overall DED prevalence increased with age among each of the 3 groups (Supplementary Table S1).

• **PROJECTED OVERALL PREVALENCE OF DRY EYE DISEASE IN THE UNITED STATES:** Projected prevalence of DED in the United States between 2003 and 2015 was 5.13% for individuals of all ages (15 849 389 female or male individuals with DED out of 308 745 538 individuals in the United States), and 6.7% in adults (15 715 793 female or male adults with DED out of 234 564 071 individuals ≥18 years old in the United States), 7.33% in female individuals (11 509 284 with DED out of 156 964 212 female individuals in the United States), and 2.86% in male individuals (4 340 105 with DED out of 151 781 326 male individuals in the United States). Projected prevalence in individuals aged 2-17, 18-39, 40-49, and 50 or more years was 0.20% (132 771/66 259 244), 2.40% (2 208 911/91 915 678), 5.71% (2 490 238/43 599 555), and 11.12% (11 017 469/99 048 838), respectively. Within each age group, projected prevalence in female individuals was 2-3 times that in male individuals: 0.27% vs 0.13% (2-17 years), 3.30% vs 1.52% (18-39 years), 8.55% vs 2.82% (40-49 years), and 15.12% vs 6.49% (50 or more years).

• **ANNUAL PREVALENCE OF DRY EYE DISEASE:** Annual prevalence of DED between 2005 and 2012 was calculated among approximately 7.4 million MHS beneficiaries. An increasing trend over time in annual prevalence (0.83% in 2005 to 3.02% in 2012; Figure 1A) was found. Prevalence of DED was consistently higher among female beneficiaries (2005-2012: 1.36%-4.52%) than male beneficiaries (2005-2012: 0.33%-1.55%; Figure 1B) and increased with age (Figure 2). Annual prevalence between 2005 and 2012 ranged from 0.14% to 0.64% in beneficiaries aged 18-39, 0.49% to 1.93% in those aged 40-49, and 1.75% to 5.98% in those aged 50 years or more. Annual prevalence in MHS beneficiaries aged 2-17 years was no greater than 0.02% for each year.

The 2012 annual prevalence of DED was 1.27% for Group 1, 0.12% for Group 2, and 0.12% for Group 3 (Supplementary Table S2; Supplemental Material available at AJO.com).

• **ANNUAL INCIDENCE OF DRY EYE DISEASE:** Annual incidence rates of DED between 2008 and 2012 were calculated among approximately 6.7 million beneficiaries. Annual incidence rates in the overall population ranged between 0.55% and 0.87%, with an increasing trend over time (Figure 1C). Incidence of DED was consistently higher among female beneficiaries (2008-2012: 0.81%-1.21%) than male beneficiaries (2008-2012: 0.30%-0.55%; Figure 1D) and increased with age (Figure 2B). Annual incidence rates between 2008 and 2012 ranged from 0.15% to 0.26% in beneficiaries aged 18-39, 0.42% to 0.65% in those aged 40-49, and 1.03% to 1.62% in those aged 50 years or more. Annual incidence rate in beneficiaries aged 2-17 years was 0.01% for each year.

The annual incidence of DED in 2012 was 0.48% for Group 1, 0.04% for Group 2, and 0.03% for Group 3 (Supplementary Table S3; Supplemental Material available at AJO.com).

DISCUSSION

USING A PURPOSE-BUILT ALGORITHM BASED ON MEDICAL claims documentation of multiple DED indicators, an estimated overall prevalence of DED of 5.28% among 9.7 million beneficiaries of all ages in the MHS between 2003 and 2015 was found. After adjustments for differences in age and sex distribution, this estimate projects to 16 million people in the United States, using 2015 US Census data. Estimates were higher among women than men, and increased with age, starting in young adulthood. Furthermore, DED incidence and prevalence each increased over time.

