Disparities in Adult Vision Health in the United States

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• PURPOSE: **To review the existing knowledge on vision health disparities in major adult vision health outcomes (age-related macular degeneration, diabetic retinopathy, glaucoma, cataract, refractive errors) and visual impairment and to identify knowledge gaps as related to the development of enhanced vision health surveillance in the United States.**
• DESIGN: **Literature review.**
• METHODS: **Analysis of relevant publications in the peer-reviewed literature.**
• RESULTS: **Prevalence data on vision health outcomes is limited to findings from a few key population-based studies. Study populations are not representative of all persons living in the United States. Vision loss and visual impairment are more common with age, and there is racial variation in the specific causes of vision loss (underlying health conditions). Women are at greater risk of vision loss than men (even after adjusting for age). Vision-related disability and disparities in visual outcomes are monitored poorly at present.**
• CONCLUSIONS: **Data to assess and monitor trends in vision health disparities in the United States are not collected presently in a systematic fashion. This lack of data limits public health efforts to overcome barriers to eye care use and to improve vision outcomes. (Am J Ophthalmol 2012;154:S23–S30. © 2012 by Elsevier Inc. All rights reserved.)**

VISUAL IMPAIRMENT, DEFINED HERE AS CORRECTable and uncorrectable blindness and low vision, underlies some of the health outcomes most costly to human health, human capital, and to the United States economy. A 2004 study estimated that 3.3 million people 40 years of age and older experience blindness and low vision.[1] Disparities in vision health have been observed based on age, sex, and sociodemographic, racial, and geographic factors, but data gaps exist in both our understanding of vision health disparities and our ability to detect and monitor trends. Public health strategies to enhance awareness, to promote education, and to increase access to successful prevention, treatment, and rehabilitation services among populations at risk for poor vision outcomes can improve vision health in the United States and globally. Systematic and ongoing collection of relevant data to track disparities in vision health and the causes of these disparities is essential to develop and monitor public health initiatives, programs, and policies aimed at reducing the burden of visual impairment and eliminating existing disparities. This literature review was designed to assess our current capacity for collecting useable data to track disparities in vision health outcomes and to assist the process of developing a successful surveillance system for adult vision health.

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METHODS

A TARGETED REVIEW OF THE PEER-REVIEWED LITERATURE published in the United States from 1980 through 2010 was conducted using PubMed and EMBASE. Search terms included the following PubMed MeSH terms and keywords:

1. *Population* or *clinic-based* or *community-based*, AND; *vision* or *visual* or *visually* or *eye*, AND; *surveillance* or *survey* or *database*, AND; *elderly* or *aged* or *older* or *adults*, AND; *America* or *American* or *United States* or *US*; limit to humans, English, 1980 through 2010.
2. *Population* or *clinic-based* or *community-based*, AND; *survey* or *surveillance* or *database*, AND; *diabetic retinopathy* or *glaucoma* or *refractive error* or *cataract* or *age-related macular degeneration*, AND; *elderly* or *aged* or *older* or *adults*, AND; *America* or *American* or *United States* or *US*; limit to humans, English, 1980 through 2010.

Search 1 generated 2310 titles and search 2 generated 1149 titles. Relevant studies were defined as those either that directly addressed vision-related health disparities or that provided data that allowed assessment of disparities in adult populations 40 years of age and older. All abstracts were reviewed to identify potentially relevant studies, and 129 full manuscripts were selected and abstracted. A 10% subset of randomly selected articles was reviewed independently by 2 authors (A.Z.W., D.F.) for quality control. The review focused on 5 major conditions (age-related macular degeneration [AMD], diabetic retinopathy [DR], glaucoma, cataract, and refractive error); in addition, we looked into disparity in visual impairment across groups. Outcomes were defined differently across studies, such that some used clinically measured outcomes and some used self-reported data. For the

