Exploring Variance with Different Levels of Data Disaggregation

Jun Li, Qian Zhao, & Michael C. Rodriguez
University of Minnesota

Minnesota Youth Development Research Group
www.mnydrg.com

April 9, 2022

Paper presented at the annual meeting of the
National Council on Measurement in Education, San Diego, CA.

Exploring Variance with Different Levels of Data Disaggregation

Abstract

With noncognitive measures and education outcomes data from 157,757 students, we partitioned variance between and within groups based on race/ethnicity versus national origin (more specific data disaggregation). ICCs were twice as large or more for groups based on national origin. We discuss implications of specificity of data disaggregation for policy and practice.

Introduction

Student social and emotional learning (SEL) competencies is a topic of growing interest among education researchers and leaders (Immordino-Yang et al., 2018; Jones & Kahn, 2017; West et al., 2020). When race and ethnicity are examined when reporting and using SEL information from students, the focus is on major racial/ethnic groups (typically American Indian, Asian, Black, Latino, and White), as required by federal school accountability legislation. We do not find studies of SEL variation within racial/ethnic groups as a function of national origin, or further data disaggregation beyond the major racial/ethnic groups. Such an approach would be consistent with the growing calls for data disaggregation.

In 2016, the Minnesota state legislature passed a number of statutes, requiring the Minnesota Department of Education (MDE) to explore the possibility of data disaggregation within the major racial/ethnic categories based on state demographic population data. The statute required MDE to disaggregate and report state education assessment results for the seven most populous Asian and Pacific Islander groups, the three most population American Indian groups, the seven most populous Latino groups, and the five most population Black and African heritage groups, based on the results of the most recent American Community Survey (https://www.revisor.mn.gov/statutes/cite/120B.35#stat.120B.35.3). MDE uses disaggregated data in public reports about successes and needs of schools and students, as well as reports to policy makers regarding opportunity gaps to enable more effective policy development focused on addressing disparities, and to answer questions such as:

- Where do ethnic disparities exist inside racial groups when it comes to graduation rates?
- What districts reflect student success when it comes to standardized testing?
- What additional information is available when we provide reports and comparisons with more detail beyond the minimum federally reporting requirement? (MDE, 2022)

Minnesota Student Survey

The Minnesota Student Survey (MSS) provided us the opportunity to study variation in student commitment to learning (CtL) and other SEL constructs as a function of group membership. The MSS is a statewide anonymous survey administered triennially to students in grades 5, 8, 9, and 11 (including 64% of the student population in those grades). In 2019, about 81% of all school districts participated. The measure of CtL included items regarding student engagement in class, preparation for learning, time spent on homework, being achievement oriented, and valuing the role of being a student. The CtL measure was constructed from six items, and scaled through the partial credit Rasch model, with adequate fit estimated through

confirmatory factor analysis (e.g., CFI = .95; Rodriguez, 2021). In addition, one item resulted in a moderate level of differential item functioning (C-level DIF in terms of standards defined by Educational Testing Service; Linacre, 2021), mostly for Somali students (who tend to report the highest levels of CtL among all student groups), regarding frequency of going to class unprepared (Rodriguez, 2021). Aside from this, the measure of CtL is uniformly and moderately associated with school grades, positive experiences in after school activities, less engagement in bullying as a perpetrator, less skipping school, and lower mental distress, across each major racial/ethnic group (non-differential prediction by race; Rodriguez et al., 2019).

The MSS included self-reported racial/ethnic identities (six major groups: American Indian or Alaskan Native; Asian or Asian American; Black, African or African American; Hispanic or Latino/Latina; Native Hawaiian or other Pacific Islander; White). Within major racial/ethnic identities, students could select from a number of specific national origins, providing information about potential within-group variation. Although the survey did not provide options for national origin for White identification, students who identified as White were also able to identify with additional racial/ethnic groups and national origins within those. The questions included the following (where students were instructed: if more than one describes you, mark all that apply):