The present study derived incidence and prevalence estimates from a comprehensive database with a substantial proportion of beneficiaries younger than 50 years of age (66.56%). These data confirm previous research that demonstrated increasing prevalence with increasing age.[5,6,11,16] These findings also confirm results of previous epidemiologic studies showing higher DED prevalence among women than men.[5,6,11,16,17] Previous US epidemiologic studies have been conducted in smaller geographically specific populations,[11,13] or in sex- or age-specific populations.[5–7,13] These findings extend prior

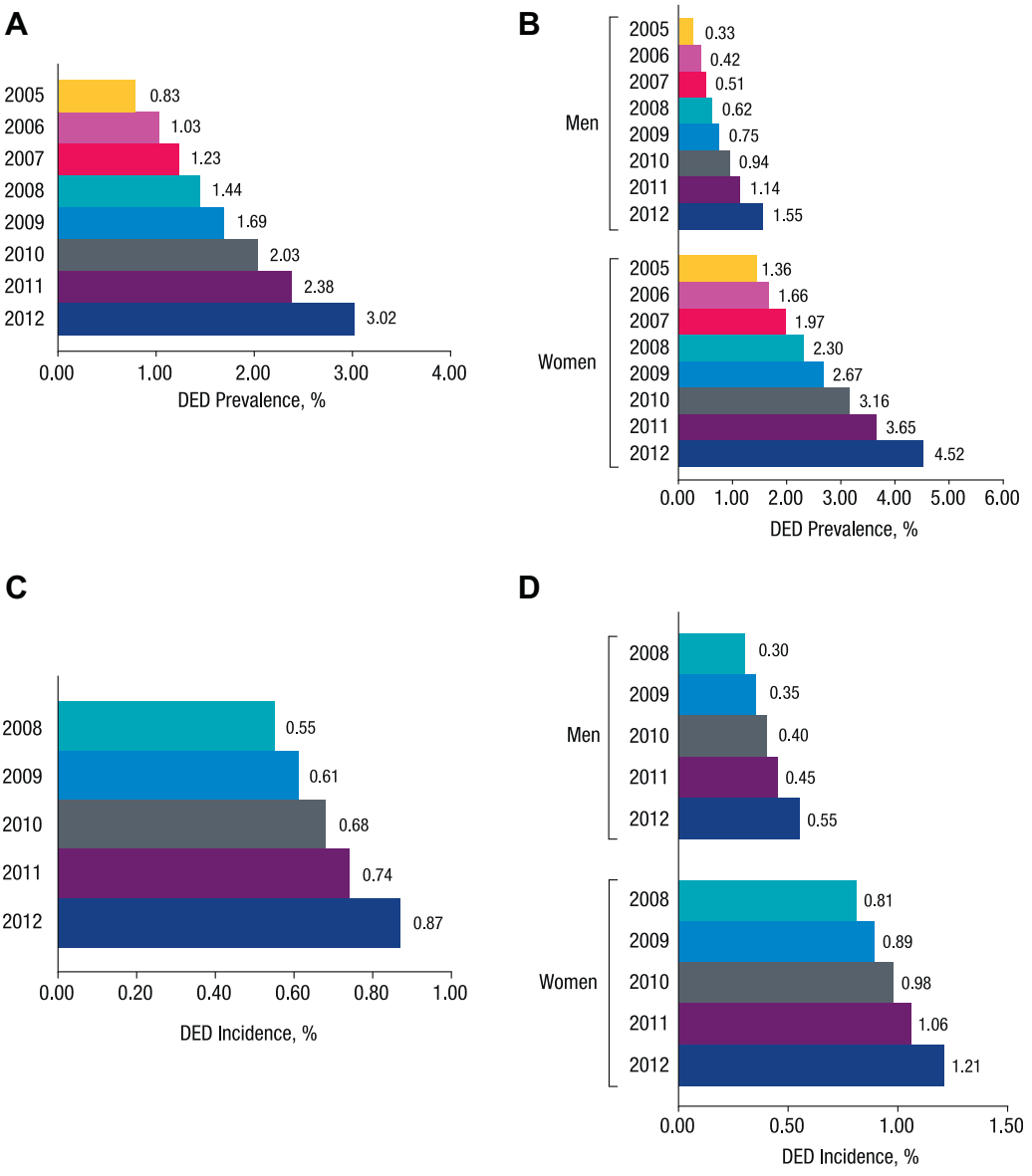

FIGURE 1. Annual prevalence of dry eye disease (DED; between 2005 and 2012) (A) in the overall population and (B) stratified by sex; and annual incidence rates of DED (between 2008 and 2012) (C) in the overall population and (D) stratified by sex.

research to younger populations and provide information on DED trends over time.

