Quantitative Intersectionality Scoring System (QISS) Profiles Explain Additional Variation in Physical Functioning and Symptom Frequency Among U.S. Adults

A comparison of 36 and 72 intersectional groups in the 2023 National Health Interview Survey

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Abstract

Objective. To examine whether physical functioning and frequency of anxiety and depressive symptoms show similar group rankings, and how much additional individual variation is explained by 36 or 72 intersectional profiles.

Methods. For 27,743 adults, we formed two standardized health scores and assigned each respondent one membership indicator per profile in two sets. We separately added the 36 and 72 indicators to the same survey-weighted main-effects model. Five-fold validation held out entire masked primary sampling units.

Results. The two sets of 72 group ranks had a Spearman correlation of −0.19. Among Black women with high school education or less, adults aged 18–44 ranked 31st for physical functioning and 54th for less frequent symptoms; adults aged 65 or older ranked 70th and 26th, respectively. Held-out R^2 for functioning was 0.0784 with main effects, 0.0829 with 36 profiles, and 0.0826 with 72. For symptom frequency, the corresponding values were 0.0676, 0.0712, and 0.0725.

Conclusions. Both profile sets explained additional individual variation in both domains. The gains were small, and allowing sex-specific intersections yielded the larger gain only for symptom frequency. Group ranks conveyed domain-specific differences that an overall health ranking would obscure.

Keywords: intersectionality, QISS, physical functioning, anxiety, depressive symptoms, educational attainment, National Health Interview Survey

Abbreviations. NHIS, National Health Interview Survey; PSU, primary sampling unit; QISS, Quantitative Intersectionality Scoring System; R^2, coefficient of determination.

Introduction

A group experiencing difficulty with mobility and self-care need not be the group reporting the most frequent anxiety or depressive symptoms. For a community assessing barriers to daily activities, the former comparison is informative. For a community assessing emotional distress, the latter addresses a different question. An index that averages across them can give similar scores to populations with quite different experiences.

Intersectionality theory directs attention to how social positions are experienced together. Crenshaw described the limitations of treating race and sex as separate axes when the experience of Black women is at issue [1]. Bowleg articulated the related problem for public health: broad comparisons between women and men or between racial and ethnic groups can conceal variation within both [2]. Age and education further distinguish people within those categories. Their inclusion creates an empirical challenge. More specific intersections can better represent a research question while yielding fewer observations and greater uncertainty for each estimate.

A quantitative intersection can identify a population whose experiences disappear in a marginal average [3]. Reviews of quantitative intersectionality research document wide variation in how investigators define and analyze those populations [4]. Bowleg's account of intersecting identities illustrates why the categories used to construct a group do not exhaust the experience of belonging to it [5]. Here the coefficients describe differences in responses to specific survey items. The analysis cannot assign a numerical value to oppression or privilege itself.

Assari and Zare proposed QISS for estimating context-specific group scores [6]. We examined the ordering of groups for two respondent-reported outcomes and tested whether representing intersections explained additional variation beyond the four characteristics entered separately.

Physical functioning and emotional symptoms may have different distributions across the life course. Life-course epidemiology distinguishes the accumulation of exposures from experiences at particular stages [7]. Educational differences in health can likewise change with age [8], and disparities across the lifespan may reflect sustained differences in access to resources [9]. Reviews of gender and health have emphasized the contribution of living and working conditions [10, 11]. Evidence on depressive symptoms also shows why conclusions based on symptom reports need to be distinguished from those based on diagnoses [12].

Education was chosen as an observable dimension of social position. The socioeconomic gradient in health extends beyond a contrast between poverty and affluence [13], and theory identifies knowledge, money, and social connections as resources relevant to many outcomes [14]. A credential captures only part of those resources. Ross and Mirowsky distinguish years of education, credentials, and educational settings [15]; subsequent work places their health associations within a broader social context [16]. We therefore label groups by the education respondents reported and leave open the question of how household economic circumstances might alter their rankings.

Methods

Study population and intersections

The 2023 National Health Interview Survey (NHIS) Sample Adult file included 29,522 respondents [17]. The complete-case analysis included 27,743 who belonged to the four race and ethnicity categories studied and had valid responses for both outcomes and the grouping variables. Using one sample allowed the two rankings to be compared among the same people. The categories were Hispanic or Latino of any race and non-Hispanic Asian alone, Black alone, or White alone. The estimates do not cover excluded American Indian, Alaska Native, multiracial, or other categories.

We crossed the four categories with survey-recorded sex (male or female), age (18–44, 45–64, or 65 years or older), and education (high school or less, some college or associate degree, or bachelor's degree or higher). Each respondent contributed to one of 72 groups. Education captures attainment at interview; younger adults may still be completing their education. The public sex variable does not measure gender identity. Reduced specifications included the Black–White by sex comparison and a race and ethnicity by sex by age comparison. For the 36-profile comparison we crossed race and ethnicity, age, and education, pooling across sex within each profile. For 72 profiles we crossed the same categories with sex. Every respondent had a 1 for one profile and 0 for all others within each set. These indicators describe membership independently of health. The group health scores, in contrast, were estimated separately from each outcome.

Construction of the two scores

Physical functioning was measured by reported difficulty walking or climbing steps, attending to self-care, raising a two-liter bottle from waist to eye level, and using the hands or fingers [18]. Responses ranged from no difficulty to unable to do the activity. For symptom frequency, respondents reported how often they felt worried, nervous, or anxious and how often they felt depressed: daily, weekly, monthly, a few times a year, or never [18]. The items measure frequency rather than symptom intensity, diagnostic status, or need for treatment.

We oriented each item so higher values were favorable, standardized it using the weighted mean and standard deviation, and averaged the standardized items within each domain.

Each domain score was rescaled to mean 50 and standard deviation 10 in the analytic population. A score of 45 is half a standard deviation below the domain mean. A five-point difference has this statistical meaning within either domain; its practical importance need not be equal across domains. We examined weighted item correlations, standardized alpha, and the eigenvalues of each correlation matrix.

Washington Group guidance distinguishes frequency of emotional symptoms from their intensity [19]. The two symptom questions used here support a frequency index. They provide no threshold for diagnosing anxiety or depression. Internal consistency was assessed as one check on whether items moved together, with the limitations of alpha in mind [20].

Estimation, ranking, and validation

For each outcome we fitted weighted least squares with one indicator per intersection and no intercept. Algebraically, each coefficient equals the survey-weighted mean outcome for that intersection. This saturated parameterization allows all interactions among the four categorical dimensions. The differences between its group coefficients include both main and interaction contributions. We applied the Sample Adult weight and estimated design-based covariance using the public masked strata and primary sampling units (PSUs).

