CALIFORNIA SAFE AND SUPPORTIVE SCHOOLS

Measurement Analysis of CHKS Core and School Climate Module Items

December 8, 2011

Healthy Kids School Climate SURVEYS

Findings and recommendations

We conducted a series of factor analyses using selected items from the Core module of the California Healthy Kids Survey (CHKS) and its supplementary School Climate Module (SCM). The purpose of these analyses was to determine the measurement structure of a selected subset of items included on the 2010-11 student surveys. The results of the analyses suggest that the items analyzed can be used to represent eight summary measures of school climate and student risk behavior. Specifically, the following underlying factors are measured by the CHKS core and SCM items analyzed:

- school connectedness (4 items)
- support from adults in the school (6 items)
- opportunities for participation in meaningful activities (3 items)
- safety perceptions at school (2 items)
- positive learning environment (11 items, S3 module)
- low substance use (15 items)
- low non-physical and physical violence victimization (11 items)
- low violence perpetration (7 items)

Each of the summary measures exhibits good internal consistency reliability, and each measure appears to represent a distinct dimension. The factor analyses also identified a latent factor for *racial/ethnic tension* (SCM), but this two-item measure exhibited too low a reliability to be recommended for future use.

This is the first analyses of School Climate Module data. Eleven of the sixteen items included on the module appear to measure a *positive learning environment* factor. A summative scale comprised of these eleven items has good psychometric qualities, with the highest internal consistency reliability of any other scale.

A notable difference from recent analytic work with these items is that a distinct underlying factor for *harassment/bullying* was not detected. The items measuring harassment and bullying at school appear to measure the same underlying factor as the items asking about victimization in general.

We recommend that these summary measures be used as the basis for concise, short, user-friendly reports for schools and school districts. Reducing the data presented to a small number of summary measures will likely make the reports more accessible and useful for practitioners.

Purpose

This document describes the results of a series of factor analyses conducted on data collected from the 2010-11 administration of the California Healthy Kids Survey (CHKS) by 294 high schools in 58 school districts participating in the Safe and School Schools (S3) project. The purpose of these analyses was to determine the measurement structure of the items included in the 2010-11 version of the student survey, and to ascertain whether it is feasible to create summary scales representing a smaller, more manageable number of underlying factors measured by the individual CHKS items. In addition to examining the dimensionality of scales via exploratory and confirmatory factor analysis models, we also examined the reliability of derived scales by estimating internal consistency reliability coefficients.

Sample

The analytic sample was based on CHKS data collected from all 9th and 11th graders in comprehensive high schools in S3 districts during the 2010-11 period. WestEd received data from 117,683 9th/11th grade students in 58 S3 school districts with 294 high schools. After excluding schools with less than 20 responses and dropping student observations with high levels of missing data, 91,183 9th/11th grade students in 56 districts and 240 schools were included in the analytic sample. The sample was heterogeneous with respect to race/ethnicity—55% of the students in the sample reported that they were of Latino origin, 18% Asian, 8% African American, and 24% white.[1] Females constituted 52% of the sample, while 51% and 49% of the sample reported that they were in 9th grade and 11th grade, respectively.

Analytic Strategy

To ascertain the factor structure of a selected set of CHKS items, we fitted a series of exploratory and confirmatory factor analysis models. Exploratory factor analysis (EFA) models were estimated to determine roughly the number of factors underlying the data and the measurement structure of the latent factors. A combination of factors was used to determine the number of factors to retain in the EFAs, including fit indices, the number of eigenvalues greater than 1, conceptual clarity, and simplicity. Models with the smallest number of possible factors and models in which each item loaded on only one latent factor (no cross-loadings) were favored over more complex models.

We then used the results of the exploratory factor analysis models as a starting point for a series of nested confirmatory factor analysis (CFA) models. We used measures of model fit,

[1] Note that the race/ethnicity items do not have mutually exclusive response categories.

correlations among the latent constructs (factors), and factor-loading patterns to make decisions about models.

To derive estimates for the EFA and CFA models, we used Muthén and Muthén's (2010) *Mplus* statistical modeling program. Because all of the items used are dichotomous or ordinal, we used Muthén's (1984) approach to exploratory and confirmatory factor analysis with categorical indicators.

Table 1 below shows the CHKS items included in the analyses, organized by the domains previously used in CHKS reports. We included in the analyses all the items in the Core Module used to assess school connectedness, school external assets, 30-day substance use, violence, safety, and harassment and bullying. We also included the items in the sixteen-item supplementary School Climate Module (SCM). We focused on items that have actionable implications for schools. We did not include in the analyses known single-item constructs (e.g., school grades, gang membership) or items used to measure neighborhood external assets, lifetime substance use, perceived harm from substance use, and gambling.