- If you are American Indian or Alaskan Native, which group best describes you?
  - Anishinaabe/Ojibwe,
  - American Indian-Dakota/Lakota,
  - other tribal affiliation;
- If you are Asian or Asian American, which group best describes you?
  - Asian-Indian,
  - Burmese,
  - Chinese,
  - Filipino,
  - Hmong,
  - Karen,
  - Korean,
  - Lao,
  - Vietnamese,
  - other Asian;
- If you are Black, African, or African American, which group best describes you?
  - African-American,
  - Ethiopian-Oromo,
  - Ethiopian-other,
  - Liberian,
  - Nigerian,
  - Somali,
  - other Black African or African American;
- If you are Hispanic or Latino/Latina, which group best describes you?
  - Colombian,
  - Ecuadoran,
  - Guatemalan,
  - Mexican,
  - Puerto Rican,
  - Salvadorian,
  - Spanish/Spanish-American,
  - other Hispanic or Latino/Latina.

Racial/Ethnic Identification

An initial sample of 170,128 students participated in the 2019 MSS, including 166,731 who reported racial/ethnic identities (139 skipped the identity questions, 3258 responded *No* to each question). An additional 5% of students failed to respond to questions in the CtL measure. In total, 157,757 students were included in the analyses of CtL.

Based on the responses of 157,757 students, we identified 61 racial/ethnic groups, including all observed unique combinations. We also identified 984 unique national origin groups, including all observed unique combinations. It became more complicated when we explored the data more deeply. For example, among the 151 students of mixed race/ethnicity with Latino and Asian identity, students reported 68 combinations of various national origins; among the 401 students of mixed race/ethnicity with Black and Latino identity, students reported 91 combinations of national origins. Given all of the combinations that we observed, the racial/ethnic groups and the national origin groups were so numerous, it appeared that more work should be done to understand how students prefer to identify themselves in terms of race, ethnicity, and national origin. Students were asked to identify all groups that applied to them, not how they prefer to identify themselves or their main group identification(s).

We also partitioned variance based on school GPA. After deleting those who did not report their racial/ethnic identities or GPA, 156,968 students were included in the analysis of GPA. Based on the responses of 156,968 students, we identified 61 racial/ethnic groups and 999 national origin groups, including all observed unique combinations.

Research Questions

In this study, we focused on exploring the variance of student CtL based on data from 157,757 students from the 2019 MSS with different levels of data disaggregation, to determine and compare the following:

1. variability in CtL between racial/ethnic groups and national origin groups, and
2. variability in CtL between specific national origins within each racial/ethnic group.

CtL is one of the most important intrapersonal SEL developmental skills of concern to educators and policy makers. It has been shown to be closely associated with many other important education outcomes (e.g., academic performance, attendance and engagement, and college aspirations; Rodriguez et al., 2019). In addition, GPA is a common indicator reflecting academic achievement and performance in school courses. As a comparison, we also analyzed the variance of student school grades (GPA on the traditional 4-point scale) from the same dataset with the same levels of data disaggregation, to explore a variable with potential for greater between-group variation.

Estimation

We used Hierarchical Linear Modeling (HLM 7.0; Raudenbush et al., 2011) two-level unconditional random effects models to estimate the variance of student CtL and GPA between racial/ethnic groups or between national origin groups:

Level-1 Model: $CtL_{ij} = \beta_{0j} + r_{ij}$ and $GPA_{ij} = \beta_{0j} + r_{ij}$

Level-2 Model: $\beta_{0j} = \gamma_{00} + u_{0j}$

This model simply estimates the mean CtL (β_0) across students *i* in group *j*. The components of interest are the student deviations (r_{ij}) from their group mean (β_{0j}) and the group deviation (u_{0j}) from the grand mean (γ_{00}). We estimated the intraclass correlation coefficient (ICC) defined as $\rho = \frac{\tau_{00}}{\tau_{00} + \sigma^2}$ which represents the proportion of variability in student CtL (or GPA) between groups, where τ_{00} represents the between-group variance (variance of u_{0j}), σ^2 represents the within-group variance (variance of r_{ij}), and $\tau_{00} + \sigma^2$ represents total variance.

Results

In addition to the research questions posed above, we provided additional information to more fully describe the exploratory analyses we examined along the way. We intended for these results to provide a deeper look at the outcomes relative to various levels of data disaggregation, and to provide some information about the uniformity or stability of estimates within major racial/ethnic groups when disaggregated further by national origin within group. Each section below begins with a statement of the major finding. To facilitate brief presentations, American Indian or Alaskan Native will be referred to as American Indian; Asian or Asian American will be referred to as Asian; Black, African, or African American will be referred to as Black, and Hispanic or Latino/Latina will be referred to as Latino.

