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Kevin R. Reitz

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Measuring Changes in Incarceration Rates: Shifts in Carceral Intensity as Felt by Communities

Kevin R. Reitz †

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INTRODUCTION

Incarceration rates (numbers of prisoners per capita) are a basic indicator of how government's use of the prison sanction permeates into the population as a whole—a concept I will call *carceral intensity*. If we view incarceration as a subtraction from the life of a community—or a succession of blows that are "felt" by the community—then the density

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† James Annenberg La Vea Professor of Criminal Procedure, University of Minnesota Law School; Co-Director, Robina Institute of Criminal Law and Justice. This article grew out of a series of conversations with Frank Zimring, Anthony Doob, Richard Frase, and Tapio Lappi-Seppälä. My thinking was advanced by the approach used in Cheryl Marie Webster & Anthony N. Doob, *Penal Optimism: Understanding American Mass Imprisonment from a Canadian Perspective*, *in* AMERICAN EXCEPTIONALISM IN CRIME AND PUNISHMENT 126–27, 128–29 tbl. 3.1, 169 n.7, 179–80 app. 3A.1. (Kevin R. Reitz ed., 2018),

of coercive "hits" within a geographic area or population group is a matter of compelling social importance.

Incarceration rates are capable of conveying the human stakes of prison policies with leaden force. For example, The Pew Charitable Trusts published a much-cited finding that "1 in 100" American adults were in prison or jail at yearend 2006—or "1 in 54" adult males.[1] Such measurements become especially vivid when we unpack the confinement rates of racial and ethnic minorities. For example, Pew's researchers also reported that approximately "1 in 9" black men aged 20–34 were in prison or jail.[2] This is a finding that should rivet everyone's attention.

As a statistical tool, incarceration rates hold tremendous power and rhetorical meaning. For those interested in the past and future of mass incarceration in America, incarceration rates are starting points for debate, basic units of research, sources of insight, triggers of moral emotions, and bullet points for advocacy. Accordingly, they should be treated with care. We should be wary about statistical uses that are nonsensical or misleading. Unfortunately, this is already a problem in the young field of incarceration scale (IS).[3] As shown in this paper, it is surprisingly problematic to measure and describe trends in carceral intensity over time.

Change in incarceration rates—on a magnificent scale—has been a defining feature of American criminal justice over the last several decades. From 1972 to a peak in 2007-08, the nation's prison-and-jail confinement rate quintupled, putting the U.S. firmly in the "world-leadership" position. Astonishingly, all states and the federal system participated in this upward drive, albeit to varying degrees.[4] Since 2008,

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[1] Pew Center on the States, One in 100: Behind Bars in America 6 tbl. A-6 (2008).

[2] *Id*. at 6.

[3] The field of IS investigates how and why different prison rates exist across different societies and legal systems, and how and why they change over time. It includes normative questions of how high or low imprisonment rates should be. It also embraces questions of practical importance: the ways in which governments and system-participants can engineer deliberate changes in incarceration rates toward desired policy goals. Frank Zimring and the late Gordon Hawkins created IS as a serious field of study, and provided what is still one of its most imaginative demonstrations. *See* FRANKLIN E. ZIMRING & GORDON HAWKINS, THE SCALE OF IMPRISONMENT (1991).

[4] *See* ZIMRING & HAWKINS, *supra* note 3, at 137–55 (analogizing the 50 states to 50 different countries). For example, the highest prison rate among all states in 2016 was 5.5 times the lowest rate. *See* E. ANN CARSON, BUREAU OF JUSTICE STATISTICS, PRISONERS IN 2016 (2018), 9 tbl. 7 (Louisiana's rate was 760 per 100,000 residents; Maine's was 137). Comparable variations exist for other forms of criminal punishment, too. For example, the highest state probation-supervision rate in 2016 was seven times the lowest. DANIELLE KAEBLE, BUREAU OF JUSTICE STATISTICS, PROBATION AND PAROLE IN THE UNITED STATES, 2016 (2018), at 13-14, app. tbl. 2. The differential in parole supervision

there have been modest declines in carceral intensity across the country as a whole (half of the drop comes from California alone). Today, many people at the national, state, and local levels hope to see significant reductions in America's prison and jail populations. The subject of American incarceration policy, past and future, forces us to think in terms of large increments of change.