We ordered coefficients from highest to lowest within each outcome. Rank 1 denotes better functioning or less frequent symptoms. Approximate 95% rank ranges are percentiles across 2,500 draws from the joint estimated coefficient distribution. They condition on the observed score scaling and can be misleading for small cells with little within-cell variation. Spearman correlation compared the two sets of 72 point ranks, giving each group equal weight. Five-fold validation held out entire masked PSUs identified jointly by stratum and PSU. The baseline included categorical main effects of race and ethnicity, sex, age, and education. We added the 36 indicators to that baseline in one model and the 72 indicators in another, using survey-weighted least squares. Redundant columns were handled by a generalized inverse. In the 36-profile model the sex difference is common across profiles; the 72-profile model permits it to differ. Outcome standardization used training-fold weights and moments. Held-out R^2 equaled one minus pooled weighted squared error divided by the pooled weighted squared deviation from each training-fold mean. No individual was evaluated in their training fold.

Results

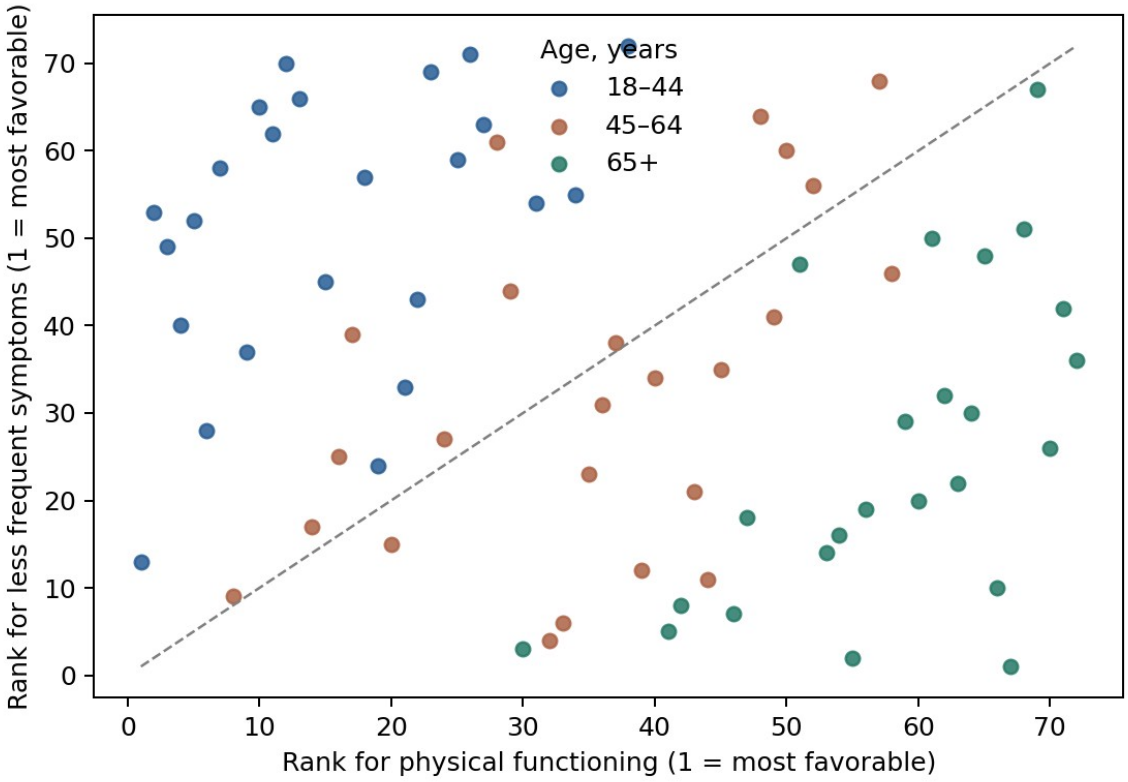
The outcomes supported different scores

The four physical items correlated 0.39–0.48; standardized alpha was 0.76 and the first principal component accounted for 58% of item variance. The two symptom items correlated 0.60, with alpha of 0.75 and 80% of variance in the first component. Pooling all six items yielded a first component accounting for 41% of variance and a second eigenvalue

of 1.47. These findings, together with the distinct question content, supported retaining the two specific outcomes.

The group rankings had little correspondence (Spearman ρ = −0.19). Figure 1 shows why a rank from one domain is a poor substitute for the other. Each point represents one group, irrespective of how many people it contains.

Figure 1. Rank agreement across 72 intersections



Note. Points on the dashed diagonal have the same rank for both outcomes. The plot shows point estimates. Rank uncertainty is reported in the supplement.

Age contrasts within Black adults with the same educational category

Among Black women with high school education or less, older adults had a lower physical functioning score than younger adults but reported less frequent symptoms. The point ranks for Black men in the same education category also moved in opposite directions across age groups. These comparisons are cross-sectional and cannot describe how a given person changes as they age.

Black adults, high school or less	N	Physical score (rank)	Symptom score (rank)
Women, 18–44	211	51.13 (31)	50.61 (54)
Women, 45–64	211	47.07 (58)	51.03 (46)
Women, 65+	263	38.66 (70)	52.78 (26)

Men, 18–44	195	52.11 (15)	51.13 (45)
Men, 45–64	204	49.68 (43)	53.20 (21)
Men, 65+	186	45.09 (64)	52.49 (30)

Table 1. Selected coefficients from the full 72-group model. The rank in parentheses is relative to all 72 intersections. Higher scores in the symptom column mean less frequent anxiety and depressive symptoms.

Group ranks and individual variance explained

The lowest symptom score was 43.77 (95% CI, 42.84–44.70) among White women aged 18–44 with high school education or less (n = 650). Its approximate rank range was 71–72. The highest symptom score, 57.06, was observed among Asian men aged 65 or older with some college or an associate degree, but only 20 respondents contributed to that cell. The lowest physical score was 37.81 among Asian women aged 65 or older with high school education or less (n = 74; 95% CI, 31.02–44.61). All 40 Asian men aged 18–44 with high school education or less reported no difficulty on all four physical items. This ceiling placed their point estimate first but produced a degenerate linearized variance. Their apparent precision should not guide interpretation.

Main effects explained 7.84% of variation in physical functioning and 6.76% in symptom frequency under cross-validation. Adding the 36 profiles increased those values by 0.45 and 0.36 percentage points, respectively. Adding the 72 profiles instead increased them by 0.42 and 0.48 points. Table 4 reports the model comparisons. Figures 2–5 and Tables 2–3 show the group counts, domain rankings, and uncertainty. Figure 6 traces how respondents were assigned to profiles. Figure 7 illustrates differences between additive and fully intersectional estimates in selected groups.

Discussion

Which intersection appears most disadvantaged depends on the difficulty being measured. The within-education comparison among Black women illustrates the point: the oldest group ranked 70th for physical functioning, yet 26th for less frequent anxiety and depressive symptoms. The youngest group ranked near the middle for functioning and nearer the unfavorable end for symptoms. Aggregating all Black women or averaging the two outcomes together would obscure that divergence. Neither approach would tell a service planner whether a difference concerned accomplishing daily activities or the frequency of distress.

The QISS results distinguish variation between group means from variation among individuals. Relatively large differences between specific groups can coexist with small gains in overall R^2 because adults within each group vary substantially. The 36-profile specification retained slightly more held-out variation for physical functioning than the 72-profile model. Symptom frequency showed the opposite ordering. These small differences do not establish superiority of either specification. Partial pooling may stabilize estimates for smaller groups [21].