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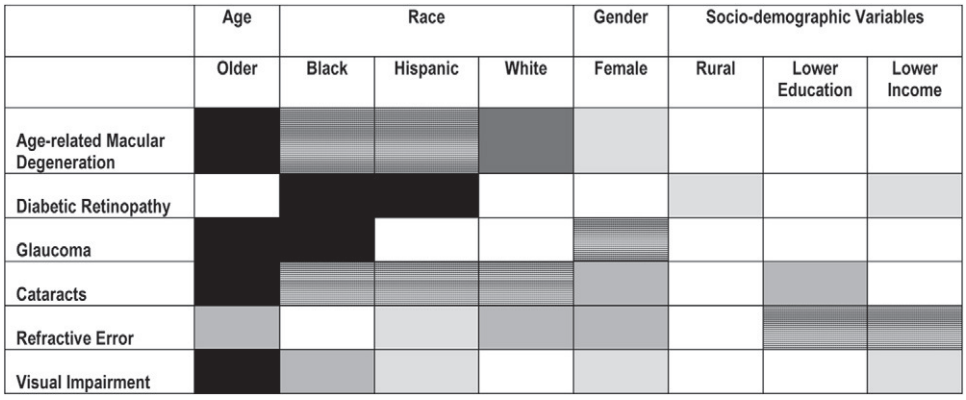

FIGURE. Graphic demonstration of availability and quality of existing data to evaluate and monitor disparities in vision health. Black indicates that the identified subgroup is at increased risk with a high level of evidence. Dark grey shading indicates that the identified subgroup is at increased risk with a moderate to high level of evidence. Medium grey shading indicates the identified subgroup is at increased risk with a low to moderate level of evidence. Light grey shading indicates the identified subgroup is at increased risk with a low level of evidence. White indicates that limited data exist to evaluate disparity. Horizontal lines indicate inconclusive or disparate evidence.

purposes of this review, no attempt was made to harmonize definitions.

RESULTS

BECAUSE VISION LOSS MOST OFTEN IS THE RESULT OF underlying degenerative processes, the strongest data exist showing increased risk with increasing age for most of the major eye diseases. In general, women are at higher risk of most major eye diseases. Major population-based studies have examined the prevalence and risk of most major eye diseases by race, but data are limited and findings are inconsistent. Data on other sociodemographic variables, such as education and income, are limited. A summary table highlights the availability and quality of existing data to evaluate and monitor disparities in vision health (see Figure). Detailed results of the literature review, by major eye disease or condition, are presented in the following sections.

• **AGE-RELATED MACULAR DEGENERATION:** AMD is an eye disease associated with aging and is characterized by the presence of yellow deposits (drusen) in the macula; abnormalities of the retinal pigment epithelium, such as changes in pigmentation; geographic atrophy of the RPE and choriocapillaris; neovascular maculopathy; or a combination thereof.[2] Older age is the most important risk factor for AMD, with those older than 60 years having the greatest risk compared with younger age groups.[3] AMD rarely affects people younger than 50 years of age, and risk for developing AMD rises sharply with older age.[4] A review and meta-analysis by Evans suggested a possible gender disparity in risk of AMD, with women experiencing a slightly greater risk than men (summary relative risk, 1.13; 95% confidence interval [CI], 1.01 to 1.26).[5] However, as authors of this study mention, the apparent increase may simply be the result of the tendency of women to live longer than men (although the relative risk was calculated after adjusting for age). Although the evidence is limited, there does not seem to be a clear association between socioeconomic status and AMD after adjusting for known risk factors.[5]

AMD is more prevalent among whites than any other racial or ethnic group and is the leading cause of blindness among older whites.[6] According to the Eye Disease Prevalence Research Group (EDPRG), whites experience higher prevalence of AMD compared with blacks, particularly among the very old (≥ 75 years).[6] Furthermore, 1 study found that AMD accounted for 54% of all cases of blindness among whites, compared with only 4% and 14% of blindness among blacks and Hispanics, respectively.[1] Data from the National Health and Nutrition Examination Survey III (NHANES) provide evidence for a higher prevalence of late age-related maculopathy in whites (0.5%) compared with both blacks (0.13%) and Mexican-Americans (0.06%) among those 40 years of age and older.[7] Self-reported data from the National Health Interview Survey (NHIS) also support the higher prevalence of AMD in whites (1.3%) compared with blacks (0.5%) or Hispanics (0.6%).[8]