This article is about how we quantify and perceive changes in incarceration rates, what we mean when we say that some states have had more incarceration growth than others, and what metrics we should treat as "success" when states experiment with prison-population controls. Because American states have broadly diverse systems of criminal punishment, it is important to ask which states and system-types had "more" versus "less" uncontrolled growth during the nation's prison buildup decades.[5] Now that the peak of the buildup appears to have passed, it will be just as urgent to study the records of jurisdictions that adopt reforms intended to reduce their prison rates, isolate instances of success, and explore why some states continue to increase their use of confinement.[6] Indeed, it is hard to imagine *not* asking comparative questions about incarceration-rate change when charting course toward the possibility of a post-mass-incarceration era.[7]

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rates was an incredible 47:1. Pennsylvania was highest with a rate of 1,097 per 100,000 adult residents, while Virginia was lowest at 25. I*d.* at 18-19, app. tbl. 5. Across states, the uses and intensity of economic sanctions and collateral consequences of conviction are widely diverse, too, although these sanction-types are not distillable into statistical rates. *See* ALEXES HARRIS, RUSSELL SAGE FOUNDATION, A POUND OF FLESH: MONETARY SANCTIONS AS PUNISHMENT FOR THE POOR 49-69 (2016); COUNCIL OF STATE GOVERNMENTS JUSTICE CENTER, NATIONAL INVENTORY OF COLLATERAL CONSEQUENCES, https://niccc.csgjusticecenter.org.

[5] *See* Tapio Lappi-Seppälä, American Exceptionalism in Comparative Perspective: Explaining Trends and Variation in the Use of Incarceration, in AMERICAN EXCEPTIONALISM IN CRIME AND PUNISHMENT (Kevin R. Reitz, ed., 2018) (conducting a multi-decade analysis of incarceration-rate trends across nations, and across different states within the U.S).

[6] For example, Franklin Zimring suggests that California's "realignment" experiment, created to comply with a federal-court order to dramatically reduce the state's prison population, may in some ways serve as a model for other states that want to reduce their prison rates (albeit in the absence of a court order). *See* FRANKLIN E. ZIMRING, THE INSIDIOUS MOMENTUM OF MASS INCARCERATION (forthcoming 2019). Zimring draws other lessons from a state-by-state analysis of prison-rate trends since 2007, including his view that the U.S. has entered a new era of "chronic" mass incarceration, which is likely to persist without large-scale changes in the legal and institutional structures of criminal law enforcement and punishment. *Id.* For the judicial spur toward realignment in California, *see Brown v. Plata*, 563 U.S. 493 (2011).

[7] In America's federal system, all 50 states ideally are capable of learning from each

This paper examines a foundational question of measurement in the IS field: When comparing the U.S. with other countries, or when analyzing the different etiologies of mass incarceration across American states, should changes in imprisonment rates be stated as the *percentage of change* in rates from Time 1 to Time 2, or as the *absolute change* in rates? This can be abbreviated as a choice between the percentage-change method (PCM) and the absolute-change method (ACM). To illustrate the alternatives using Bureau of Justice Statistics data, we can say that the prison rate in Mississippi rose by 786 percent from 1972-2008—a *percentage-change* measure. Alternatively, we can say that Mississippi's prison rate rose by 652 per 100,000 general population over that time period—an *absolute-change* approach.[8] Either statement is based on a reported increase in Mississippi's prison rate from 83 per 100,000 general population in 1972 to 735 per 100,000 in 2008.[9]

Both calculations are mathematically impeccable, but which of the two measures gives us the most useful information from a policy perspective? This simple methodological riddle has large implications for how we perceive comparative prison growth across jurisdictions, and the policy conclusions we draw from those observations.

