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ORIGINAL ARTICLE

Visual Correction and Occupational Social Class

Laura Guisasola*, Ricard Tresserras†, Anna Rius*, and Elisabeth Purtí†

ABSTRACT

Purpose. To determine whether types of optical correction for refractive error are associated with sex, social class, and occupational group in the working population.

Methods. A cross-sectional study was carried out among employees in Catalonia (Spain) aged 16 to 65 years who underwent the Asepeyo Prevention Society health examination in 2009 (86,831 participants: 59,397 men and 27,421 women). The type and purpose of refractive correction used were self-reported, as were sociodemographic variables; visual acuity with habitual correction was also measured. We performed descriptive and logistic regression analyses to evaluate the prevalence and type of correction used for refractive error as a function of age, sex, social class, and occupational group.

Results. Forty-six percent (95% confidence interval [CI] = 45.6 to 46.3) of individuals in this sample were users of optical correction for refractive error. Use of optical correction was more common among women than among men (54.8 and 41.9%, respectively) and especially among women aged 55 to 64 years (91.8%). Nonmanual (class I) workers were three times more likely to use optical correction than manual (class V) workers (odds ratio = 3.02; 95% CI = 2.82 to 3.24). Individuals in technical, administrative, or intellectual occupations were more likely to wear optical correction than unskilled professionals.

Conclusions. The use of visual correction is more prevalent among women than among men, especially in older individuals. The use of optical correction is more common among more advantaged social groups and is associated with particular occupations.

(Optom Vis Sci 2014;91:00–00)

Key Words: cross-sectional studies, employees, glasses, occupation, social class

Uncorrected refractive error is the principal cause of visual impairment and blindness worldwide,[1] as recognized by the World Health Organization.[2] Refractive error correction is one of the most simple and effective health interventions and is essential in the working environment for productivity,[3] employee welfare, and reduction of occupational risk.[4]

People with severe visual impairment have reduced occupational competitiveness and poorer chances of immersion in the labor market. Their opportunities to develop new skills[5] are also more limited, their productivity and welfare are reduced, and their risk of accidents increases.

In a previous study of vision problems in the working population of Catalonia,[6] we evaluated problems that cause visual acuity (VA) below 0.5 (visual impairment), as well as those that do not cause any visual impairment, and concluded that visual impairment was more common in manual and disadvantaged social classes,[7–9] whereas vision problems without impairment were more common in nonmanual and advantaged social classes.[4,7,10] These problems were mainly caused by refractive errors that were fully or partly resolved by optical correction. This finding prompted us to extend this study to the use of correction and its relationship with social class and occupational group. Given that social class assignment is based on workers' occupation, these two labor-specific variables justify this study's focus on the working population; we note that it would also be of great interest to perform a similar analysis in the general population.

Four previous studies have analyzed the association between optical correction for refractive error and social class or occupation in high-income countries (two in Finland,[11,12] one on the use of contact lenses [CL] in the United States,[13] and a multicenter study of five European countries[14]), and two Asian studies[15,16] analyzed the association between optical correction and social class in middle-income countries. None of these studies were carried out in the working population, and there is no previous evidence on how the use of different types of refractive error correction may vary as a function of social class and occupation.

The Spanish public health system provides universal access to health care but does not cover refractive error correction using either glasses or CL. Thus, optical correction is a private payment

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service whose cost is a function of the power of the lenses required and the selected frame. This has economic implications[17] that could partially explain differences in access between social classes and occupational groups.

This study addresses the social and health problems of poor vision in the workplace because of inequalities in the use and type of correction between social classes and occupation.

The aims of this study were to analyze the magnitude and distribution of the use of optical correction for refractive error in a sample of the working population of Catalonia, Spain, and to determine whether there are differences between sex, social classes, and occupational groups.

METHODS

Study Population

The study sample consisted of Catalonia-based employees of companies covered by Asepeyo Prevention Society (SPdA) who underwent a health examination in 2009. According to SPdA, 60% of workers in each company attended the examination, on average.