• **DIABETIC RETINOPATHY:** DR occurs as a complication of diabetes mellitus and results from damage to blood vessels in the retina. With delayed or no treatment, DR can lead to impaired vision and even blindness,[9,10] with nearly 100% of type I diabetics and more than half of type 2 diabetics becoming blind within 2 decades of disease onset.[11] Although the EDPRG did not find consistent differences in rates of DR when looking at age or gender among persons with diabetes,[12] interview data from the NHIS indicate that ethnic disparities in DR prevalence

may exist with 1.2% of blacks and 1.3% of Hispanics reporting a diagnosis of DR compared with 0.6% of whites. These differences were not statistically significant; however, slightly elevated likelihood of DR among diabetics was observed for both blacks and Hispanics compared with whites (odds ratio [OR] of DR among blacks, 1.08; 95% CI, 0.70 to 1.67; and OR of DR among Hispanics, 1.3; 95% CI, 0.76 to 2.21).[9]

Data from NHANES III show that among adults 40 years and older with diabetes, the prevalence of DR was 46% and 84% higher in blacks and Hispanics, respectively, compared with whites.[13] Emanuele and associates found higher prevalence rates of moderate to severe DR among blacks and Hispanics with diabetes compared with their white counterparts that was not accounted for by known risk factors such as age, duration of diagnosed diabetes, or hemoglobin A_{1C} levels.[14]

Another large study also identified higher DR rates among blacks and Hispanics. The Multi-Ethnic Study of Atherosclerosis reported that among persons with diabetes 45 to 85 years of age, prevalence of DR was higher among blacks (37%) and Hispanics (37%) compared with whites (25%) and Chinese (26%; $P = .01$).[15] Black participants with diabetes in the Atherosclerosis Risk in Communities study also had a higher prevalence of DR (28%) than white participants (17%).[16]

There also seems to be some evidence for disparities in DR according to geographic location. Using data from the 2006 Behavioral Risk Factor Surveillance System, Hale and associates identified significantly higher rates of self-reported DR among persons with diabetes living in rural versus urban areas (25.8% vs 22.0%; $P = .007$).[17] The authors of this study also found that lower income, but not education, was associated with an increased likelihood of reporting DR.

In addition to having a higher prevalence of diabetes and a higher prevalence of DR among those with diabetes, blacks also may be more likely than whites to develop visual impairment as a result of DR. In the Salisbury Eye Evaluation study, which evaluated visual impairment associated with DR, blacks experienced a 6-fold higher prevalence of DR-related visual impairment compared with whites (1.2% and 0.2%, respectively).[18]

• **GLAUCOMA:** Glaucoma is a characteristic optic neuropathy that produces loss of peripheral vision initially and leads to central visual impairment only late in the disease. Glaucoma can occur at high or low eye pressure.[19] Although there are several types of glaucoma, open-angle glaucoma is the most common form, affecting approximately 1.86% (2.2 million) of United States adults older than 40 years.[20]

People of older age are at greatest risk for developing glaucoma.[21] Gender disparities also have been reported, although findings have been inconsistent. For example, according to results of a Bayesian meta-analysis performed by Rudnicka and associates, men were more likely to have primary open-angle glaucoma (POAG) than women, even after adjusting for age, race, and year of publication (summary relative risk, 1.37; 95% CI, 1.22 to 1.53).[22] The EDPRG group, however, did not find any significant gender differences in prevalence of POAG.[20] The evidence for gender disparities in primary angle-closure glaucoma is more consistent, with several studies demonstrating a higher risk among women (as reviewed by Vajaranant and associates).[23] There are limited data assessing socioeconomic disparities in prevalence of glaucoma in the United States, and most studies in this area have focused on attitudes and knowledge of glaucoma, rather than disease prevalence.[24]