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other. If one state develops a particularly successful approach to a problem (such as deliberate management of prison rates), the idea can be exported to other states. *See New State Ice Co. v. Liebman*, 285 U.S. 262 (1932) (Brandeis, J., dissenting). The "laboratory-of-innovation" process collapses, however, if states have faulty criteria for distinguishing successes from failures in other jurisdictions.

[8] This paper deals only in state *prison* rates. For many research purposes, a better measure of incarceration scale within the U.S. would combine both prison and jail rates of confinement. In most states, roughly speaking, jail populations are about one-third the size of prison populations, although the ratio varies. Unfortunately, the federal government has not compiled jail population counts on an annual basis, with many missing years in the distant and recent past. One new resource worthy of note is the Vera Institute's interactive website, *Incarceration Trends*, at http://trends.vera.org/incarceration-rates (last visited March 14, 2018.) Vera has generated state-by-state and county-by-county estimates of jail confinement rates, the portion of jail confinement that is pretrial confinement versus sentenced offenders, and jail admissions going back as far as 1970. At present the resource is cumbersome to use, however, as the website is designed to click-and-show only one data-point at a time.

[9] Unless otherwise noted, all prison-rate statistics mentioned in text for individual US states from 1972-2008 are taken from BUREAU OF JUSTICE STATISTICS, SOURCEBOOK OF CRIMINAL JUSTICE STATISTICS, 1990 (1991), at 605 tbl. 6.56 (for years 1972-1983); UNIVERSITY AT ALBANY, HINDELANG CRIMINAL JUSTICE RESEARCH CENTER, SOURCEBOOK OF CRIMINAL JUSTICE STATISTICS ONLINE tbl. 5.29.2012, https://www.albany.edu/sourcebook/pdf/t6292012.pdf, (last visited March 13, 2018) (for years 1984-2008). State-by-state prison rates in 1972 and 2008, ranked by state for each year, are shown in Appendix Table 5.

What gives this article significance, and justifies its extended analysis, is that the PCM is overwhelmingly the favored measure within the IS field, government agencies, the criminal justice profession generally, and the media. It is very difficult to persuade people they should rethink its use. And yet, for the purposes of measuring prison-rate change, especially when the task at hand involves comparisons across jurisdictions, long time periods, or different time periods, the PCM is deeply flawed. It tells us a story that is true but largely irrelevant to the values important to human beings, communities, and societies when thinking about incarceration growth. It tells us nothing about variations in carceral intensity or, worse, points us in the wrong direction. This article will argue that the ACM—or some other alternatives one might suggest—would give us clearer vision into the past and future of American incarceration policy.

A. Three Illustrations of the Problem

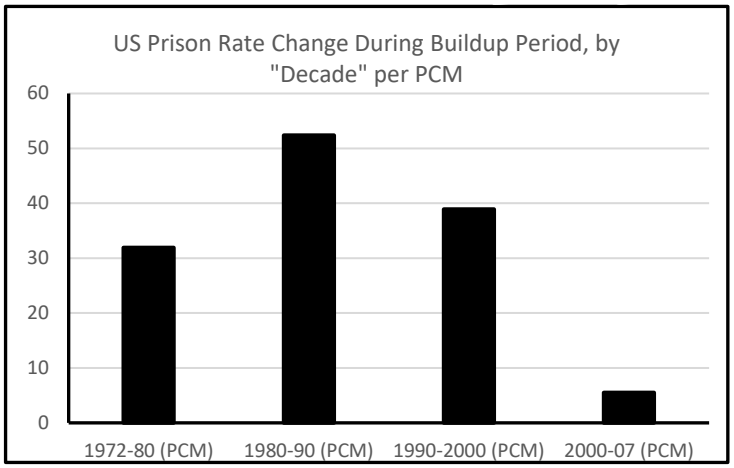
Observations based on percentage change can be tricky. On the day my son turned two years old, the ratio between our numerical ages was nearly cut in half. More precisely, his age increased by 100 percent from his first to second birthdays. Over roughly the same year, my age increased by 2.2 percent. As Frank Zimring has told me more than once, younger people are always aging at a faster *rate* than older people. The younger they are, the higher the rate. Yet everyone ages one year at a time, stated as an absolute increment. In that fateful year, from 2004 to 2005, did my son really age 4,500 percent "more" or "faster" than me? Or did we both age one year? Both answers are mathematically correct, but both do not *feel* right as a matter of human significance.[10] In statistical terminology, the question is not which measure is more "accurate," but which is more "relevant" to the concerns of the people who make use of the observation.