Racial and ethnic labels in these tables describe social positions. Research links residential segregation with unequal access to health-promoting resources [22] and identifies discrimination and stress as distinct exposures [23, 24]. A broader review emphasizes how institutions can shape these exposures across the life course [25]. None of those mechanisms was observed directly here. Likewise, work conditions [26], social integration [27], and isolation among older adults [28] could vary among people with the same educational credential. These are hypotheses for further study, not explanations identified by a rank difference.

The physical items address mobility, dexterity, upper-body function, and self-care. They cannot capture pain, endurance, or every activity that matters to independence. The two symptom items do not measure positive affect, severity, duration of episodes, or clinical diagnoses. Differences in reporting, language, treatment, and interpretation could affect comparisons. Internal consistency does not establish measurement equivalence across groups. The use of equal spacing for ordinal responses and the physical scale ceiling are further reasons to interpret numerical gaps cautiously.

Education was the only socioeconomic dimension studied. Household resources, occupation, wealth, and exposure to discrimination may differ substantially within an educational category. The study measured neither those mechanisms nor the effects of intersecting systems of power directly. Complete-case selection, exclusion of several racial and ethnic categories, and a single survey year further limit coverage. A next study could pool years, examine item-level response differences, and incorporate income with the survey's multiple-imputation procedures. In service planning, the present results can inform which questions to ask communities; group membership alone provides a weak basis for assigning an individual to a service.

A rank can change when neighboring point estimates differ only slightly. The general problem of overinterpreting league tables is well documented [29]. For this analysis the problem is most visible near the physical-functioning ceiling. A useful comparison pairs the rank with its coefficient, uncertainty, and number of respondents. Future analyses should also examine income and access to care as additional socioeconomic dimensions [30] and compare partially pooled estimates with the unpooled coefficients reported here.

Conclusion

Across 72 intersections of race and ethnicity, sex, age, and education, a favorable position for physical functioning did not consistently accompany less frequent anxiety and depressive symptoms. Reporting separate scores, group sizes, and uncertainty preserves the distinction between these experiences and gives the rankings a clearer public health interpretation. In both domains, each membership specification increased held-out R^2 relative to the same main effects. Most individual variation remained unexplained.

Data and analytical materials

The data are from the public 2023 NHIS Sample Adult file. The accompanying workbook provides the two domain scores, design-based standard errors, confidence intervals, and rank ranges at each resolution. The analysis used secondary, deidentified public-use survey data without participant contact. OpenAI's ChatGPT assisted with statistical programming, model estimation, tables, figure preparation, and manuscript editing. Fold-specific R^2 values are provided in Supplementary Table S1 in the data and analysis package.

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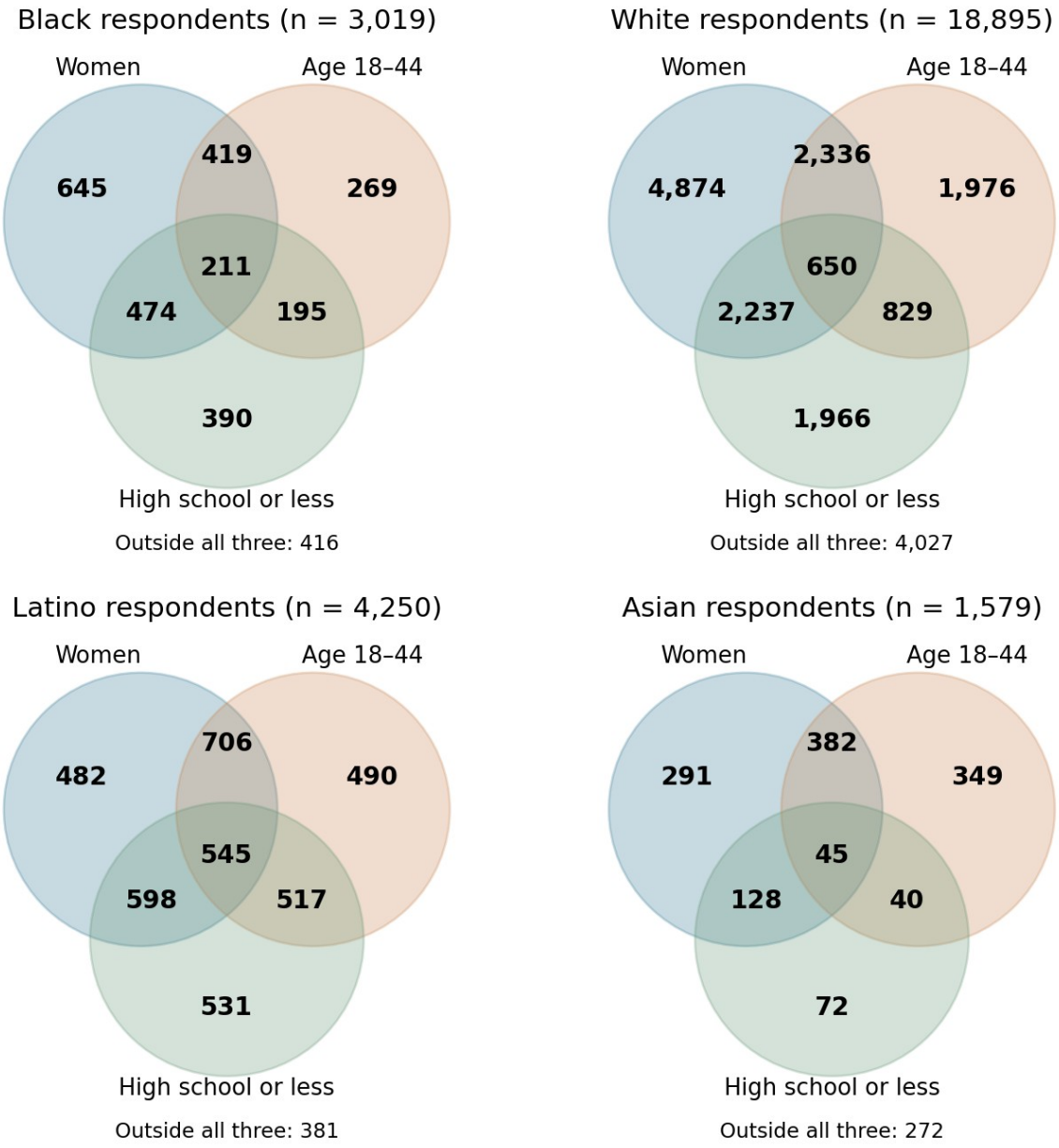
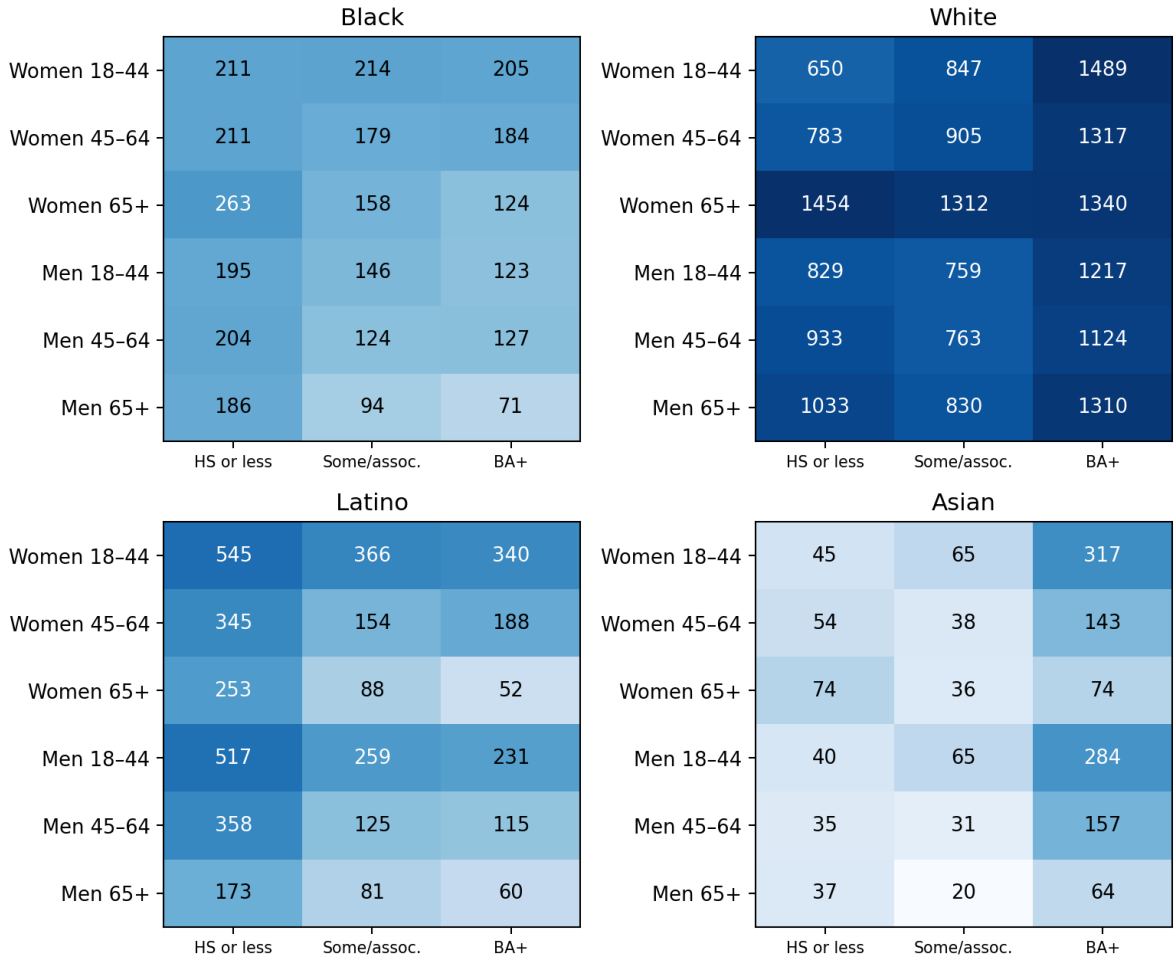
Figure 2. Who is represented in each intersection?



