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Developing a School Functioning Index for Middle Schools

Amanda S. Birnbaum, Leslie A. Lytle, Cheryl L. Perry, David Murray, Mary Story

ABSTRACT: *Despite widespread recognition of schools' role in the healthy development of youth, surprisingly little research has examined the relationships between schools' overall functioning and the health-related behavior of students. School functioning could become an important predictor of students' health-related behavior and may be amenable to intervention. This paper describes the development and testing of the School Functioning Index (SFI) as a first step in investigating this question. The index was developed for use with middle schools and conceived as a predictor of students' violent behavior, with the potential for extending research applications to additional health and social behaviors. Using social cognitive theory, social ecological theory, and social disorganization theory as guides, three domains were identified to operationalize school functioning and identify candidate SFI items: 1) resources available to the school and students; 2) stability of the school population; and 3) the schools' performance as a socializing agent for students. Data for candidate SFI items were collected from public archives and directly from 16 middle schools participating in a school-based dietary intervention study. Data collection from schools, particularly concerning student aggressive behavior and disciplinary actions, presented challenges. The final SFI comprised nine items and demonstrated good internal consistency and variability. The SFI was modestly correlated in expected directions with violence and other health behaviors. This work supports the feasibility of combining multiple school-level indicators to create a measure of overall school functioning. Further investigation of validity and more acceptable data collection methods are warranted. (J Sch Health. 2003;73(6):232-238)*

Despite widespread recognition of schools' role in the healthy development of youth, surprisingly little research has examined the relationships between schools' overall functioning and the health-related behavior of students. Schools should provide safe, stimulating environments that engage students and encourage them to strive for and expect achievement in learning academic and life skills.¹⁻⁴ To function in these capacities, schools require adequate financial and physical resources,⁵ committed and skilled staff, strong administration, good communication with students and families, and an atmosphere that conveys stability, confidence in students, and expectations of success.^{1,3-5}

Just as relationships are observed between a child's family functioning and his/her behavior,^{6,7} it seems likely that the functioning of schools – the primary social setting and institutional connection for youth – would also play a role in shaping behaviors. School-based youth health promotion builds on schools' influence on student behavior, advocating not only health education but healthy physical and social environments that facilitate and encourage healthy behavior.⁸ Schools, like families, give implicit and explicit messages concerning health behavior, and school functioning may affect how those messages are transmitted and received. For school-based health promotion programs, overall functioning of schools can affect program effectiveness.⁹ School functioning also may influence the extent to which risky behaviors are prevalent and visible on school grounds which, in turn, affects social norms, behavioral role models, opportunities for vicarious learning, and incentives and barriers for specific behaviors. In addition,

schools and school personnel play important roles in socializing students by communicating academic and behavioral expectations.³

Behavioral theories often used in school-based health promotion programs, particularly social ecology^{10,11} and social cognitive theory,¹² recognize the social and institutional environments as critical among the multilevel determinants of health behavior. Despite notable progress in developing behavior-specific indices of school health,¹³ a paucity of research has examined the quality of school functioning as a characteristic of one of the most important social contexts for youth behavior. Increasing attention has been given to an important related hypothesis: that students' feelings toward school are related to their health behavior. Adolescents' self-reported sense of school connectedness¹⁴ and school bonding^{15,16} have been found protective against several risk behaviors. These reports support the hypothesis that schools affect youth behavior beyond academics. However, the focus is generally on the individual: how youth feel about their school. What remains largely unexplored is how the school itself functions as an institution and how that relates to students' behavior.

In this paper, development and testing of the School Functioning Index (SFI) are described as a first step in investigating this question. The index, developed for use with middle schools, was initially conceived as a predictor of students' violent behavior, with the potential for extending its research applications to additional health and social behaviors. This paper provides the background and rationale for the SFI, describes the methodology, presents field experiences and challenges, and identifies needs for refinement and future applications of the measure.