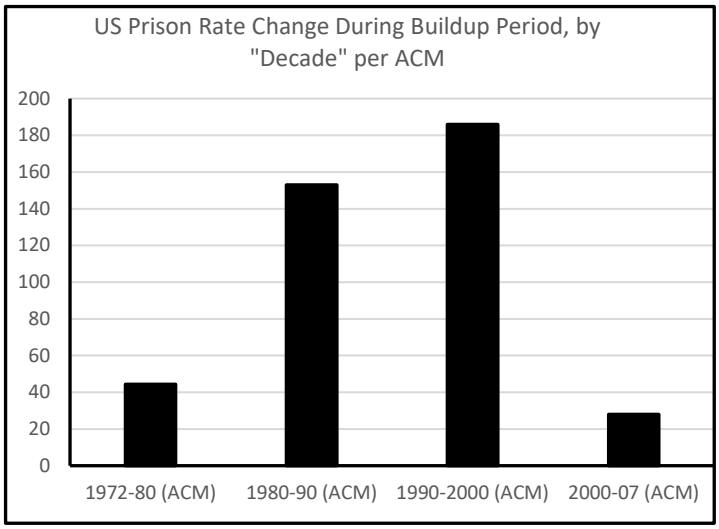
Related difficulties occur when we try to measure and report changes in the use of incarceration. Figure 1 compares the two very different historical accounts of the American prison-buildup period that are provided by the PCM and the ACM. On the top half of the figure, the "PCM version," the decade in which the biggest surge in national prison growth occurred appears to be the 1980s. Further, the PCM bar chart indicates that there was more growth in prison rates in the 1990s than in the 1970s, but not by a dramatic amount. One might conclude that, whatever forces were at work to drive U.S. prison rates skyward, they

[10] Curiously, the subjective experience of aging is one of *ever-increasing* speed.

were at their greatest strength in the 1980s, with substantial tapering off in the following two decades. The path upward to the peak of the prison-growth era, and the retreat back downward, is somewhat smooth and rounded.

Figure 1. Different Accounts of the U.S. Prison Buildup Period, 1972 to 2007, Percentage-Change versus Absolute-Change Measure[11]





[11] U.S. DEPT. OF JUSTICE, BUREAU OF JUSTICE STATISTICS, SOURCEBOOK OF CRIMINAL JUSTICE STATISTICS—1990 605 tbl. 6.56 (1991) (for years 1972-1983); UNIVERSITY AT ALBANY, HINDELANG CRIMINAL JUSTICE RESEARCH CENTER, SOURCEBOOK OF CRIMINAL JUSTICE STATISTICS ONLINE, tbl. 6.29.2012, https://www.albany.edu/sourcebook/pdf/t6292012.pdf (last visited March 13, 2018) (for years 1984-2008); JUSTICE STATISTICS ONLINE, tbl. 6.29.2012, https://www.albany.edu/sourcebook/pdf/t6292012.pdf, (last visited March 13, 2018) (for years 1984-2008).

The lower chart in Figure 1, the "ACM version," supports a narrative of events quite different from the PCM. Per the ACM, it is during the 1990s that the nation moved most aggressively toward mass incarceration, with steady *acceleration* in prison-rate growth across decades from the early 1970s to sometime near the end of the century. Furthermore, in contrast with the PCM's visual suggestion, the 1970s and 1990s were starkly different sub-periods within the prison buildup decades according to the ACM. Whatever was going on in the 1990s, it was producing national prison-rate change at *four times* the velocity seen in the 1970s. Finally, the ACM makes it appear that the American rush to mass incarceration "hit a brick wall" around the turn of the century, after accelerating right up to the point of impact. The visual metaphor is a cliff rather than a curve.