In all cases below, the between-group variance (τ_{00}) was statistically different than zero ($p \leq .001$). This indicated that for all models, there was non-zero variation between groups, for each method of defining groups.

Compared to the population, more students identified as multiracial, fewer students identified as American Indian, Black, or Latino only.

We noticed some differences between the state population data (Minnesota Compass, 2022) for ages 10 to 17 and students who responded to the MSS (those in grades 5, 8, 9, and 11). About 5.7% identified with two or more races in the population compared to 8.6% in the MSS (51% more than the population), 2.0% were American Indian only in the population compared to 1.6% in the MSS (20% less than the population), 10.5% were Black only in the population compared to 8.5% in the MSS (19% less), and 9.0% were Latino only in the population compared to 6.1% in the MSS (32% less). The percentages of White and Asian students were similar to the population. Because of the small number of Native Hawaiian/Pacific Islander-only students ($n = 411$), this group was not reported below (Table 1), but their membership was included when students in other groups also identified as Native Hawaiian or Pacific Islander.

Table 1
Racial/Ethnic Identities of Students

Group	Population (N = 972,222)	Participants with race/ethnicity (n = 166,731)		Participants with race/ethnicity and CtL scores (n = 157,757)	
	%	n	%	n	%
American Indian	2.0	2715	1.6	2465	1.6
Asian	6.4	11182	6.7	10531	6.7
Black	10.5	14123	8.5	12498	7.9
Latino	9.0	10231	6.1	9347	5.9
White	66.4	113769	68.2	109080	69.1
Multiracial	5.7	14300	8.9	13473	8.5

Note. The total sample sizes included Native Hawaiian/Pacific Islander students (411 for all participants, 363 for participants with scores).

White students had the highest percentage reporting to be a single race only, whereas American Indian students had the lowest single-race identities.

Of the 126,151 White students who participated in the 2019 MSS, 113,769 (90%) reported to be White only. In contrast, 36% of American Indian students (2715 out of 7543) reported to be American Indian only. The single race percentages for Latino students, Black students, and Asian students were from 70% to 80%.

There was modest variability in student average CtL between different racial/ethnic groups and between different national origins; the ICC for national origin was twice as large as for race/ethnicity.

We estimated the ICC for racial/ethnic groups and all observed combinations and found between-group variance (τ_{00}) to be 0.049, within-group variance (σ^2) to be 2.270, and the ICC to be .021 (0.049/[0.049 + 2.270]), indicating that 2.1% of student CtL score variance was between racial/ethnic groups (Table 2). This ICC was very small, indicating that nearly all of the variance (97.9%) in CtL scores existed within groups, with little variation between groups (i.e., little variation in group means).

Table 2
ICCs of Student CtL between Racial/Ethnic Groups and National Origin Groups

Group	$n1$	$n2$	σ^2	τ_{00}	Total variance	ICC
Racial/ethnic	157757	61	2.222	0.049	2.270	.021
National origin	157757	984	2.211	0.100	2.312	.043

Note. $n1$ = level-1 sample size (students). $n2$ = level-2 sample size (groups).

We estimated the ICC for national origin groups and all observed combinations and found between-group variance of 0.100, within-group variance of 2.211, and an ICC of .043, indicating that 4.3% of student CtL score variance was between national origin groups (Table 2). This ICC was also small, indicating that most of the variance (95.7%) in CtL scores existed within groups.

The ICC based on national origin groups (.043) was twice as large as the ICC based on racial/ethnic groups (.021); the variability in student CtL scores between national origin groups was larger than that between racial/ethnic groups.

Black and Asian student groups had the highest ICCs between national origins in CtL scores; the American Indian student group had the lowest between national origins variation in CtL scores.

We estimated the ICC for each racial/ethnic group separately, with national origin combinations within each group. The Black and Asian student groups had ICCs of .052, indicating that 5.2% of student CtL score variance was between national origin groups (Table 3). These two groups had the highest between national origin group ICCs in student CtL scores.

