RESEARCH YOU CAN USE
A physicist tries to solve the city

A paper I reviewed recently for a planning journal (that asked to remain unnamed) applies Luis Bettencourt and Geoffrey West's Urban Scaling Theory to an analysis of crime in cities across the U.S., finding that the number of crimes committed follows a superlinear (upward curving) relationship as a function of the population size. That is, crime increases faster than population. If the paper were any good, that conclusion would not exactly be a selling point for big city living. It is not, so don't relocate just yet.

Bettencourt and West, two physicists, argue that virtually any urban phenomenon can be described by a simple formula:

Outcome = a x Population^b
- where a and b are constants, and b specifically is the power to which population is raised (the exponent).
- when b = 1, a relationship is linear.
- when b < 1, a relationship is sublinear. This applies, for example, to most urban infrastructure such as road capacity.
- when b > 1, a relationship is superlinear. This applies to most economic activity and, superficially, to crime.

Urban Scaling Theory has been topical ever since a popular piece called "A Physicist Solves the City" appeared in the *New York Times* in 2010. The *Times* article made the theory sound really profound, and appeared without much of a critique. But one critique in the *Times* article was itself profound and has tended to be ignored by many who subsequently subscribed to the theory:

"While listening to West talk about cities, it's easy to forget that his confident pronouncements are mere correlations, and that his statistics can only hint at possible explanations. Not surprisingly, many urban theorists disagree with West's conclusions. Some resent the implication that future urban research should revolve around a few abstract mathematical laws."

In urban scaling theory, population size is what is referred to as a confounding variable. As population increases, so does everything else in a city, from number of pigeons, to number of coffee shops, to number of vehicle miles traveled, to number of crimes committed. In a multivariate analysis, one controls for a confounding variable like population either by including it as a control variable or by representing dependent and independent variables on a per unit or per capita basis.

The variables of ultimate interest in such analyses aren't correlates of size but such things as population density and income inequality, controlling for population size, because these variables can be affected by policies and practices.

The use of population exclusively as the independent variable is atheoretical. Because everything in a city increases with size, there will necessarily be a statistical relationship between population and every scaled variable. This relationship may be linear, sublinear, or superlinear. By definition, it has to be one of the three. As every student of statistics knows, any two variables are always correlated to some degree in a bivariate analysis, and any regression analysis will show the relationship between them to be one of the three, sublinear, linear, or superlinear. The important thing isn't the power exponent of the relationship, but the degree of scatter around the regression line.

Original empirical evidence on the number of crimes versus the population of cities comes from Bettencourt and West themselves back in 2007. They found serious crimes to be superlinear vis-à-vis city size, with a b value of 1.16 and with R^2 of 0.89. This is significant for two reasons. First, this relationship (crimes versus population) has already been studied extensively by Bettencourt et al. and other researchers cited in the paper I reviewed for that unnamed planning journal. Is one more study groundbreaking enough to warrant publication? The fact that this paper disaggregates crime statistics by type of crime and analyzes relationships over a 16-year period (1995 to 2010) is a modest innovation.

The second significant thing about the Bettencourt et al. study is the R^2, 0.89. As statistics students will recall, an R^2 measures the proportion of variation in the dependent variable explained by the independent variable or variables. For two variables that are both scale-dependent, 0.89 is not a very high R^2. In other words, there is a lot of scatter around the regression line (regression curve). The scatter is what is really interesting. Are some cities above or below the regression line because they have higher or lower population

CRIME VS. POPULATION IN U.S. CITIES, 2013
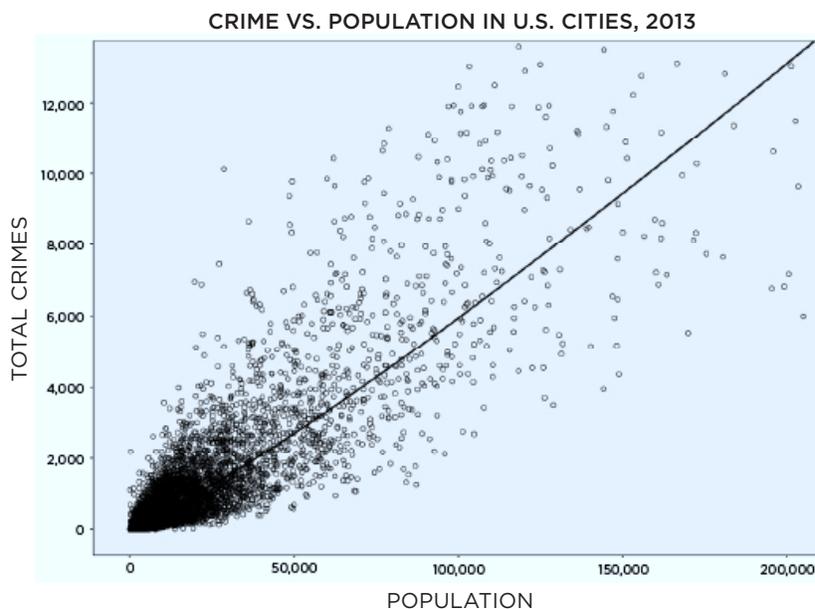
SOURCE: FBI UNIFORM CRIME STATISTICS; GRAPHIC BY TORREY LYONS, UNIVERISTY OF UTAH

