Summary And Recommendations

This review of research about the effects of school size on an array of important stud organizational outcomes was undertaken as background to decisions facing the *Board of Education of the Regina School Division No. 4*. These are decisions about the educational and economic virtues of retaining or amalgamating smaller schools in the face of cha student populations. While school districts across North America have struggled with these decisions for many decades, the outcome has almost always resulted in larger schoo outcome has been justified as the least expensive and, at the secondary level, one w provides students with a more comprehensive education.

Results of this review of 59 post-1990 empirical studies suggests that the longstandir trend toward larger schools is not in the best interests of students. More specifically:

1 The weight of evidence provided by these studies clearly favors smaller school "smaller" is a relative term. In districts with secondary school sizes exceeding 2500 st for example, smaller can mean as many as 1500 students, a size which would be considered very large in other districts.

2 While smaller schools are an advantage for most types of student outcomes, there is some evidence recommending larger schools for advancing the subject matter achiev academically successful senior high school students. One plausible explanations for this evidence is that students in larger schools have greater access to the specialized instr needed to master complex subject matter. Students in smaller schools with access to comparable instructional resources could be expected to achieve as well or better than students in large schools. A second explanation for this evidence is the failure of this b research to consider the larger drop out rates associated with larger schools. Secondar schools with higher retention rates are likely to have lower mean levels of achievement than secondary schools with high drop out rates.

secondary schools manage to graduate a significantly larger proportion of their students than do large secondary schools.

The most practical and obvious policy question that school size research should he answe 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 tl following recommendations :

- Elementary schools serving student populations exclusively or largely from diverse and/or disadvantaged backgrounds should be limited in size to not more than about students.
- Elementary schools serving economically and socially heterogeneous or relatively advantaged students should be limited in size to a 500 students.
- Secondary schools serving student populations exclusively or largely from diverse and/or disadvantaged backgrounds should be limited in size to about 600 students c
- Secondary schools serving economically and socially heterogeneous, or relatively advantaged, students should be limited in size to about 1000 students.

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A Review of Empirical Evidence about School Size Effects

A Policy Perspective

Introduction

Purposes for the Review

This review of research was commissioned by the

The oldest of the studies reporting an inverse relationship between school size and stude
achievement is Eberts, Schwartz & Stone (1990). Indeed, this study actually used evi

In a subsequent review and report of their own original evidence, Walberg and Walbe
(1994) once again pointed to substantial evidence that academic achievement is cons
better in small elementary schools. From their perspective, this evidence was quite

Negative relations. Eight of the 19 studies of secondary school size effects on academi achievement reported negative, linear relationships. The smaller the school the greate academic achievement. Rather than describing individual examples of these studies h 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 ba 1959. Taking the Fox review as their point of departure, Andrews, Duncombe and Yinger (2002) examined a further 22 studies. Both reviews included studies concerned with c as well as school size, sometimes together in one study and sometimes separately. T re

conducted in elementary schools, the remainder in secondary schools. These
look beyond the effects of school size on average school achievement and as
the extent to which such achievement is comparable among students who var
their previous achievement levels and such other “background” factors as
socioeconomic status (SES), family educational culture, first language and the
All of these studies associated better outcomes for disadvantaged/low SES st
with smaller schools and not found no negative effects for advantaged/high SES
students.

A series of similarly designed studies carried out in five U.S. states are examp
research which have produced very similar results (reviewed by Howley & Bic
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 distri
school size on student achievement with student SES included as a moderatir
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
grade 8 Iowa Test of Basic Skills in language and mathematics. For secondary
students, the achievement measure was the State criterion-referenced tests in English,
mathematics, social studies and science. Results confirmed the expected con
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 1001 Texas schools produce
similar results. Using performance on the Texas Assessment of Academic Skills (rea

- "…students in smaller schools learn more in these [math, reading, science, so
studies] important areas of the curriculum/ These results are net of differences in the
academic and social character, as well as the academic and social characteristics of their
students" (p. 8);
- "Achievement gains in the four subjects we considered are more equitably dist
in smaller schools" (p. 8);
- "Students in smaller schools are more engaged in their courses" (p. 9).

These results support the tenor of earlier studies which, Bickel and Howley summe
follows:

> *nearly a decade of research on school size (in particular) has developed a preponderance of evidence to suggest that smaller school size would improve schooling in impoverished communities.* (2000, p. 3)

In sum, these studies as a whole tell us that school size has a larger impact on the lea
disadvantaged and/or low SES students than on the learning of advantaged or high S
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 subjects
matter is typically learned well in these smaller, more communal environments.
Disadvantaged or struggling students benefit most from the care and attention they re
such environments.