METHODS

Population

Data were obtained from the Teens Eating for Energy and Nutrition at School (TEENS) study, a group randomized intervention trial conducted in 16 middle and junior high schools to reduce cancer-related dietary risk among young adolescents.¹⁷ TEENS was designed for a lower-income population, and only school districts with at least 20% of students receiving free or reduced-price lunches

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were eligible. Schools also were required to enroll seventh and eighth graders in the same building and enroll at least 30 students per grade. Thirty-three schools from 14 districts were eligible, and 20 schools from nine districts agreed to participate. Reasons for not participating included time constraints, personnel changes, and lack of interest in an intervention component focused on the school food environment. One school was chosen as a pilot school, and three schools were judged ineligible due to scheduling conflicts. The remaining 16 schools were assigned randomly to treatment conditions after baseline measurement. All research was approved by the University of Minnesota Committee on the Use of Human Subjects in Research and its counterpart at the University of Memphis.

Procedures

TEENS surveyed a cohort of students three times between fall 1998 and spring 2000. In light of evidence that eating covaries with other health behaviors,¹⁸ and in the interest of learning more fully about young adolescents' health and social behavior, the student survey was designed to cover topics beyond nutrition, including physical activity, sedentary behavior, substance use, and violent behavior.¹⁹ This approach facilitated investigation of novel hypotheses while creating little added participant burden.

Index Development

Four steps were used to develop the SFI: 1) literature review; 2) operationalizing school functioning; 3) data collection; and 4) computation and analysis.

Literature Review. An initial literature review revealed a lack of publications assessing overall school functioning. A more-detailed review explored prior research on school-level measures and developed a conceptual model for the SFI. Three types of school-level measures were identified: school climate, school health, and school administrative policies and practices.

School climate, generally assessed using student or staff surveys, in some cases may be interpreted as an indicator of school functioning. However, this interpretation may be misleading. Measures such as the Quality of School Life Scale (QSL),^{20,21} the Charles F Kettering School Climate Profile (CFK),²² and the School Environment Scale,²³ are derived from survey measures and focus on individuals' perceptions. Typical items include: "The school and I are like (a) good friends, (b) friends, (c) distant relatives, (d) strangers, (e) enemies" (QSL); "Teachers here have a way with students that makes us like them" (QSL); "School is a nice place to be because I feel wanted and needed there" (CFK).

These measures were developed mainly to study correlations between individual students' scores and their academic achievement and family experiences. Implicit in that rationale is an assumption of within-school variability in scores. Using an adapted QSL scale in 50 Australian schools, Mok and McDonald²⁴ found intraschool correlations across the total QSL scale and all seven subscales quite low, with only 2% to 3% of variance in each scale attributable to school-level factors. This result suggests responses to measures like the QSL are shaped more by characteristics of individual respondents than of their institutions, making it potentially misleading to interpret scores at the institutional level.

School health instruments,^{13,25} which generally focus on particular health behaviors, are important for performing needs assessments and designing, monitoring, and evaluating school health interventions. Although school functioning and school health probably are closely linked,⁹ instruments such as the School Health Index for Physical Activity, Healthy Eating, and a Tobacco-Free Lifestyle were developed specifically for self-assessment, planning, and evaluation of efforts targeting those behaviors, and were designed accordingly. Such instruments and the intensive measurement processes they entail are not appropriate for assessing overall school functioning. They have much greater depth and probably less breadth than needed. Similarly, the School Health Policies and Programs Study (SHPPS)²⁶ provides information for monitoring school health, but does not provide overall measures of school functioning. The SHPPS School Policy and Environment Questionnaire²⁷ contains a number of items related to the general school environment that are potential indicators of school functioning, but this instrument does not include any measure of school achievement or performance.

Measures of school administrative policies and practices focus on higher-level aspects of school, district, or state education policy, school reform, and education expenditures.^{5,28,29} Studies using such measures generally evaluate effects of particular policies on educational outcomes. The main independent variables, therefore, include one or two specific items such as school size, school administrative structure, or implementation of education reforms. While these measures and the studies that employ them can prove helpful in identifying elements of school functioning, individual measures alone are too narrow to adequately characterize school functioning.