Table 1. CHKS measures included in measurement analyses, grouped by domain used in prior work

Core Module

School connectedness

- A11. I feel close to people at this school.
- A12. I am happy to be at this school.
- A13. I feel like I am a part of this school.
- A14. The students at this school treat students fairly.
- A15. I feel safe in my school.

School supports

Caring relationships

- A16. At my school… there is an adult who really cares about me.
- A18. At my school… there is an adult who notices when I'm not there.
- A20. At my school… there is an adult who listens to me when I have something to say.

High expectations

- A17. At my school… there is an adult who tells me when I do a good job.
- A19. At my school… there is an adult who always wants me to do my best.
- A21. At my school… there is an adult who believes that I will be a success.

Opportunities for meaningful participation

- A22. At school I do interesting activities.
- A23. At school I help decide things like class activities or rules.
- A24. At school I do things that make a differences.

Tobacco, alcohol, or other drug use (30-day use)

- A61. Past 30 days…cigarettes
- A62. Past 30 days…smokeless tobacco.
- A63. Past 30 days…at least one drink of alcohol
- A64. Past 30 days…five or more drinks of alcohol
- A65. Past 30 days…marijuana
- A66. Past 30 days…inhalants
- A67. Past 30 days…cocaine
- A68. Past 30 days…methamphetamine or amphetamines
- A69. Past 30 days…ecstasy, LSD, or other psychedelics
- A70. Past 30 days…any other illegal drug or pill to get "high"
- A71. Past 30 days…two or more drugs at the same time

Tobacco, alcohol, or other drug use at school

- A72. Past 30 days on school property…smoke cigarettes.
- A73. Past 30 days on school property…at least one drink of alcohol.
- A74. Past 30 days on school property…smoke marijuana.
- A74. Past 30 days on school property…use any other illegal drug.

Continued→

Table 1. CHKS measures included in measurement analyses, grouped by domain used in prior work

Physical/verbal/emotional violence victimization and perpetration
A100. Past 12 months on school property…been pushed, shoved, slapped, hit.
A101. Past 12 months on school property…been afraid of being beat up.
A102. Past 12 months on school property…been in a physical fight.
A103. Past 12 months on school property…had mean rumors or lies spread about you.
A104. Past 12 months on school property…had sexual jokes, comments, or gestures made to you.
A105. Past 12 months on school property…been made fun of because of your looks/way you talk.
A106. Past 12 months on school property… had your property stolen or deliberately damaged.
A107. Past 12 months on school property…been offered, sold, or given an illegal drug.
A108. Past 12 months on school property…damaged school property on purpose.
A109. Past 12 months on school property…carried a gun.
A110. Past 12 months on school property…carried any other weapon.
A112. Past 12 months on school property…seen someone carrying a gun, knife, other weapon.
Harassment and bullying victimization
A113. Past 12 months on school property… harassed or bullied – race/ethnicity.
A114. Past 12 months on school property… harassed or bullied – religion.
A115. Past 12 months on school property… harassed or bullied – gender.
A116. Past 12 months on school property… harassed or bullied – gay/lesbian.
A117. Past 12 months on school property… harassed or bullied – physical or mental disability.
Perceived Safety
A119. How safe do you feel when you are at school?
School Climate Module
G1. Adults at this school treat all students with respect
G2. My class lessons include examples of my racial, ethnic, or cultural background
G3. I have been disrespected by an adult at school b/c of race/ethnicity
G4. There is a lot of tension in this school between people of different cultures, races, and ethnicities
G5. Adults at this school encourage me to work hard so I can be successful in college or at the job I choose.
G6. My teachers work hard to help me with my schoolwork when I need it.
G7. Teachers show how classroom lessons are helpful to students in real life.
G8. Teachers give students a chance to take part in classroom discussion or activities.
G9. Students at this school are motivated to learn.
G10. This school promotes academic success for all students.
G11. This school is a supportive and inviting place for students to learn.
G12. All students are treated fairly when they break school rules.
G13. This school clearly informs students if they break school rules
G14. The schoolyard and buildings are clean and in good condition.

Note. All items were coded so that higher values correspond to more positive outcomes (e.g., high school connectedness, low school violence, low substance use).

