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## **A Review of Empirical Evidence About School Size Effects: A Policy Perspective**

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*This review examined 57 post-1990 empirical studies of school size effects on a variety of student and organizational outcomes. The weight of evidence provided by this research clearly favors smaller schools. Students who traditionally struggle at school and students from disadvantaged social and economic backgrounds are the major benefactors of smaller schools. Elementary schools with large proportions of such students should be limited in size to not more than about 300 students; those serving economically and socially heterogeneous or relatively advantaged students should be limited in size to about 500 students. Secondary schools serving exclusively or largely diverse and/or disadvantaged students should be limited in size to about 600 students or fewer, while those secondary schools serving economically and socially heterogeneous or relatively advantaged students should be limited in size to about 1,000 students.*

**KEYWORDS:** school size, school structure, student outcomes, policy.

Questions about school size never seem to go away. This is because school districts are dynamic organizations that continue to shrink or grow and almost never have enough money to put questions about the efficient use of resources on the back burner. Many local policy makers, as a consequence, confront decisions about building new schools and closing or amalgamating existing schools on at least an annual basis. Historically, North American policy makers have been persuaded that larger school units are at least less costly than smaller school units, if not more cost-effective, as well.

Larger schools typically have been justified on the grounds that they provide increased variety of classes for students and allow for increased specialization of teachers through a finer division of labor. Large school units, it has been asserted, can be run at lower per-pupil costs because the same equipment is used by more than one student. Large schools, according to some, are more likely to draw a more diverse population, thus exposing students to greater diversity; furthermore, such schools are likely to include a greater variety of teachers and so are more stimulating for students.

Large schools are less likely to “pigeonhole” students (e.g., teachers assuming that younger siblings have the same characteristics as older siblings they have already had in their classes) and provide greater opportunity for students to develop

social relationships, not to mention greater access to secondary teachers with more specialized instructional skills. Larger schools have been assumed to have greater flexibility to offer specialized courses to small numbers of students (these arguments are put forward, e.g., by Kuziemko, 2006; Ready, Lee, & Welner, 2004).

A number of these justifications for large schools, however, have been seriously challenged by empirical evidence. For example Coladarci and Cobb (1996) found significantly higher rates of extracurricular participation in smaller schools, Monk (1987) found no change in the quality of courses offered in smaller and larger secondary schools, and a number of the cost studies reviewed in the following found larger schools to be less efficient than smaller schools. The theoretical case for small schools rests on the grounds that it is easier to develop relationships with other students in small schools and that there is a better chance of staff knowing students well. Small schools are thought to encourage teachers to take more responsibility for student learning and offer students a better chance to be known by someone; they increase the connection between student and community. Small schools, it is claimed, engender better teaching strategies and likely also diminish the need for costly monitoring and supervision.

Theoretical arguments underpinning the historical trend toward larger school units have not held up well to empirical scrutiny even though this seems not to have seriously slowed the move toward larger units. This ought to provide a lesson for those now offering arguments for smaller schools. The lesson is to let school size policies be driven by empirical evidence, not by attractive theory or ideology. Hence, the purpose of this review—to help determine the impact of school size on an array of different student and organizational outcomes.

## **Review Methods**

### *Search Procedures*

We began the search for relevant evidence by mining the ERIC electronic database, narrowing the search from the outset to published articles. Using 1990 as the starting point, the abstracts of all studies located using the search terms *school size* and *school organization*, in combination with a wide array of student outcomes (e.g., achievement, attendance, dropping out), were read. This amounted to more than 280 papers in total. From the abstracts, we further narrowed our selection of papers to (a) those published in refereed journals, (b) those that reported original evidence, and (c) those that included explicit descriptions of their research methods. Relevant studies cited in papers selected using this procedure were also included if they met our criteria.

### *Studies Selected for Review*

Using these procedures, 57 empirical studies were selected.<sup>1</sup> Of these studies, 18 were published between 1990 and 1999, the remaining 39 between 2000 and 2007. In addition to the 57 studies that formed the core of our database, we also located and read frequently cited pre-1990 studies, along with a small number of particularly well-done reviews;<sup>2</sup> one of these reviews, Andrews, Duncombe, and Yinger (2002), while fairly recent, included fewer studies (22) than this review and studies particularly focused on economies of size. These studies and reviews are

cited throughout the paper as a means of filling gaps in the post-1990 evidence base. There is a significant amount of pre-1990 school size research beginning, as far as we could discern, with a still frequently cited study by Barker and Gump published in 1964.

Two other features of the evidence base should be noted:

- School level: 40 studies provided information about secondary (including middle) school size effects; 11 studies were conducted in elementary schools, and the remaining 6 included data about both levels of schooling.
- Research context: The vast majority of studies (38) were conducted in the United States. While this might be considered a potential limitation, studies conducted outside of the United States typically reported results very similar to those found in the United States. Other countries serving as contexts for the research included Canada (4 studies), England (3 studies), and New Zealand, Australia, and Norway with 2 studies each. Single studies were conducted in Wales, Iceland, Northern Ireland, Israel, Scotland, and the Netherlands.

We do not claim that the 57 original studies forming the core of this review exhaust the post-1990 evidence base concerning school size. Nevertheless, they capture quite well both the central tendencies in the evidence base as well as most of the important nuances. Comparing the number of original studies included in the review with similar information about other related reviews provides one yardstick for judging the review's comprehensiveness. One of the most frequently cited reviews of literature on school size, for example, was published by Cotton in 1996. For this review, Cotton was able to locate 49 original empirical studies. Two other reviews that we found especially useful were concerned specifically with economies of scale in relation to schools, a narrower focus than we adopted for the present article. One of these reviews (Fox, 1981) analyzed 29 studies published up to about 1980. The second review (Andrews et al., 2002) addressed concerns Fox (1981) raised in his paper, including a total of 44 post-1981 studies. Judged by most social science standards, as these three comparisons illustrate, the evidence base for this review would be considered relatively large and, with the inclusion of results from earlier reviews, quite comprehensive.

A significant proportion of the 57 studies are based on evidence collected from very large samples, frequent uses of longitudinal designs, and applications of advanced statistical data analysis procedures. Most such studies relied for their data on international or national databases such as the Third International Mathematics and Science Study (TIMSS), the U.S. National Educational Longitudinal Studies beginning in 1988–1989 (NELS:88), the NELS High School Effectiveness Study, the High School and Beyond Study, and the National Longitudinal Study of Adolescent Health (Add Health). This is a methodologically more sophisticated database than one typically finds in the accumulated body of research about most educational policy issues. A significant, although minor, proportion of the studies are also theoretically well informed.

The nature of the data reported across the 57 studies did not permit a meta-analysis without eliminating a significant number of studies, along with the useful information they provide. Results reported in this article include indications of the direction of the results.

## School Size Effects on Student Outcomes

### *Academic Achievement*

In this section, evidence about the effects of school size on elementary and secondary student achievement is examined separately. Much more evidence is available about secondary as compared with elementary schools and students, a reversal of the emphasis evident in the pre-1990 research on school size.