Operationalizing School Functioning. Social cognitive theory (SCT) – the primary theory behind the TEENS intervention – was used with social ecological theory and social disorganization theory^{30,31} as the underpinning of the SFI. Social Cognitive Theory identifies three domains that interact to shape behavior: personal, behavioral, and environmental. An important feature of SCT is triadic reciprocity, or the dynamic interaction of domains and their ability to change and be changed by the individual. This factor highlights the importance of interpersonal as well as intrapersonal factors, including social dynamics between and among students and school staff. Another important component of SCT is recognition that individuals' behavioral repertoires can be built not only through direct experience, but through vicarious learning and behavioral role models in the environment.³²

The environment also is recognized as essential in social ecological theory, which specifies the importance of organizational structures and policies as behavior-shaping contexts that support, constrain, and otherwise carry messages about health and social behaviors. Social disorganization theory, which focuses on communities but assisted our thinking about schools, specifies that structural characteristics such as socioeconomic status and residential mobility affect the quality and nature of interpersonal relationships and networks which, in turn, affects the level of social control exerted on community members.³³ Decreased social control results in social disorganization, which facilitates violence and other antisocial behavior.³¹

With these theoretical guides, three domains were identi-

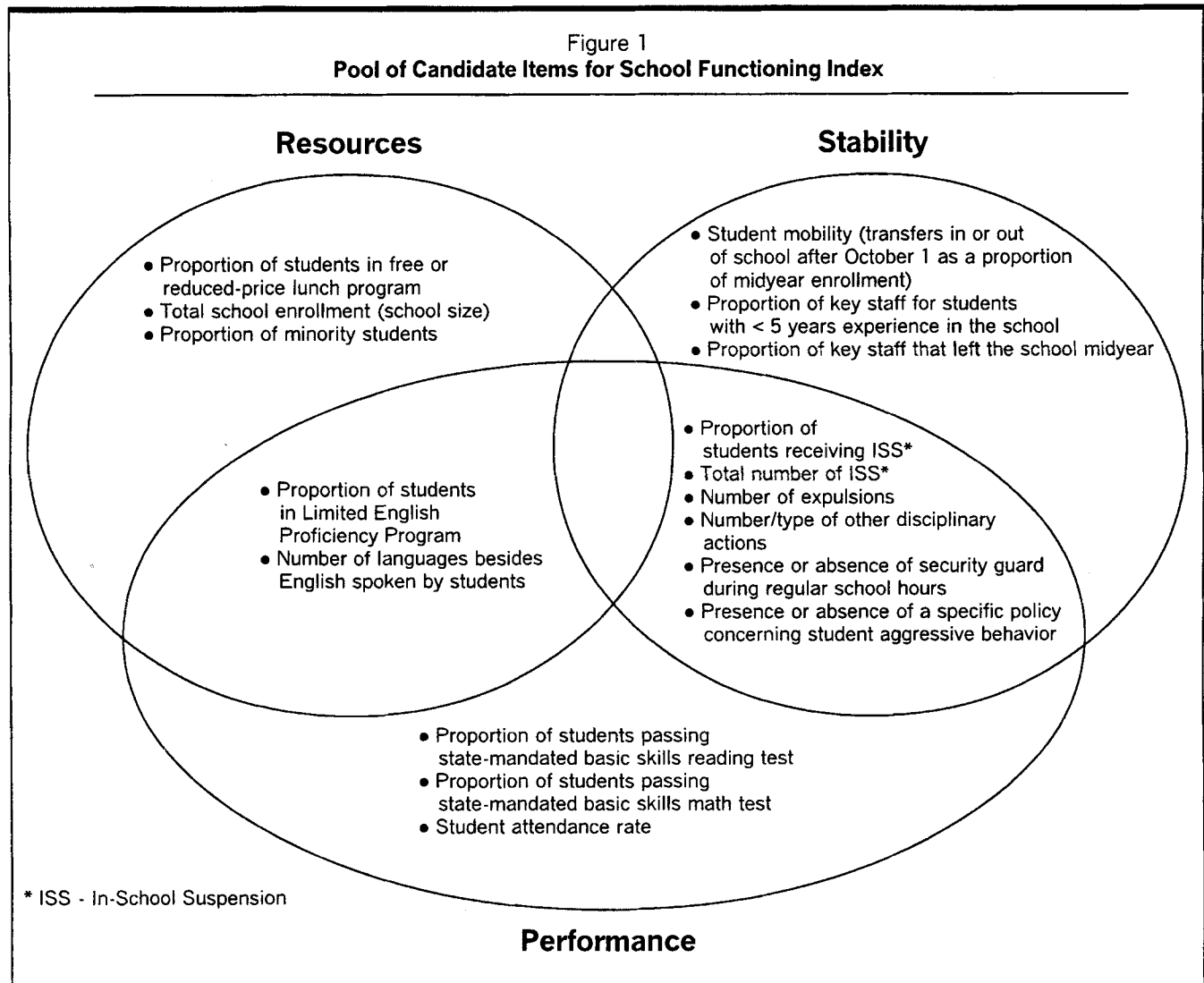
fied to operationalize school functioning and identify items for the SFI: 1) resources available to the school and students; 2) stability of the school population, including children and adults; and 3) schools' performance as a socializing agent for students. The domains were conceived as overlapping, each with some unique contributions. Figure 1 presents the pool of items identified to sample the three domains and serve as candidate items for the SFI. Candidate items were selected based on substantive considerations and the projected feasibility of data collection. Several items were conceived as tapping more than one domain.