Exploratory Factor Analysis Results

Table 2 shows the goodness-of-fit information for the series of EFA models estimated. The goodness-of-fit information from the EFA models suggest that 10 factors are measured by the CHKS core and S3 module items analyzed.[2] The factor pattern and loadings for the 10-factor solution are displayed in Table 3. As shown by the **bolded loadings** in Table 3, distinct factors are apparent for the following domains:

- school connectedness (5 items)
- support from adults in the school (6 items, caring relations and high expectations)
- opportunities for participation in meaningful activities (3 items)
- low substance use (15 items)
- low victimization, harassment, and bullying (11 items)
- low violence perpetration (7 items)
- safety perceptions at school (1 item)
- positive learning environment (13 items, S3 module)
- low racial/ethnic tension (2 items, S3 module)

Moreover, a non-distinct *non-physical victimization* construct was identified (factor 7), which positively loaded on items A103 ("had mean rumors or lies spread about you") and A104 ("sexual jokes, comments, or gestures made to you"). This construct is not distinct from the *general victimization* construct because items A103 and A104 cross-load on both constructs. Nevertheless, the 10-factor EFA model was used as a starting point for a series of nested CFA models.

[2] Item G9 from the S3 Module—"Students at this school are motivated to learn"—was dropped from the analyses because it was not associated with any of the underlying constructs revealed in the EFA models. It would be more appropriate to use this item as a single-item indicator than to include it in any of the derived scales.

Table 2. CHKS measures - goodness-of-fit information for EFA Models

Model	RMSEA	CFI	TLI	SRMR
1 Factor	0.089	0.584	0.569	0.179
2 Factor	0.077	0.702	0.680	0.111
3 Factor	0.067	0.781	0.758	0.089
4 Factor	0.059	0.837	0.812	0.053
5 Factor	0.049	0.890	0.868	0.042
6 Factor	0.043	0.920	0.901	0.037
7 Factor	0.039	0.935	0.916	0.032
8 Factor	0.036	0.947	0.929	0.028
9 Factor	0.033	0.958	0.942	0.025
10 Factor*	0.029	0.968	0.954	0.020

Notes: Analytic sample consists of 9th and 11th grade respondents in S3 comprehensive high school who participated in the 2010-11 CHKS administration.

* Preferred model.

RMSEA = Root Mean Square Error of Approximation (recommended value ≤0.06).

SRMR = Standardized Room Mean Square Residual (recommended value ≤0.06).

CFI = Comparative Fit Index (recommended value ≥ 0.95).

TLI = Tucker Lewis Index (recommended value ≥ 0.95).