Importantly, data from the present study suggest that annual prevalence and incidence rates have increased over time. In this database analysis, annual prevalence tripled over the 7 years from 2005 to 2012. However, the study was not designed to specifically identify the contributing factors in this trend. One likely contributing factor is an increase in education and awareness of DED over time as a treatable condition. The data also show annual prevalence increasing faster among men than women, although the condition still disproportionately affects women.

Two of the 4 most common indicators of DED from this analysis, rheumatoid arthritis (7.98%) and Sjögren sicca syndrome (6.58%), are DED-associated autoimmune diseases that disproportionately affect women.[18] Annual prevalence increased sharply among beneficiaries older than 50 years of age, but also rose steadily for younger age groups. Stratification by 3 distinct groupings of DED claim codes did not reveal trends distinct from the overall results, or sex or age stratifications of these results. Possible explanations for an increase could be related to increased recognition of the disease among both patients and practitioners over time, as well as true increases owing to shifting exposure to DED risk factors.

Comparison of these incidence and prevalence estimates with previous studies is difficult because of differences in

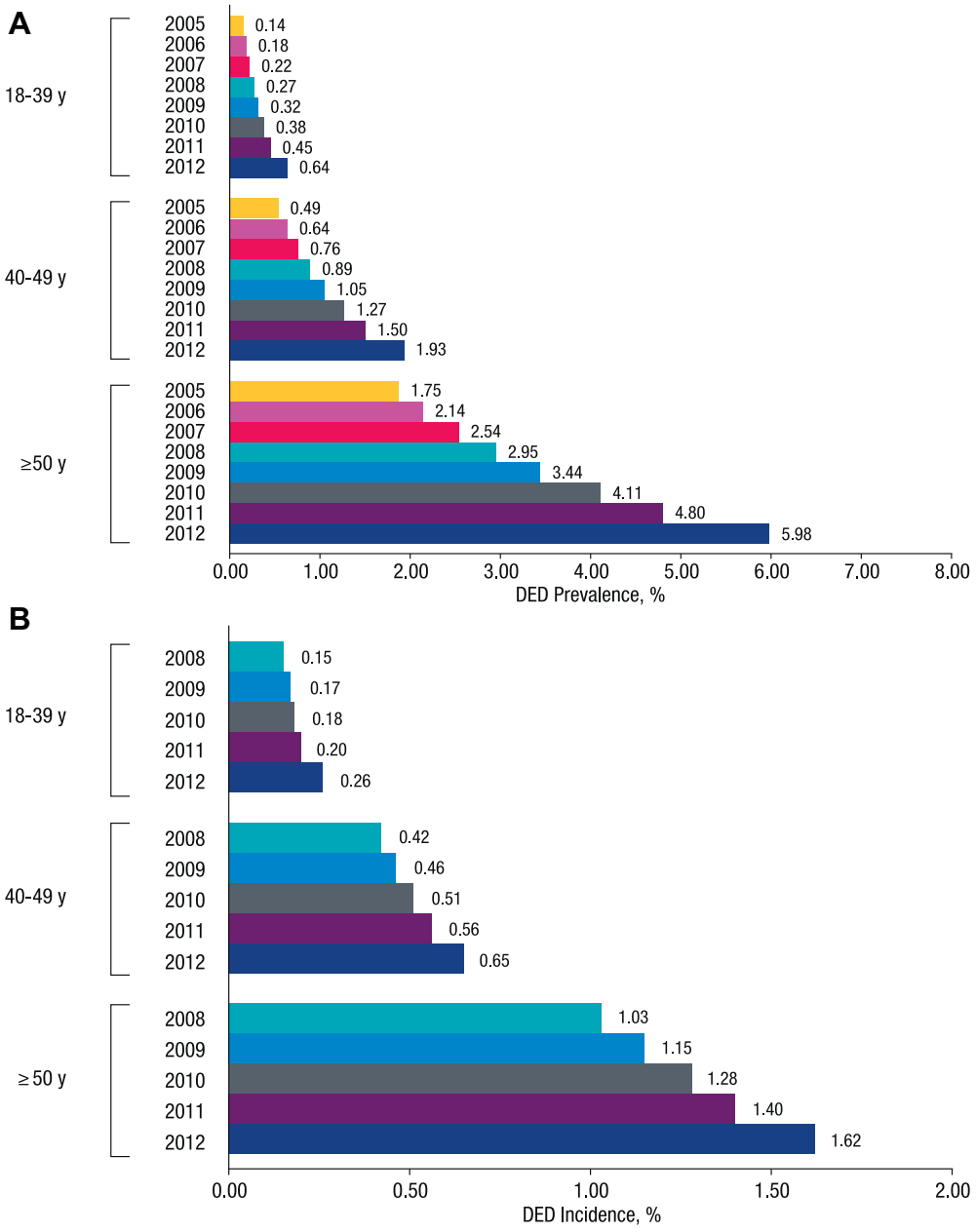

FIGURE 2. (A) Annual prevalence of dry eye disease (DED) between 2005 and 2012 in beneficiaries 18-39, 40-49, and 50 or more years old and (B) annual incidence rates of DED (between 2008 and 2012) in beneficiaries 18-39, 40-49, and 50 or more years old. Annual prevalence and annual incidence in beneficiaries 2-17 years old is not shown (≤0.02% for each year).