It is important to note that inclusion of sociodemographic variables does not imply assumptions of causality. For example, a high proportion of students receiving free or reduced-price lunches, or a high proportion of minority students, was not hypothesized to cause lower school functioning. Rather, the demographic variables are associated with social conditions such as poverty and racial discrimination that were hypothesized to affect school functioning in multiple ways, including availability and distribution of resources, experiences of discrimination, and cultural barriers. In situations where sociodemographic equity exists in education, school-level sociodemographic items would not

be correlated with other school-level candidate items. That was not the case in this sample, nor would it be so in many other places.

Data Collection. Seven of the 17 candidate items were available in public datafiles from the Minnesota Department of Children, Families, and Learning. Remaining data were collected directly from schools using the TEENS School Information Form. This form, containing 12 questions needed to compute the remaining 10 candidate items, was pretested with a teacher in the pilot school. After making minor revisions, university staff contacted principals at each of the 16 TEENS schools to arrange data collection. All principals agreed to complete the form or have a staff member do so. Schools received a \$100 check for participating. Job titles of individuals who completed forms included principal/assistant principal (n = 8); principal's secretary/school secretary (n = 4); teacher (n = 2); counselor (n = 1); and doctoral student intern (n = 1). Repeated contact and second mailings were necessary in about one-quarter of the schools to achieve a 100% response rate.

Computation and Analysis. Initial inspection of the completed School Information Forms raised serious concerns about the quality of data for several questions.



Items with suspect validity (for example, in-school suspensions) were eliminated, leaving 10 candidate items for the index with three items coming from the School Information Forms.

A correlation matrix of the 10 items was inspected to assess the suitability of combining items into a single index. The proportion of minority students, and the proportion of students receiving free or reduced-price lunches, correlated almost perfectly ($r = 0.98$), meaning only one item contributed unique information. This result most likely points to issues of racial economic inequality in the population. For the SFI, the economic item (lunch program) rather than racial/ethnic item (minority students) was retained as the more interpretable of the two. The final nine items were standardized to a common metric (mean = 0, standard deviation = 1) to weight them equally, then summed to compute the SFI.