The sample consists of 86,831 workers (59,397 men and 27,421 women) aged between 16 and 65 years. Of these, 1363 workers (1.55%) who were habitual wearers of optical correction were excluded because they had not brought their glasses or CL with them on the day of the vision study, resulting in a final study sample size of 85,468 (see Discussion).

Data Collection

Prevention corporations are entities whose function is to provide external prevention services to companies. Workers undergo a comprehensive health examination depending on the specific occupational hazards, including a sight examination.

Workers were referred to the delegation of SPdA that was situated closest to their workplace, and the visit was structured in two phases.

In the first phase, the examiner subjected the patient to a questionnaire on personal and family history of eye disease, history of ocular surgery, and ocular drug use and determined which types of vision tests should be performed.

In the second phase, participants were asked if they use glasses or CL (Fig. 1), and if so, self-reported information on the type F1

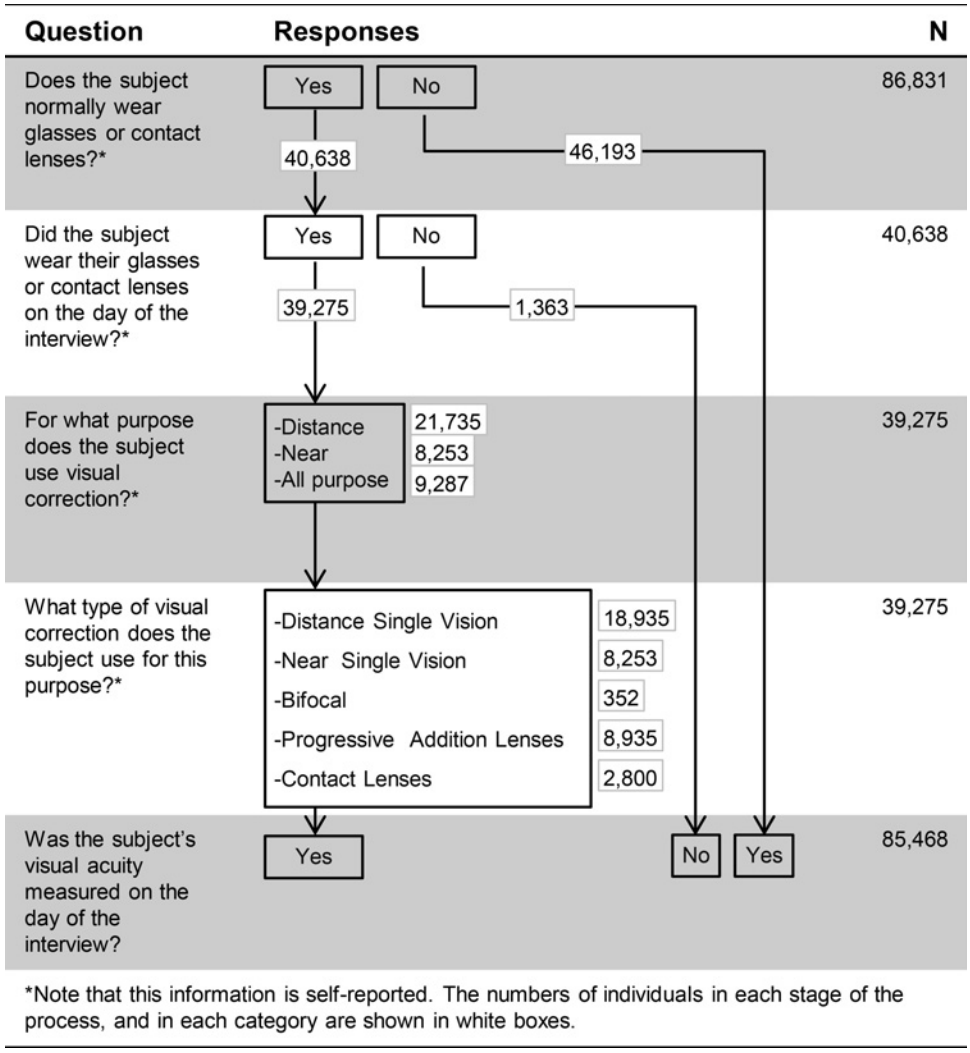


FIGURE 1.
Study question sequence.