*Elementary schools.* Of the studies, 10 provided evidence about the relationship between school size and the academic achievement of elementary school students. None of these studies found evidence that achievement rises with increases in school size and only 3 found nonsignificant relationships (Sadoski & Willson, 2006). The 6 remaining studies reported a negative relationship between size and achievement (Archibald, 2006; Bickel, Howley, Williams, & Glascock, 2001; Eberts, Schwartz, & Stone, 1990; Kuziemko, 2006; Lee & Loeb, 2000; Ma & McIntyre, 2005). The smaller the school, the better the achievement. We illustrate more fully the research giving rise to this central finding by describing 2 of these 6 studies.

The oldest of the studies reporting an inverse relationship between school size and student achievement is Eberts et al. (1990). Indeed, this study actually used evidence collected by a U.S. government agency in 1978. This was evidence about 1-year gains in math achievement on the part of 14,000 Grade 4 students, along with information about the teachers, administrators, and other features of the 281 schools attended by these students. The study also included measures of four student background variables—sex, race, parental involvement, and economic status. Schools in the study were classified as small (less than 200 students), medium (400–600 students), or large (more than 800 students). Schools in the 400 to 600 and 600 to 800 ranges were not included to simplify the analysis. The main results of this study indicated significantly greater math achievement among students in small schools. Students in small schools (less than 200 students) had significantly greater gains in achievement over a 1-year period than students in either medium or large schools; students in medium-sized schools had significantly greater gains in achievement than students in large schools. Student background variables did not contribute to these differences.

A second study reporting an inverse relationship between school size and academic achievement was conducted in Indiana (Kuziemko, 2006). This study provides a methodologically sophisticated example of current research about the effects of elementary school size on both achievement in math and language, as well as average daily attendance. The study “exploit[ed] shocks to enrollment provided by school openings, closings, and mergers” (p. 63) to control for the interactive effects of school size and achievement; student performance was compared before and after the shocks. Using schools experiencing shocks to enrollment is an important control because successful schools, over time, may attract additional students because of their reputation while less successful schools’ enrollments may decline.

The sample for this study included 57 schools that had experienced a shock leading to fewer students and 39 schools experiencing shocks producing increased student enrollment. Measured both 2 and 3 years later, changes in enrollment

produced by the shocks resulted in statistically significant, negative effects on both attendance and math scores as well as a negative, though not significant, effect on language scores. These results suggest that the longer students attend larger (or smaller) schools, the more their achievement would decrease (or increase). Kuziemko (2006) also claimed that his estimates of school size effects “compare favorably with even the most generous estimates of the effect of reducing class size” (p. 71).

*In sum.* Studies consistently found that smaller elementary schools benefit the academic achievement of their students. These findings, furthermore, are very much in line with research conducted prior to 1990. For example, Fowler and Walberg (1991) reviewed eight such studies (all but one of which included controls for student background or socioeconomic status [SES]). Each of these studies found negative relationships between school size and one or more student outcomes. In a subsequent review and report of their own original evidence, Walberg and Walberg (1994) once again pointed to substantial evidence that “small elementary schools show reasonably consistent and positive learning effects” (p. 21). Evidence in support of this claim seemed to be quite conclusive at the time of their review, although, anticipating the focus of some subsequent research, they noted the possibility of greater benefits to lower-SES students as well as a nonlinear relationship between elementary school size and student achievement.

*Secondary schools.* More evidence was available about school size effects on secondary school student achievement than on any of the other student outcomes addressed by the review. Of the 18 studies in total:

- 5 found that as school size increased so did achievement.
- 6 found an “inverted U” relationship between size and achievement. Achievement rises with school size up to some optimum school size then begins to decline as school size exceeds this optimum.
- 8 found that as school size increased, achievement declined; for the 3 studies that permitted its calculation, effect size (ES) ranged from essentially nonexistent ( $-.00075$ ) to medium ( $-.30$ ).

*Positive relations.* Three of the five studies finding positive relationships between school size and achievement were conducted in the U.K. context and were explicitly related to one another by their authors.<sup>3</sup> The initial study in this series was carried out in England by Bradley and Taylor in 1998. Two national data sets provided evidence for variables examined in this study. The dependent variable was the proportion of 15- to 16-year-old pupils achieving five or more GCSEs at A\*-C (the most common measure of secondary school achievement in studies carried out in the United Kingdom); the annual Secondary School Performance Tables were the source of this information for years 1992 through 1996. Independent variables included a variety of school characteristics including school size. Information about these variables was provided by the annual school’s census. This study found a strong positive relationship between secondary school size and student achievement. A similarly significant relationship was found between changes in achievement and changes in school size over time (1992–1996). These relationships were best described as an inverted U, however. Pupil performance peaked in schools

serving years 11 to 16 pupils above 900 but under 1,500, whereas in schools serving years 11 to 18 pupils, the peak in performance was in schools between about 1,200 to 1,800 pupils.

A second U.K. study reported in 2002 referenced Bradley and Taylor (1998) directly. Barnett and his colleagues (Barnett, Glass, Snowdon, & Stringer, 2002) examined the relationship between school size and achievement in 152 Northern Ireland secondary schools using evidence from 2 years of achievement data (1994–1995 and 1995–1996). Schools were classified into seven size groupings with 19% of schools in the largest two groupings (800–999 students and over 1,000 students). Consistent with Bradley and Taylor's results, this study found a significant positive relationship between size and achievement. The explanation suggested by the authors for their findings concerned the greater opportunities for both instructional and curriculum specialization in larger schools, opportunities that could only be provided in smaller schools through sufficient additional funds to permit comparable specialization.

Some studies carried out in the United States have reported results similar to those reported in the United Kingdom. For example, Schreiber (2002) assessed the factors influencing students' advanced mathematics achievement with evidence from 162 schools and 1,839 senior high school students who participated in the Third International Mathematics and Science Study (TIMSS; Population 3 Final Cohort). In addition to factors associated with students, three school-level factors significantly influenced advanced math achievement, including resources, average parent education, and school size. The larger the school, the greater the achievement. Schreiber argued that larger secondary schools are likely to have more teachers with specialized skills in teaching advanced mathematics.

The line of evidence illustrated by these three studies raises two important issues. First, as the authors of several of these studies point out themselves, school size itself is not likely what contributes to students' achieving more specialized and complex subject matter. Rather, it is more likely the availability, in larger schools, of teaching staff capable of providing effective instruction in that complex subject matter. The second issue is one of research design. Rumberger and Palardy (2005), for example, suggested that studies finding a positive, linear relationship between high school size and student achievement may not be adequately taking into account the higher drop-out rates typically associated with large secondary schools. Improved average school performance in large high schools may simply be a function of the increased drop-out rates found in such schools. Few of the studies reporting positive school size–achievement relations took this variable into account.

*Nonlinear relations.* Of the 19 studies about secondary school size effects on academic achievement, 6 reported nonlinear relationships. Two U.K. studies illustrate this evidence. One of these studies (Sawkins, 2002) used Scottish data about student performance reported in 1993–1994 and in 1998–1999 for 398 secondary school. This study found that as school size increased, student performance first declined and then improved, the turning point being around the 1,200-student range.