Results such as these are not new. Studies examining the interactions among schoo
student SES and achievement began, according to Bickel and Howley (2000), with a
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 impoveris
low SES students and communities.

Attendance or Truancy and Retention or Dropping Out

Evidence about attendance or truancy and retention or dropping out are considered togethe
since the causes of each are approximately the same and most studies measuring or
measure the other, with very similar results. As Table 1 indicates:

- 1 study reported a positive relationship between retention and/or attendance and
larger schools;
- 7 studies reported this relationship to be negative (favoring small schools);
- 2 studies reported evidence favoring mid-size schools or evidence of a non-linear
relationship between school size and student dropout or attendance;
- 4 reported non-significant relationships.

Positive relationships. Rumberger and Thomas (2000) authored the only study in our re
reporting a positive linear relationship between high school size and dropout rates. Ev
for this study was provided by 7642 grade 10 students in 247 schools who participated in the
NELS *High School Effectiveness Study*. The authors found that "larger schools actually had
lower adjusted dropout rates than did smaller schools…" (p. 56).

Negative relationships. Of

> *attendance rates than those in large schools …, but students who change from large schools to small alternative secondary schools generally exhibit improvements in attendance.* (p. 7)

The most defensible conclusion from our review would likely argue for medium sized secondary schools, with dropping out increasing at the more extreme ends of the siz continuum. What is medium sized, however, varies considerably from distric district. Medium in these studies exceeds 600 students and rises as high as 1500.

In an effort to explain evidence linking lower dropout rates to small or medium sized h schools, Lee and Burkham argue that " School size, per se, is unlikely to directly influence the probability that students will dropout of high school. Rather there are likely to be c organizational features that accrue to students and staff in smaller high schools". The include how teachers and students relate to one another and may also include "organization trust, members commitment to a common purpose and more frequent contact with pe with whom members share their difficulties, uncertainties and ambitions" (p. 385).

Participation, Identification and Connection with School

Six studies included in the review provided evidence about the relationship between s size and some form of engagement by students in their schools beyond simply attenc and retention. One study included evidence from both elementary and secondary schools, th remainder were concerned only with secondary schools. Five studies were conducted U.S. and one in Australia. And five of the six (those summarized below) are based on 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 conducted by Lee and Smith (1995). Based on the *High School and Beyond* data base, this study 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 forward to various subjects (e.g. math, social studies), the extent to which they believed stu of these subjects would be useful to them in the future and issues related to their beha school. The study reported a significant negative relationship between student engage and school size.

McNeely, Nonnemaker and Blum (2002) used the concept of "connectedness" in their U.S. study

Using survey data from 2503 teachers and 3500 students in 96 Australian secondary
Silins and Mulford (2004) examined the influence of a small handful of school cont
internal school variables, including school size, on students' participation in school ac
(four "levels" of participation) and the extent to which students identify with school as
place to be. School size had direct, negative, effects on student participation and
engagement in school. Indeed, the effects of school size on both student participation
engagement were greater than the effects of SES and most other measured variables

Crosnoe, Kilpatrick and Elder's (2004) study of student attachment to their school, (amon
other issues) was based on evidence from 14,966 students in 84 schools collected as
the U.S. *National Longitudinal Study of Adolescent Health* (Add 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 1900 and 2000 students. These four studies
unambiguous evidence to indicate that both elementary and secondary students are
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
negative relationship between elementary school size and student attendance rates.
Furthermore this negative relationship increased the longer students were enrolled smaller
schools.