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(single vision, bifocal, progressive addition lenses [PAL], or CL) and main purpose of the correction (distance, near, or all-purpose) were recorded. If patients reported that they regularly wore two different pairs of glasses, both were analyzed. Although the examiner verified the type of correction, the power of the lenses was not measured. The VA measurements were made for all participants. Presenting monocular and binocular near and distance VA was determined using a screenoscope (Control Vision Screenoscope Topcon SS-3, Tokyo, Japan), a stereoscopic instrument designed to examine visual functions such as VA, astigmatism, phorias, and stereopsis. Thanks to its simplicity and speed, this instrument is suitable for use in hospitals, clinical examinations, schools, driving test factories, and companies' premises. No objective or subjective refraction examination was carried out in any of the participants, and best-corrected VA was not determined.

Variables

The dependent variables were (1) the use of correction, defined as individuals who wore glasses or CL at the time of the health examination, and (2) type of correction, which was categorized into five groups: single far vision, single near vision, bifocal, PAL, and CL.

The following were the independent variables:

Age, categorized into five groups: 16 to 24, 25 to 34, 35 to 44, 45 to 54, and 55 to 64 years.

Social class,[18] categorized into six groups (I to III defined as nonmanual, and IVa, IVb, and V defined as manual):

I. Executives of public companies with more than 10 employees; professions associated with the second and third cycle of the university
II. Managers of firms with fewer than 10 employees; professionals with a college degree; technicians, artists, and athletes
III. Administrative employees and professionals involved in support of administrative and financial management; personal service and security workers; self-employed; supervisors of manual workers
IVa. Skilled manual workers
IVb. Semiskilled manual workers
V. Unskilled

Occupational group, structured in 10 categories[19]:

1. Military
2. Business and public administration managers
3. Technical, scientific, and intellectual professionals
4. Technicians and support professionals
5. Administrative employees
6. Restaurant services, personal protection, and sellers of businesses
7. Skilled workers in agriculture and fishing
8. Artisans and skilled workers in manufacturing, construction, and mining
9. Plant and machinery operators and assemblers
10. Unskilled

Analysis

Bivariate analysis was performed using chi-square tests to test for association between correction magnitudes and types and each of the independent variables: age, social class, and occupational group. Age-adjusted logistic regression models were fit, and odds ratios (ORs) and 95% confidence intervals (CIs) were calculated to assess the relationship between the use of correction and age, social class, and occupational group. All analyses were stratified by sex and were carried out using SPSS v17.0.

RESULTS

Types of Visual Correction

Forty-six percent (95% CI = 45.6 to 46.3) of workers (n = 39,275) were habitual wearers of optical correction owing to refractive error. Use of correction was more common among women (54.8%, n = 14,833) than among men (41.9%, n = 24,442). Of the total number of optical correction users, 55.3% (n = 21,735) were corrected for distance vision, 21% (n = 8253) were corrected for near vision, and 23.6% (n = 9287) were corrected for both. Almost half of the corrections (48.2%, n = 18,935) were single vision lenses for distance vision, followed by PAL (22.7%, n = 8935) and single vision lenses for near vision (21%, n = 8253; Table 1). T1

Prevalence of Type of Visual Correction According to Sex, Age, and Social Class

In the 55- to 64-year age group, 84.8% of men and 91.8% of women used visual correction. Notably, most of these individuals had had their presbyopia corrected using PAL (men, 45.3%; women, 49.7%) or single vision near lenses (men, 25.9%; women, 26.1%).

Only 19.3% of young male workers aged 16 to 24 years used visual correction, mainly single distance vision (72.5%) or CL (25.3%), compared with 39.9% of female workers.

Of the men in social class I, 58.4% used correction, compared with just 30.3% of those in social class V; the differences between classes were smaller in women (59.8 and 48.7%, respectively). The

TABLE 1.