The most recent U.K. study in our review (Foreman-Peck & Foreman-Peck, 2006) reported similar results. Evidence from this study suggested a nonlinear relationship between achievement and school size best described as an inverted U,

although pupil performance peaked in much smaller schools (about 600) than was the case in Bradley and Taylor's (1998) study.

*Negative relations.* Of the 19 studies of secondary school size effects on academic achievement, 8 reported negative, linear relationships; the smaller the school, the better. Rather than describing individual examples of these studies here, we demonstrate the consistency of the findings from these studies with findings from earlier research. Three reviews of literature are used for this purpose.

One of these reviews (Fox, 1981) examined 29 studies of economies of size dating back to 1957. Taking the Fox (1981) review as their point of departure, Andrews et al. (2002) examined a further 22 studies. Both reviews included studies concerned with district as well as school size, sometimes together in one study and sometimes separately. These reviews included careful attention to both conceptual and methodological features of the studies selected for review, eliminating studies believed to be weak on either grounds. With respect to the impact of school size on the quality of education (usually academic achievement), Fox approvingly quoted James and Levin (1970): "All the studies that have tried to relate school or district size to education outcomes have found either no relationship or a negative one between student enrollments and the level of education outcome" (p. 287)

While there are limitations on all of the studies Fox (1981) reviewed, he considered the direction of the results to be clear. Andrews et al.'s (2002) conclusions were quite similar. Noting a fair degree of consistency in the results, they concluded that holding both school and other inputs constant, larger schools are associated with reduced levels of achievement and that "decreasing returns to size may begin to emerge for high schools above 1000 students" (p. 255).

The third, by Walberg and Walberg (1994), considered results about secondary school size effects to be less conclusive than results about elementary schools, but still clearly favoring smaller schools. Citing an especially well-designed national study by Marian and McIntire (1992), the authors also associated smaller high schools with many of the other outcomes we consider in later sections of the review.

*In sum.* While evidence about secondary school size effects on academic achievement is mixed, the most defensible conclusion favors smaller to mid-sized schools. This conclusion is most accurately portrayed in studies reporting nonlinear relationships between school size and achievement. Lack of attention to dropout rates in studies favoring large schools seriously undermines the confidence we can have in their results.

### *Equitable Distribution of Learning*

Evidence about the effects of school size on more or less disadvantaged students in schools was derived from six studies, one conducted in elementary schools, the remainder in secondary schools. These studies look beyond the effects of school size on average school achievement and ask about the extent to which such achievement is comparable among students who vary in their previous achievement levels and other background factors such as socioeconomic status, family educational culture, and first language. All of these studies associate better outcomes for disadvantaged/low-SES students with smaller schools and most find no negative effects for advantaged/high-SES students.

A series of similarly designed studies carried out in five U.S. states are examples of research that has produced very similar results (reviewed by Howley & Bickel, 1999). By way of illustration, the Georgia study carried out as part of this series (Bickel & Howley, 2000) examined the combined and separate effects of district and school size on student achievement with student SES included as a moderating variable. A total of 367 elementary and 298 secondary schools were included in the sample for this study. The achievement measure for elementary students was the Grade 8 Iowa Test of Basic Skills in language and mathematics. For secondary students, the achievement measure was the state's graduation tests in English, mathematics, social studies, and science. Results confirmed the expected conclusion that (among other things) small school size is good for the performance of disadvantaged students and does no harm to the achievement of advantaged students. Bickel et al.'s (2001) replication of the Georgia study in 1,001 Texas schools produced very similar results. Using performance on the Texas Assessment of Academic Skills (reading, math, and writing), this study reported a statistically significant, negative size by SES interaction effect and replicated results of their earlier studies.

A second series of well-designed U.S. studies has been carried out by Valerie Lee and her colleagues (Lee & Loeb, 2000; Lee, Smerdon, Alfeld-Liro, & Brown, 2000; Lee & Smith, 1993, 1995, 1997). As with the Bickel and Howley studies, Lee and her colleagues set out to uncover the size of schools that allow low-SES students, or those who typically struggle at school, to be successful academically without disadvantaging high-SES students or those who typically do well. This series of studies, including both middle and high schools, used data from one or more of three rounds of the National Educational Longitudinal Studies beginning in 1988–1999 (NELS:88). These studies found more equitable distribution of achievement in very small schools.

As an example, Lee & Smith's 1995 study sampled 11,794 Grade 10 students in 820 high schools from the NELS:88 database. Student outcome measures included changes in student achievement from Grade 8 to Grade 10 (math, reading, history, and science), student engagement in school, and equitable distribution of achievement gains across student with different SES levels. While the main focus of the study concerned the impact of various initiatives aimed at restructuring schools, its clearest results were about the superior impact of smaller secondary schools on students' engagement in their courses and achievement in math, reading, science, and social studies across students with different academic and social characteristics. These results support the tenor of earlier studies that, Bickel and Howley (2000) claimed, "suggest that smaller school size would improve schooling in impoverished communities" (p. 3).

*In sum.* These studies as a whole indicate that school size has a larger impact on the learning of disadvantaged and/or low-SES students than on the learning of advantaged or high-SES students. But smaller schools do not seem to harm the learning of more advantaged students, at least at the elementary level. The explanation for these effects may be found in the communal environments more likely to develop in smaller schools; less complex subject matter is typically learned well in these smaller, more communal environments. Disadvantaged or struggling students benefit most from the care and attention they receive in such environments.

Results such as these are not new. Studies examining the interactions among school size, student SES, and achievement began, according to Bickel and Howley (2000), with a study by Friedkin and Necochea in 1988. Most evidence that has inquired about these interactions since that time has confirmed the value of relatively small schools for more impoverished or low-SES students and communities.

*Attendance or Truancy and Retention or Dropping Out*

Evidence about attendance or truancy and retention or dropping out is considered together for two reasons. First, the causes of each are approximately the same, an assertion that finds theoretical support, for example, in Finn's (e.g., 1989) theory of school withdrawal and empirical support in studies of students' participation and engagement in school (e.g., Osterman, 2000). The second reason for considering evidence about these outcomes together is that most of the 13 studies included in the review measuring one of these variables also measured the other, with very similar results: 1 study reported a positive relationship between retention and/or attendance and larger schools; 5 studies reported this relationship to be negative, favoring small schools; 3 studies reported evidence favoring midsize schools or evidence of a nonlinear relationship between school size and student dropout or attendance; and 4 reported nonsignificant relationships.

*Positive relationships.* Rumberger and Thomas (2000) authored the only study reviewed reporting a positive linear relationship between high school size and drop-out rates. Evidence for this study was provided by 7,642 Grade 10 students in 247 schools who participated in the NELS High School Effectiveness Study. The authors reported lower adjusted drop-out rates for larger as compared with smaller schools.