methodologies, age ranges of studied populations, and lack of standard definitions for DED prior to DEWS II or for dry eye symptoms (ie, clinical diagnosis vs use of indicators as a surrogate). The projected US adult population prevalence of 6.7% is similar to a DED prevalence estimate of 6.8% of the US adult population that was obtained from a recent data analysis of the 2013 National Health and Wellness Survey.[19] That study analyzed response data from 75 000 participants and used patient self-reports of DED diagnosis to estimate DED prevalence among individuals 18 years of age or older.

In the current study, the 12.9% overall prevalence in adults 65 years of age or older is somewhat lower than estimates in older patients from some previous studies. The Beaver Dam Eye Study, for example, observed a prevalence of 14.4% for adults aged 48 years or older,[16] and the Salisbury Eye Evaluation estimated that 14.6% of adults aged 65 years or older had DED.[13] Both of these studies used self-reporting of DED symptoms ("1 or more symptoms" and "often or all of the time") or broad definitions of DED symptoms ("for the past 3 months or longer, have you had dry eyes?") to classify participants as having DED. However,

other studies[5–7] have shown that the stringency of a DED definition is a key determinant of prevalence, with higher estimates derived from less stringent definitions, such as that used in the Beaver Dam Eye Study and Salisbury Eye Evaluation. Although estimates with lower stringency may be valid, they are likely to capture a wider population of DED patients who have mild disease, including those who are untreated or undiagnosed by a physician. Lower estimates are generally derived from more restrictive definitions, such as severe symptoms, combined with a higher number of criteria (≥2 symptoms) and/or self-report of a DED diagnosis by a clinician. Examples come from the 2003 Women's Health Study (WHS)[5] and 2009 Physician's Health Study (PHS),[6] in which participants aged 49 or more years were required to have *both* dryness and irritation at least often, and DED prevalence estimates below 10% were reported.[5,6]