This graphic illustrates how much scatter there is around the best-fit regression line.

densities than average, or perhaps more interestingly, because they have more or less income inequality or more or less emphasis on community policing?

Our team at the University of Utah developed sprawl measures for 994 metropolitan counties and 221 metropolitan areas in the country. I wonder if this sprawl variable, which is also subject to influence by planners, explains some of the scatter in crime statistics.

The authors of the paper I reviewed proudly trumpet their approach: "The dependent variable is crime counts instead of crime rate . . . " and " . . . the only independent variable to be examined is the population size of cities." Such bravado. They estimate the constants a and b in the above formula for 176 different years and types of crime using simple regression analysis, and get R2s typically in the neighborhood of 0.7.

Hopefully, in light of the preceding arguments, the shortcomings of their approach are readily apparent to the reader. Interestingly, the authors of the reviewed paper describe several studies that investigate crime in a smarter way, examining "the partial effect of population [on the] crime rate by incorporating a number of socio-economic covariates in their analyses."

Needless to say, I recommended rejection of the reviewed paper in its original form. The authors of the paper failed to grasp an essential point—that a couple of physicists may not have that much to tell planners.

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LETTERS
Detroit's side of the story
The comeback of Detroit's Midtown area ("Is Midtown the New Detroit?" July) was realized because of decades of investment through planning efforts facilitated by the city's Planning and Development Department and the City Planning Commission. It may be true that the Midtown organiza-

tion received city funds only recently, but as Gary Sands alluded to, the city has been funding the area for decades.

The city approved Community Development Block Grant and HOME funds for various groups in the area, including Mid-City CDC (Citizen District Council), Brush Park CDC, Art Center CDC, the Cass Corridor Neighborhood Development Corporation, and University City CDC, largely for housing rehabilitation administration of urban renewal planning. These funds helped to stabilize the area and set the stage for the designation of the Empowerment Zone that infused additional millions into Midtown in the late 1990s.

Much of the planning that occurred centered on preservation of architecturally historic buildings and affordable housing delivery. The outcomes demonstrate that it is most effective to target physical development strategies to areas of strength while allocating resources for retention strategies and public services in the more hard-hit areas. The Midtown organization used this methodology as it worked to improve blocks containing Wayne State University assets and moving south toward the CBD and north toward New Center, taking a block-at-a-time approach.

—Robert C. Davis, AICP Former planning director, Planning and Development Department Detroit

It's elementary
It is encouraging to hear about the CS 300 green infrastructure playground project ("NYC Makes Play More Sustainable," News, October). I agree that public-private partnerships are necessary to meet the park needs of dense and established cities. In recent years, the Community-School-Park program developed by People for Parks (peopleforparks.org/community-school-parks) has helped make maximum use of existing facilities here in Los Angeles by opening up elementary schools for public recreation.

The plan also calls for replacing asphalt on school playgrounds with lawns and trees, and the creation of new joint

use facilities that serve the community as both schools and parks. This approach is slowly being implemented, with two projects completed a few years ago.

Ideally, school facilities should be planned, constructed, and used in ways that allow them to serve the requirements of schools and the community at large. In reality, however, schools are under the jurisdiction of school districts formed with an important, but narrow mission: to meet students' educational needs. Intervention by local or state political leaders may be necessary to make joint use happen.

Over the years, I have learned that discussions and negotiations at the staff level can drag on for extended periods with limited or no progress because of the complexity of such arrangements and the bureaucratic nature of the organizations. To expedite matters and actually reach joint use agreements, there needs to be political will and community support.

The joint use of schools as recreational facilities has been successful in many California communities. Local jurisdictions and school districts should continue working together to pursue projects that meet both the educational and recreational needs of communities, especially those that lack parks and other amenities.

—Clement Lau, AICP Departmental Facilities Planner II Los Angeles County Department of Parks and Recreation

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Life of Nolen
John Nolen died in 1936, after the Depression shredded his planning practice and as modernists were taking over his profession. His view of planning as art applied to landscape was being tossed into the dustbin of history. In 1973 St. Petersburg, Florida, unwittingly paralleled Nolen's 1923 plan for the city—the only copy of which was "boxed in the Cornell University archives."