*Negative relationships.* All five studies reporting higher attendance and/or drop-out rates in larger schools were methodologically quite robust. Four of these, all conducted in U.S. schools, are described here to illustrate the range of evidence available about this matter.

Rumberger (1995) examined the relationship between a handful of student-level (e.g., SES) and school-level variables (including school size) on drop-out rates. Data for this study were provided by the 1988 and 1990 responses of 17,424 students in 981 schools to surveys included as part of the NELS:88 survey of students, teachers, schools, and families. Other factors equal, this study found students in larger middle schools were at increased risk of dropping out as compared with their peers in smaller schools.

Lee and Burkam's (2003) data, also from the NELS:88 database, were provided by a sample of 3,840 students in 190 urban and suburban schools. Drop-out rates were estimated from the numbers of students who left school between Grades 10 and 12. Results indicated that large schools (1,500–2,500 students) had higher drop-out rates than either very large (+2,500 students) or medium sized (600–1,500 students) schools. However, small schools had the lowest drop-out rates.

Using data from both U.S. national and state (California) sources, Gardner, Ritblatt, and Beatty (2000) compared the drop-out rates of 67 randomly selected large California high schools (+2,000 students) to the drop-out rates of 60 randomly selected small high schools (200–600 students). Drop-out rates were significantly higher in the large schools.

Providing evidence about school size effects on both attendance and graduation rates, Darling-Hammond and her colleagues (Darling-Hammond, Aness, & Ort, 2002) reported the results of a 7-year study of New York City's Coalition Campus Schools project. This project aimed to replace a number of large, failing comprehensive secondary schools with much smaller organizations, typically about 200 students. In particular, this study focused on the six small schools that replaced Julia Richman High. Collected in three waves over 7 years, evidence for this study was provided by the city's school record data on student characteristics, attendance, achievement, and graduation. A wide array of other data was also collected from other sources. Even though the student populations in the six new small schools ended up being more "at risk" than those attending the former large high school, both attendance and graduation rates in the six small schools were much better.

*Nonlinear relationships.* Three studies reported evidence favoring midsize schools or evidence of a nonlinear relationship between school size and dropping out. Funk and Bailey (1999) used evidence from both U.S. national and state (Nebraska) sources. This study, including evidence from almost all districts in the state, assessed differences in student drop-out rates of districts with varying numbers of high school students. Results of this analysis indicated that "high school completion rates are lowest for school districts with 600 to 999 high school students" (p. 4).

Two studies (Lee & Burkam, 2003; Rumberger & Palardy, 2005) reported nonlinear relationship between high school size and student drop-out rates. Both studies used samples of data collected as part of the U.S. NELS High School Effectiveness Study. As well, both studies included a wide array of both independent and dependent measures and analyzed their data using multilevel methods.

Rumberger and Palardy's (2005) data were from a sample of 14,199 students attending 912 high schools who provided valid data from the 1988, 1990, and 1992 survey years. Estimates of drop-out rates were based on the number of students who left school between 1990 and 1992. Results of this study provide a complex account of the factors associated with student success and suggest that with respect to the alternative outcomes measured in the study, one size does not fit all. Drop-out rates tended to be lower in midsized (600–1,200 students) rather than smaller or very large high schools. This result, the authors suggested, may help explain the findings of other studies reporting higher levels of achievement in large high schools. Students struggling to succeed in such schools drop out at significantly higher rates, thereby eliminating the depressing effect their scores would have on their schools' average performance.

*Nonsignificant relations.* Of the four studies reporting nonsignificant relationships between school size and rates of dropping out, one was conducted in a small sample of low-SES urban schools in the Netherlands (Bos, Ruijters, & Visscher, 1990), one was conducted in 38 urban and suburban secondary schools in the Milwaukee area of the United States (Witte & Walsh, 1990), one was conducted in 23 middle schools in a predominantly African American suburban U.S. county (Phillips, 1997), and one used data from the U.S. national High School and Beyond study (McNeal, 1997). While there was considerable variation in samples, all of the studies were methodologically of very good quality. Other factors explored in these studies overwhelmed school size as explanations for variations in dropping out across schools. Some of these other factors, however, might be related to size in

some school contexts. For example, McNeal's (1997) study found significant effects of pupil-teacher ratio on student dropout. Larger schools in some contexts also have higher pupil-teacher ratios.

*In sum.* Evidence from the 13 studies is mixed and only 2 of the studies (concerned with attendance rates) are relevant to elementary schools. There is a clear indication in the weight of this evidence, however, that smaller secondary schools have superior "sticking" power; student attendance and retention rates are significantly better in smaller than larger secondary schools. This conclusion is very similar to the conclusions drawn from reviews of earlier evidence. For example, from her review of 10 drop-out studies (only 6 of which were original) Cotton (1996) concluded that results favored small schools. Citing a total of 16 "documents" located for her review of evidence about school size effects on attendance (5 would have met our criteria to be included in this review), Cotton also reported higher attendance rates of students in smaller schools and increases in attendance rates on the part of students who move from a large high school to a small alternative secondary school. The most defensible conclusion from our review, therefore, would be that medium-sized secondary schools are optimum, with dropping out increasing at the more extreme ends of the size continuum. What is medium sized, however, varies considerably from district to district. "Medium" in these studies exceeded 600 students and rose as high as 1,500.

In an effort to explain evidence linking lower drop-out rates to small or medium-sized high schools, Lee and Burkam (2003) argued that organizational conditions other than school size are more likely to directly influence student dropout. These conditions include how teachers and students relate to one another and may also include "organizational trust, members commitment to a common purpose and more frequent contact with people with whom members share their difficulties, uncertainties and ambitions" (p. 385).

#### *Participation, Identification, and Connection with School*

Six studies provided evidence about the relationship between school size and some form of engagement by students in their schools beyond simply attendance and retention. One of these studies included evidence from both elementary and secondary schools, the remainder were concerned only with secondary schools. Five studies were conducted in the United States and one in Australia (Silins & Mulford, 2004). And five of the six (those summarized in the following) are based on large samples of schools and students. The results of all studies indicate significantly stronger student engagement in smaller as compared with larger schools.

The earliest of these studies was by Lee and Smith (1995). This study, based on the U.S. High School and Beyond database, examined the effects of school size on a host of outcomes including student engagement in school. An 18-item survey scale was used as the measure of engagement. These items asked students about the extent to which they looked forward to various subjects (e.g., math, social studies), the extent to which they believed study of these subjects would be useful to them in the future, and issues related to their behavior in school. The study reported a significant negative relationship between student engagement and school size.

McNeely, Nonnemaker, and Blum (2002) used the concept of "connectedness" in their U.S. study drawing on data collected in 1994–1995 from school

administrators and students in Grades 7 to 12 as part of the National Longitudinal Study of Adolescent Health. These data were from 83,074 students in 127 schools. Among the structural variables explored in the study—public/private, school location (suburban, rural), class size, and school size—only school size had a significant relationship with students' connectedness to their school. As school size decreased, school connectedness increased.