For individuals younger than 50 years old, the current overall prevalence estimates are substantially lower than those from the Beaver Dam Offspring Study, which reported estimates of 12.8% among participants aged 21-34 and 14% among those 35-44 years of age from 2005 to 2008.[11] However, that study was based on self-reported dry eye symptoms, and it is well known that such symptoms are not specific to DED and may vary depending on activities and other environmental influences.[20,21] Because the current estimates were based on identifying patients who sought care, higher estimates from previous studies may reflect a substantial number of undiagnosed DED cases indicated by patient self-reporting of dry eye symptoms on surveys/questionnaires, or diagnosed patients who do not seek care. This study's estimates based on sex are larger than 2 previous large sex-specific studies. Cross-sectional data from the WHS/PHS revealed DED in 7.8% of 36 995 female participants aged 50+ and 4.3% of 25 444 male participants aged 50+.[5,6] The differences could be due to increased awareness of DED as a treatable condition as well as increased DED prevalence/incidence.

The present study targeted diagnostic codes indicating DED or related conditions, procedures, or treatment across all ages; thus, these findings include DED epidemiology data for younger age groups than have been published previously.[7,10] Estimates of DED prevalence in beneficiaries under 40 years of age in this study provide context for additional research in these young age groups and perhaps demonstrate that DED starts to appear at an earlier age than has been reported previously.

A key limitation of this study is the challenge of identifying a condition that may be classified under several codes in US claims data, and for which underdiagnosis has been suspected.[2] Even though there are some ICD/CPT codes for DED, they are not always used, and they are not unique (ie, there are multiple codes that could be used). Thus, using only 1 code for analyses would underestimate the prevalence of what is widely considered DED. In the present study, an algorithmic combination of diagnoses, procedures, and/or prescription fills related to DED was used to assign a likely indication of DED and minimize misclassification by related conditions. However, because the combination of codes that resulted in an assignment of likely DED for this study may overlap with other conditions, an inconsequential number of beneficiaries without DED may have been included, though unlikely in high enough numbers to impact the DED estimates presented. The database also may contain inaccuracies, variations, or omissions in coded procedures, diagnoses, or medication claims (eg, over-the-counter artificial tears purchased without use of pharmacy benefit), which should be noted as a limitation of the study approach. In addition, ophthalmic cyclosporine use was identified based on claims for prescription fills, which do not confirm that the beneficiary used the medication, although the likelihood is strong that such a prescription would occur primarily only in the context of DED. Finally, as noted above, the impact of changes in the threshold for diagnosis of DED over time or in variations in the diagnostic practices of the many physicians in the MHS during the time period covered or subsequent to the consensus procedures published by the Dry Eye WorkShop II cannot be ruled out.[1,22] However, since the same method was applied to all years, any over- or underdiagnosis, given the limitations of the methods, still suggest a real trend in the measurable and significant changes over time, either in the "real" incidence or prevalence rates, or a progressively increased propensity for health providers to make a diagnosis and code it using the DED diagnosis codes. As a retrospective analysis, the design aspects of the present study were limited to the data available.

Relative to previous epidemiologic estimates of DED, this study's strength is based on its large size and the comprehensive nature of the population that is representative of the US population. Although higher prevalence rates are consistently reported with age and female sex, among other factors, the epidemiology of DED is underinvestigated in younger adults (<50 years old). Additionally, incidence of DED has been poorly documented thus far.

The MHS has few barriers to care for its covered beneficiaries, and medications can be obtained at no cost or for low copayments. The MHS covers a large geographically and demographically diverse population. It also includes a large number of beneficiaries who are younger than 50 years old. These 2 properties make MHS a rich and unique dataset that can reveal trends over many dimensions of DED epidemiology. For this study, a methodology was developed to capture all relevant codes, and used combinations of indicators and procedures that would be common for patients with DED in order to obtain estimates with a favorable balance of sensitivity and specificity.

In summary, these data from a very large geographically and demographically diverse study population provide the first population-based evidence for a rise in annual incidence/prevalence of DED in the United States over the

past decade. Although the findings from the present study cannot provide an explanation for these observed increases, the pattern is clearly present across all age groups. Moreover, DED impacts more than twice as many women as men overall. Based on the largest US population studied to date, the results of this claims database analysis also support prior estimates of increasing risk of DED with age and among female individuals. Further research to understand the factors responsible for these demographic and temporal trends in DED is needed.

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