Table 3

ICCs of Student CtL between National Origin Groups, by Racial/Ethnic Group

Group	*n*1	*n*2	σ^2	τ_{00}	Total variance	ICC
American Indian	6995	402	2.144	0.024	2.167	.011
Asian	13339	487	2.111	0.116	2.228	.052
Black	16754	495	2.339	0.129	2.468	.052
Latino	14099	564	2.181	0.052	2.23	.023
White	120765	549	2.072	0.063	2.135	.030

Note. *n*1 = level-1 sample size (students). *n*2 = level-2 sample size (groups). Each racial/ethnic group includes all combinations of race/ethnicity and national origin.

On the contrary, the American Indian student group had the lowest ICC between national origin groups of .011, indicating that only 1.1% of student CtL score variance was between national origin groups. National origin groups within Asian and Black student groups varied more than within American Indian students, indicating the three national origin groups for American Indian students were substantially more similar.

Except for American Indian students, there was more variance within racial/ethnic group (larger ICCs; Table 3, row 1) than between racial/ethnic groups (Table 2, row 1).

The ICC of student CtL scores for national origin groups was similar to the ICC for racial/ethnic groups, when all complex combinations of race/ethnicity and national origin groups were excluded.

As many of the complex combinations of race/ethnicity and national origin were rather small, we excluded the complex (more than one) combinations of race/ethnicity and national origin and examined ICCs for students with a single race/ethnicity and a single national origin. The ICC based on racial/ethnic groups (.033) was essentially the same as the ICC based on national origin groups (.034), as shown in Table 4. This was in contrast to our previous finding; where all combinations of race/ethnicity and national origin were included, the ICC based on national origin groups (.043) was twice as large as the ICC based on racial/ethnic groups (.021). This suggested that the variance in student CtL scores between different national origin groups may mainly come from the complex combinations of multiple group identities.

Table 4

ICCs of Student CtL between Racial/Ethnic Groups and National Origin Groups, including Students with a Single Group Membership

Group	$n1$	$n2$	σ^2	τ_{00}	Total variance	ICC
Racial/ethnic	29549	4	2.311	0.079	2.390	.033
National origin	29549	28	2.254	0.079	2.333	.034

Note. $n1$ = level-1 sample size (students). $n2$ = level-2 sample size (groups). Sample included 28 national origin groups (3 American Indian groups, 10 Asian groups, 7 Black groups, 8 Latino groups).

ICCs for student CtL scores for racial/ethnic groups were similar, for students with a single national origin.

We examined variation between the larger single-national-origin groups within each racial group separately, excluding the complex combinations of national origin. As shown in Table 5, the American Indian, Asian, and Black student groups had similar ICCs (.024 to .029); the ICC for the Latino student group was .011. Compared to the previous estimates including the complex combinations of national origin, the ICC of student CtL scores for the American Indian group increased from .011 to .028, indicating greater variability between national origins for students with a single national origin (Tables 3 and 5). However, ICCs decreased for the Asian student group from .052 to .029, the Black student group from .052 to .024, and the Latino student group from .023 to .011. Student CtL score ICCs for the larger single-national-origin groups within racial/ethnic groups were more similar to each other after excluding the many unique small sized combinations of national origin.

In this case of students with only one national origin, there was only slightly more variance between racial/ethnic groups (larger ICCs; Table 4, row 1) than within racial/ethnic group (Table 5); but these ICCs are much more similar than when including all complex combinations of national origins as above (comparing Tables 2 and 3).

Table 5
ICCs of Student CtL between National Origin Groups by Racial/Ethnic Group, including Students with a Single National Origin

Group	*n*1	*n*2	σ^2	τ_{00}	Total variance	ICC
American Indian	2143	3	2.198	0.063	2.261	.028
Asian	9401	10	2.112	0.063	2.175	.029
Black	10745	7	2.442	0.061	2.503	.024
Latino	7260	8	2.177	0.025	2.202	.011

Note. *n*1 = level-1 sample size (students). *n*2 = level-2 sample size (groups). Sample included 28 national origin groups (3 American Indian groups, 10 Asian groups, 7 Black groups, 8 Latino groups).

There was moderate variability in student average GPAs between different racial/ethnic groups and different national origin groups; the ICCs for student GPAs were larger than those for student CtL.