Using survey data from 2,503 teachers and 3,500 students in 96 Australian secondary schools, Silins and Mulford (2004) examined the influence of a small handful of school context and internal school variables, including school size, on students' participation in school activities (four "levels" of participation) and the extent to which students identify with school as a good place to be. School size had direct, negative effects on both student participation and engagement in school. Indeed, the effects of school size on both student participation and engagement were greater than the effects of SES and most other measured variables.

Crosnoe, Johnson, and Elder's (2004) study of student attachment to their school (among other issues) was based on evidence from 14,966 students in 84 schools collected as part of the U.S. National Longitudinal Study of Adolescent Health. This study found that student attachment declined at a slowing rate as school size increased, with the lowest levels occurring at schools with between 1,900 and 2,000 students. These four studies offer unambiguous evidence to indicate that both elementary and secondary students are much more likely to feel connected and engaged in smaller rather than larger schools.

Finally, Kuziemko's (2006) study using Indiana Department of Education data found a negative relationship between elementary school size and student attendance rates. Furthermore, this negative relationship increased the longer students were enrolled in smaller schools.

*In sum.* Though only six studies were located for our review of school size effects on student engagement, they are of quite good quality and provide entirely consistent evidence in support of the claim that smaller schools are associated with greater student engagement conceived of in several different ways. Several frequently cited pre-1990 studies have reported similar results (Hulling, 1980; Lindsay, 1982), as did the Cotton (1996) review.

### *Course-Taking Patterns*

This student outcome is unique to the higher grades where students typically have some choice in the courses they take. Three studies, each described in the following, were included in the review about the effects of school size on course-taking patterns. All three studies were carried out in the United States, and all three used evidence from large populations of schools and students.

Drawing on evidence from 682 schools included in the U.S. High School and Beyond study, Monk and Haller (1993) concluded that larger school size is positively related to the number of senior course credits available to students but that "the effects of size are differentiated within high schools" (p. 3). The positive relationship between size and number of courses was stronger for nonurban than for urban schools, nonunionized versus unionized schools, and for vocational versus academic offerings. Larger schools were also more likely to have greater numbers of specialized courses within subject areas.

Whether these results favoring larger schools should be viewed as educationally positive is less clear. Monk and Haller (1993) offered a possible equity argument favoring large schools, that is, equitable access to the same breadth of courses. On the other hand, a growing body of literature now argues that a narrower academic curriculum is in the best interests of all students and the so-called shopping mall, comprehensive high school was an old reform initiative badly conceived from the outset.

Evidence provided by Lee and Smith (1995) significantly advanced this position, offering a strong, opposing view of what would constitute equity with respect to course-taking patterns. Using the 1995 U.S. NELS database, they inquired not about course availability in relation to school size but about the relationships between school size, different course-taking patterns, and student achievement. This study found that more within-school variability in course taking was negatively related to all their measures of student outcomes. Smaller secondary schools, furthermore, were found to offer a more constrained variety of courses with greater academic emphasis (or higher standards) and higher academic achievement for all students was the consequence. Lee and Smith concluded from their study that "high schools with constrained curricula, in which all students take a similar set of academic offerings, appear to increase the learning of all of their students" (p. 8).

Alexander's (2002) study tested the possibility of changing the typical pattern of course taking reflected in the studies by Monk and Haller (1993) and Lee and Smith (1995). Alexander examined the course-taking patterns of students in different-sized secondary schools within the context of a New York State policy that called for "greater prescription of courses and the expanded use of curriculum exit examinations" (p. 677). Students' course-taking patterns were examined 4 years before and 6 years after the policy was enacted. The expected changes were threefold: an increase in the proportion of class periods devoted to core courses, a greater proportion of time within the core devoted to advanced courses, and reduced relationships between course-taking trends and student background variables. The outcomes of this study most relevant to our review were twofold. First, in New York City schools, the likelihood of the expected results of the policy increased with increases in secondary school size; for example, a 10% increase in the size of a school was associated with a .3% increase in the share of the curriculum allotted to the core. Outside the city, however, in other large districts, smaller schools were more likely to have more class time focused on the core parts of the curriculum.

*In sum.* In general, these studies suggest that course-taking patterns in larger secondary schools are typically more varied. That said, Monk (1987) concluded from his comparison of curricular offerings in secondary schools in New York State that large school size does not guarantee an expanded, more specialized curriculum. Schools with as few as 400 students were able to offer a curriculum comparable in scope and specialization to what would be expected in much larger schools.

But some evidence has also suggested that curricular breadth is not in the interests of students' academic success, in any event. Patterns of course taking most likely to emerge in smaller secondary schools—fewer courses and, within those courses, a clear emphasis on core academic outcomes—seems to promote greater academic achievement for all students. An admittedly small body of research

suggests that the more varied course-taking patterns associated with larger secondary schools can be changed with focused intervention and without reducing school sizes.

### *Extracurricular Participation*

Four studies, all published between 1996 and 2007, examined school size effects on extracurricular participation (EP). Based on the reviews of literature included in these studies and other earlier reviews, it is likely that the total body of empirical English language research bearing on this relationship is in the range of approximately two dozen studies. While four studies seems a small proportion of the total available, these are the most recent.

More important, these are the most methodologically robust studies to be published to date, at least in terms of their external validity. All of these studies used evidence from one of three large, national U.S., longitudinal data sets. One might argue that restricting the review to U.S. evidence is a serious limitation, but we have encountered no reasons to believe that the EP–school size relationships would vary significantly across North American contexts. A more serious limitation is the complete lack of evidence about elementary school EP, an historical limitation of EP studies.

Coladarci and Cobb (1996), the earliest of the four studies to be published, examined the relationship between school size and secondary school students' EP using evidence provided by a U.S. national database, the National Educational Longitudinal Study of 1988<sup>4</sup>. To be included in this study, students had to have participated in all three waves of NELS data collection—when they were in the 8th, 10th, and 12th grades. Furthermore, students were included only if they attended either a “small” high school (fewer than 800 students) or a “large” high school (1,600 or more students). NELS data provided information about student participation in a range of extracurricular activities (29 in total) classified as academic (14), sport (11), and performing arts (4), along with the number of hours per week they devoted to these activities. Coladarci and Cobb (1996) summed up the main results of their studies as follows:

EP is significantly greater among smaller-school students for 21 of the 29 activities: 8 of the 11 sports activities, all 4 performing-arts activities, and 9 of the 14 club [academic] activities. . . . Across all activities and both grades, participation was roughly four tenths of a standard deviation higher for smaller school students than for students attending larger schools. (p. 96)

Results for this study also indicated that as a determinant of EP, school size outweighed other variables for which data were available, including student SES, academic achievement, and student self-esteem.

McNeal's (1999) analysis of the 1983 data provided by the (U.S.) National Center for Educational Statistics High School and Beyond study was based on evidence from 5,772 students in 281 public schools. McNeal found significant effects of school size on the extent of extracurricular participation by students. He also found much greater joint effects of school climate and school size on such participation. McNeal concluded that “students attending schools that are larger or have problematic climates are generally less likely to participate in extracurricular

activities” (p. 8). Together, participation and climate explained 66% of the between-school variation in athletic participation, in particular.