Published studies on the prevalence of glaucoma in the United States are limited, particularly those directly comparing rates across racial and ethnic minority groups. The Baltimore Eye Survey was the first study to compare directly prevalence the of POAG between black and white Americans, showing that blacks had almost 4 to 5 times the age-adjusted prevalence of glaucoma than white subjects.[25] Rates among blacks ranged from 1.23% in those 40 through 49 years of age to 11.26% in those 80 years or older; rates for whites ranged from 0.92% to 2.16%, respectively. The EDPRG reported similar prevalence rates of POAG among Hispanics and whites, whereas blacks had nearly a 3-fold increased prevalence. Results of the Los Angeles Latino Eye Study (LALES) suggest that prevalence of POAG among Hispanics (4.74%) is similar to that among blacks (4.97%) and higher than that among whites (1.69%),[26] especially in older Hispanics. The Proyecto VER study found the age-specific prevalence of a separate Hispanic population to range from 0.50% in those 41 to 49 years of age to 12.63% in those 80 years of age and older.[27] Authors of the LALES study offer possible explanations for the higher prevalence among Hispanics in the LALES study compared with the Proyecto VER study, such as differences in the genetic admixture of the 2 populations.

Self-reported data from the NHIS also found higher rates of glaucoma among blacks compared with whites, with Hispanics having similar rates to whites.[8] Because self-reported data may not be a highly accurate measurement of actual disease burden, particularly among groups in which poorer access to health care has been well documented, results need to be interpreted with caution. For instance, Varma and associates found that only 25% of the LALES participants with POAG had been diagnosed previously and were aware of their condition.[26] Previous diagnosis rates vary by race, with rates closer to 50% for POAG among white populations in most other studies.[28-30]

• **CATARACT:** Cataract is a clouding of the crystalline lens that most frequently occurs with aging and is the most common cause of low vision and blindness (other than refractive error).

Cataracts can occur in one or both eyes, but do not spread from one eye to the other.[31] Many studies rely on the Lens Opacities Classification System II to measure the presence of cataracts because of its ease of administration and good reproducibility.[32] However, definitions of cataract used to determine prevalence have not been consistent in that some include the requirement of visual impairment and some do not. The EDPRG defined presence of a cataract by having either (1) posterior subcapsular cataract, (2) cortical cataract occupying 25% or more of the lens visible through a dilated pupil, or (3) nuclear cataract greater than or equal to the penultimate grade in the system used (ie, grade 3 or more in the Wilmer Cataract Grading System and in the Lens Opacities Classification System II, and grade 4 or more in the Wisconsin Cataract Grading System). Using such a definition for cataracts that did not require visual impairment, the EDPRG estimated that approximately 17.2% (20.5 million) of United States adults older than 40 years have cataracts in at least 1 eye.[33] Recently published national data on self-reported cataracts in the United States estimated that 8.6% (17 million) of United States adults older than 18 years had cataracts.[8] According to the EDPRG, cataracts are responsible for approximately 112 000 and 1.3 million prevalent cases of blindness and low vision, respectively, among United States adults older than 40 years.[1]

Age is the primary risk factor for cataract.[33,34] In a review of risk factors for cataract, West and Valmadrid reported some evidence, mostly from case-control studies, for an association between lower educational level and higher rates of cataract.[35] Women also had a slightly greater risk, a finding that has been supported by more recently pooled data derived from 7 population studies.[33] According to these data, women have a 37% higher risk than men, even after adjusting for age (OR, 1.37; 95% CI, 1.26 to 1.50).

The EDPRG pooled analysis reported a higher prevalence of cataracts among whites compared with blacks, except in females younger than 70 years, among whom the prevalence was greater among younger black females compared with younger white females.[33] There are significant limitations with interpreting these results, given that these conclusions were based on 2 studies, the Salisbury Eye Evaluation Project[36] (which included only adults older than 65 years) and the Barbados Eye Study.[37] Relying on studies of blacks living outside of the United States to estimate prevalence among blacks in the United States may lead to an inaccurate portrayal of the true prevalence, because cultural, environmental, genetic, and access to health care factors are likely to vary between the 2 populations.

