

Appendix 1. Sensitivity Analyses

Race and ethnicity had persistent effects on the relationship between VFL and VSQOL in sensitivity analyses that restricted the MOCCaS analytic cohort to subgroups by age and sex, SES, immigration status, depression, and VA impairment (**Figure S7**). The effect of age was investigated by fitting separate models for participants older and younger than 65 years. Differences by sex were assessed by refitting models separately for women or men. The impact of socioeconomic status (SES) was studied using models for participants who had graduated high school, were currently employed, earned an annual household income of \$20,000 or higher, or had health insurance.¹ The influence of immigration was studied by fitting models for those born in a foreign country and in the US.² We investigated whether depression affected findings by excluding those who self-reported being depressed a good bit of the time or more in the previous month.³ Finally, we evaluated whether central VI influenced findings by excluding participants with VA of 20/40 or worse.

Age and Sex

There was no interaction by race and ethnicity for participants aged 65 years and older (n = 3,909). However, variation intensified among those less than 65 years of age (n = 10,661); associations in Chinese Americans decreased by 19.8% for completing vision tasks and by 26.1% for socioemotional well-being and in African Americans decreased by 23.4% and 29.2%, respectively. The effect of race and ethnicity might diminish with age as older patients experience greater numbers of comorbidities and experience similarly worse VSQOL. Of note, the absence of a significant interaction for the older subgroup may be due to a reduction in power, which included only 27% of the MOCCaS cohort.

We did not observe differences by race and ethnicity when restricting to women in the MOCCaS (n = 8,913), but variation in associations between VSQOL and VFL were magnified among men (n = 5,667). Associations in Latinos increased by 14.3% for completing vision tasks, but in African Americans decreased by 17% for socioemotional well-being. Men from all cohorts were also somewhat more impacted by VFL compared to women. These findings may complement findings reported by Klein et al., who found women had greater prevalence of lens opacities, visual impairment, and open-angle glaucoma at younger ages.⁴ Men could be less accustomed to visual pathologies, and may report greater losses to VSQOL for the same amount of VFL. However, these data may not be comparable as they were pooled from studies as early as 1980 and included predominantly non-Hispanic White participants.

Socioeconomic Status

We anticipated MOCCaS participants with higher SES might be more similar in their associations between VSQOL and VFL, as greater education and higher income would protect VSQOL by allowing greater ease in navigating barriers to care.¹ We observed this trend only for the association of socioemotional well-being on VFL among high earners with \geq \$20,000 annual income. Racial and ethnic differences were greater among participants having completed high school ($n = 9,617$); associations in Latinos increased by 29.8% for completing vision tasks and by 28.5% for socioemotional well-being. Differences also intensified among participants who were employed ($n = 7,248$); associations in Latinos increased by 24.5% and 13.8% and in African Americans decreased by 49.0% and 23.7%, respectively. Differences were greater among participants with health insurance ($n = 10,549$); associations in Latinos increased by 10.1% for task and well-being. Differences persisted among high earners for completing vision-related tasks but were unobserved for socioemotional well-being ($n = 8,865$).

There was more variation by race and ethnicity in the impact of VFL on VSQOL for task and well-being outcomes when restricting to higher SES subgroups, including participants with greater education, employment, and insurance coverage, as well as for high earners in completing vision tasks only. These counterintuitive findings might be explained by complete separation of SES variables across racial and ethnic cohorts. For example, graduating high school was observed for 92.7% of the AFEDS, but only 33.8% of the LALES participants. Similarly, health insurance was seen in 89.7% of the AFEDS, but only 53.0% of the CHES participants. There were smaller differences in employment and income, which may be due to older AFEDS participants being more likely to be retired than younger LALES participants. Restricting on variables that correlate with each of the cohorts may lead to overadjustment and an inability to capture associations that vary by race and ethnicity.