Using evidence from 14,966 students in 84 schools collected as part of the U.S. National Longitudinal Study of Adolescent Health, Crosnoe et al. (2004) examined the effects of school size on students’ participation and several other measures of interpersonal climate<sup>5</sup> in a total of 33 different activities (athletic, academic, performing arts, leadership, and other). School size was treated as a continuous rather than categorical variable in this study. Results indicated that increases in school size were associated with decreases in EP as well as other measures of interpersonal climate. In the case of EP specifically, the relationship was entirely linear, that is, “each increase in school size was associated with an equal decrease in the predicted extracurricular participation of a student” (p. 1270).

The fourth and most recently published study of EP included in the review was by Feldman and Matjasko (2007). This study used data provided by Wave 1 of the National Longitudinal Study of Adolescent Health, including responses to surveys by students, parents, and school administrators (a total sample of 14,411). School sizes, based on the estimates of school administrators, were categorized as small (1–400 students), medium (401–1,000 students), and large (1,001–4,000 students). Suggesting limits on the opportunities for engagement as the reason (after Barker & Gump, 1964), the authors reported that nonparticipating students were more likely to attend schools classified as large.

*In sum.* Results of the four studies of school size–EP relationships are very similar. All four indicate that extracurricular participation decreases as secondary school size increases. Furthermore, this seems to be a simple linear relationship, one for which a plausible explanation has been available since Barker and Gump (1964) proposed their “overmanning” hypothesis to explain increased participation with decreased school size. According to this hypothesis, most schools offer a fixed number of activities (e.g., athletic activities), each of which has a fixed number of possible positions to be filled. Smaller schools offer a greater proportion of students opportunities to fill those positions. There also is more pressure for students in smaller schools to fill the available positions. All four studies included in this section offer support for this hypothesis. Cotton’s (1996) review of a substantial amount of earlier evidence also pointed to the more extensive and varied pattern of student participation in small schools, a pattern she claimed was “the single best supported finding in the school size research” (p. 7).

#### *Other Student Outcomes*

Only small amounts of evidence (five studies in total) were located about school size relationships and several other student outcomes—self-esteem, physical safety, and social behavior.

*Student attitudes about self and others.* Two studies provided evidence about school size relationships with student self-esteem or self-concept. The first of these studies inquired about the relationship between school size and student self-esteem, defined as “the value or sense of worth one perceives about one’s self” (Holland & Andre, 1994, p. 345). This study was based on evidence from 648 students attending either small or large high schools. Schools were classified as small if they

had fewer than 100 students per grade and large if they had more than 250 students per grade. School size had no effect on student self-esteem.

The second study also failed to find a significant relationship between student self-esteem and school size using evidence from the NELS:88 database, described more fully earlier (Coladarci & Cobb, 1996). This study tested for an indirect effect of schools size on student self-esteem through school size effects on extracurricular participation.

Although neither of these two studies reported significant relationships between school size and student self-esteem or self-concept, Cotton's (1996) review of several earlier studies led her to conclude that higher levels of student personal and academic self-regard was associated with smaller schools. But evidence on this matter remains meager and the results inconclusive.

*Physical safety, health, well-being.* Rubie-Davies and Townsend (2007) was the only study located for the review that examined the relationship between school size and student safety, in this case the incidence of bone fractures among elementary school students in New Zealand. Based on evidence from a representative sample of 76 Grade 1 to 6 schools, results indicated that fractures were more common in larger schools (and among boys). Reduced ability of staff to monitor the activities of students was the primary explanation for these results.

*Social behavior.* Two studies, one in elementary and one in secondary schools, found reduced incidence of misbehavior in smaller schools. Cross-sectional data from the New Brunswick School Climate Study were used by Ma (2001) to examine, among other things, the effects of school size on the disciplinary climate in schools. Data for the study were provided by 6,883 Grade 6 students and 6,868 Grade 8 students. In particular, this study aimed to better understand the relationship between bullies and victims. Students in small schools, the results indicated, were more likely to become bullies than victims. But bullying was reduced by greater parental involvement, such involvement being more likely in small schools.

The second study of social behavior was by Darling-Hammond et al. (2002). Described in some detail earlier, this study tracked the effects on students of disbanding a large comprehensive high school in New York City and creating five smaller secondary schools in its place. All student outcomes measured in this study, including the incidence of indiscipline, improved in the smaller schools. The study's design, however, makes it difficult to distinguish the effects of smaller structures from the effects of the many other improvement initiatives undertaken simultaneously in these schools.

No firm conclusions can be drawn about school size–social behavior relationships from just two studies. Cotton's (1996) review, however, provides a useful synopsis of evidence predating these two studies. This earlier evidence encompassed many forms of social behavior (e.g., class disruption, vandalism, aggressive behavior, theft, and substance abuse). From this evidence, Cotton concluded that these forms of social behavior are much less likely in small than large schools, a school size effect that seems to be especially significant for ethnic minority and low-SES students.

### School Size Effects on Organizational Characteristics

Many fewer studies, 17 in total, were located about school size effects on school organizations than on student outcomes. These studies provide information about the costs and cost-efficiencies of different sized schools and the effects of school size on both teacher turnover and teachers' school-related attitudes.

#### *Costs and Cost-Efficiency*

Evidence about the costs and cost-efficiencies of schools varying in size was provided by five studies, four carried out in the United States and one in Northern Ireland. All were concerned with secondary schools. Bowles and Bosworth (2002) argued that there is a large school finance literature about economies of scale in education, but empirical analysis in much of this work depends on expenditure data at the district level. As a consequence, there is little evidence about economies of scale at the school level. Studies included in this section of the review use school-level cost data.

Two of these studies report results favoring large schools, two favoring small schools and one favoring midsize schools.

*Evidence favoring large schools.* The single non-U.S. study included in the review was reported by Barnett and his colleagues (2002). They examined the relationships among secondary school size, student achievement, and the costs of schooling in Northern Ireland. To assess the most cost-effective school size, these researchers used the typical U.K. measure of secondary school achievement (percentage of pupils achieving five A\*-C grades on the GCSE exams) along with a measure of costs that included the number of full-time equivalent teachers, the average annual salary for these teachers, annual expenditures on teaching staff, annual expenditures on support staff, and annual expenditures on other nonlabor "input" resources. The results of this analysis are described as a "cost-constrained best practice performance score" (p. 302). Maximum values on this score were achieved by the largest schools in the sample, suggesting that "larger schools perform relatively better than smaller schools when measured relative to cost-constrained best-practice benchmarks" (p. 303). Barnett et al. went on to argue that the only realistic way that smaller schools can match the performance of larger schools is by adding the resources necessary to allow for the levels of specialization in teaching they believe explains the effects of larger schools.

Bowles and Bosworth (2002) used detailed expenditure data for each school in 17 Wyoming school districts to examine how per-pupil costs vary by school size. They wanted to know the effect of changes in school size on per-pupil costs with student test scores held constant. This study found greater costs to educate a student in a small as compared with a large school; for example, a 1% change in school size is associated with a 0.2% change in costs per student.