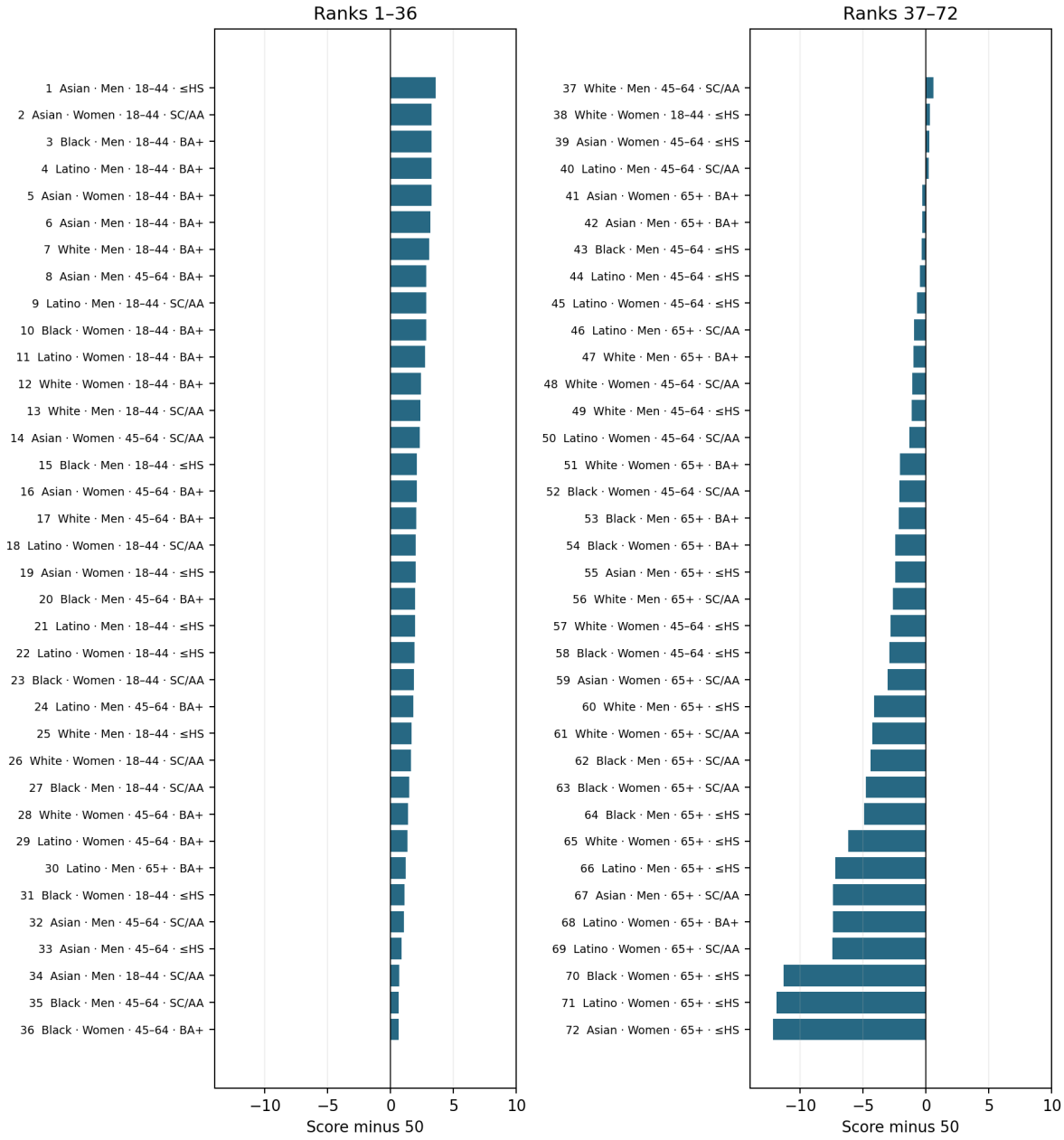
Note. Counts are unweighted respondents. Within each panel the eight regions are mutually exclusive and exhaustive. The center counts women aged 18–44 with high school education or less. Circle areas are schematic. Latino includes any race; the other three panels are non-Hispanic single-race groups.

