
Evidence That Smaller Schools Do Not Improve Student Achievement

If more small schools than “expected” are among the high achievers, then creating more small schools would raise achievement across the board, many proponents of small schools have argued. Mr. Wainer and Mr. Zwerling challenge the faulty logic of such inferences.

BY HOWARD WAINER AND HARRIS L. ZWERLING

It was the best of times, it was the worst of times, it was the age of wisdom, it was the age of foolishness, it was the epoch of belief, it was the epoch of incredulity.

— Charles Dickens,
A Tale of Two Cities

THE urbanization that characterized the 20th century led to the abandonment of the rural lifestyle and, with it, an increase in the size of schools. The time of one-room schoolhouses ended and was replaced by the era of large schools, often with more than a thousand students, dozens of teachers of many specialties, and facilities that would not have been practical without the enormous increase in scale. Yet during the last quarter of

the 20th century there were rumblings of dissatisfaction with large schools, and the suggestion that smaller schools could provide better-quality education gained adherents.¹ In the late 1990s the Bill & Melinda Gates Foundation began supporting small schools on a broad-ranging, intensive, national basis. By 2001, the foundation had given approximately \$1.7 billion in grants to education projects. It has since been joined in support for smaller schools by the Annenberg Foundation, the Carnegie Corporation, the Center for Collaborative Education, the Center for School Change, Harvard’s Change Leadership Group, the Open Society Institute, the Pew Charitable Trusts, and the U.S. Department of Education’s Smaller Learning Communities Program. The availability of such large amounts of money to implement a smaller-schools policy yielded a concomitant increase in the pressure to do so, with programs to splinter large schools into smaller ones being proposed and implemented broadly in such cities as New York, Los Angeles,

Chicago, and Seattle.

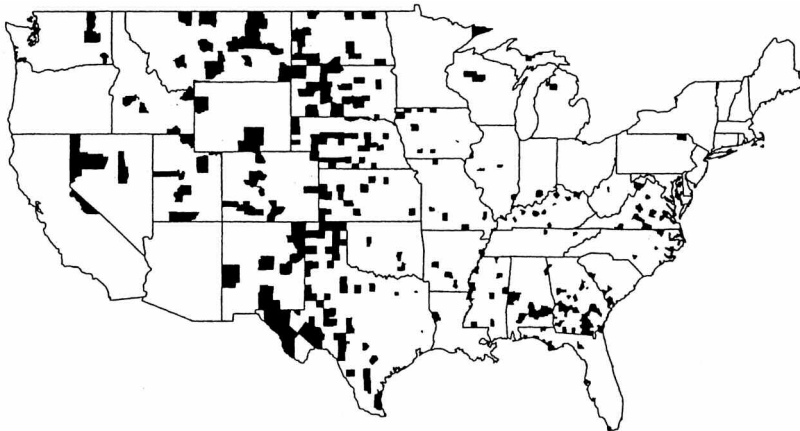
What is the evidence in support of such a change? Many claims have been made about the advantages of smaller schools, but we will focus here on just one — that when schools are smaller, students’ achievement improves, all else being equal, of course. The supporting evidence for this contention is that, when one looks at high-performing schools, one is apt to see an unrepresentatively large proportion of smaller schools. But seeing a greater than anticipated number of small schools in this group does not imply that being small means having a greater likelihood of being high performing.

KIDNEY CANCER

To illustrate our point, consider the example of kidney cancer. Figure 1 is a map of age-adjusted kidney cancer rates for men. The shaded areas are those counties that are in the lowest decile of the cancer distribution. We note that these healthy counties tend to be rural and located in the

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FIGURE 1.



The counties with the lowest 10% age-standardized death rates for cancer of the kidney/ureter for U.S. males, 1980-89. Reprinted, by permission, from Andrew Gelman and Deborah Nolan, *Teaching Statistics: A Bag of Tricks* (New York: Oxford University Press, 2002), p. 15.

ure 3). We see the typical triangular-shaped bivariate distribution. When the population is small (left side of the graph), there is wide variation in kidney cancer rates, from 20 per hundred thousand to zero. When county populations are large (right side of the graph), there is very little variation, with all counties at about five cases per hundred thousand.