*Evidence favoring small schools.* In addition to finding significant negative relations between school size and student achievement for students spanning the SES spectrum, Bickel et al.'s (2001) study, carried out in 1,001 Texas schools, raised a provocative question about the number of grades included in a single school. The context for this study is important to acknowledge: Many small rural schools spanning all elementary and secondary grades are often in districts with only one high

school. Within this context, Bickel and his colleagues reported evidence clearly favoring schools with large grade spans with respect to costs. Specifically: "With expenditure per pupil as the outcome measure, multiple regression analysis shows that single unit schools, on average, correspond to a reduction of \$1,017 per pupil a substantial efficiency, when compared with conventionally grade-specialized high schools" (p. 3). Bickel et al. explained that this significant per-pupil savings can be accounted for by the fact that each single unit school in their study was the only school in the district and each had the full range of grades from K (or earlier) to 12. This evidence also indicated that the savings in these single-unit schools declined as they became larger.

Kuziemko's (2006) Indiana elementary school study asked whether decreasing school size would be worth the cost. For this analysis, the author examined only the individual benefits to the future income of a representative student. Based on expected increases in achievement resulting from decreases in school size and the pay-off of such increased achievement in employment earnings, a 2% increase in income would be predicted for a 50% reduction in school size.

*Evidence of a nonlinear relationship.* Stiefel, Berne, Intarola, and Fruchter's (2000) cost-effectiveness study was carried out with a sample of 121 New York City high schools. This study used graduation rates as the measure of school effectiveness and estimated school-level costs using a 4-year budget per graduate for each school in order to cover the entire career of a typical high school student and to combine budgets and graduates; this method for calculating costs means, of course, that dropouts greatly increase per pupil budgets for schools.

The 121 high schools sampled in this study were divided into three groups by size: small schools (1–600 students), medium (601–2,000 students), and large (more than 2,000 students). Evidence indicated that the small to medium-sized schools (600–1,200 students) had the highest budget per student. Large high schools had the lowest budget per student followed closely by those small high schools with an academic mission (some New York high schools have specialized missions, not always academic). So large and small schools seem to be relatively efficient, midsized schools much less so.

*In sum.* The five studies reviewed here offer no clear direction about the most cost-efficient size of secondary schools, a result consistent with much earlier research.<sup>6</sup> These mixed results are likely due to the quite different methods used to calculate results. Most studies finding an inverse relationship between size and cost-effectiveness also have a strong interest in equity as an outcome.

Among earlier reviews of cost-effects evidence, Walberg and Walberg (1994) are most inclined to favor small schools. Noting the long-standing trend across North America to reduce the number and increase the size of both districts and schools, the authors reviewed research suggesting that theories about scale effects have been called into question by evidence in most sectors and certainly with respect to districts and schools. While results of scale economy studies are still described as "mixed," there is a growing tendency among economists to write about the "diseconomies" of scale. The long-standing trend toward greater size, the authors concluded, is "in exactly the wrong direction" (p. 19).

### Teacher Turnover

Two studies, both carried out in Northern Europe, examined the effects of school size on teachers' decisions to change schools. Undertaken in Norway using a national sample of schools, Falch and Strom (2005) inquired about the factors that give rise to teacher turnover (the authors used the term *quit behavior*), which in Norway averages about 9.5% annually. Because teacher salaries are determined nationally, the context for the study controlled for this variable. Quit behavior or turnover for this study included changing schools within the same jurisdiction, changing schools across jurisdictions, and leaving the profession. Teacher turnover data in Norway between 1992–1993 and 1999–2000 were used for the study. Results indicated that school size was a significant factor in teachers' turnover decisions. The highest quit rate was in the smallest and largest schools; evidence indicated that "the quit probability is equal in schools with about 70 and 670 pupils" (p. 624). This finding about very small schools is quite consistent with results of Dunathan's much earlier study (as cited in Eberts et al., 1990) suggesting that small schools typically have difficulty attracting and retaining teachers.

Adalsteinsdottir (2004) examined not only the tenure but the behaviors and practices of 20 teachers in 10 small ( $M = 57$  students) and 10 large ( $M = 309$  students) Icelandic primary schools. Longer tenure was associated with larger schools in this study. Given the small size of the "large" schools in this study, however, the results actually seem to be quite consistent with those reported in the Norwegian study. Midsize elementary schools, those in the range of about 300 students, may be an optimum size for retaining teachers.

### Teacher Attitudes

There were 10 studies that examined the relationship between school size and several different teacher work-related attitudes. Of these studies, 7 were conducted in elementary schools, 3 in secondary schools. Of the 10, 1 found a nonlinear relationship between school size and teacher work-related attitudes, 7 reported evidence favoring smaller schools, and 2 found nonsignificant relationships.

*Nonlinear relationships.* The one study reporting a nonlinear relationship was reported by Barty and her colleagues (Barty, Thomson, Blackmore, & Sachs, 2005). This study examined a wide range of Australian data to identify factors influencing attitudes and decisions related to applying for the principalship. Australian schools varied substantially in the number of applicants they attracted when a new principal is required. This study found school size to be one of a small handful that influenced the decision to apply. The presence of an incumbent candidate and local educational politics also were found to influence such decisions. The most attractive size school for applicants was at neither of the extremes. Principal applicants appeared to favor schools larger than 200 students, worrying about such matters as inadequate funding, insufficient staff, and difficulty in moving to another school later in one's career. These applicants also appeared to avoid schools larger than about 800 students because of their more complex budgets and organizational structures, substantial managerial demands, and inadequate support for administrative tasks (even though Australia has devolved considerable decision-making authority to school principals).

*Evidence favoring small schools.* Seven studies reported linear relationships between size and teachers' work-related attitudes. By way of example, Sturman's (2003) study, carried out in English primary schools, examined the test preparation attitudes and activities in which teachers engaged their Year 6 students prior to the national high-stakes science tests. Evidence for the study was provided by the responses of 64 headteachers to a survey. Results indicated that teachers in smaller schools began preparing their students for the test later than did teachers in larger schools. Sturman speculated,

This may be because less preparation time is required with a small Y6 class or where liaison with other Y6 teachers is not required, or it may arise from the difficulties of reviewing with mixed-age classes which are common in small schools. (p. 269)

Eberts et al. (1990) found that teachers in small schools were more satisfied with their schools' programs, relations among staff in their schools, and the manner in which conflicts in their schools were addressed. But these teachers also perceived that their principals were less effective than did teachers in larger schools. By way of explanation, Eberts and his colleagues reasoned that in small schools, principals have to take on a wide variety of duties, only some of which they may be skilled at, whereas large-school principals may be able to delegate tasks better carried out by other staff in the school.

A qualitative study by Lee et al. (2000) in nine high schools varying widely in size aimed to better understand the relationship between school size and both social relations in schools and the nature of the school curricula. This study did find closer social relationships between students as well as between staff and students (although not always to the advantage of some students). The study also found a narrower curriculum offered by smaller schools, as would be expected.