The EDPRG pooled analysis found that Hispanics have a higher prevalence of cataracts compared with both blacks and whites, a finding that authors noted had not been documented previously.[33] Again, these data must be interpreted with caution because the data on Hispanics were based solely on the Proyecto VER study, which included only Mexican Americans living in Arizona.[38] According to the self-reported NHIS data, lifetime prevalence of cataracts was highest among whites (9.3%) compared with blacks (7.5%) or Hispanics (6.0%).[8] Results of LALES suggest that prevalence of any visually significant cataract among Hispanics is 1.92% overall and 3.9% for prevalence of any prior cataract surgery,[39] whereas the Proyecto VER study reports that the prevalence of visually significant cataract among those of Mexican descent is 2.8% and 5.1% for prevalence of bilateral cataract surgery.[39] To our knowledge, there are no recently published studies on United States national prevalence estimates of cataracts in other racial and ethnic subgroups.

Another important consideration with regard to cataract is the uptake of cataract surgical services. Cataract is a curable cause of vision loss with widely available surgery. Black participants in the Baltimore Eye Study were 5 times as likely as whites to have unoperated cataract.[28] In the LALES population, 118 (34.3%) of the 344 participants who needed cataract surgery had not undergone the procedure.[39]

• **REFRACTIVE ERROR:** Refractive error is present when the eye cannot focus images clearly, resulting in blurred vision. The most common types of refractive errors are (1) myopia (nearsightedness), (2) hyperopia (farsightedness), (3) astigmatism (irregularly curved cornea), and (4) presbyopia (inability to focus on near objects that occurs with aging). Refractive errors are not preventable, but can be treated easily with corrective eye glasses or contact lenses and, in some cases, corrective surgery.[40] According to the EDPRG, approximately 25.4% (30.4 million) and 9.9% (11.8 million), respectively, of United States adults older than 40 years have myopia and hyperopia.[41]

Refractive error changes with age, with higher rates of hyperopia and decreasing rates of myopia associated with older age.[41-43] According to a recent analysis of NHANES 1999 through 2004 clinical data on refractive error, high hyperopia (defined as spherical equivalent value of ≥ 3 diopters [D]) was greatest in older adults older than 60 years (10.0%) compared with younger adults 20 through 39 years of age (2.4%) and those 40 through 59 years of age (1.0%).[42] Conversely, myopia (defined as spherical equivalent value of ≤ -1.0 D) was lowest in older adults older than 60 years (20.5%) compared with both younger adults aged 20 through 39 years (36.2%) and those 40 through 59 years of age (37.6%).

Recent studies provide consistent evidence for a higher rate of hyperopia among women, but a similar prevalence of myopia in men and women. The EDPRG reported a higher prevalence of hyperopia among women compared with men among adults 40 years of age and older, even after adjusting for age and race or ethnicity (OR, 1.28; $P < .001$). Results from the 1999 through 2004 NHANES were similar, with a greater proportion of hyperopic women (6.5%) than men (3.8%) 40 years of age and older. The EDPRG and the 1999 through 2004 NHANES found no gender differences in prevalence of myopia among persons

40 years of age and older, even after adjusting for age and race or ethnicity.[41] Most of what is known about disparities in refractive error and socioeconomic status is derived from United States and international studies of small sample size that are not representative of the general United States population.[42] Although not certain, it seems that hyperopia prevalence declines with increasing education, whereas myopia increases with increasing years of education.[43,44]

Pooled data from the EDPRG showed that, after adjusting for age and gender, whites have a significantly higher prevalence of both hyperopia (OR, 1.22; $P < .001$) and myopia (OR, 1.25; $P < .001$) compared with Hispanics. Hispanics, in turn, had higher prevalence rates of both hyperopia (OR, 1.69; $P < .001$) and myopia (OR, 1.52; $P = .001$) compared with blacks.[41] As previously mentioned, these results should be interpreted cautiously when making assumptions about the national population, because data for blacks and Hispanics relied on 1 single study each (the Baltimore Eye Study and the Proyecto VER study). However, measured data from the 1999 through 2004 NHANES demonstrate highly comparable trends; the prevalence of hyperopia and myopia were highest in whites, then Hispanics, and lowest among blacks.[42] To our knowledge, there are no published studies on United States national prevalence estimates of refractive error in other racial and ethnic subgroups.