Table 3. CHKS EFA factor loadings— 10-factor solution

Item	Item Description	1	2	3	4	5	6	7	8	9	10
A11	I feel close to people at this school.	**0.67**	0.02	0.11	-0.04	0.06	-0.03	-0.06	-0.04	-0.06	-0.02
A12	I am happy to be at this school.	**0.84**	-0.06	0.04	0.05	-0.02	-0.01	0.04	0.02	0.03	0.00
A13	I feel like I am a part of this school.	**0.77**	-0.01	0.19	0.01	0.01	0.02	-0.01	-0.01	-0.01	-0.02
A14	The students at this school treat students fairly.	**0.33**	0.18	-0.12	0.07	-0.01	-0.02	0.19	0.11	0.27	0.06
A15	I feel safe in my school.	**0.53**	0.08	-0.09	0.01	-0.03	0.07	-0.02	0.48	0.08	0.03
A16	At my school… there is an adult who really cares about me.	0.05	**0.71**	0.13	0.00	-0.02	0.00	-0.02	0.03	-0.03	-0.03
A17	At my school… there is an adult who tells me when I do a good job.	0.02	**0.76**	0.04	0.03	0.01	-0.01	-0.02	-0.01	0.03	0.01
A18	At my school… there is an adult who notices when I'm not there.	0.00	**0.70**	0.09	-0.02	0.04	-0.02	-0.03	0.05	-0.02	-0.03
A19	At my school… there is an adult who always wants me to do my best.	0.01	**0.85**	-0.02	0.04	-0.01	-0.02	-0.02	-0.04	0.03	0.02
A20	At my school… an adult who listens to me when I have something…	0.00	**0.79**	0.04	0.00	0.00	0.02	0.03	0.04	0.04	0.01
A21	At my school… there is an adult who believes that I will be a success.	0.01	**0.79**	0.06	0.04	0.00	0.01	0.02	-0.04	0.03	0.02
A22	At school I do interesting activities.	0.16	0.06	**0.60**	0.06	0.00	-0.03	-0.03	-0.02	0.02	0.03
A23	At school I help decide things like class activities or rules.	0.01	0.07	**0.78**	-0.01	0.00	0.02	0.05	0.01	0.04	-0.02
A24	At school I do things that make a difference.	0.03	0.08	**0.78**	0.01	-0.01	0.00	-0.01	0.00	0.02	0.00
A61*	Past 30 days…cigarettes	0.06	-0.04	0.04	**0.82**	0.01	-0.01	0.05	-0.06	-0.02	0.00
A62*	Past 30 days…smokeless tobacco.	0.05	0.02	-0.06	**0.77**	0.15	0.01	-0.10	-0.04	0.01	-0.03
A63*	Past 30 days…at least one drink of alcohol	0.00	-0.02	0.00	**0.88**	-0.03	-0.17	0.36	-0.04	0.01	0.08
A64*	Past 30 days…five or more drinks of alcohol	0.01	-0.03	-0.02	**0.96**	-0.02	-0.18	0.32	-0.06	0.00	0.07
A65*	Past 30 days…marijuana	0.02	-0.06	0.04	**0.91**	-0.21	0.08	0.17	0.00	-0.01	-0.02
A66*	Past 30 days…inhalants	-0.01	0.03	0.03	**0.83**	0.10	0.00	-0.03	0.03	0.00	-0.01
A67*	Past 30 days…cocaine	0.05	0.05	-0.02	**0.86**	0.13	0.02	-0.14	0.00	-0.02	-0.04
A68*	Past 30 days…methamphetamine or amphetamines	0.03	0.08	-0.04	**0.86**	0.20	0.00	-0.15	-0.01	0.02	-0.04
A69*	Past 30 days…ecstasy, LSD, or other psychedelics	0.00	0.02	0.03	**0.89**	0.05	0.01	0.02	0.02	-0.01	-0.02
A70*	Past 30 days…any other illegal drug or pill to get "high"	-0.06	0.03	0.04	**0.91**	0.04	0.02	0.01	0.09	0.00	0.00
A71*	Past 30 days…two or more drugs at the same time	0.01	-0.05	0.06	**0.95**	-0.08	0.02	0.18	-0.03	0.01	0.00
A72*	Past 30 days on school property…smoke cigarettes.	0.06	0.04	-0.03	**0.78**	0.04	0.12	-0.09	0.01	0.01	0.00
A73*	Past 30 days on school property…at least one drink of alcohol.	-0.04	0.03	-0.02	**0.75**	-0.05	0.12	-0.01	0.08	0.00	0.02
A74*	Past 30 days on school property…smoke marijuana.	-0.01	0.02	-0.01	**0.80**	-0.21	0.25	0.02	0.08	0.00	-0.01
A75*	Past 30 days on school property…use any other illegal drug.	-0.08	0.06	0.01	**0.85**	0.00	0.13	-0.03	0.13	0.01	-0.01
A100*	Past 12 months on school property… been pushed, shoved, slapped, hit.	0.02	0.04	0.00	-0.08	**0.44**	0.38	0.09	0.05	-0.03	-0.01
A101*	Past 12 months on school property… been afraid of being beat up.	0.05	0.03	0.01	-0.08	**0.54**	0.26	0.05	0.14	-0.06	-0.06
A102*	Past 12 months on school property…been in a physical fight.	0.03	0.00	-0.04	0.16	0.10	**0.58**	0.02	-0.01	-0.01	0.01
A103*	Past 12 mnths./school property…had mean rumors/lies spread about…	0.04	0.01	-0.05	0.01	**0.55**	0.16	**0.40**	0.01	-0.01	-0.04
A104*	Past 12 mnths./school property…had sexual jokes, comments, gestures.	-0.02	-0.01	0.00	0.01	**0.54**	0.12	**0.52**	-0.01	0.04	-0.01
A105*	Past 12 mnths./school property…been made fun of b/c of your looks…	0.01	0.01	0.06	-0.13	**0.71**	0.10	0.32	0.01	-0.02	-0.02
A106*	Past 12 mnths./school property… had your property stolen/damaged.	-0.01	0.03	-0.03	-0.06	**0.43**	0.35	0.13	0.03	-0.01	-0.02