The ICC for racial/ethnic groups for student GPA was .076, indicating that 7.6% of the total GPA variance was between racial/ethnic groups (Table 6). The ICC for national origin groups for student GPA was .122, indicating that 12.2% of student GPA variance was between national origin groups.

Table 6
ICCs of Student GPA between Racial/Ethnic Groups and National Origin Groups

Group	*n*1	*n*2	σ^2	τ_{00}	Total variance	ICC
Racial/ethnic	156968	61	0.901	0.074	0.975	.076
National origin	156968	999	0.894	0.124	1.019	.122

Note. *n*1 = level-1 sample size (students). *n*2 = level-2 sample size (groups).

As with the pattern in student CtL variability, the ICC based on national origin groups was nearly twice as large as the ICC based on racial/ethnic groups. On average, there was more variability in student GPAs between national origin groups than between racial/ethnic groups.

The ICCs for student GPA were three-times larger than the ICCs for student CtL (.021 versus .076 for race/ethnicity and .043 versus .122 for national origin; Tables 2 and 6). The larger ICCs in student GPA relative to CtL indicated that GPA, or academic performance, differs

substantially more by racial/ethnic groups and national origin groups than does an SEL measure of commitment to learning.

Asian and White student groups had the highest ICCs between national origins in student GPA; the American Indian student group had the lowest ICC between national origins.

We estimated the student GPA ICC for each racial/ethnic group, with national origin combinations within group. As shown in Table 7, the Asian student group had an ICC of .169, indicating that 16.9% of student GPA variance was between national origin groups. The White student group had an ICC of .137, indicating that 13.7% of GPA variance was between national origin groups. The American Indian student group had the lowest within group variation, with an ICC of .027, indicating that only 2.7% of student GPA variance was between national origin groups. GPA differences between Asian students of different national origins and GPA differences between different combinations of White students were larger than the differences between American Indian, Black, and Latino students of different national origins.

Table 7

ICCs of Student GPA between National Origin Groups, by Racial/Ethnic Group

Group	$n1$	$n2$	σ^2	τ_{00}	Total variance	ICC
American Indian	7041	403	1.247	0.034	1.281	.027
Asian	13085	491	0.771	0.157	0.928	.169
Black	17176	513	1.101	0.067	1.168	.058
Latino	14398	580	1.195	0.035	1.229	.028
White	119484	547	0.844	0.134	0.977	.137

Note. $n1$ = level-1 sample size (students). $n2$ = level-2 sample size (groups).

For student GPA, there was more variance within the Asian and White student groups between national origins (larger ICCs; Table 7) than between racial/ethnic groups overall (Table 6, row 1).

The ICC of student GPA for national origin groups was slightly larger than the ICC for racial/ethnic groups, when all complex combinations of race/ethnicity and national origin were excluded.

Again, as many of the complex combinations of racial/ethnic and national origin groups were rather small, we excluded the complex combinations of race/ethnicity and national origin and examined ICCs for the larger single racial/ethnic and national origin groups. By eliminating the complex combinations of group membership, the ICC for student GPA based on national origin groups decreased from .122 to .091, and the ICC based on racial/ethnic groups were essentially the same, .076 and .078 respectively (Table 6 and 8). Unlike the change in ICC for student CtL, the ICC in GPA based on national origin was still larger than the ICC based on race/ethnicity, after excluding the complex combinations of national origin.

Table 8

ICCs of Student GPA between Racial/Ethnic Groups and National Origin Groups, including Students with a Single Group Membership

Group	*n*1	*n*2	σ^2	τ_{00}	Total variance	ICC
Racial/ethnic	30009	4	1.060	0.090	1.150	.078
National origin	30009	28	1.022	0.102	1.124	.091

Note. *n*1 = level-1 sample size (students). *n*2 = level-2 sample size (groups). Sample included 28 national origin groups (3 American Indian groups, 10 Asian groups, 7 Black groups, 8 Latino groups).

ICCs for student GPA for the Asian student group was much larger than other racial/ethnic groups, for students with a single national origin.

We examined ICCs for the larger single-national-origin groups within each racial group, excluding the unique complex combinations of national origin. The Asian student group had an ICC of .107 (Table 9), indicating that 10.7% of GPA variance was between national origin groups. Compared to the previous estimate including the complex combinations of national origin, the GPA ICC for the Asian student group decreased from 16.9% to 10.7% (Tables 7 and 9), although still large. The GPA ICC for the American Indian student group also decreased from the 2.7% to 1.8%, which remained the lowest ICC among the groups, after excluding the many small combinations of national origins.