Figure 3. Respondent counts for all 72 groups



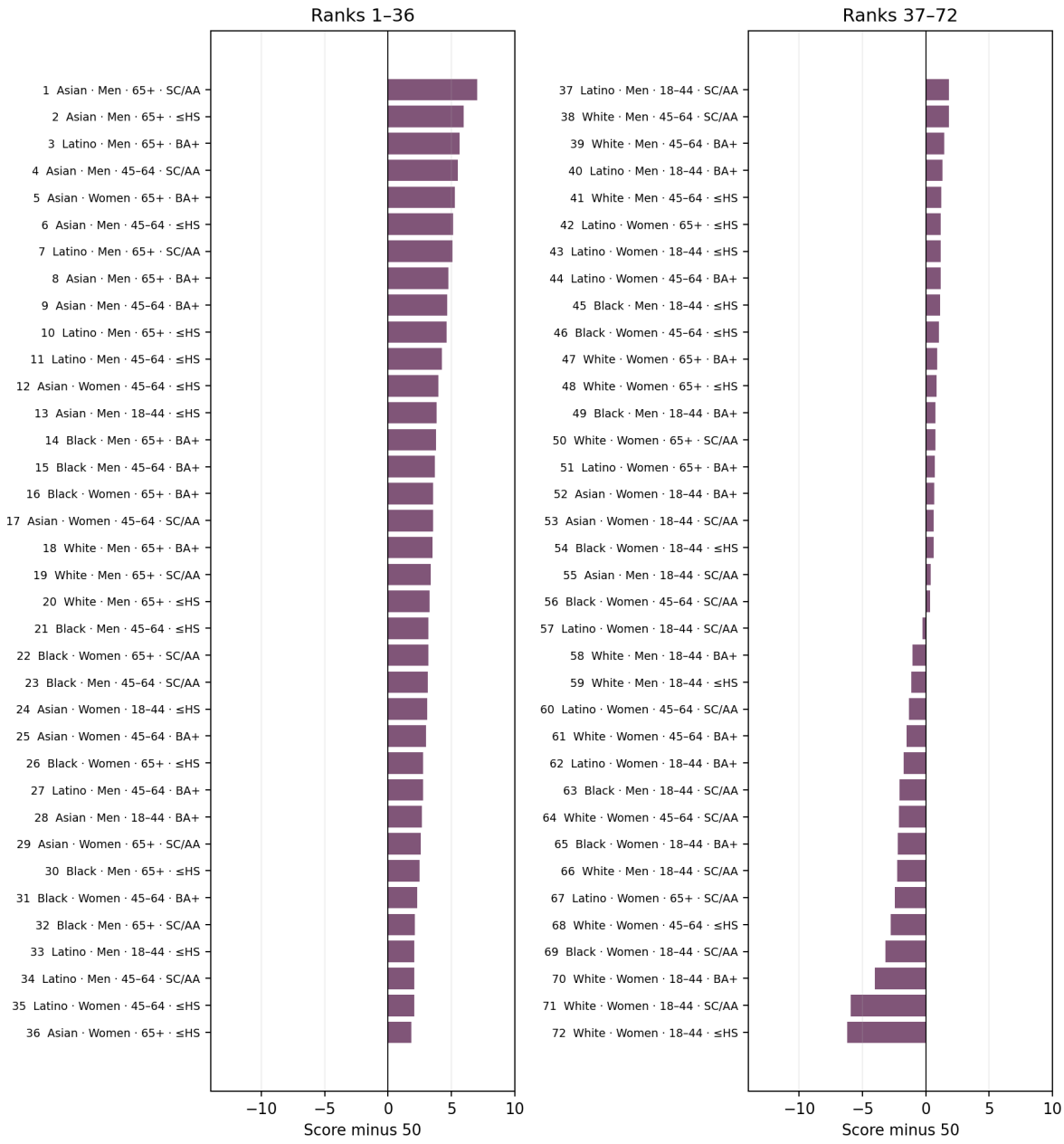
Note. Each cell gives a distinct respondent count. Darker shading indicates more respondents. The same adults contributed to both outcome rankings.

Figure 4. Physical functioning: all 72 groups in rank order



Note. Bar length shows the group coefficient relative to the analytic mean of 50. Rank 1 is the most favorable point estimate. HS = high school; SC/AA = some college or associate degree; BA+ = bachelor's degree or higher. Exact scores and intervals follow.

Figure 5. Less frequent anxiety and depressive symptoms: all 72 groups in rank order



Note. Bar length shows the group coefficient relative to the analytic mean of 50. Rank 1 is the most favorable point estimate. HS = high school; SC/AA = some college or associate degree; BA+ = bachelor's degree or higher. Exact scores and intervals follow.

Table 2. Physical functioning (ranks 1–24)

Rank	Intersection	N	Score (95% CI)	Rank range
1	Asian · Men · 18–44 · ≤HS	40	53.58 (ceiling)	—
2	Asian · Women · 18–44 · SC/AA	65	53.28 (52.91–53.65)	1–10
3	Black · Men · 18–44 · BA+	123	53.27 (52.91–53.63)	1–10
4	Latino · Men · 18–44 · BA+	231	53.26 (53.00–53.53)	2–9
5	Asian · Women · 18–44 · BA+	317	53.25 (52.97–53.52)	2–9
6	Asian · Men · 18–44 · BA+	284	53.18 (52.90–53.46)	2–11
7	White · Men · 18–44 · BA+	1217	53.06 (52.89–53.24)	4–11
8	Asian · Men · 45–64 · BA+	157	52.86 (52.43–53.29)	4–16
9	Latino · Men · 18–44 · SC/AA	259	52.83 (52.44–53.22)	5–16
10	Black · Women · 18–44 · BA+	205	52.82 (52.30–53.34)	4–17
11	Latino · Women · 18–44 · BA+	340	52.74 (52.08–53.41)	3–20
12	White · Women · 18–44 · BA+	1489	52.42 (52.02–52.81)	11–21
13	White · Men · 18–44 · SC/AA	759	52.39 (52.02–52.76)	11–22
14	Asian · Women · 45–64 · SC/AA	38	52.30 (51.37–53.24)	5–29
15	Black · Men · 18–44 · ≤HS	195	52.11 (51.35–52.87)	10–29
16	Asian · Women · 45–64 · BA+	143	52.08 (50.90–53.26)	5–34
17	White · Men · 45–64 · BA+	1124	52.06 (51.65–52.47)	14–27
18	Latino · Women · 18–44 · SC/AA	366	52.01 (51.09–52.94)	9–32
19	Asian · Women · 18–44 · ≤HS	45	51.98 (50.35–53.61)	2–39
20	Black · Men · 45–64 · BA+	127	51.95 (50.85–53.06)	8–34
21	Latino · Men · 18–44 · ≤HS	517	51.93 (51.04–52.82)	11–33
22	Latino · Women · 18–44 · ≤HS	545	51.89 (51.21–52.58)	13–31
23	Black · Women · 18–44 · SC/AA	214	51.85 (51.06–52.64)	13–32
24	Latino · Men · 45–64 · BA+	115	51.81 (50.40–53.21)	6–38

Note. Survey-weighted coefficients; unweighted N. Rank ranges are approximate 95% simulation ranges. HS = high school; SC/AA = some college or associate degree; BA+ = bachelor's degree or higher. At the physical ceiling, model-based intervals are uninformative and are omitted.