PENNSYLVANIA TEST SCORES

The Pennsylvania System of School Assessment (PSSA) currently yields scores in third-, fifth-, eighth-, and 11th-grade mathematics and reading, as well as scores in writing for grades 6, 9, and 11.² If we examine the mean scores of the 1,662 separate schools that provided fifth-grade math scores for 2001-02, we find that, of the 50 top-scoring schools (the top 3%), six of them were among the 50 smallest schools (the smallest 3%).³ This is an overrepresentation by a factor of four. If size of school were unrelated, we would expect 3% to be in this select group, yet we found 12%. The bivariate distribution of enrollment and

Midwest, the South, and the West. It is both easy and tempting to infer that their low cancer rates are directly due to the clean living of the rural lifestyle — no air pollution, no water pollution, and access to fresh food without additives.

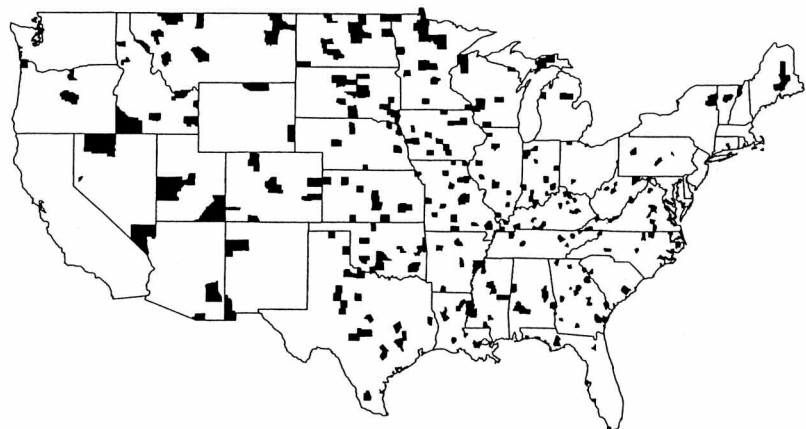
Figure 2 is another map of age-adjusted kidney cancer rates. Though it looks much like Figure 1, it differs in one important detail — the shaded counties are those in the *highest* decile of the cancer distribution. Note that these ailing counties tend to be rural and located in the Midwest, the South, and the West. It is easy to infer that their high cancer rates might be directly due to the poverty of the rural lifestyle — limited access to good medical care, a high-fat diet, too much alcohol, and too much tobacco.

If we were to plot Figure 1 on top of Figure 2, we would see that many of the shaded counties on one map are right next to the shaded counties on the other. So what is going on? What we are seeing is variance. The variance of the mean is proportional to the sample size; thus small counties have much larger variation than large counties. A county with, say,

100 inhabitants that has no cancer deaths would be in the lowest category. But if it has one cancer death it would be among the highest. Counties like New York, Los Angeles, or Harris (Houston), with millions of inhabitants, do not bounce around like that.

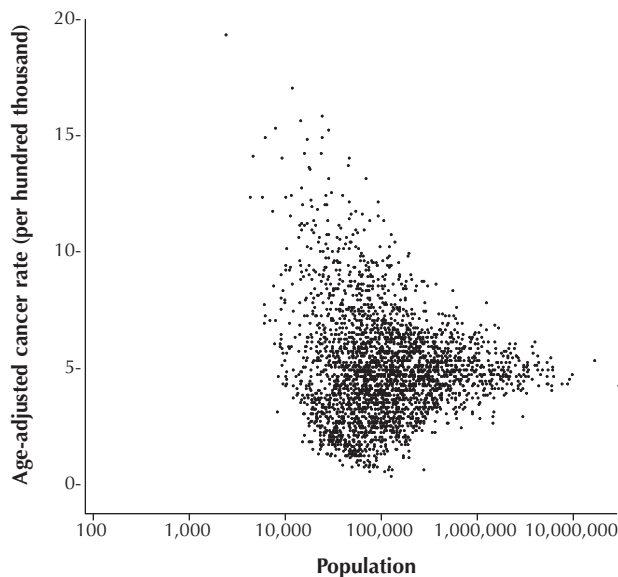
If we plot the age-adjusted cancer rates against county population, this result becomes clearer still (Fig-

FIGURE 2.