Visual impairment resulting from uncorrected refractive error is a common condition in the United States. Using NHANES data, Vitale and associates estimate the total prevalence of visual impairment resulting from uncorrected refractive errors in the United States population to be 5.3%, 6.9% in blacks, 9.2% in Hispanics, 4.1% in whites; 9.0% in those 12 through 19 years of age; 5.0% in those 20 through 39 years of age; 4.0% in 40 through 59 years of age, and 5.2% in those 60 years of age and older.[45] Interventions focused on detecting and correcting refractive error have the potential to have significant impact on vision health disparities.

• **VISUAL IMPAIRMENT:** Varying definitions of blindness and low vision can complicate the ability to determine prevalence and compare results across studies. For example, the World Health Organization defines blindness as best-corrected visual acuity of less than 20/400 in the better-seeing eye and low vision as acuity better than 20/400 but worse than 20/60.[46] The United States, however, defines blindness as best-corrected visual acuity of 20/200 or worse in the better-seeing eye and low vision as best-corrected acuity better than 20/200 but worse than 20/40 (which coincides with restrictions on a driver's license in most American states).[1,47] Other definitions of blindness and low vision have depended on the degree of functional impairment associated with visual impairment, such as the inability to drive or work, which may represent more meaningful measures of vision impairment than other, more simplified, definitions.

It is well known that sensory impairment, including visual impairment, increases with older age. According to a recent data brief from the National Center for Health Statistics, 1 in 6 Americans 70 years of age and older is visually impaired (defined as not being able to read letters or numbers on the line 20/50 or below on the visual acuity chart in the better-seeing eye), and prevalence doubled with increase of age from persons aged 70 through 79 years to those 80 years of age and older.[48] Authors of this study found no gender differences in prevalence of visual impairment among older Americans (70 years of age and older). Data from the Behavioral Risk Factor Surveillance System 2005 vision module (administered in 5 states) found that women are more likely than men to report having visual impairment (21.5% vs 16.0%), determined by responding to 2 questions—How much difficulty, if any, do you have in recognizing a friend across the street? or How much difficulty, if any, do you have watching television?—with a little difficulty, moderate difficulty, extreme difficulty, or unable to do because of eyesight.[49] However, response rates were low, and this may or may not represent a true difference in impairment rates. Visual impairment, according to the report, also is more common among Americans living below the poverty level, with prevalence rates 50% higher than that of other older adults.

Racial and ethnic disparities in visual impairment also have been documented. The aforementioned NHCS report found that blacks (21.1%) and Mexican Americans (24.0%) are more likely to be visually impaired than whites (13.8%).[48] According to EDPRG, the prevalence of age-specific blindness (based on United States definition of $<$ 20/200 or the World Health Organization standard of $<$ 20/400 for best-corrected visual acuity in the better-seeing eye) is highest among blacks compared with whites (OR, 2.77; 95% CI, 1.56 to 4.92) or Hispanics (OR, 3.13; 95% CI, 2.29 to 4.29), whereas the prevalence of low vision (defined as VA $<$ 20/40 best-corrected in the better-seeing eye in that study) is highest among Hispanics.[1] There are also significant racial and ethnic disparities in the prevalence of self-reported visual impairment based on responses to the following questions: Do you have any trouble seeing, even when wearing glasses or contact lenses? and Are you blind or unable to see at all? According to these data, Ryskulova and associates found that among adults (18 years of age and older), age-adjusted visual impairment or blindness prevalence was higher among blacks than whites, but that Hispanics and whites had similar prevalence rates.[8]