Table 2. Physical functioning (ranks 25–48)

Rank	Intersection	N	Score (95% CI)	Rank range
25	White · Men · 18–44 · ≤HS	829	51.65 (51.02–52.28)	17–33
26	White · Women · 18–44 · SC/AA	847	51.64 (51.21–52.08)	19–32
27	Black · Men · 18–44 · SC/AA	146	51.49 (49.54–53.44)	3–43
28	White · Women · 45–64 · BA+	1317	51.38 (51.00–51.76)	23–34
29	Latino · Women · 45–64 · BA+	188	51.33 (50.04–52.61)	13–40
30	Latino · Men · 65+ · BA+	60	51.18 (49.81–52.56)	14–42
31	Black · Women · 18–44 · ≤HS	211	51.13 (49.51–52.75)	11–44
32	Asian · Men · 45–64 · SC/AA	31	51.08 (47.60–54.56)	1–54
33	Asian · Men · 45–64 · ≤HS	35	50.86 (48.03–53.70)	2–52
34	Asian · Men · 18–44 · SC/AA	65	50.67 (46.00–55.33)	1–61
35	Black · Men · 45–64 · SC/AA	124	50.65 (49.24–52.07)	21–45
36	Black · Women · 45–64 · BA+	184	50.65 (49.68–51.63)	26–43
37	White · Men · 45–64 · SC/AA	763	50.61 (50.07–51.14)	31–41
38	White · Women · 18–44 · ≤HS	650	50.33 (49.34–51.32)	30–45
39	Asian · Women · 45–64 · ≤HS	54	50.25 (48.28–52.22)	18–52
40	Latino · Men · 45–64 · SC/AA	125	50.22 (48.58–51.86)	23–50
41	Asian · Women · 65+ · BA+	74	49.72 (48.13–51.30)	30–52
42	Asian · Men · 65+ · BA+	64	49.70 (47.25–52.16)	21–56
43	Black · Men · 45–64 · ≤HS	204	49.68 (48.15–51.21)	31–52
44	Latino · Men · 45–64 · ≤HS	358	49.51 (48.06–50.97)	33–53
45	Latino · Women · 45–64 · ≤HS	345	49.27 (48.08–50.47)	36–53
46	Latino · Men · 65+ · SC/AA	81	49.05 (46.95–51.15)	32–57
47	White · Men · 65+ · BA+	1310	49.03 (48.48–49.57)	42–52
48	White · Women · 45–64 · SC/AA	905	48.90 (48.15–49.66)	41–53

Note. Survey-weighted coefficients; unweighted N. Rank ranges are approximate 95% simulation ranges. HS = high school; SC/AA = some college or associate degree; BA+ = bachelor's degree or higher. At the physical ceiling, model-based intervals are uninformative and are omitted.

Table 2. Physical functioning (ranks 49–72)

Rank	Intersection	N	Score (95% CI)	Rank range
49	White · Men · 45–64 · ≤HS	933	48.85 (48.13–49.57)	42–53
50	Latino · Women · 45–64 · SC/AA	154	48.70 (46.88–50.52)	36–58
51	White · Women · 65+ · BA+	1340	47.93 (47.27–48.58)	49–57
52	Black · Women · 45–64 · SC/AA	179	47.89 (46.44–49.34)	44–60
53	Black · Men · 65+ · BA+	71	47.83 (44.80–50.87)	33–64
54	Black · Women · 65+ · BA+	124	47.54 (44.47–50.62)	36–65
55	Asian · Men · 65+ · ≤HS	37	47.54 (43.80–51.28)	31–65
56	White · Men · 65+ · SC/AA	830	47.36 (46.45–48.27)	51–60
57	White · Women · 45–64 · ≤HS	783	47.20 (46.34–48.07)	52–61
58	Black · Women · 45–64 · ≤HS	211	47.07 (44.82–49.33)	45–64
59	Asian · Women · 65+ · SC/AA	36	46.96 (43.24–50.67)	36–67
60	White · Men · 65+ · ≤HS	1033	45.88 (44.84–46.92)	57–65
61	White · Women · 65+ · SC/AA	1312	45.73 (44.91–46.54)	58–65
62	Black · Men · 65+ · SC/AA	94	45.61 (41.68–49.54)	43–68
63	Black · Women · 65+ · SC/AA	158	45.23 (42.38–48.09)	53–68
64	Black · Men · 65+ · ≤HS	186	45.09 (42.02–48.16)	52–68
65	White · Women · 65+ · ≤HS	1454	43.80 (42.91–44.69)	63–68
66	Latino · Men · 65+ · ≤HS	173	42.79 (38.80–46.79)	58–70
67	Asian · Men · 65+ · SC/AA	20	42.59 (28.07–57.12)	1–72
68	Latino · Women · 65+ · BA+	52	42.58 (35.11–50.06)	40–72
69	Latino · Women · 65+ · SC/AA	88	42.55 (38.89–46.21)	60–70
70	Black · Women · 65+ · ≤HS	263	38.66 (35.36–41.96)	68–72
71	Latino · Women · 65+ · ≤HS	253	38.13 (34.67–41.58)	68–72
72	Asian · Women · 65+ · ≤HS	74	37.81 (31.02–44.61)	64–72

Note. Survey-weighted coefficients; unweighted N. Rank ranges are approximate 95% simulation ranges. HS = high school; SC/AA = some college or associate degree; BA+ = bachelor's degree or higher. At the physical ceiling, model-based intervals are uninformative and are omitted.