In sum. Though a relatively small number of studies (6) were located for our review of
school size effech er r boTho- (e)-3.9 (f)10.ude eler cively shi6 BT 11.52[417.72 Tm

Whether or not these results favoring larger schools should be viewed as educationally positive or not is less clear. Monk and Haller (1993) offer a possible equity argument favoring large schools—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 opposing, strong, opposing, view of what would constitute equity with respect to course taking pa Using the 1995 U.S. NELS data base, they inquired not about course availability in rel school size, but the relationships among school, different course-taking patterns and student achievement. This study found that more within-school variability in course taking was negatively related to all of their measures of student outcomes. Smaller secondar schools were found to offer a more constrained variety of courses with greater academic emphasis (or higher standards) and higher academic achievement for all students wa

Evidence also suggests that curricular breadth is not in the interests of students' acad
success in any event. Patterns of course taking most likely to emerge in smaller seco
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

Results for this study also indicated that, as a determinant of EP, school size outwei
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* (HSB) was based on evidence from
5,772 students in 281 public schools, McNeal found significant effects of school size o

From her review of a substantial amount of earlier evidence, Cotton (1996) a
conduded that:

> *The greater and more varied participation I extracurricular activities by students in small schools is 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* data base, 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 "both personal and academic self-regard are more positive in smaller schools" (p. 8). Evidence on this matter, in sum, is meager and the results inconclusive.

Physical safety. Rubie-Davies and Townsend (2007) was the only study located for the review which 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

small schools, the results indicated, were more likely to become bullies than victims. bullying was reduced by greater parental involvement, such involvement being more in small schools.

The second study of social behavior was Darling-Hammond, Ancess & Wichterie Ort (200 Described in some detail earlier, this study tracked the effects on students of disbanc large comprehensive high school in New York City and creating five smaller secondary

No firm conclusions can be drawn about school-size and social behavior relationships from just two studies. Cotton's review (1996), however, provides a useful synopsis of evidence predating these two studies. She found that this earlier evidence encompassed many social behavior including, for example, class disruption,

cost-constrained best-practice benchmarks" (p. 303). Barnett et al. go on to argue that the only realistic way that smaller schools can match the performance of larger schools is adding the resources necessary to allow for the levels of specialization in teaching the believe explains the effects of larger schools.

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

Evidence favoring small schools. In addition to finding significant negative relations betw school size and student achievement for students spanning the SES spectrum, Bickel (2001) study, carried out in 1001 Texas schools, raised a provocative question about 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 grade often in districts with only one high school. Within this context Bickely and his colleagu report 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 [italics in original] a substantial efficiency, when compared with conventionally grade-specialized high schools.* (p. 3)

Bickel et al. explain th this significant per pupil savings can be accounted for by the fact that each single school in their study was the only school in the district and each had the full range of grades (or earlier) to 12. This evidence also indicated that the savings in these single unit scl declined as they became larger.

The context in which the Bickel et al. (2001) study was carried out is quite unlike the Re school system context, of course. Nonetheless, moving toward the creation of 9-12 all H schools is an interesting policy option to consider even for a medium sized urban/sub schooldistrict like Regina. It is an option that clearly flies in the face of historic trends toward larger size, greater specialization and the ingrained expectations of students, and other members of the community about what high schools should be. But the bulk of the evidence in this review also implies that these trends have not served to improve stuc learning or reduce educational costs particularly well, either.

Kuziemko's(2006) Indiana elementary school study asked whether or not decreasir 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 expec increases in achievement resulting from decreases in school size and the payoff 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 non-linear relationship. Stiefel et al's (2000) cost-effectiveness study was carried out with a sample of 121 New York City high schools. This study used graduat rates as the measure of school effectiveness and estimated school 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 cos 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: smal schools (0-600 students); medium (601-2000); and large (more than 2000 students). Evidence indicated that the small to medium-sized schools (600 to 1200) had the highest budget per students. 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 specialized missions, not always academic). So large and small schools seem to be efficient, mid-sized schools much less so.

In sum. The five studies included in this review alone offer no clear direction about t most cost-efficient size of secondary schools, a result consistent with much earlier research.[viii] These mixed results are likely due to the quite different methods used to calculate results. Most studies finding an inverse relationship between size and cos effectiveness also have a strong interest in equity as an outcome.

Among earlier reviews of cost effects evidence, Walberg and Walberg's (1994) review is most inclined to favor small schools. Noting the longstanding trend across North Amer reduce the number and increase the size of both districts and schools, the authors rev 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 resu scale economy studies are still described as "mixed", there is a growing tendency among economists to write about the "diseconomies" of scale. The longstanding trend toward gre size, the authors conclude, is "in exactly the wrong direction" (p. 19).

Teacher Turnover

Two studies, both carried out in Northern Europe, examined the effects of school size teachers' decisions to change schools. Undertaken in Norway using a national samp

Evidence from this study found that school size was a significant factor in teachers' turn
decisions. The highest quit rate was in the smallest and largest schools; evidence ind
that "The quit probability is equal in schools with about 70 and 670 pupils" (p. 624). T
finding about very small schools is quite consistent with results of Dunathan's (1980) r
earlier study (cited in Eberts, Schwartz & Stone, 1990) suggesting that small schools
have difficulty attracting and retaining teachers.