It is important to tell a historically meaningful story about what happened across the U.S. during the prison buildup decades. For those of us who have been in the IS field for any length of time, the ACM bar chart does a better job than the PCM in describing the late-20th century American experience. The number of prisoners added to the national total from 1972 to 1980 was 108,600. From 1980 to 1990, it was 470,338. From 1990 to 2000, it was 616,231.[12] While these raw numbers are not corrected for population growth (that is the sole task performed by the ACM), they tell an "accelerating-growth" story across the three decades rather than a "peaked-in-the-1980s-then-slowed-down" story. Also, when looking at the raw numbers, it is very hard to say that the growth in American prisons was roughly comparable in the 1970s and 1990s, as the PCM indicates. I do not know any critic of mass incarceration who says the '70s were "nearly as bad" as the '90s.

The source of these quantitative discrepancies is simple. The heights of the four bars on the "PCM side" of Figure 1 are skewed by the fact that each percentage-change calculation is made with a radically different denominator. At the beginning of each decade displayed, the denominator changes to absorb all of the prison-rate growth in the previous decade. One might say that the unit of prison-rate change in the PCM goes from apples-to-oranges-to-cantaloupes from the 1970s through the 1990s. In contrast, the basic rules of measurement do not heave around

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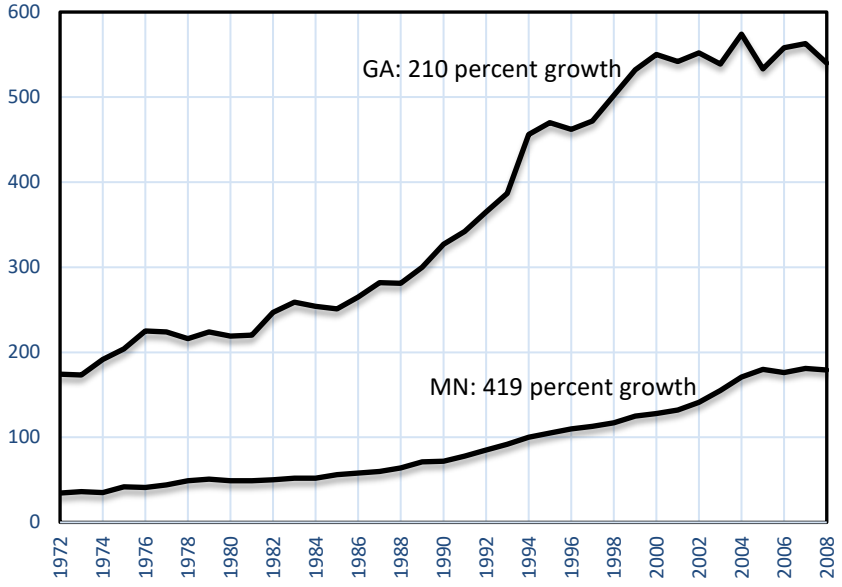
[12] Patrick A Langan, et al., Bureau of Justice Statistics, Historical Statistics on Prisoners in State and Federal Institutions, Yearend 1925-86 11, 13, tbl. 1 (1988); Tracy L. Snell & Danielle C. Morton, Bureau of Justice Statistics, Prisoners in 1991 2 tbl. 2 (1992) (reporting final counts for 1990); Paige M. Harrison & Allen J. Beck, Bureau of Justice Statistics, Prisoners in 2001 3 tbl. 3 (2002) (reporting final counts for 2000). According to these sources, the total numbers of state and federal prisoners in the U.S. were 196,092 (1972), 304,692 (1980), 775,030 (1990), and 1,391,261 (2000).

from decade to decade under the ACM. The only mathematical filter applied to the raw numbers of prison-population change is to correct for growth in the general population.