But these results by Lee and her colleagues (2000) raised more complex questions about the viability of small secondary schools. For example, whether a school was small by choice or by default (declining enrollments over a substantial period of time) seemed to influence staff attitudes in the school and the likelihood of teachers taking advantage of the smallness of their organizations. Enrollment-driven funding formula also provided serious constraints to the resource base of small secondary schools. In addition, while the small schools were in a good position to develop a more constrained academic curriculum for all students (a curriculum that evidence now suggests offers all students significant achievement advantages), many small schools did not take advantage of this opportunity. Instead, they wished to be able to offer the broad curriculum associated with large, comprehensive high schools.

Lee and her colleagues (2000) as well as Rosenblatt (2001) associated smaller schools with higher levels of teacher commitment and sense of responsibility for student learning.

*Nonsignificant relationship.* Of the 10 studies about teacher attitudes and school size, 2 found no relationship. Of these studies, 1 (Brown, 2004) examined teachers' attitudes toward the purposes for assessment and the second (Duncan & Noonan, 2007) was concerned with secondary teachers' attitudes and practices related to student grading and assessment.

*In sum.* While not a unanimous finding, the combined weight of these results seem to indicate that smaller school size enhances the chances that teachers will hold positive work-related attitudes.

### Conclusion

Results of the 57 post-1990 studies that were the focus of the article, along with evidence from reviews of earlier research, justify six claims about school size effects.

- Smaller schools are generally better for most purposes. The weight of evidence provided by the review clearly favors smaller schools for a wide array of student outcomes and most organizational outcomes as well.
- “Smaller” does not usually mean “really small.” *Smaller* is a relative term. In districts with secondary school sizes exceeding 2,500 students, for example, smaller can mean as many as 1,500 students, a size that would be considered very large in other districts.
- One size may not fit all purposes. Smaller schools are an advantage for most, although not all, types of student outcomes. Some evidence, for example, recommends larger schools for nurturing the achievement of academically successful senior high school students, whereas many other student outcomes seem to develop best in smaller schools.
- Student background matters. Students who traditionally struggle at school, students from disadvantaged social and economic backgrounds, for example, are the major benefactors of smaller schools. But smaller schools do not seem to be an impediment to the learning of more advantaged and/or high-achieving students, at least if those students have access to the specialized instruction they need to master complex subject matter.
- Breadth of curriculum is no longer a justification for large schools. The breadth of the curriculum, often cited as a major advantage of large comprehensive secondary schools, seems achievable in schools as small as 500 to 600 students. Such breadth, however, is now regarded as a threat to the academic progress of most students (e.g., Lee, Bryk & Smith, 1993).
- Cost-efficiency is no longer a justification for large schools. Most contemporary studies have concluded, unlike an earlier generation of studies, that small schools are more efficient or cost-effective. This reversal of opinion is the result of taking student graduation rates into account. Small secondary schools manage to graduate a significantly larger proportion of their students than do large secondary schools. The higher drop-out rates of large secondary schools is also one of the most plausible explanations for the results of studies associating higher achievement levels among senior students with larger school size.

### *Implications for Policy*

The most practical and obvious policy question that school size research should help to answer concerns the optimal size of schools. While the results of this review help to explain why this is not a simple question to answer, there is ample justification for four recommendations. First, elementary schools serving student populations exclusively or largely from diverse and/or disadvantaged backgrounds should be limited in size to not more than about 300 students. Second, elementary

schools serving economically and socially heterogeneous or relatively advantaged students should be limited in size to about 500 students. Third, secondary schools serving student populations exclusively or largely from diverse and/or disadvantaged backgrounds should be limited in size to about 600 students or fewer. Finally, secondary schools serving economically and socially heterogeneous or relatively advantaged students should be limited in size to about 1,000 students.

*Implications for Policy-Oriented Research*

Although varying widely depending on the student or organizational outcome, the most consistent finding in the evidence summarized for this review is its support for smaller rather than larger schools. Many have interpreted this finding as a call for transforming large schools into much smaller organizational units. But this is an enormously expensive proposition on a large scale and is especially unrealistic in an environment already challenged with seriously inadequate financial support. If school size effects are to become part of the larger reform effort, this cannot be the only alternative. In the majority of school systems, a more realistic policy direction (one that might be pursued in parallel with the small schools movement, rather than as a replacement) would be to engender or protect, in large schools, the mechanisms accounting for student success more “naturally” associated with small schools.

At this point, however, there is only a modest amount of evidence to help guide such a policy direction; indeed, its feasibility has rarely been tested systematically. So a substantial strand of research, in the not-too-distant future, should aim to provide such guidance. Questions such research would address would include, for example: What are the mechanisms accounting for different degrees of student success in smaller as compared with larger schools? What is it that erodes the quality of these mechanisms and their impacts on students in large schools? How can such erosion be prevented? What supports would assist teachers and administrators in large schools protect from erosion these key mechanisms for learning?

“Schools-within-schools” has been the most frequently cited policy response to the challenges that arise from large school size. But this alternative has been more talked about than actually implemented (Lee, Ready, & Johnson, 2001), so little evidence has accumulated to demonstrate that its hoped for benefits actually materialize. In any event, this alternative leaves the mechanisms explaining its hoped for benefits largely unexplored in a systematic way. Among the most frequently invoked mechanisms are, for example, teachers’ and students’ sense of community, students’ sense of identification with the school, and more personalized relationships providing teachers opportunities to know their individual students well. But these mechanisms are often invoked after the fact—as plausible explanations for evidence of small school effects rather than being studied from the outset as causal mechanisms. Furthermore, they are only a small proportion of a much larger set of variables making demonstrably important contributions to student learning, for example, academic press (Goddard, Sweetland, & Hoy, 2000), school disciplinary climate (Willms & Ma, 2004), uses of instructional time (Tornroos, 2005), teachers’ sense of efficacy (Tschannen-Moran, Hoy, & Hoy, 1998), and teacher quality (Akiba, LeTendre, & Scribner, 2007). Research exploring the interactions between school size and a comprehensive set of variables influencing student learning and engagement is called for. Most such research will need to be qualitative in the early stages, aimed at better understanding how size and the key learning

variables interact. Design research (Collins, Joseph, & Bielaczyc, 2004) also seems appropriate for generating solutions to the erosion of these key learning variables that often occurs in large schools.

### Notes

1. An appendix summarizing the methodological characteristics of each of these studies, along with a summary of the results reported in each study, is available from the first author. Space limitations prevented it from being included in this publication.

2. Fox (1981), Walberg and Walberg (1994), Cotton (1996), and Andrews, Duncombe, and Yinger (2002).

3. Curiously, these studies typically began by claiming little prior research on school size, a claim that would only be defensible by restricting one's attention to research carried out in the United Kingdom.

4. This study also tested claims about the contributions of extracurricular participation to student achievement and self-esteem.

5. These other interpersonal climate variables included school attachment (or identification) and student-teacher bonding.

6. For example, Chakraborty and Lewis (1996) and Monk (1990).

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