Table 3. CHKS EFA factor loadings— 10-factor solution

Item	Item Description	1	2	3	4	5	6	7	8	9	10
A107*	Past 12 mnths./school property…been offered, sold, … an illegal drug.	-0.03	-0.05	0.08	0.29	0.00	**0.48**	0.32	0.03	0.01	0.02
A108*	Past 12 mnths./school property …damaged school property on purpose.	-0.04	0.01	0.06	0.19	0.11	**0.56**	0.10	0.00	0.06	0.04
A109*	Past 12 months on school property…carried a gun.	0.04	0.01	-0.05	0.21	0.07	**0.74**	-0.21	-0.11	0.07	-0.02
A110*	Past 12 months on school property…carried any other weapon.	0.00	-0.03	0.04	0.14	-0.07	**0.85**	-0.07	-0.05	0.01	0.03
A111*	Past 12 mnths./school property … been threatened or injured weapon.	0.04	0.02	-0.06	0.10	0.18	**0.69**	-0.07	0.00	0.00	0.02
A112*	Past 12 mnths./school property…seen someone w. gun, knife, other…	-0.02	-0.04	0.04	0.01	0.00	**0.75**	0.08	0.07	0.00	0.06
A113*	Past 12 mnths./school property … harassed or bullied – race/ethnicity.	-0.02	-0.01	0.02	0.02	**0.72**	0.01	-0.05	0.05	0.01	0.18
A114*	Past 12 months on school property… harassed or bullied – religion.	-0.02	-0.04	0.00	0.10	**0.74**	-0.02	-0.17	-0.03	0.03	0.12
A115*	Past 12 months on school property… harassed or bullied – gender.	-0.02	-0.03	-0.02	0.17	**0.82**	-0.09	-0.02	-0.02	0.05	0.10
A116*	Past 12 months on school property… harassed or bullied – gay/lesbian.	0.00	-0.02	0.02	0.17	**0.73**	-0.02	0.03	0.02	0.01	0.01
A117*	Past 12 mnths./school property… harassed/bullied – disability	0.02	0.00	-0.01	0.19	**0.69**	0.10	-0.15	-0.04	0.01	0.02
A119*	How safe do you feel when you are at school?	0.28	0.08	0.04	-0.05	0.07	0.14	0.01	**0.45**	0.09	0.05
G1	Adults at this school treat all students with respect	0.08	0.09	-0.07	0.05	0.03	-0.03	0.19	0.00	**0.65**	0.00
G2	My class lessons include examples my racial, ethnic, or cultural backgrnd	0.03	0.02	0.02	0.02	0.01	-0.01	0.00	-0.04	**0.41**	-0.29
G3*	I have been disrespected by an adult at school b/c of race/ethnicity	0.02	0.12	-0.03	0.01	0.01	0.03	-0.01	-0.03	0.03	**0.76**
G4*	…tension in school between … different cultures, races, and ethnicities	0.05	-0.02	0.04	-0.04	0.07	0.01	0.06	0.18	-0.06	**0.53**
G5	Adults at this school encourage me to work hard so I can be successful...	0.01	0.20	-0.02	-0.02	-0.04	0.06	-0.04	-0.28	**0.71**	0.04
G6	My teachers work hard to help me with my schoolwork when I need it.	0.01	0.17	-0.02	-0.06	0.01	0.05	0.08	-0.31	**0.77**	0.01
G7	Teachers show how classroom lessons are helpful to students in real life.	0.00	0.05	0.03	-0.06	0.03	0.02	0.07	-0.26	**0.78**	-0.07
G8	Teachers give students chance…in classroom discussions or activities.	-0.02	0.06	0.02	0.01	-0.02	0.05	-0.11	-0.19	**0.77**	0.03
G9	Students at this school are motivated to learn.	*Item dropped – did not load*									
G10	This school promotes academic success for all students.	0.01	-0.07	0.08	0.01	-0.03	0.03	-0.22	0.03	**0.83**	0.03
G11	This school is a supportive and inviting place for students to learn.	0.04	-0.09	0.08	0.00	-0.01	0.01	-0.16	0.09	**0.85**	0.00
G12	All students are treated fairly when they break school rules.	-0.03	-0.03	0.00	0.07	0.04	-0.09	0.14	0.12	**0.74**	-0.03
G13	…school clearly informs students what would happen if…break…rules	-0.05	-0.01	-0.01	0.08	0.01	-0.07	-0.03	0.02	**0.76**	0.00
G14	The schoolyard and buildings are clean and in good shape.	0.04	-0.08	0.01	-0.02	0.03	-0.04	0.01	0.20	**0.63**	-0.06

Notes: Analytic sample consists of 9th and 11th grade respondents in S3 comprehensive high schools who participated in the 2010-11 CHKS administration.

* Item was reverse-coded

Confirmatory Factor Analysis Results

Using the 10-factor EFA model as a foundation, we estimated a series of confirmatory factor analysis (CFA) models to determine the "optimal model" underlying the CHKS items. Measures of model fit, correlations among the constructs (factors), and factor loading patterns were used to make decisions about models. Table 4 provides goodness-of-fit information for some of the CFA models estimated.