Table 3. Less frequent anxiety and depressive symptoms (ranks 1–24)

Rank	Intersection	N	Score (95% CI)	Rank range
1	Asian · Men · 65+ · SC/AA	20	57.06 (55.00–59.12)	1–7
2	Asian · Men · 65+ · ≤HS	37	55.99 (53.69–58.29)	1–17
3	Latino · Men · 65+ · BA+	60	55.65 (54.00–57.29)	1–14
4	Asian · Men · 45–64 · SC/AA	31	55.53 (53.36–57.70)	1–20
5	Asian · Women · 65+ · BA+	74	55.29 (53.78–56.80)	2–16
6	Asian · Men · 45–64 · ≤HS	35	55.16 (52.60–57.71)	1–27
7	Latino · Men · 65+ · SC/AA	81	55.08 (53.07–57.10)	1–24
8	Asian · Men · 65+ · BA+	64	54.76 (53.02–56.50)	2–24
9	Asian · Men · 45–64 · BA+	157	54.69 (53.60–55.78)	3–17
10	Latino · Men · 65+ · ≤HS	173	54.62 (53.24–55.99)	3–22
11	Latino · Men · 45–64 · ≤HS	358	54.27 (53.30–55.25)	6–21
12	Asian · Women · 45–64 · ≤HS	54	53.96 (52.50–55.43)	5–30
13	Asian · Men · 18–44 · ≤HS	40	53.86 (50.97–56.75)	2–48
14	Black · Men · 65+ · BA+	71	53.80 (51.83–55.76)	4–35
15	Black · Men · 45–64 · BA+	127	53.69 (52.23–55.14)	6–32
16	Black · Women · 65+ · BA+	124	53.58 (52.48–54.69)	9–30
17	Asian · Women · 45–64 · SC/AA	38	53.56 (51.24–55.88)	4–43
18	White · Men · 65+ · BA+	1310	53.50 (52.98–54.02)	13–25
19	White · Men · 65+ · SC/AA	830	53.40 (52.76–54.03)	13–27
20	White · Men · 65+ · ≤HS	1033	53.27 (52.63–53.90)	14–29
21	Black · Men · 45–64 · ≤HS	204	53.20 (51.64–54.77)	9–38
22	Black · Women · 65+ · SC/AA	158	53.19 (51.73–54.65)	9–36
23	Black · Men · 45–64 · SC/AA	124	53.13 (51.62–54.63)	10–38
24	Asian · Women · 18–44 · ≤HS	45	53.09 (50.02–56.16)	4–54

Note. Survey-weighted coefficients; unweighted N. Rank ranges are approximate 95% simulation ranges. HS = high school; SC/AA = some college or associate degree; BA+ = bachelor's degree or higher. At the physical ceiling, model-based intervals are uninformative and are omitted.

Table 3. Less frequent anxiety and depressive symptoms (ranks 25–48)

Rank	Intersection	N	Score (95% CI)	Rank range
25	Asian · Women · 45–64 · BA+	143	53.01 (51.82–54.20)	12–37
26	Black · Women · 65+ · ≤HS	263	52.78 (51.56–54.01)	14–40
27	Latino · Men · 45–64 · BA+	115	52.76 (51.02–54.50)	10–45
28	Asian · Men · 18–44 · BA+	284	52.69 (51.64–53.74)	15–38
29	Asian · Women · 65+ · SC/AA	36	52.58 (49.33–55.83)	4–57
30	Black · Men · 65+ · ≤HS	186	52.49 (50.37–54.61)	10–52
31	Black · Women · 45–64 · BA+	184	52.33 (51.04–53.63)	17–46
32	Black · Men · 65+ · SC/AA	94	52.10 (49.57–54.63)	10–56
33	Latino · Men · 18–44 · ≤HS	517	52.08 (51.13–53.04)	24–45
34	Latino · Men · 45–64 · SC/AA	125	52.07 (50.15–53.99)	13–53
35	Latino · Women · 45–64 · ≤HS	345	52.06 (50.92–53.20)	22–46
36	Asian · Women · 65+ · ≤HS	74	51.87 (49.55–54.19)	12–56
37	Latino · Men · 18–44 · SC/AA	259	51.84 (50.63–53.05)	23–50
38	White · Men · 45–64 · SC/AA	763	51.82 (51.12–52.53)	28–45
39	White · Men · 45–64 · BA+	1124	51.44 (50.85–52.03)	33–49
40	Latino · Men · 18–44 · BA+	231	51.30 (50.16–52.44)	29–54
41	White · Men · 45–64 · ≤HS	933	51.24 (50.44–52.04)	33–52
42	Latino · Women · 65+ · ≤HS	253	51.19 (49.48–52.89)	26–57
43	Latino · Women · 18–44 · ≤HS	545	51.16 (50.27–52.04)	34–53
44	Latino · Women · 45–64 · BA+	188	51.15 (49.63–52.68)	27–56
45	Black · Men · 18–44 · ≤HS	195	51.13 (49.58–52.69)	27–56
46	Black · Women · 45–64 · ≤HS	211	51.03 (49.27–52.79)	26–57
47	White · Women · 65+ · BA+	1340	50.90 (50.34–51.46)	40–53
48	White · Women · 65+ · ≤HS	1454	50.85 (50.22–51.48)	39–54

Note. Survey-weighted coefficients; unweighted N. Rank ranges are approximate 95% simulation ranges. HS = high school; SC/AA = some college or associate degree; BA+ = bachelor's degree or higher. At the physical ceiling, model-based intervals are uninformative and are omitted.

Table 3. Less frequent anxiety and depressive symptoms (ranks 49–72)

Rank	Intersection	N	Score (95% CI)	Rank range
49	Black · Men · 18–44 · BA+	123	50.78 (48.65–52.90)	26–61
50	White · Women · 65+ · SC/AA	1312	50.74 (50.16–51.33)	41–55
51	Latino · Women · 65+ · BA+	52	50.71 (47.59–53.83)	16–65
52	Asian · Women · 18–44 · BA+	317	50.66 (49.73–51.59)	38–56
53	Asian · Women · 18–44 · SC/AA	65	50.64 (48.33–52.95)	26–62
54	Black · Women · 18–44 · ≤HS	211	50.61 (49.13–52.08)	34–58
55	Asian · Men · 18–44 · SC/AA	65	50.39 (48.00–52.78)	27–64
56	Black · Women · 45–64 · SC/AA	179	50.33 (48.60–52.06)	33–60
57	Latino · Women · 18–44 · SC/AA	366	49.76 (48.63–50.88)	48–61
58	White · Men · 18–44 · BA+	1217	48.96 (48.40–49.53)	56–62
59	White · Men · 18–44 · ≤HS	829	48.86 (48.02–49.69)	55–64
60	Latino · Women · 45–64 · SC/AA	154	48.69 (46.53–50.84)	49–69
61	White · Women · 45–64 · BA+	1317	48.48 (47.92–49.04)	58–65
62	Latino · Women · 18–44 · BA+	340	48.26 (47.09–49.42)	57–68
63	Black · Men · 18–44 · SC/AA	146	47.92 (45.79–50.05)	54–70
64	White · Women · 45–64 · SC/AA	905	47.89 (47.14–48.64)	60–68
65	Black · Women · 18–44 · BA+	205	47.79 (46.14–49.44)	57–69
66	White · Men · 18–44 · SC/AA	759	47.73 (46.89–48.57)	61–68
67	Latino · Women · 65+ · SC/AA	88	47.56 (44.60–50.51)	51–70
68	White · Women · 45–64 · ≤HS	783	47.24 (46.30–48.18)	62–69
69	Black · Women · 18–44 · SC/AA	214	46.80 (45.05–48.54)	61–70
70	White · Women · 18–44 · BA+	1489	45.96 (45.45–46.47)	68–70
71	White · Women · 18–44 · SC/AA	847	44.05 (43.24–44.86)	71–72
72	White · Women · 18–44 · ≤HS	650	43.77 (42.84–44.70)	71–72

Note. Survey-weighted coefficients; unweighted N. Rank ranges are approximate 95% simulation ranges. HS = high school; SC/AA = some college or associate degree; BA+ = bachelor's degree or higher. At the physical ceiling, model-based intervals are uninformative and are omitted.