The counties with the highest 10% age-standardized death rates for cancer of the kidney/ureter for U.S. males, 1980-89. Reprinted, by permission, from Andrew Gelman and Deborah Nolan, *Teaching Statistics: A Bag of Tricks* (New York: Oxford University Press, 2002), p. 14.

FIGURE 3.



Age-adjusted death rates for cancer of the kidney/ureter for U.S. males, for all U.S. counties, 1980-89, shown as a function of the log of the county population.

shown that this variation is entirely expected; the phenomenon follows statistical theory and shows up empirically wherever we look. Our examination of fifth-grade performance suggests that school size alone seems to have no bearing on student achievement, which is not true at the high school level, where larger schools show better performance. This also is not unexpected, because small high schools cannot provide as broad a curriculum or as many highly specialized teachers as can large schools.

In July 2005, Bob Geballe provided anecdotal evidence supporting this point in the *Seattle Weekly*.⁴ Geballe described the conversion of Mountlake Terrace High School in Seattle from a large suburban school with an enrollment of 1,800 students into five smaller schools. The conversion was enabled with a Gates Foundation grant of almost a million dollars. Though class sizes remained the same, each of the five schools had fewer teachers. Students complained, “There’s just

test scores is shown in Figure 4. The top 50 schools are displayed in red. We also identified the 50 lowest-scoring schools, displayed in blue in Figure 4. Nine of these (18%) were among the 50 smallest schools.

This result is completely consonant with what is expected — the smaller schools should have higher variance and hence should be overrepresented at both extremes. Note that the regression line shown in Figure 4 is essentially flat, indicating that, overall, there is no apparent relationship between school size and performance.

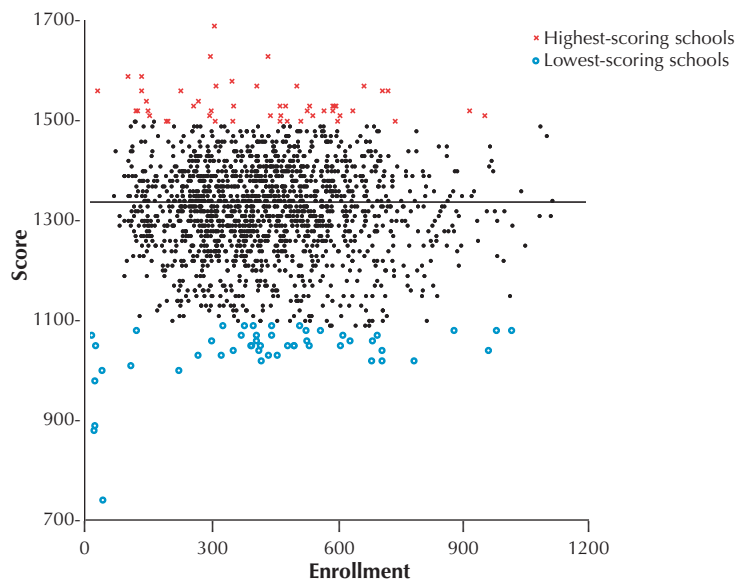
But this is not always true. Figure 5 is a similar plot of 11th-grade scores. We find a similar overrepresentation of small schools at both extremes, but this time the regression line shows a significant positive slope; overall, students at bigger schools do better.

SIZE MAY MATTER

The small schools movement seems to have arrived at one of its recom-

mendations through the examination of only one tail of the performance distribution. Small schools are overrepresented at both tails, and we have

FIGURE 4.



Average fifth-grade mathematics scores shown as a function of school size.

one English teacher and one math teacher. Teachers end up teaching things they don't really know." Perhaps this helps to explain the regression line in Figure 5.

ensure proper instruction" and promote "long-term success."⁶

To return to Charles Dickens' famous observation with which we began this article, among small groups