Table 9
ICCs of Student GPA between National Origin Groups by Racial/Ethnic Group, including Students with a Single National Origin

Group	*n*1	*n*2	σ^2	τ_{00}	Total variance	ICC
American Indian	2203	3	1.319	0.024	1.343	.018
Asian	9249	10	0.757	0.090	0.848	.107
Black	11077	7	1.073	0.047	1.120	.042
Latino	7480	8	1.186	0.036	1.221	.029

Note. *n*1 = level-1 sample size (students). *n*2 = level-2 sample size (groups). Sample included 28 national origin groups (3 American Indian groups, 10 Asian groups, 7 Black groups, 8 Latino groups).

Finally, in this case of students with only one national origin, again, there are larger differences between Asian students of different national origins (larger ICC; Table 9), than between racial/ethnic groups overall (Table 8, row 1); although, the within Asian student group ICC is much smaller when only including students with one national origin (.107 in Table 9 relative to .169 in Table 7). This is different than what we found with CtL, where when excluding the complex combinations of national origin, ICCs between and within racial/ethnic groups became more similar. Here, at least for the Asian student group, GPA continues to vary more within the Asian student group (between national origin groups) than between racial/ethnic groups overall.

When comparing these broader results across CtL and GPA, we notice mostly similarities, with one exception. When including all complex combinations of national origins, there is greater variation within racial/ethnic groups (between national origins) than between these broad groups. This indicates the greater heterogeneity within race/ethnicity. When we include only students with one national origin (excluding the complex combinations), ICCs between and within race/ethnicity become more similar, and are slightly larger between racial/ethnic groups, with one notable exception. For the Asian student group, the ICC for GPA within the racial group becomes much smaller when excluding the complex combinations of national origin, yet remains larger than the overall racial/ethnic between-group ICC. This suggests that for the Asian student group, within group heterogeneity regarding GPA remains greater than the differences between racial/ethnic groups, regardless of whether complex combinations of national origin are included.

Discussion

To explore the potential for increased information from data disaggregation, we examined variability in two student outcomes, including Commitment to Learning (CtL) and grade point average (GPA). ICCs for CtL and GPA were estimated, considering membership in general racial/ethnic groups and more specific national origin groups. We compared membership including all observed complex combinations of race/ethnicity (over 60 unique groups) and national origin (nearly 1000 unique groups), and also by including only students with a single race/ethnicity (four groups) or national origin (28 groups). A few general observations resulted.

There were larger differences in student CtL and GPA between the more specific national origin groups than between racial/ethnic groups overall.

The ICC for student CtL based on national origin groups (.043) are larger than that based on racial/ethnic groups (.021). Similarly, the ICC for student GPA based on national origin groups (.122) is larger than that based on racial/ethnic groups (.076). Put plainly, there are bigger differences in student CtL and GPA between the more specific national origin groups than between the more general racial/ethnic groups. Since national origin is often affiliated with language and other cultural characteristics, and racial/ethnic groups are determined by far more ambiguous socially-determined characteristics (including governmental bureaucratic definitions not grounded in characteristics relevant to individuals and communities), student CtL may be associated with specific sociocultural backgrounds more so than broader racial/ethnic identities. For this SEL measure, the more specific group identity (national origin rather than race/ethnicity) results in larger group differences, potentially providing more specific information regarding efforts to meet group needs; although, the overall differences (ICCs) are small.

Additionally, to address academic performance gaps as seen in GPA group differences, and to know which groups may need additional supports (or to be responsive to group characteristics, needs, and preferences), we may need to focus more on student cultural characteristics and experiences as defined by national origin, rather than the typical heterogeneous racial/ethnic groups.

GPA resulted in larger differences between students from different racial/ethnic groups and national origins than CtL.

The ICCs between different racial/ethnic and national origin groups for student GPA (.076 and .122, respectively) are larger than those for student CtL (.021 and .043, respectively), illustrating the fact that the magnitude of group differences depend on the nature of the outcome of interest. For these two school-based measures, the order of magnitude for racial/ethnic groups (smaller values) versus national origin groups (larger values) is consistent, as discussed above.

