

Crosswalking MMSE and TICS: Performance Across Sociodemographic Groups

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Subgroup-specific crosswalks provide practical tools to improve comparability across studies and diverse populations.

INTRODUCTION

The rapidly growing global dementia burden underscores the need to synthesize and compare research findings on cognitive aging across diverse populations.

While new methods such as cogxwalkr for crosswalking effect estimates enable comparisons across studies, little is known about whether crosswalk performance may differ by sociodemographic groups.

This study aims to crosswalk the Mini-Mental State Examination (MMSE) and several versions of the Telephone Interview for Cognitive Status (TICS) and to evaluate the extent to which these crosswalks vary across demographic groups.

METHODS

1. DATA SOURCE



2016 HRS Harmonized Cognitive Assessment Protocol (HCAP)

Nationally representative older adult sample

2. CONDITIONAL RANDOM SPLITTING (ON DEMENTIA STATUS)

Stratify by dementia status

No Dementia

Dementia

Pseudo-Group A

Pseudo-Group B

Creates covariate-balanced pseudo-groups within dementia strata

3. ESTIMATE SLOPES TO CROSSWALK STUDY-LEVEL EFFECT ESTIMATES

Within each dementia stratum, compare study-level effect estimates between pseudo-groups

Effect Estimate (Study B)

Effect Estimate (Study A)

Estimate slope (crosswalk factor) to map Study A effects to Study B

4. STRATIFY CROSSWALKS BY SOCIODEMOGRAPHIC GROUPS

Repeat crosswalk estimation within levels of:

Age, Sex/Gender, Race and Ethnicity, Education, Income, Rurality

Enables evaluation of estimates across diverse populations

Avoids crosswalking individual test scores and strong assumptions about anchor items

SUMMARY OF APPROACH

Use 2016 HRS HCAP data > Condition on dementia status and randomly split into balanced pseudo-groups > Estimate slopes to crosswalk study-level effect estimates > Stratify by key sociodemographic characteristics = Valid crosswalks that are robust and generalizable across populations

RESULTS

Crosswalk coefficients and 95% confidence intervals in the whole study population and different demographic groups

Stratifying variable	Subgroups	MMSE to TICS-20	MMSE to TICS-27	MMSE to TICS-30	MMSE to TICS-35	MMSE to TICS-40
	Whole sample	0.66 (0.60, 0.73)	0.94 (0.85, 1.02)	0.76 (0.67, 0.84)	1.24 (1.14, 1.33)	1.09 (0.99, 1.19)
Age	65-69	0.51 (0.12, 0.91)	1.05 (0.57, 1.54)	1.07 (0.35, 1.79)	1.34 (0.82, 1.86)	1.36 (0.58, 2.14)
	70-74	0.63 (0.28, 0.97)	0.81 (0.38, 1.23)	0.28 (-0.37, 0.93)	1.32 (0.85, 1.78)	0.79 (0.13, 1.45)
	75-79	0.52 (0.37, 0.67)	0.81 (0.62, 0.99)	0.34 (0.04, 0.64)	1.11 (0.89, 1.33)	0.61 (0.30, 0.93)
	80 >	0.56 (0.47, 0.65)	0.80 (0.69, 0.91)	0.65 (0.50, 0.80)	1.10 (0.97, 1.23)	0.89 (0.72, 1.05)
Sex/Gender	Male	0.54 (0.43, 0.65)	0.82 (0.69, 0.96)	0.66 (0.44, 0.87)	1.15 (1.00, 1.30)	0.95 (0.73, 1.18)
	Female	0.70 (0.61, 0.79)	0.98 (0.88, 1.09)	0.68 (0.55, 0.82)	1.33 (1.21, 1.46)	0.99 (0.84, 1.15)
Race and ethnicity	Non-Hispanic White	0.73 (0.64, 0.82)	1.00 (0.89, 1.11)	0.65 (0.49, 0.81)	1.24 (1.11, 1.36)	1.05 (0.87, 1.22)
	Non-Hispanic Black	0.49 (0.32, 0.66)	0.76 (0.52, 0.99)	0.61 (0.30, 0.91)	1.05 (0.78, 1.33)	0.78 (0.44, 1.12)
	Hispanic	0.47 (0.30, 0.65)	0.93 (0.70, 1.15)	0.83 (0.54, 1.12)	0.92 (0.66, 1.17)	1.05 (0.73, 1.37)
Education level	Lower than High school	0.51 (0.41, 0.62)	0.70 (0.57, 0.82)	0.50 (0.31, 0.69)	1.08 (0.93, 1.24)	0.84 (0.64, 1.05)
	High school	0.63 (0.49, 0.77)	0.90 (0.72, 1.08)	0.47 (0.19, 0.76)	1.21 (1.01, 1.41)	1.05 (0.74, 1.36)
	Some college	0.62 (0.24, 1.00)	0.57 (0.11, 1.04)	0.62 (-0.12, 1.36)	1.08 (0.56, 1.59)	0.93 (0.16, 1.70)
	Education beyond college	0.81 (0.63, 0.99)	1.03 (0.82, 1.25)	0.77 (0.45, 1.09)	1.26 (1.03, 1.50)	1.16 (0.80, 1.52)
Total household income	Lower than or equal to median	0.57 (0.49, 0.64)	0.86 (0.76, 0.95)	0.51 (0.39, 0.63)	1.11 (1.00, 1.23)	0.82 (0.70, 0.95)
	Higher than median	0.83 (0.67, 0.99)	0.93 (0.74, 1.12)	0.53 (0.26, 0.81)	1.28 (1.07, 1.48)	0.85 (0.55, 1.15)
Residence	Urban/suburban	0.64 (0.56, 0.72)	0.91 (0.81, 1.01)	0.69 (0.55, 0.84)	1.20 (1.09, 1.32)	1.02 (0.86, 1.18)
	Rural	0.67 (0.54, 0.80)	1.00 (0.84, 1.16)	0.69 (0.45, 0.94)	1.20 (1.01, 1.39)	0.90 (0.63, 1.17)

Note. MMSE: Mini-mental state examination; TICS: Telephone Interview for Cognitive Status

The coefficients illustrate how associations between an exposure or intervention and cognitive outcome measured by MMSE can be rescaled when translated to TICS; for example, an estimated effect measured by MMSE could be multiplied by 0.94 when TICS-27 was used or by 1.09 for TICS-40.

Example - To estimate the corresponding effect on TICS-27:

$$\hat{E}_{TICS-27} = 0.94 \times \hat{E}_{MMSE}$$

Multiply the estimated MMSE effect by 0.94 to obtain the corresponding effect on TICS-27.

A 1-point change between groups on the MMSE corresponds to a 0.94-point change on the TICS-27.

CONCLUSIONS

These crosswalk coefficients provide an accessible tool for translating effect size estimates, improving comparability.

The inconsistency of crosswalk coefficients across demographic groups suggest a need for careful consideration regarding the study populations from which crosswalk coefficients are derived.

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R cogxwalkr package

<https://jrgant.github.io/cogxwalkr/>



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