Rural America: A Reassessment of Conventional Wisdom (Boulder, Colo.: Westview Press, 1977), pp. 123-47; Weldon Beckner, *The Case for the Smaller School* (Bloomington, Ind.: Phi Delta Kappa Educational Foundation, 1983); Craig B. Howley, "Synthesis of the Effects of School and District Size: What Research Says About Achievement in Small Schools and School Districts," *Journal of Rural and Small Schools*, vol. 4, 1989, pp. 2-12; Robert L. Larson, "Small Is Beautiful: Innovation from the Inside Out," *Phi Delta Kappan*, March 1991, pp. 550-54; Gene I. Maeroff, "To Improve Schools, Reduce Their Size," *College Board News*, vol. 20, 1992, p. 3; and William J. Fowler, Jr., "School Size and Student Outcomes," in Benjamin Levin, William J. Fowler, Jr., and Herbert J. Walberg, eds., *Advances in Education Productivity: Vol. 5 — Organizational Influences on Productivity* (Greenwich, Conn.: JAI Press, 1995), pp. 3-25.

2. PSSA scores can be accessed at www.pde.state.pa.us/a_and_t.

3. Enrollment data were obtained directly from the Pennsylvania Department of Education. The authors are indebted to Rosanne Cramer and Richard Hruska for their assistance.

4. Bob Geballe, "Bill Gates' Guinea Pigs," *Seattle Weekly*, 20 July 2005, pp. 1-9.

5. Lynn Thompson, "School Size: Is Smaller Really Better?," *Seattle Times*, 26 October 2005, available at <http://seattletimes.nwsourc.com>.

6. Alfred S. Posamentier, "How to Assess a School," *New York Times*, 7 November 2005, p. A-19. ■

➤➤ **The small schools movement seems to have arrived at one of its recommendations through the examination of only one tail of the performance distribution. Small schools are overrepresented at both tails, and this variation is entirely expected.**

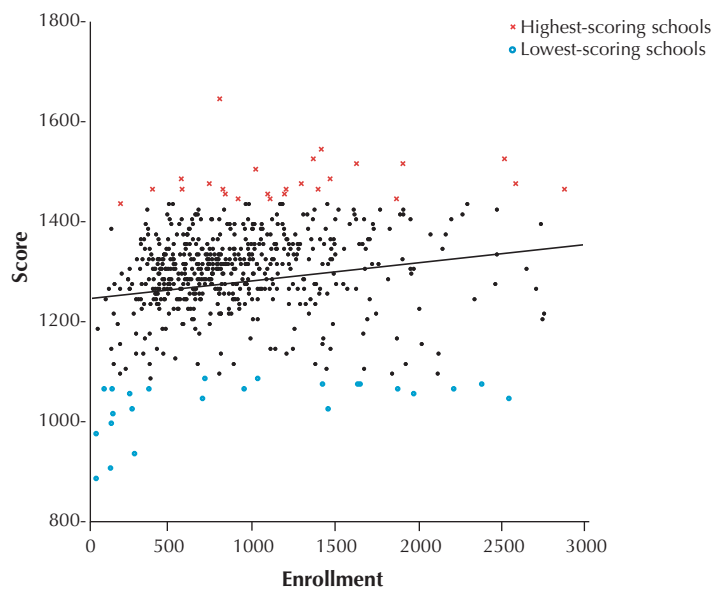
In October 2005, Lynn Thompson reported in the *Seattle Times*, "The Gates Foundation announced last week it is moving away from its emphasis on converting large high schools into smaller ones and instead giving grants to specially selected school districts with a track record of academic improvement and effective leadership." The foundation's leaders concluded that "improving classroom instruction and mobilizing the resources of an entire district were more important first steps to improving high schools than breaking down the size."⁵

The following month, Alfred Posamentier, dean of the School of Education at City College of the City University of New York, posted a letter to the editor of the *New York Times* in which he argued that studies describing the advantages of small schools "seem to miss the most important issues to be addressed by any secondary school educational innovations: a focus on curriculum and instruction." Posamentier suggested that it was critical to ask, "Can these schools provide a wide enough offering of courses to meet the needs of their students?" He also questioned whether subject-matter supervision would be "adequate to

there will be greater variation, so when we examine their performance we are likely to find both the best and the worst of performance. If we pay attention to both ends, we demonstrate that ours is the age of wisdom; if we don't, we provide evidence that the age of foolishness prevails.

1. See, for example, Faith Dunn, "Choosing Smallness," in Jonathan R. Sher, ed., *Education in*

FIGURE 5.



Average 11th-grade mathematics scores shown as a function of school size.

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