In the future, researchers could explore other variables from various contexts to examine differences between group memberships. However, differences in the two variables used in this study do not necessarily indicate one is better or worse, as different variables represent different characteristics, and may be differentially associated with group membership. In our case, the national origin groups result in greater variation than the more general racial/ethnic groups for both CtL and student GPA.

The complex combinations of identities had an impact on the proportion of variance between different national origin groups and between different racial/ethnic groups, although many group sample sizes were relatively small.

The ICCs for student CtL vary more within racial/ethnic group between national origin groups (0.011 to 0.052) relative to the global racial/ethnic groups (.021) and national origin groups (.043), when including all complex combinations of groups. When excluding the complex combinations, the ICCs within racial/ethnic group between national origins vary less (.011 to .029), as do the global racial/ethnic groups (.033) and national origin groups (.034).

We observe similar results for student GPA, with greater variability in ICCs for national origin within racial/ethnic groups (.027 to .169) and global racial/ethnic groups (.076) and national origins (.122), relative to the ICCs for those students with a single group members, where racial/ethnic groups ICCs range from .018 to .107, and global racial/ethnic groups ICC of .078 and national origin groups ICC of .091.

When we examined between-group variation for student CtL with the larger single-national-origin groups within each racial group, excluding the unique complex combinations of national origin, the variance of those groups with bigger variability decreases and the variance of those groups with smaller variability slightly increases, such that the variances between groups become more similar. For student GPA, the ICCs for each racial/ethnic group tend to be smaller when excluding the complex combinations of national origin. However, the impact of the complex national origin combinations is not consistent—neither correlated to the number of combinations nor to the number of single national origins within the groups.

Another implication of this work is that the common approach of putting all complex identities together in a single multiracial group likely distorts (hides) important differences within such a group. Researchers could conduct sensitivity analyses to determine the impact of the complex combinations of racial/ethnic identity and national origin to better understand the role of group membership—perhaps deepening our understand of the role of sociocultural context in education outcomes beyond the typical global racial/ethnic groups.

References

Immordino-Yang, M. H., Darling-Hammond, L., & Krone, C. (2018). *The brain basis for integrated social, emotional, and academic development. How emotions and social relationships drive learning.* The Aspen Institute. https://www.aspeninstitute.org/publications/the-brain-basis-for-integrated-social-emotional-and-academic-development/

Jones, S. M., & Kahn, J. (2017*). The evidence base for how we learn: Supporting students' social, emotional, and academic development*. (Consensus statements of evidence from the council of distinguished scientists). The Aspen Institute. https://assets.aspeninstitute.org/content/uploads/2018/03/FINAL_CDS-Evidence-Base.pdf

Linacre, J. M. (2021). *A user's guide to Winsteps® Rasch-model computer programs* [version 5.0] (see section 13.39). http://www.winsteps.com/

Minnesota Compass. (2022). *All Minnesotans by race & ethnicity*. Wilder Research. https://www.mncompass.org/topics/demographics/race-ethnicity?population-by-age-and-race#1-14882-g

Raudenbush, S. W., Bryk, A. S., Cheong, Y. F., Congdon, R. T., & du Toit, M. (2011). *HLM 7: Hierarchical linear and nonlinear modeling* [Computer software]. Scientific Software International. https://ssicentral.com/index.php/products/hlm-general/

Rodriguez, M. C. (2021). *Technical report on developmental skills, supports, & challenges from the 2013, 2016, and 2019 Minnesota Student Survey*. Minnesota Youth Development Research Group, University of Minnesota. https://conservancy.umn.edu/handle/11299/225357

Rodriguez, M. C., Dosedel, M., & Kang, Y. (2019, April). *Interpretation and use validation of social and emotional learning measures in inequitable settings* [Paper presentation]. National Council on Measurement in Education Annual Meeting, Toronto, Canada. https://conservancy.umn.edu/handle/11299/202391

West, M. R., Pier, L., Fricke, H., Hough, H., Loeb, S., Meyer, R. H., & Rice, A. B. (2020). Trends in student social-emotional learning: Evidence from the first large-scale panel student survey. *Educational Evaluation and Policy Analysis, 42*(2), 279-303.