Description of types of correction by sex and distance

Correction type	All, n (%)	Men, n (%)	Women, n (%)	Distance, n (%)	Distance and near, n (%)	Near, n (%)
Far single vision	18,935 (48.2)	11,542 (47.2)	7,393 (49.8)	18,935 (48.2)	—	—
Near single vision	8,253 (21.0)	5,316 (21.7)	2,937 (19.8)	—	—	8,253 (21.0)
Bifocals	352 (0.9)	271 (1.1)	81 (0.5)	—	352 (0.9)	—
PAL	8,935 (22.7)	6,156 (25.2)	2,779 (18.7)	—	8,935 (22.7)	—
CL	2,800 (7.1)	1,157 (4.7)	1,643 (11.1)	2,800 (7.1)	—	—
All	39,275 (46.0)	24,442 (41.9)	14,833 (54.8)	21,735 (55.3)	9,287 (23.6)	8,253 (21.0)

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prevalence of use of progressive lenses in men from class I (14.9%) was twice that in men from class V (7.1%) and remained higher in nonmanual compared with manual groups. However, the prevalence of use of progressive lenses among women was more evenly distributed between social classes. We observed a higher prevalence of CL use in nonmanual groups, especially among women (between 7.1 and 10% in classes I, II, and III). We observed no differences in the use of near vision spectacles between social classes in either sex. Bifocals were used infrequently, with prevalence between 0.3 and 0.6% in all classes and among both men and women (Table 2).

The use of optical correction was significantly more common among nonmanual social classes and in women of all groups (Fig. 2).

Association between Visual Correction and Sex, Occupational Group, and Social Class

We fit age-adjusted logistic regression models, taking unskilled workers as reference group. Four occupational groups were found to be more likely to wear optical correction: administrative employees (OR = 3.15; 95% CI = 2.9 to 3.42), followed by technical, scientific, and intellectual professionals (OR = 2.99; 95% CI = 2.81 to 3.18); technicians and support professionals (OR = 2.71; 95% CI = 2.58 to 2.85); and business and public administration managers (OR = 2.5; 95% CI = 2.28 to 2.75). Stratifying this analysis by sex, a similar pattern was observed for these occupational groups, but with slightly greater differences among men (OR = 2.74 to 3.49) than among women (OR = 2.15 to 2.28) (Table 3).

In terms of social class, the likelihood of wearing correction was higher in nonmanual classes (OR = 3.02, 95% CI = 2.82 to 3.24, in class I compared with class V), and again this difference was more exaggerated among men (OR = 3.41; 95% CI = 3.13 to 3.72) than among women (OR = 2.46; 95% CI= 2.19 to 2.76).

Visual Acuity According to Social Class and Occupational Group

We observed generally higher VA among nonmanual than among manual social classes, with similar distributions for both near and distance VA measured with habitual correction (Fig. 3).

TABLE 2.