Behavioral and Psychosocial Variables

As a preliminary test of construct validity, correlations of the SFI with health behaviors measured on TEENS student surveys were examined. These items included violent behaviors; past-month alcohol, tobacco, and marijuana use; physical activity; and sedentary behavior. One psychosocial variable, future outlook,¹⁹ also was examined.

RESULTS

Empirical Results

Table 1 presents the correlation matrix (including p-values) of the nine items included in the SFI. Cronbach's alpha was 0.88, suggesting a stable measure with variables driven by a common factor. Whether the SFI represents a higher-order factor that could be decomposed into the hypothesized domains of school resources, stability, and school performance as a socializing agent remains unknown. Factor analysis was not possible due to the relatively small number of schools. Additional item reduction was not undertaken because the alpha for the full set of items was high and all data were already available.

Table 2 presents correlation coefficients and p-values of the SFI with self-reported health behaviors and outlook for the future. The SFI was modestly negatively correlated with violent behavior ($r = -0.14$), sedentary behavior ($r = -0.16$), and past-month marijuana use ($r = -0.13$). It was modestly positively correlated with physical activity levels ($r = 0.17$) and positive future outlook ($r = 0.16$).

Figure 2 presents the distribution of SFI values across the 16 schools. Scores ranged from -11.16 to +6.73. To facilitate interpretation of parameter estimates for analyses using the SFI as an independent variable, cutpoints of ± 4.45 could be used to create three roughly balanced ordi-

Table 1
Correlation Matrix (including P-Values) for Final Items in the School Functioning Index

	SIZE	FREE	LEP	MOBIL	NEWSTF	MIDYR	READ	MATH	ATTEND
SIZE	1.00	0.42	0.21	0.28	0.23	0.18	0.31	0.27	0.40
School size	(0.00)	(0.10)	(0.43)	(0.29)	(0.39)	(0.50)	(0.24)	(0.32)	(0.13)
FREE (R)		1.00	0.59	0.70	0.42	0.36	0.94	0.95	0.66
% in free/reduced-price lunch program		(0.00)	(0.02)	(0.00)	(0.11)	(0.18)	(0.00)	(0.00)	(0.01)
LEP (R)			1.00	0.24	0.39	-0.27	0.55	0.46	0.02
% students with Limited English proficiency			(0.00)	(0.36)	(0.14)	(0.30)	(0.03)	(0.07)	(0.93)
MOBIL (R)				1.00	0.13	0.36	0.59	0.74	0.74
% midyear student transfers in/out of school				(0.00)	(0.64)	(0.17)	(0.02)	(0.00)	(0.00)
NEWSTF (R)					1.00	0.02	0.47	0.33	0.20
% staff in the school < 5 years					(0.00)	(0.93)	(0.07)	(0.21)	(0.45)
MIDYR (R)						1.00	0.19	0.32	0.54
% staff leaving school midyear						(0.00)	(0.49)	(0.22)	(0.03)
READ							1.00	0.95	0.63
% eighth graders passing state-mandated reading test							(0.00)	(0.00)	(0.01)
MATH								1.00	0.71
% eighth graders passing state-mandated math test								(0.00)	(0.00)
ATTEND									1.00
Attendance rate									(0.00)

(R) - Reverse-coded

nal categories: low SFI (n = 4), moderate SFI (n = 6), and high SFI (n = 6).³⁴

School Information Form Results

Field experience with the School Information Form indicated that school administrators were unable or reluctant to provide precise, accurate information concerning some institutional characteristics, policies, and practices. For example, one school where TEENS staff spent a great deal of time reported that students did not speak any other languages besides English, but staff knew this report to be a substantial underestimate. In some cases, administrators from schools within the same district gave conflicting responses concerning district policy on student aggressive behavior, and the recording and reporting of disciplinary actions was inconsistent across schools. Plausible responses from all 16 schools were provided for only three items on

the School Information Form: attendance, proportion of key staff with less than five years' experience at that school, and proportion of staff that left the school midyear.