Table 4. CHKS measures - goodness-of-fit information for CFA Models

Model	RMSEA	CFI	TLI	WRMR
Model 1 – 9 factor model (eliminated overlapping non-physical victimization factor)	0.035	0.939	0.934	8.537
Model 2 – 10 factor model (separate harassment)	0.035	0.938	0.935	8.281
Model 3 – 9 factor model (2-item safety factor)*	0.034	0.943	0.939	8.274
Model 4 – 10 factor model (separate substance use at school factor)	0.034	0.943	0.939	8.206
Model 5 – 10 factor model (separate high expectations and caring relationships)	0.034	0.943	0.939	7.958

Notes: Analytic sample consists of 9th and 11th grade respondents in S3 comprehensive high schools who participated in the 2010-11 CHKS administration.
* Preferred model.
RMSEA = Root Mean Square Error of Approximation (recommended value ≤ 0.06).
CFI = Comparative Fit Index (recommended value ≥ 0.95).
TLI = Tucker Lewis Index (recommended value ≥ 0.95).
WRMR = Weighted Root Mean Square Residual (recommended value of ≤ 1.0 or minimum value)

The first estimated CFA model (Model 1) in Table 4 is equivalent to the 10-factor EFA model shown in Table 3, but with two exceptions. First, for conceptual clarity, the *non-physical victimization* factor was eliminated (i.e., items A103 and A104 were not allowed to cross-load on the *general victimization factor* and the *non-physical victimization factor*).[3] Second, item G2 ("My class lessons include examples of my racial, ethnic, or cultural background") was dropped from the CFA analyses because it was not strongly associated with any of the derived constructs. This item would probably be best used as a single indicator.

Model 2 is equivalent to Model 1 except that separate constructs were specified for *victimization* and *harassment/bullying*. This modification resulted in an improvement in model fit, as evidenced by a reduction in the WRMR.[4] However, the estimated correlation between

[3] Moreover, this model could not be fitted because the resulting estimated covariance matrix was not positive-definite.
[4] Because WRMR has been tested for models with categorical outcomes (see Yu and Muthén 2001), we place greater weight on this index in CFA model selection than on the RMSEA, CFI, and TLI.

the victimization and harassment/bullying factors was 0.76. Additional calculations indicated that there was too much overlap between the *victimization* and *harassment/bullying* factors to discriminate between the two constructs.[5] We therefore rejected Model 2 and used the *harassment/bullying* items as indicators of a global *victimization* construct.

In Model 3, the school connectedness safety item (A15) was used to measure global student perceptions of *school safety* (along with item A119) instead of *school connectedness*. The loading of A15 on the *school connectedness* construct was constrained to be zero. This modification resulted in an improvement in model fit over Model 1.

Finally, Model 3 was modified to include a separate construct for *substance use at school* (Model 4). This modification too resulted in an increase in model fit as evidenced by a reduction in the WRMR. However, examination of the latent factor correlations estimated from Model 4 indicated that the correlation between *substance use at school* and *substance use* in general was 0.93. Such a high correlation suggests that these two factors are not distinct. We therefore conclude that the data do not support the presence of a distinct *substance use at school* factor, at least at the student-level. The items measuring *substance use at school* appear to measure the same underlying factor as the items asking about 30-day substance use in general.

We further modified Model 3 to include separate constructs for *high expectations* and *caring relationships* with adults at the school (Model 5). Specifically, instead of a global factor for *adult supports*, we specified two factors reflecting *high expectations* and *caring relationships*. Model 5 resulted in an improvement in fit over Model 3 – but the estimated correlation between *high expectations* and *caring relationships* was 0.98. Clearly, such a high correlation suggests that the high expectations and caring relationships items measure the same underlying factor.

Further modifications to the CFA models either could not be fitted due to technical considerations or did not result in improvements in model fit. We therefore conclude that the 9-factor solution from Model 3 is the most suitable model.

The estimated factor loadings from Model 3 are presented in Table 5. We show both "raw" and standardized loadings. For the raw loadings, the metric of the underlying factor is set to that of the first item listed for each domain. The standardized loading shows the relationship between

[5] We used Fornell and Larcker's (1981) test for assessing discriminant validity of factors (i.e., the extent to which latent variables adequately discriminate from other latent variables). This involves comparing the average variance explained by the latent factor on observed indicators with the shared variance explained by latent factors. If the shared variance explained with any other construct is larger than the average variance explained by a latent factor, then discriminant validity is not supported. When applied to the victimization and harassment/bullying factors in Model 2, discriminant validity was not supported.

the underlying factor and each item in standard deviation units. Overall, the factor pattern revealed by Model 3 suggests that the following underlying factors are measured by the CHKS Core and School Climate Module items analyzed