Prevalence of type of correction, according to sex, age, and social class

	All, n (%)	No correction, n (%)	Any correction, n (%)	Single far, n (%)	Single near, n (%)	Bifocal, n (%)	PAL, n (%)	CL, n (%)	
Men									
Age, y									**p < 0.001**
16–24	3,791 (100)	3,059 (80.7)	732 (19.3)	534 (14.1)	14 (0.4)	1 (0)	5 (0.1)	178 (4.7)	
25–34	16,268 (100)	12,139 (74.6)	4,129 (25.4)	3,473 (20.8)	108 (0.6)	1 (0)	26 (0.2)	521 (3,1)	
35–44	18,223 (100)	12,759 (70.0)	5,464 (30.0)	4,469 (24.2)	456 (2.5)	9 (0)	208 (1.1)	322 (1.7)	
45–54	13,397 (100)	5,013 (37.4)	8,384 (62.7)	2,306 (17.2)	3,009 (22.5)	102 (0.8)	2,851 (21.3)	116 (0.9)	
55–64	6,485 (100)	985 (15.2)	5,500 (84.8)	719 (11.1)	1,678 (25.9)	145 (2.2)	2,938 (45.3)	20 (0.3)	
Missing	233 (0.4)	—	233 (0.4)	41 (0.1)	51 (0.1)	13 (0.0)	128 (0.2)	0 (0.0)	
Social class									**p < 0.001**
I	4,074 (100)	1,691 (41.5)	2,383 (58.4)	1,228 (30.1)	403 (9.9)	13 (0.3)	609 (14.9)	130 (3.2)	
II	4,866 (100)	2,643 (54.3)	2,223 (45.6)	1,252 (25.7)	377 (7.7)	20 (0.4)	439 (9)	135 (2.8)	
III	11,069 (100)	5,012 (45.3)	6,057 (54.7)	2,885 (26.1)	1,217 (11.0)	38 (0.3)	1,613 (14.6)	304 (2.7)	
IVa	21,663 (100)	13,981 (64.5)	7,682 (35.5)	3,230 (14.9)	1,989 (9.2)	124 (0.6)	2,038 (9.4)	301 (1.4)	
IVb	6,367 (100)	4,084 (64.1)	2,283 (35.8)	1,117 (17.5)	536 (8.4)	26 (0.4)	516 (8.1)	88 (1.4)	
V	8,262 (100)	5,769 (69.8)	2,493 (30.3)	1,172 (14.2)	576 (7.0)	40 (0.5)	585 (7.1)	120 (1.5)	
Missing	2,096 (100)	775 (1.3)	1,321 (2.3)	658 (1.1)	218 (0.4)	10 (0.0)	356 (0.6)	79 (0.1)	
All	58,397 (100)	33,955 (58.7)	24,442 (41.9)	11,542 (19.5)	5,316 (9.0)	271 (0.5)	6,156 (10.4)	1,157 (2.0)	
Women									
Age, y									**p < 0.001**
16–24	1,562 (100)	939 (60.1)	623 (39.9)	430 (27.5)	34 (2.2)	0 (0.0)	2 (0.1)	157 (10.1)	
25–34	8,907 (100)	5,053 (56.7)	3,854 (43.3)	2,898 (32.5)	202 (2.3)	5 (0.1)	12 (0.1)	737 (8.3)	
35–44	8,531 (100)	4,743 (55.6)	3,788 (44.4)	2,648 (30.2)	486 (5.5)	3 (0.0)	122 (1.4)	529 (6.0)	
45–54	5,984 (100)	1,338 (22.4)	4,646 (77.6)	1,147 (19.2)	1,672 (27.9)	35 (0.6)	1,603 (26.8)	189 (3.2)	
55–64	2,021 (100)	165 (8.2)	1,856 (91.8)	261 (12.9)	528 (26.1)	36 (1.8)	1,004 (49.7)	27 (1.3)	
Missing	66 (0.2)	-	66 (0.2)	9 (0.0)	15 (0.1)	2 (0.0)	36 (0.1)	4 (0.0)	
Social class									**p < 0.001**
I	2,184 (100)	876 (40.1)	1,308 (59.8)	728 (33.3)	199 (9.1)	3 (0.1)	159 (7.3)	219 (10)	
II	3,170 (100)	1,408 (44.4)	1,762 (55.6)	897 (28.3)	313 (9.9)	7 (0.2)	317 (10.0)	228 (7.2)	
III	11,793 (100)	4,916 (41.7)	6,877 (58.3)	3,664 (31.1)	1,194 (10.1)	19 (0.2)	1,160 (9.8)	840 (7.1)	
IVa	2,184 (100)	1,221 (55.9)	963 (44.2)	456 (20.9)	199 (9.1)	4 (0.2)	222 (10.2)	82 (3.8)	
IVb	3,031 (100)	1,590 (52.5)	1,441 (47.5)	631 (20.8)	354 (11.7)	16 (0.5)	339 (11.2)	101 (3.3)	
V	4,158 (100)	2,131 (51.3)	2,027 (48.7)	786 (18.9)	592 (14.2)	29 (0.7)	510 (12.3)	110 (2.6)	
Missing	551 (4.7)	96 (3.0)	455 (1.7)	231 (0.9)	86 (0.3)	3 (0.0)	72 (0.2)	63 (0.2)	
All	27,071 (100)	12,238 (45.7)	14,833 (54.8)	7,393 (27.1)	2,937 (10.7)	81 (0.3)	2,779 (10.2)	1,643 (6)	

Classes I to III were defined as nonmanual, and classes IVa, IVb, and V were defined as manual.