Immigration

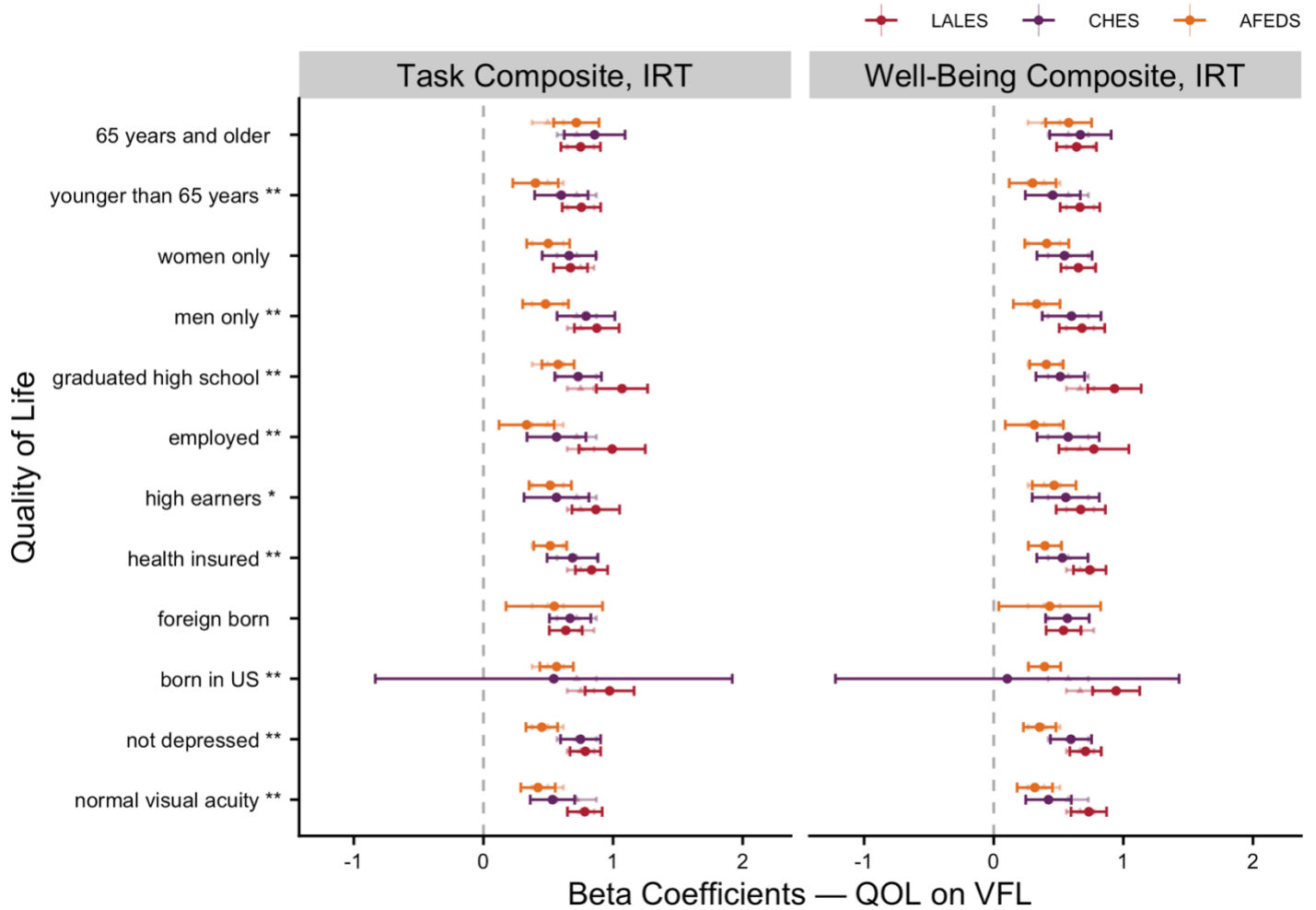
There were no significant interactions by race and ethnicity among foreign-born participants ($n = 8,522$). Yet racial and ethnic differences in associations between VSQOL and VFL were amplified within the subgroup of US-born participants ($n = 6,166$); associations in Latinos increased by 23.0% for completing vision tasks and by 29.4% for socioemotional well-being, but in the Chinese Americans were much smaller with large confidence intervals due to only 1.3% of participants being born in the US. Furthermore, VSQOL in the US-born group was more sensitive to VFL, particularly in the LALES cohort. The “healthy migrant hypothesis” may explain this observation, which proposes that healthier individuals were more capable of immigrating from their home country and were therefore more resilient to visual impairment. NHANES researchers, however, have demonstrated no differences in visual impairment for recent

immigrants compared to US citizens.² Differences by patriation, however, may not be measured reliably in the MOCCaS due to complete separation by racial and ethnic cohorts; 98.4% of the CHES were born abroad, while 91.0% of the AFEDS were born in the US.

Depression and Visual Acuity

We also noted differences by race and ethnicity were somewhat larger for participants who were not depressed and who had normal VA defined as better than 20/40. Racial and ethnic differences were greater among participants who were not depressed ($n = 13,146$); associations decreased in African Americans by 9.4% for completing vision tasks and by 10.1% for socioemotional well-being. Complete separation may have caused this subtle increase in racial and ethnic variation because the LALES participants were almost three times as likely to be depressed as those in the CHES or the AFEDS. Differences were also magnified among participants with normal visual acuity ($n = 13,665$); associations decreased in the Chinese Americans by 35.0% and 36.0% and decreased in African Americans by 17.8% and 22.3%, respectively. The prevalence of visual impairment was more similar across all three cohorts. Latent factors associated with race and ethnicity may have been responsible for differences in associations between self-perceived VSQOL and VFL across cohorts among those with normal visual acuity.

Figure S7: Linear regression beta coefficients of NEI-VFQ-25 IRT composite domains on VFL (MD in dB) in the BSE by cohort in sensitivity analyses



NEI-VFQ-25 = National Eye Institute Visual Function Questionnaire 25-Item; VFL = Visual Field Loss; MD = Mean Deviation; dB = Decibels; BSE = Better-Seeing Eye

Sensitivity analysis excluded participants, leading to subgroups that were 65 years and older (n = 3,909), younger than 65 years (n = 10,661), graduated high school (n = 9,617), women only (n = 8,913), men only (n = 5,667), foreign born (n = 8,522), born in the US (n = 6,166), employed (n = 7,248), high earners \geq \$20,000 annual income (n = 8,865), health insured (n = 10,549), not depressed (n = 13,146), and having normal visual acuity better than 20/40 (n = 13,665).

Multivariate Wald tests comparing the main effects and interaction models were significant ($P < 0.05$), for:

- * IRT Task Composite
- ** IRT Task and Well-Being Composites

Triangles and confidence intervals faded in color represent the associations in the complete MOCCaS cohort (n = 14,570), which are repeated for each subgroup analysis to facilitate comparisons with main findings.

References

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