- school connectedness (4 items)
- support from adults in the school (6 items)
- opportunities for participation in meaningful activities (3 items)
- safety perceptions at school (2 items)
- positive learning environment (11 items)
- low racial/ethnic tension (2 items)
- low substance use (15 items)
- low non-physical and physical violence victimization (11 items)
- low violence perpetration (7 items)

Table 5. Final 9-factor CFA model – factor loadings

Item	Construct	Construct and Associated Items	Loadings	Standard Loadings
A11	School Connectedness	I feel close to people at this school.	1	0.60
A12		I am happy to be at this school.	1.31	0.79
A13		I feel like I am a part of this school.	1.33	0.80
A14		The students at this school treat students fairly.	1.22	0.74
A16	Adult Supports	…there is an adult who really cares about me.	1	0.77
A17		…there is an adult who tells me when I do a good job.	1.06	0.82
A18		…there is an adult who notices when I'm not there.	0.92	0.71
A19		…there is an adult… always wants me to do my best.	1.11	0.86
A20		…an adult who listens to me when I have something…	1.09	0.84
A21		…an adult who believes that I will be a success.	1.11	0.85
A22	Meaningful	At school I do interesting activities.	1	0.78
A23	Participation	…I help decide things like class activities or rules.	1.00	0.80
A24		At school I do things that make a difference.	1.02	0.79
A15	Perceived safety	I feel safe in my school.	1	0.84
A119*		How safe do you feel when you are at school?	0.84	0.71
G1	Positive Learning	Adults at this school treat all students with respect	1	0.73
G2	Environment	…lessons…examples racial/ethnic/cultural backgrnd	*Item dropped*	
G5		Adults… encourage… work hard…can be successful...	1.13	0.82
G6		…teachers work hard to help me with my schoolwork.	1.15	0.84
G7		…classroom lessons helpful to students in real life.	1.05	0.77
G8		…give students chance…classroom discussions/ activ.	1.09	0.79
G10		…school promotes academic success for all students.	1.13	0.82
G11		…school is supportive/inviting…for students to learn.	1.17	0.85
G12		…students…treated fairly when…break school rules.	0.97	0.70
G13		…clearly informs students…happen if…break…rules	0.99	0.72
G14		…schoolyard/buildings…clean and in good condition	0.81	0.59
G3*	Low Racial/Ethnic	…tension in school between different…ethnicities	1	0.87
G4*	Tension	…been disrespected by…adult…b/c of race/ethnicity	0.57	0.49

Table 5. Final 9-factor CFA model – factor loadings

Item	Construct	Construct and Associated Items	Loadings	Standard Loadings
A61*	Low Substance Use	Past 30 days…cigarettes	1	0.81
A62*		Past 30 days…smokeless tobacco.	1.04	0.84
A63*		Past 30 days…at least one drink of alcohol	0.98	0.79
A64*		Past 30 days…five or more drinks of alcohol	1.05	0.85
A65*		Past 30 days…marijuana	1.07	0.87
A66*		Past 30 days…inhalants	1.07	0.87
A67*		Past 30 days…cocaine	1.16	0.94
A68*		Past 30 days…methamphetamine or amphetamines	1.20	0.97
A69*		Past 30 days…ecstasy, LSD, or other psychedelics	1.12	0.91
A70*		Past 30 days…other illegal drug or pill to get "high"	1.14	0.93
A71*		Past 30 days…two or more drugs at the same time	1.15	0.93
A72*		Past 30 days on school property…smoke cigarettes.	1.11	0.90
A73*		Past 30 days on school property…any alcohol.	1.00	0.81
A74*		Past 30 days on school property…smoke marijuana.	1.10	0.89
A75*		Past 30 days on school property…other illegal drug.	1.14	0.93
A100*	Low Violence Victimization	…on school property…pushed, shoved, slapped, hit.	1	0.71
A101*		…on school property… been afraid of being beat up.	0.96	0.69
A103*		…on school property…mean rumors/lies spread…	1.00	0.71
A104*		…school property…sexual jokes, comments, gestures.	0.95	0.68
A105*		…on school property…made fun of b/c of your looks…	0.96	0.69
A106*		…on school property…property stolen/damaged.	0.95	0.68
A113*		harassed or bullied – race/ethnicity.	0.99	0.71
A114*		harassed or bullied – religion.	1.01	0.72
A115*		harassed or bullied – gender.	1.12	0.80
A116*		harassed or bullied – gay/lesbian.	1.06	0.76
A117*		harassed/bullied – disability	1.18	0.84
A102*	Low Violence Perpetration	…on school property…been in a physical fight.	1	0.73
A107*		…school property…offered, sold, … an illegal drug.	0.99	0.72
A108*		…school property …damaged school property...	1.09	0.80
A109*		…on school property…carried a gun.	1.28	0.93
A110*		…on school property…carried any other weapon.	1.16	0.85
A111*		…school property…threatened or injured weapon.	1.18	0.86
A112*		…school property…seen someone w. gun, knife…	0.97	0.71

Notes: Analytic sample consists of 9th and 11th grade respondents in S3 comprehensive high schools who participated in the 2010-11 CHKS administration.