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FIGURE 2.
Prevalence of visual correction, stratified by sex and social class.

Consistent with this, we also observed generally higher distance VA among individuals in the four occupational groups mentioned above (administrative employees; technical, scientific, and intellectual professionals; business and public administration managers; and technicians and support professionals; Fig. 4).

DISCUSSION

In this study, which focuses on the use rather than on the need for visual correction, we highlight three main findings: (1) half of the workers in the study were habitual wearers of optical correction for refractive error; (2) there were notable differences between social classes and occupational groups in the use and type of optical correction and in VA; and (3) the proportion of correction use was consistently higher among women than among men,[20] especially among manual workers.

Age is a key factor in the use of correction because of the onset of presbyopia and the resulting need for near distance correction.[21] However, the differences we observed between social classes and occupational groups remained even after adjusting for age.

Our study showed that the most common type of correction was single vision lenses (48.2%), followed by PAL (22.7%), which is consistent with the results reported by Lafuma et al.[14] (single vision, 52.2%; PAL, 24.1%).

Our study shows that a higher proportion of women (54.8%) use optical correction than men (41.9%), which is consistent with the results of Lafuma et al.[14] in a study conducted in five European countries, including Spain (women, 53.5%; men, 46.5%), and those of Parssinen et al.[22] in a study carried out in Finland. Similarly, the Eye Diseases Prevalence Research Group[23] found that hyperopia, but not myopia, is more common among women. An important factor to consider is that women generally are more aware of their health problems and more proactive in seeking solutions. This is reflected in our previous work on the burden of visual defects in Catalonia,[24] which highlighted that women are more likely to use eye medication and to visit eye specialists, a similar observation to that reported by Stang and Jockel in a German study.[9] A meta-analysis[25] of sex-specific differences in presbyopia showed that women were more likely than men to need near vision correction, after controlling for age. However, sex differences were not caused by differences in focusing ability but rather by sex differences in factors related to preferred reading distances, such as arm length, occupation, indoor light levels, and specific conditions related to desired tasks.

Economic factors have been identified as the main barrier to accessing eye care services and the acquisition of glasses.[7,26,27] In a study carried out in Los Angeles,[28] more than 50% of people who had been prescribed corrective glasses had not acquired them, mainly for economic reasons. Other aspects not explored in this study, such as

TABLE 3.
Association between visual correction and sex, occupational group, and social class

	Men, aOR (95% CI)	Women, aOR (95% CI)	All, aOR (95% CI)
Occupational group			
Military	1.25 (0.82–1.89)	0.71 (0.35–1.45)	1.00 (0.7–1.43)
Business and public administration managers	2.85 (2.55–3.18)	2.28 (1.87–2.77)	2.5 (2.28–2.75)
Technical, scientific, and intellectual professionals	3.49 (3.22–3.78)	2.15 (1.95–2.37)	2.99 (2.81–3.18)
Technicians and support professionals	2.74 (2.56–2.93)	2.14 (1.97–2.32)	2.71 (2.58–2.85)
Administrative employees	3.36 (2.95–3.82)	2.2 (1.97–2.47)	3.15 (2.9–3.42)
Restaurant services, personal protection, and sellers	1.72 (1.53–1.93)	1.12 (1–1.26)	1.58 (1.46–1.71)
Skilled workers in agriculture and fishing	1.2 (1.01–1.42)	1.21 (0.8–1.82)	1.02 (0.87–1.2)
Artisans and skilled workers in manufacturing, construct, and mining	1.09 (1.03–1.17)	0.82 (0.7–0.96)	0.88 (0.83–0.93)
Plant and machinery operators and assemblers	1.28 (1.19–1.37)	1.1 (0.97–1.25)	1.09 (1.03–1.15)
Unskilled	1	1	1
Social class			
I	3.41 (3.13–3.72)	2.46 (2.19–2.76)	3.02 (2.82–3.24)
II	2.38 (2.20–2.58)	1.90 (1.72–2.11)	2.23 (2.09–2.37)
III	2.73 (2.56–2.93)	2.13 (1.97–2.31)	2.70 (2.57–2.84)
IVa	1.19 (1.12–1.26)	1.06 (0.94–1.19)	0.97 (0.92–1.02)
IVb	1.28 (1.19–1.39)	1.13 (1.02–1.26)	1.21 (1.14–1.29)
V	1	1	1