Aside from the question of which of the two measures is better, it is clear that the PCM and ACM give startlingly different "objective" portrayals of a ground-shaking period in American criminal justice history. At least one of the two measures is showing us a distorted picture, as if through a fun-house mirror.

Figure 2 provides a third example of the stakes involved in choosing between the PCM and ACM, this time focusing on the comparative experiences of two American states over the nation's prison-buildup period. Georgia's prison rate increased from 174 to 540 per 100,000 general population from 1972 to 2008. Minnesota's rate increased from 35 to 179.

Figure 2. Prison Rate Trends in Georgia and Minnesota, 1972 to 2008[13]



If we choose to rely on the PCM, we would say that Minnesota had twice as much prison-rate growth as Georgia (419 percent versus 210 percent) over the prison buildup decades. If we switch to the ACM, we would calculate that Georgia experienced growth in its prison rate of 366

[13] *See supra* note 12.

per 100K, while Minnesota's growth in rate was 146 per 100K. By this yardstick, Georgia had more than twice as much prison-rate growth as Minnesota (by a ratio of 2.5:1). In describing the histories of the two states in the buildup era, the PCM and ACM give *more-than*-diametrically-opposed accounts.

To most people who have seen it, the visual message in Figure 2 fights against the percentage-change statement that Minnesota had much more prison growth than Georgia. Subjectively, to pre-publication readers, the ACM captures the figure's two-dimensional import better than the PCM. We can cross-examine this impression with some value-laden questions: Does the PCM allow us to gauge the relative human impact of the growth in prison scale in Minnesota and Georgia, or does the ACM do a better job? In which state did the average person's risk of imprisonment increase by more? Should we permit ourselves to conclude that Georgia was a "low" prison-rate-growth state compared with Minnesota? Let us assume there are other states that want to reform their sentencing systems to resist unplanned prison expansion in the future. Should Georgia be their "go-to" model over Minnesota, as the PCM suggests? Or is Minnesota the better source of ideas?[14] If we see mass incarceration as a serious problem, which of the two states contributed more to the problem? Should we be more concerned about what happened in Minnesota or in Georgia from 1972 through 2008? Should we be *twice* as concerned about Minnesota?

To my eye, the ACM is a more faithful shorthand for the graphic information in Figure 2 than the PCM. Starting from a much lower position, it took Minnesota 36 years to catch up to Georgia's *starting* prison rate in 1972. If I had to decide which of the two states most needed to change its way of doing things in the coming years, it would be Georgia. In this example, the ACM outperforms the PCM as a policy-relevant statistical tool.

B. PCM versus ACM: 50-State Rankings

Let's say we want to compare states' experiences during the prison buildup period, 1972-2008, ranking states from the "most" to

[14] Both the American Bar Association and the American Law Institute have explicitly used the "Minnesota model" as the foundation for law-reform recommendations addressed to all American states. *See* AMERICAN LAW INSTITUTE, MODEL PENAL CODE: SENTENCING, PROPOSED FINAL DRAFT (approved May 24, 2017); AMERICAN BAR ASSOCIATION, STANDARDS FOR CRIMINAL JUSTICE, SENTENCING, THIRD EDITION (3d ed.1994). As far as I know, there is no one who advocates the "Georgia model" as a source of ideas on the restraint of prison growth.

"least" prison growth. Perhaps we want to identify the ten states that had the most prison expansion, to see if those states also had unusually high violent crime rates or unusually low levels of social welfare provision.[15] Perhaps we want to select the ten lowest-growth states so we can study whether there was something about their sentencing systems that tended to inhibit prison-population growth.[16] Perhaps we want to compare the track records of different sentencing-system "types." For example, did states with discretionary parole release have less prison growth than the minority of "determinate" states that abolished parole release?[17] Perhaps we would like to add Western European countries to the 50-state rankings, to shed an international perspective on the U.S. prison buildup period.[18] Perhaps we merely want to pass moral judgment on individual states. Many researchers make lists like these as the starting point for further statistical or policy analyses. Policy makers and system participants generally consider multi-jurisdiction rankings useful and provocative.[19]

Even the most sophisticated analyses of incarceration trends suffer from "garbage-in" vulnerability. To derive the 50-state continuum from "most" to "least" prison expansion, we must choose the best available method. As we will see, the choice *really* matters.