DISCUSSION

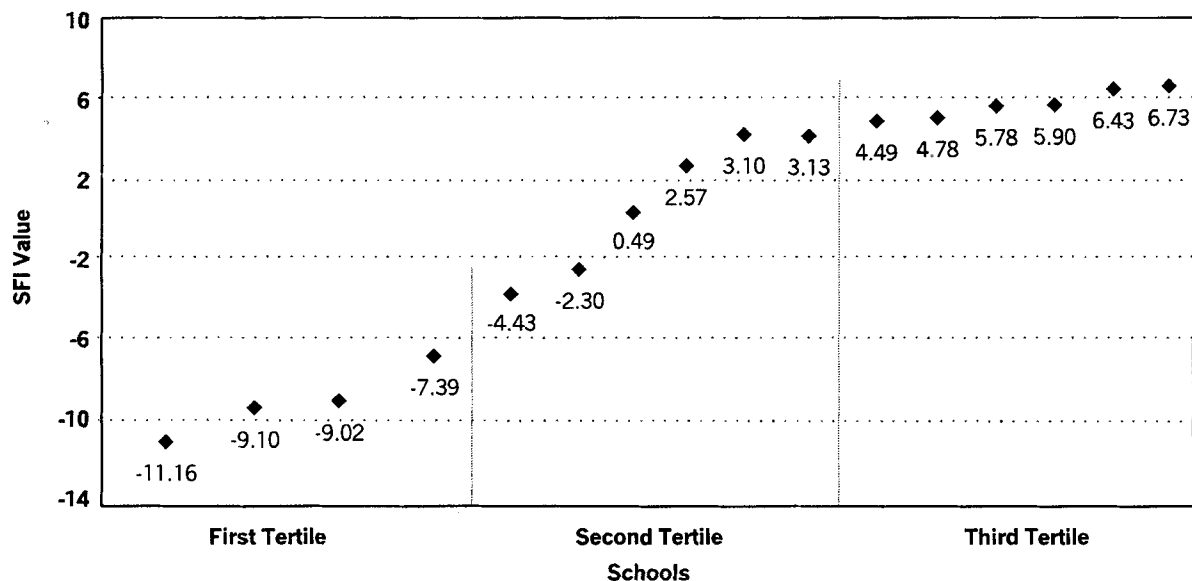
This work supports the feasibility of combining multiple school-level indicators to create a measure of overall school functioning. The SFI was comprised of nine items that correlated with one another as hypothesized, and that demonstrated good internal consistency. Items included in the SFI reflected school resources (school size, proportion of students receiving free or reduced-price lunches), stability (student mobility, proportion of key staff with less than five years experience at the school, proportion of staff that left midyear), and performance (proportion of students passing state-mandated basic reading and math skills tests, attendance), as well as an item hypothesized to be related to both resources and performance (proportion of students in the Limited English Proficiency Program). The items appear to complement one another to create a measure of how a school may function. Sufficient variability existed in SFI values in the sample of 16 middle schools to allow for creation of three roughly balanced categories (low, moderate, and high school functioning). The SFI represents an early step in building capacity to measure and model school functioning to explore its role in social ecological and social cognitive models of youth behavior.

Validity of the SFI remains in question. Due to concerns about the quality of data from School Information Forms, some potentially important items were excluded. Without those items, the conceptual basis and theoretical framing of the SFI was weakened. Yet, we see inherent value and validity to the composite score that the nine final items yielded. Relative ranking of the 16 schools based on the SFI resonated well with investigators' subjective ranking of the schools' overall functioning, based on qualitative

Table 2
Correlations of School Functioning Index (SFI)
with Behavioral and Psychosocial Variables