Classes I to III were defined as nonmanual, and classes IVa, IVb, and V were defined as manual.
aOR, age-adjusted odds ratio.

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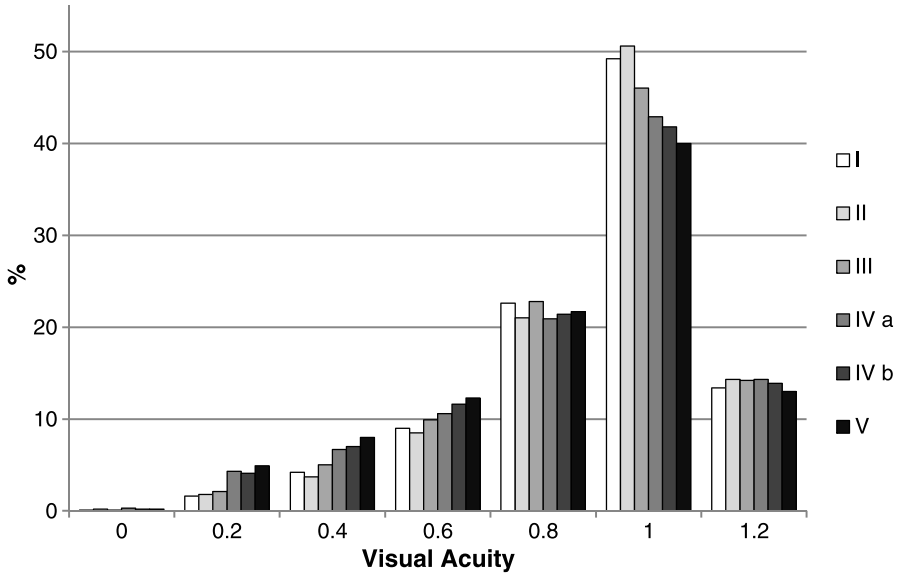


FIGURE 3.
Distribution of distance VA, stratified by social class.

discomfort or cultural acceptance of the use of glasses, may also be relevant. Although these issues have been widely studied in students[29] or people with visual impairment,[30] it would be necessary to conduct qualitative studies in the adult population.

Our analysis highlights four occupational groups that are most likely to wear correction: business and public administration managers; technical, scientific, and intellectual professionals; technicians and support professionals; and administrative employees. Studies by Parssinen et al.[11,12] in Finland have shown a correlation between the use of glasses and occupations that require good vision for detailed near distance work and those involving computer monitors. As in our study, these authors concluded that farmers, industry workers, and service personnel were the occupational groups least likely to use correction, which is consistent with some tasks, such as those involving computer terminals, having greater vision requirements than others.[31] Also, VA is generally higher in these four occupational groups than in others.

Studies in Bangladesh[15] and India[16] have also reported that the highest prevalence of correction use is found among nonmanual workers and those of higher socioeconomic status, and therefore, VA is again generally higher in nonmanual social classes.