To contrast the operations of the two measures when comparative rankings are drawn, Table 1 ranks the top ten states in prison growth according to the PCM (left column) and ACM approaches (right column).

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[15] *See* Tapio Lappi-Seppälä, *supra* note 6 (analyzing state-by-state prison population expansion and other possible correlates of dramatic prison growth, across American states and across developed nation-states).

[16] *See* Don Stemen & Andres F. Rengifo, Policies and Imprisonment: The Impact of Structured Sentencing and Determinate Sentencing on State Incarceration Rates, 1978–2004, 28 JUST. Q. 174 (2010) (conducting a related study).

[17] *See* America Law Institute, Model Penal Code: Sentencing, Tentative Draft No. 2 144–59 (2011).

[18] *See* Franklin E. Zimring, The Insidious Momentum of Mass Incarceration (forthcoming 2019).

[19] In my experience, every time a multi-state ranking is presented on a topic having to do with criminal-justice topics, the relevant officials and practitioners in most states are keen to know where they are ranked in relation to everyone else. A 50-state ranking is catnip to people's curiosity, and most people read connotations of judgment into their own state's position. For example, I once brought a new, unpublished chart to a national meeting of state sentencing commissions. The chart showed how much prison growth each sentencing-guidelines state had experienced during the years their guidelines had been in effect. I was mobbed. Also, I think the representatives of the Pennsylvania Sentencing Commission were embarrassed to be in the highest-growth slot by a comfortable margin.

Table 1. Top Ten States: Most Prison-Rate Growth, *Percentage-Change* Measure (PCM) v. *Absolute-Change* Measure (ACM), 1972-2008[20]

***PCM* Top Ten in Prison-Rate Growth**	***ACM* Top Ten in Prison-Rate Growth**
Idaho	Louisiana
Delaware	Mississippi
Montana	Oklahoma
Louisiana	Alabama
Mississippi	Texas
Vermont	Arizona
Oklahoma	Missouri
Hawaii	Arkansas
Wisconsin	Idaho
South Dakota	Florida

The alternative top-ten selections in Table 1 are not much alike. The states that appear on the respective top-ten lists are largely different; there is agreement across the two lists on only four states. Some instances of disagreement are bizarrely pronounced when we cross-check the rankings of individual top-ten states on the PCM list with their positions among all 50 states on the ACM continuum. Montana ranks 3rd on the PCM high-growth list but does not appear on the ACM top-ten list. In fact, Montana ranks 27th by ACM calculation.[21] That is a "difference of opinion" of 24 slots out of 50, which is unsettling considering that the PCM and ACM are both supposedly quantifying the same objective phenomenon. The Montana discrepancy is hardly unique, however, as seen if we cross-check additional states. Vermont ranks 6th highest in prison-rate growth on the PCM list and falls to 38th per the ACM. Hawaii

[20] *See supra* note 12.
[21] *See infra* Table 2 (listing rankings for all 50 states under both methods).

drops from 8th (PCM) to 31st (ACM). Wisconsin drops from 9th (PCM) to 26th (ACM).

The incongruities run in both directions: Ranked 5th on the ACM top-ten roster, Texas is not anywhere near the top ten on the PCM scale. In percentage-change, Texas ranks 35th out of 50 in prison-rate growth over the buildup period. For those troubled by mass incarceration, the PCM suggests that Texas is among the least of our worries. More anomalies like this can be found: Florida, 10th on the ACM index as a high-growth state, plummets to 43rd in percentage change. Alabama is 4th per ACM and 23rd under the PCM.

With erratic results like these, it is unlikely that both measures can be "correct" in the sense of giving us information that is relevant to the human consequences of incarceration growth. The remaining sections will investigate further, from a number of angles.