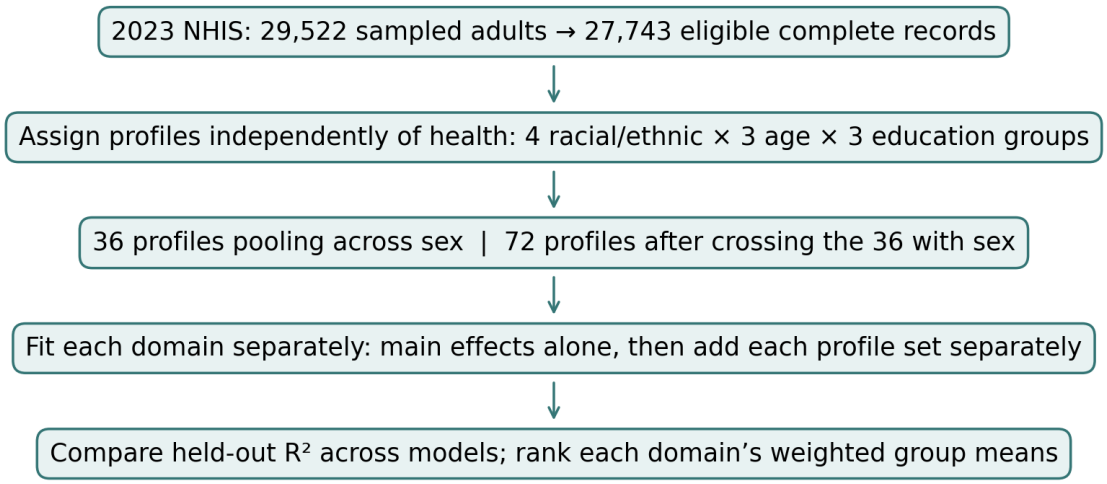
Table 4. Survey-weighted variance explained in held-out PSUs

Domain	Baseline R^2	With 36	With 72	ΔR^2 (36)	ΔR^2 (72)
Physical functioning	0.07843	0.08289	0.08264	0.00446	0.00421
Mental symptom frequency	0.06764	0.07124	0.07248	0.00360	0.00484

Note. Each comparison adds one set of membership indicators to the same main effects, using the same 27,743 respondents, survey weights, and folds. Differences use unrounded values. These are descriptive point estimates without intervals for the change in R^2.

Figure 6 shows why the model with 36 profiles still accounts for sex: sex is a main effect in every model, and enters the intersection itself only in the 72-profile set.

Figure 6. Respondent assignment, scoring, and model comparison

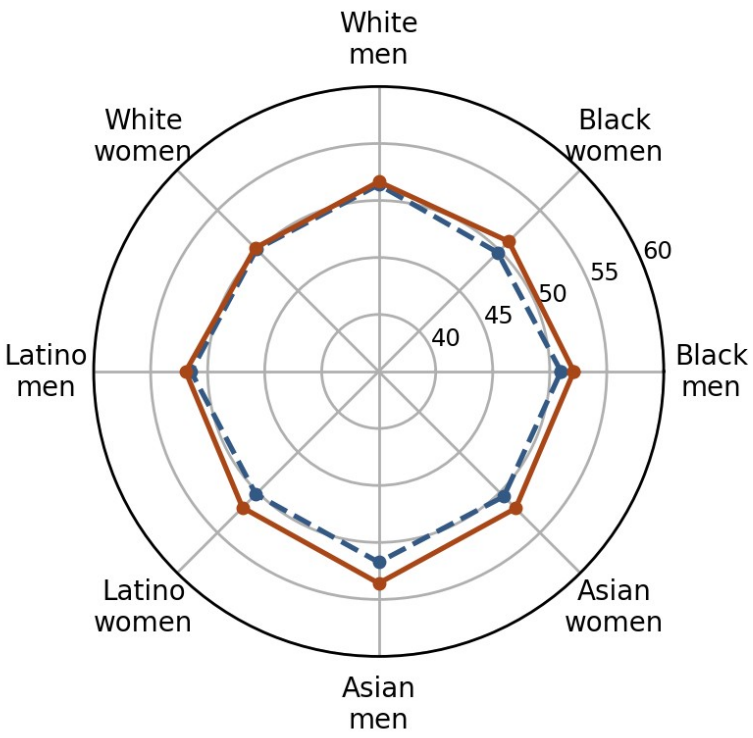


Note. In each specification the indicators are mutually exclusive. For example, a Black woman aged 18–44 with high school education or less belongs to the corresponding race–age–education profile and its female-specific counterpart. Her other membership indicators in each set equal zero.

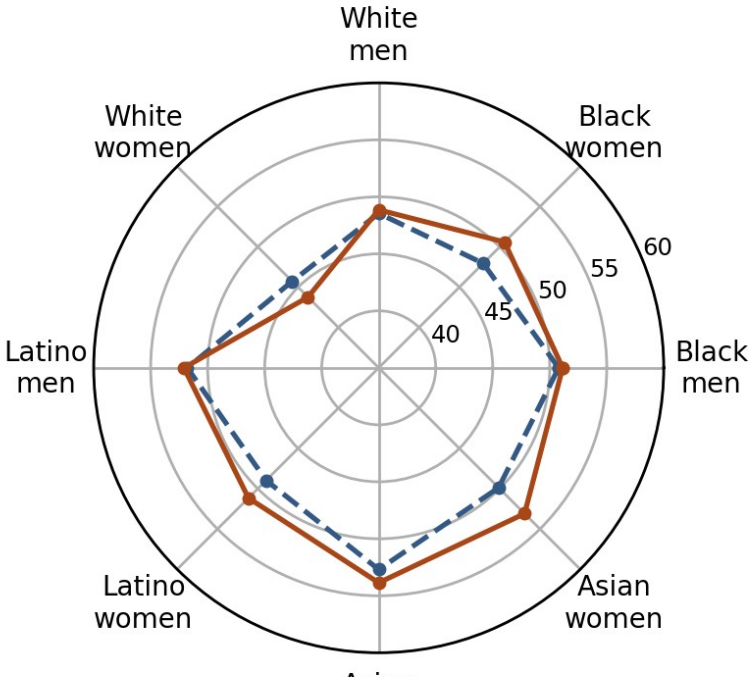
Figure 7 compares eight groups at a common age and education level. This descriptive comparison uses the full sample; Table 4 measures fit in held-out respondents.

Figure 7. Domain scores before and after allowing all 72 intersections

Physical functioning



Mental symptom frequency



Note. Both panels show adults aged 18–44 with high school education or less. Higher scores indicate better functioning or less frequent symptoms. Rings show standardized score units. Apparent extremes in small cells are uncertain; see Tables 2 and 3 for group sizes and intervals.