Adalsteinsdotti's (2004) examined not only the tenure but the behaviors and practices
teachers in 10 small (m =57 students) and 10 large (m =309 students) Icelandic prima
schools. Longer tenure was associated with larger schools in this study. Given small size
of the "large" schools in this study, however, the results actually seem to be quite cons
with those reported in the Norwegian study. Mid-size elementary schools, those in the range
of about 300 students, may be an optimum size for retaining teachers.

Teacher Attitudes

Ten of the 59 studies in the review (see Table 2) examined the relationship between
size and several different teacher work-related attitudes. Seven of these studies were
conducted in elementary schools, three in secondary schools. Of the ten, one found a non-
linear relationship between school size and teacher-related attitudes, seven reported
evidence favoring smaller schools and two found non-significant relationships

Non-linear relationships. The one study reporting a non-linear relationship was reported by
Barty and her colleagues (2005). This study examined a wide range of Australian dat
identify factors influencing attitudes and decisions related to applying for the principal
Australian schools varied substantially in the number of applicants they attracted when
principal is required. This study found schools 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

Table 2 Evidence about School Size Effects on the School Organization

The numbers in the cells correspond to the numbers assigned studies cited in the Appendix.
+ = studies reporting positive relationships between size and organizational outcomes
-= studies reporting negative relationships between size and organizational outcomes
studies reporting non-linear relationships between size and organizational outcomes
studies reporting non-significant relationships between size and organizational outcomes

Conclusion

Limitations on the Scope of the Review

The terms of the contract for this review mentioned an array of different outcomes fo school size effects were of interest. These were outcomes including, but not limited t academic achievement, social impacts, psychological impacts, community integration, “at risk” children, “at risk” neighborhoods, extra-curricular programming, teacher effectiven and teacher satisfaction. Although not all of these labels explicitly appear in the t of this paper, all of the outcomes they signify have been considered, with two exceptions.

One exception concerns “community integration”. Adopting a broad conception of wha term could mean, we were unable to locate evidence inquiring about the effects of school siz on it. We did find, however, that many parents felt smaller schools to be more welcom less intimidating, places than larger schools and as a consequence, more likely to par in school-related matters with their children.

The second exception is “teacher effectiveness”. We were able to locate very little evidence bearing on this outcome. None of the evidence that we did find linked sch

smaller (but not very small) schools are likely to be considered by the majority of te
to be attractive workplaces. This, in turn, seems to result in a more stable teaching
and a greater sense of responsibility for student learning on the part of teachers. But
evidence about these responses by teachers is quite limited in the review.

With these limitations in mind, we turn to three matters in this final section of the pape
results of the review are summarized first. Second, four recommendations are offered about
optimum school sizes. Third, arguments that appear in the literature favoring both larg
smaller school sizes are briefly rehearsed and, finally, some important evidence is pre
about the interactive effects of school and district size.

Summary of Results

Results of the 59 post-1990 studies which were the focus of the paper, along with
evidence from reviews of earlier research, justify six claims about school size effe

1 *Smaller schools are generally better for most purposes*. The weight of evidence

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.

Recommendations about Optimum School Sizes

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 the following recommendations :

- Elementary schools serving student populations exclusively or largely from disadvantaged and/or disadvantaged backgrounds should be limited in size to not more than about students.
- Elementary schools serving economically and socially heterogeneous populations of relatively advantaged students should be limited in size to about 500 students.

Saskatchewan. While evidence from this study strongly suggested the value of reducti
either district or school size, "…the combined strategy of reducing both school and dis
size would be predicted to yield substantial equity and excellence effects" (p. 21). In the
Bickel and Howley (2000) study "equity effects" refer to increases in the achievement
SES students without harming the achievement of high SES students and "excellence
refer to increases in the mean levels of achievement across all students in a school.
Replicating, in Texas, studies completed in Georgia and several other states, Bickel e
(2001) reported additional evidence confirming the important, combined, effects of dis
and school size on student achievement identified in their earlier efforts. "The expected
achievement gains of lesmr11.f10.4 (i)-3.3 ((i)-3.2 (.52 90 616.(-99 Tm as)3.6dvr)3.6

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