Variable	Correlation with SFI	P-Value
Past year fighting and violent behavior	-0.14	< 0.01
Past 30 day alcohol use	0.01	0.66
Past 2 week binge drinking	-0.04	0.01
Past 30 day tobacco use	-0.01	0.47
Past 30 day marijuana use	-0.13	< 0.01
Frequency of regular physical activity	0.17	< 0.01
Frequency of sedentary behavior (TV, computer, video)	-0.16	< 0.01
Outlook for future (higher score = more positive outlook)	0.16	< 0.01

Figure 2
Distribution of School Functioning Index Values,
TEENS Middle Schools, 1998 - 1999



impressions formed from visiting and working with the 16 schools over two or more years as part of TEENS. In this sample, the SFI was significantly correlated in expected directions with several variables beyond violence, including physical activity, sedentary behavior, marijuana use, and future outlook, thereby lending support for construct validity. Furthermore, in a separate analysis, low SFI was a significant predictor of past-year violent behavior even after multilevel modeling was used to adjust for individual-level predictors of violence.³⁴ In addition, a recent study supports several components of the SFI as indicators and predictors of school disorder,³⁵ a likely negative correlate of school functioning.

Revisiting some of the originally conceived variables seems appropriate for further application and refinement of the SFI. Initial conceptualization included several items specifically assessing institutional characteristics related to violence, such as the presence and types of policies for dealing with aggressive behavior, number of students receiving in-school suspensions and expulsions, and total number of in-school suspensions. These items could prove particularly relevant for explaining individuals' violent behavior, and could contribute vital information concerning overall school functioning because the items describe the extent to which disruptive and antisocial behaviors exist in the school environment. In addition, the number of languages other than English spoken by students was hypothesized as a component of school functioning, because it has a strong effect on interpersonal communication. This point was considered distinct from the proportion of students with limited English proficiency (LEP), because a school with 40% LEP students all speaking a single language would differ from a school with 40% LEP students speaking 10-20 languages.

Data collection remains the main challenge for revisiting these variables. Multiple factors probably contributed to the apparent poor quality of data from the School Information Forms, including staff burden and perceived low importance, inconsistent record keeping within schools and diverse practices across schools, concerns about sensitivity of certain data, and perceptions of threat or negative portrayal of the school. These issues represent formidable challenges that may seriously limit the feasibility of collecting such data as part of large-scale studies. More pilot testing and formative assessment with school administrators might have improved data quality and should be considered as a first step in future applications of the SFI.

Although several limitations exist, the construct of school functioning appears to warrant further consideration, and the SFI appears to offer a viable starting point for its measurement. Additional work to learn more about measurement properties of the SFI including reliability and validity would be valuable. In addition to seeking ways to improve validity of school administrators' reporting about sensitive school characteristics, future work should examine the distribution of the SFI in larger samples and a wider range of geographic and sociodemographic areas, and to track stability of the SFI over time.

No objective gold-standard criterion measure exists, but greater exploration of validity is possible. In addition to data-driven exercises, perhaps the most useful approach to validation would elicit responses from school staff and students concerning how well they believe the SFI reflects

actual school functioning.

CONCLUSION

As measurement properties of the SFI or related measures are established, such measures can yield multiple applications in school-based health behavior research. Exploring associations between school functioning and health-risk/health-promoting behaviors can help establish an empirical base for understanding the multiple roles of school in students' lives.

Questions for future exploration include: Does school functioning predict health-risk behavior and health-promoting behavior equally well? Does school functioning help shape students' behavior independent of other school-level factors, such as an environment that supports healthy eating and physical activity, or is school functioning a proxy for behavior-specific constructs? What mechanisms exist by which school functioning affects student health behavior, and what implications do the mechanisms suggest for interventions? Are these relationships present in the adult members of the school community as well? Which components of the SFI are most amenable to change? Is school functioning a possible effect modifier in school-based intervention trials?⁹

By advancing knowledge concerning the relationships between school functioning and student behavior, these questions can assist efforts to maintain healthy schools that foster the well-being of young people. ■

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