In agreement with the results of a study conducted in the United States,[13] the use of CL was most common in women, younger individuals, and advantaged social classes, probably because their daily care requires a complex manipulation and use of expensive solutions.[32]

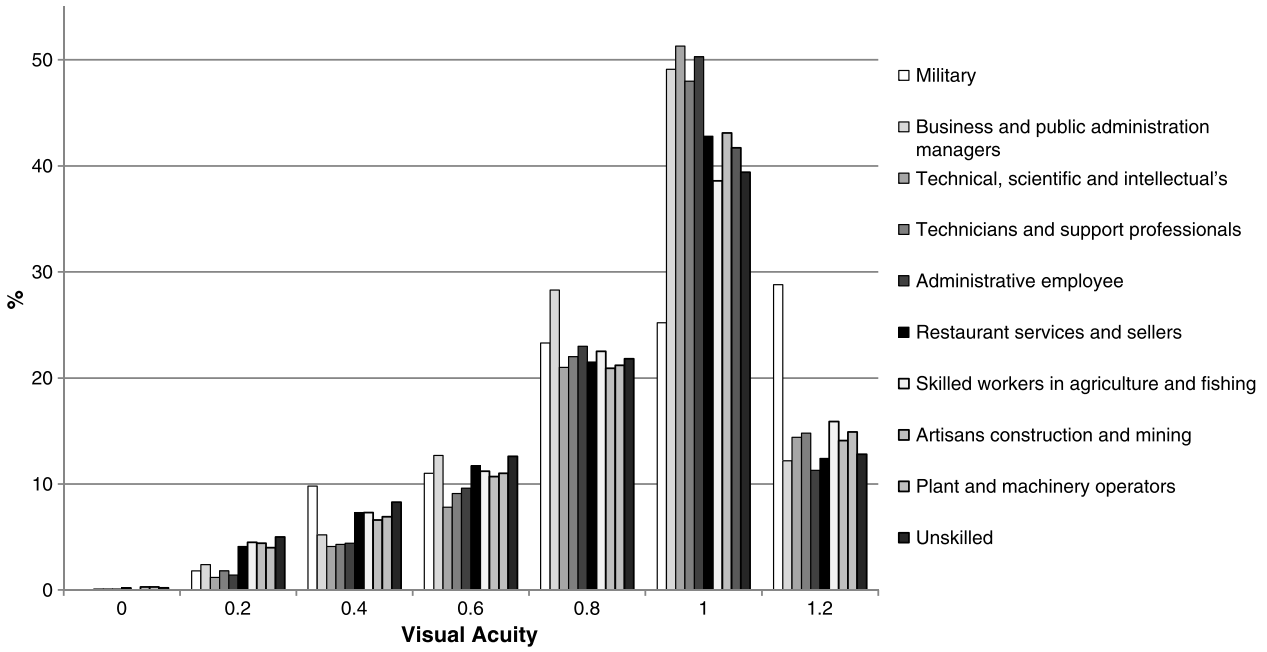


FIGURE 4.
Distribution of distance VA, stratified by occupational group.

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Data on VA with habitual correction show that 2 out of every 100 individuals in the active working population studied had visual impairment (VA < 0.5) (2.2%; 95% CI = 2.1 to 2.3) even while wearing corrective lenses. Although this is a relatively low proportion, this group should receive special attention given that it represents the working population.

Our study has various limitations. Data were collected for presenting VA (with habitual correction) but not for VA without correction (i.e., without glasses for subjects who normally wear them) or for optimally corrected VA. In addition, the pinhole test[33] was not used to identify uncorrected or undercorrected refractive errors.

Among individuals who were excluded from the study, 76% were men and 82.7% had been corrected for near vision. This may result in a slight underestimation of the prevalence of near vision corrections, especially among men.

As far as we are aware, ours is the first study of optical correction of refractive error in such a large population of workers from a high-income country. Our exceptionally large sample size allows us to overcome some of the problems associated with stratifying by sex, age group, correction type, and social class.

CONCLUSIONS

The prevalence of correction use responds not only to the prevalence of refractive error but also to other factors, such as the vision requirements inherent to certain occupations, purchasing power, and ability to identify the need for corrective lenses.

In this study of visual correction in a developed country with an aging population, almost half of individuals required vision correction, in large part because of the onset of presbyopia.

Because this is a study of the working population, our results cannot be generalized to the rest of the population; furthermore, the study analyzes the use of correction and consequently underestimates the need for correction.

This study shows a clear link between the use of optical correction and social class and occupational group. The prevalence of the use of correction is higher in more advantaged social groups and is clearly associated with particular occupations.

Finally, the use of correction is more prevalent among women than among men.

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