* Item was reverse-coded.

Table 6 shows the correlations between the latent factors. High correlations between factors suggest that there is a high degree of overlap across constructs. In general, the size of most of the correlations suggests that the factors measured are distinct from each other. However, perceived safety is highly correlated with school connectedness (0.73) and violence perpetration is highly correlated with substance use (0.67) and victimization (0.70). Although

highly correlated, these underlying factors appear to exhibit adequate discriminant validity and face validity to be useful for reporting and research.[6]

Table 6. Latent factor correlations — Final CFA model (Model 3)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) School connectedness	1.00								
(2) Adult supports	0.55	1.00							
(3) Meaningful participation	0.51	0.57	1.00						
(4) Perceived safety	**0.73**	0.44	0.34	1.00					
(5) Positive learning environment	0.54	0.51	0.33	0.47	1.00				
(6) Low racial/ethnic tension	0.28	0.20	0.07	0.35	0.21	1.00			
(7) Low substance use	0.28	0.26	0.16	0.24	0.30	0.17	1.00		
(8) Low violence victimization	0.23	0.12	0.02	0.37	0.20	0.26	0.34	1.00	
(9) Low violence perpetration	0.29	0.22	0.12	0.37	0.31	0.26	**0.67**	**0.70**	1.00

Notes: Analytic sample consists of 9th and 11th grade respondents in S3 comprehensive high schools who participated in the 2010-11 CHKS administration. Bolded numbers indicate correlations of sufficient magnitude to suggest possible overlap across factors.

Reliability of derived CHKS Core/School Climae Module scales

We calculated internal consistency estimates of the scales using Cronbach's alpha coefficient for the overall sample and by grade (9th, 11th) and gender. These estimates are presented in Table 7. For the most part, the derived scales demonstrate acceptable levels of reliability, with 8 of the 10 scales exhibiting reliabilities greater than 0.75 for the overall sample. The exceptions to this are the two scales comprised of only two items: *perceived safety* and *low racial/ethnic tension*. The low racial/ethnic tension scale demonstrates particularly low reliability – with Cronbach alphas ranging from 0.52 to 0.59 depending on the sample. We recommend caution in using this scale in research. The estimated reliabilities do not vary substantially across each of the subsamples. In sum, the internal consistency reliability estimates are of sufficient magnitude to support use of all of the derived scales in research, with the potential exception of the *low racial/ethnic tension* scale.

[6] Applying Fornell and Larcker's (1981) test (see note #5) suggested that each of these factors demonstrated adequate levels of discriminant validity.

Table 7. Internal consistency reliability coefficients by school grade and gender

		Grade		*Gender*	
	All	9th	11th	Female	Male
Supports and Engagement					
School connectedness	0.77	0.76	0.78	0.77	0.78
Adult supports	0.89	0.87	0.90	0.88	0.89
Meaningful participation	0.75	0.73	0.78	0.76	0.75
Perceived safety	0.67	0.65	0.68	0.69	0.65
Positive learning environment	0.93	0.94	0.93	0.93	0.94
Equity and Cultural Sensitivity					
Low racial/ethnic tension	0.56	0.57	0.54	0.52	0.59
Violence, Victimization, & Substance Use					
Low substance use	0.91	0.92	0.90	0.89	0.93
Low violence victimization/harassment	0.81	0.82	0.81	0.79	0.84
Low violence perpetration	0.77	0.78	0.75	0.70	0.80

Notes: Analytic sample consists of 9th and 11th grade respondents in S3 comprehensive high schools who participated in the 2010-11 CHKS administration.

Summary

We conducted a series of factor analyses using selected items from the CHKS Core and School Climate Modules. The purpose of these analyses was to determine the measurement structure of a selected subset of items included in the 2010-11 CHKS as implemented by the 294 high schools participating in the Safe and Supportive Schools project survey. The results of the analyses suggest that the items analyzed can be used to represent five distinct summary measures of supports and engagement and three distinct summary measures of violence, victimization, and substance use (see Table 7). The scales derived from the survey exhibit good internal consistency. We recommend using these scales in future summary reports.

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