Lam and associates reported on visual impairment among racial and ethnic subgroups (also based on NHIS data), assessing Hispanics in more depth.[50] Impairment was defined based on positive response to 2 questions: Do you have any trouble seeing, even when wearing glasses or contact lenses? (some visual impairment), and Are you blind or unable to see at all? (severe visual impairment). Authors of this study found that among middle-aged adults

(45 through 64 years), individuals who defined themselves as Native American, Puerto Rican, Dominican, and of mixed race experienced significantly higher prevalence of self-reported visual impairment when compared with whites. Among older adults (≥ 65 years), prevalence of any visual impairment was greatest among Native Americans, Chinese Americans, Puerto Ricans, Dominicans, and Central and South Americans compared with all other racial and ethnic groups. Comparing the results of the studies of Lam and associates and Ryskulova and associates highlights the fact that Hispanic (referring to a group of people of Spanish-speaking ancestry that actually represents several, heterogeneous ethnic groups) is too broad a category for identifying disparities in visual impairment, and using this classification scheme may obscure the true picture.

More recently, researchers have defined visual impairment for those with best-corrected visual acuity worse than 20/40 because this level of vision is associated with substantial impairment of day-to-day routines and leisure time.[51] Although this cutoff likely offers some insight into the disability experienced by populations, total disability related to visual impairment does not encompass acuity alone. In a recent review, Colenbrander clearly delineates functional vision from visual functions.[52] Visual impairment results in disability and decreased quality of life, particularly among the elderly population. A large body of research has demonstrated an association between visual impairment among older adults and an increased dependence on others to perform daily activities, decreased participation in social activities, higher rates of depression, increased likelihood of falls and injury, and other negative health outcomes.[51,53-66] However, studies examining disparities in disability resulting from visual impairment are limited.

DISCUSSION

HEALTHY PEOPLE 2020 SPECIFICALLY CALLS FOR THE ELIMInation of health disparities that occur by race and ethnicity, gender, socioeconomics (education and income), geographic location, disability status, or sexual orientation.[67] With regard to vision health, disparities exist in the major eye diseases, but also extend greatly beyond eye function to visual impairment (function), disability, rehabilitation, and access to care, among others. The regular collection of data in a systematic fashion (ie, surveillance) is needed to characterize these health disparities better. Clearly, blacks and Hispanics have higher levels of vision loss and do not access care as frequently as whites. Identifying underlying barriers and enablers, developing effective interventions, and monitoring the changes in disparities will be essential to improving the overall vision health of persons living in the United States. Successfully documenting disparities at all levels will enable the development of public health interventions that are reflective of and responsive to the complexity of the disease experience.

Variations in definitions of vision health outcomes in part explain some of the variability of prevalence estimates and comparisons across groups. Therefore, the development of international standards and guidelines for assessing vision outcomes, and visual impairment in particular, are imperative to the development of appropriate and reliable surveillance systems.

Equally important to creating focused public health interventions in vision health will be identifying the causes of disparities to inform strategies to overcome barriers to care. Data do not exist currently to identify barriers and facilitators to accessing vision and eye health services, particularly in populations at greatest risk for poor vision outcomes. For example, data are lacking to address questions such as: Why is it that refractive error is far less frequently corrected among Hispanics? Why do blacks seem to have a lower uptake of cataract surgical services, even when they have health insurance? Having the capacity to monitor trends among high-risk populations would allow stake holders to track progress toward reducing disparities in vision health outcomes.

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Biosketch

April Zambelli-Weiner received her PhD in Epidemiology/Human Genetics from Johns Hopkins University and went on to found Translational Technologies International after serving as Senior Epidemiologist and chief operating officer for Epidemiology International Inc. She is a seasoned Epidemiologist with over 15 years of experience in clinical research, epidemiology, biostatistics, strategic health program planning, implementation, and evaluation, and health communications. Dr Zambelli-Weiner has extensive experience in chronic disease epidemiology and health outcomes across the lifespan.