PART 1. STATIC MEASUREMENT OF CARCERAL INTENSITY

In deciding on an appropriate measure of change, it is helpful to begin with the subject of *static* measurement of incarceration scale. Cross-sectional or "snapshot" descriptions of the size of a state's prison system usually reflect the total number of prisoners residing in a state's prisons on any given day. On December 31, 2016, for example, BJS reported that the Louisiana prisons held a total of 35,628 inmates and the California prisons held 130,390.[22] This raw-numbers comparison is of limited use in comparing the prison policies of the two states, however, until we ascertain that California's general population is about eight times the size of Louisiana's.[23] For comparative purposes, per-capita observations carry greater meaning than unadjusted raw numbers.

This concern has given rise to many forms of per-capita measurement of incarceration scale, including the ubiquitous *prisoners-per-100,000-population* unit.[24] When ranking states cross-sectionally,

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[22] E. Ann Carson, Bureau of Justice Statistics, Prisoners in 2016 4 tbl. 2. (2018).

[23] U.S. CENSUS BUREAU, 2018 NATIONAL AND STATE POPULATION ESTIMATES (2018), Table 1. Annual Estimates of the Resident Population for the United States, Regions, States, and Puerto Rico: April 1, 2010 to July 1, 2018, at https://www.census.gov/newsroom/press-kits/2018/pop-estimates-national-state.html.

[24] When deriving rates of confinement in a jurisdiction's adult institutions, it might make greater sense to use the jurisdiction's adult population rather than general population as the denominator. *See* Richard S. Frase, *A Consumers' Guide to Sentencing Reform: Reflections on Zimring's Cautionary Tale*, 23 BERKELEY J. CRIM. L. 1 (2018). Throughout this article I will rely on the general-population denominator simply because it is the unit used in U.S. Bureau of Justice Statistics prison and jail reports.

prison *rates* gives us more policy-relevant information than raw numbers precisely because rate-per-100,000 is an indicator of carceral intensity. As Zimring and Hawkins concluded in *The Scale of Imprisonment*:

> Rates of imprisonment [as opposed to "numbers of offenders in prison"] provide better information regarding the relative importance of the prison enterprise to the general society. What are trends in imprisonment relative to the growth or stability of the general population? What fraction of society's population is being brought under this form of social control?[25]

For snapshot assessments across more than one jurisdiction, there is no controversy among IS scholars that it is best to use per-capita rates. If this consensus is correct, then the per-capita principle is probably worth building on when we express *changes* in incarceration scale.

PART 2. PERCENTAGE CHANGE VERSUS ABSOLUTE CHANGE

Prison and jail statistics should ideally connect to human values and community experience. When designing a standard unit to track *changes over time* in prison rates, what are our values and priorities? In my view, it is most important to state the amount of any new increment of carceral intensity (or diminution of intensity) that has occurred in a jurisdiction. The statement should be compatible across jurisdictions. We should principally be concerned with changes in human displacement that readers or hearers can wrap their heads around. (Human brains process some kinds of statistical observations better than others.) And, of course, the measure we choose should not deliver absurd results. It should be able to survive basic reality checks.

The mathematical formulas for the PCM and ACM tell us what considerations are fed into their results. Below are the computational steps needed to calculate percentage change and absolute change in prison rates over a defined time period:

$$\boldsymbol{Percentage\ change\ in\ prison\ rate\ from\ Time\ 1\ to\ Time\ 2}$$

$$\left(\left(\frac{Prisoners\ at\ Time\ 2}{100{,}000} - \frac{Prisoners\ at\ Time\ 1}{100{,}000}\right) \div \frac{Prisoners\ at\ Time\ 1}{100{,}000}\right) \times 100$$

$$\boldsymbol{Absolute\ change\ in\ prison\ rate\ from\ Time\ 1\ to\ Time\ 2}$$

$$\left(\frac{Prisoners\ at\ Time\ 2}{100{,}000} - \frac{Prisoners\ at\ Time\ 1}{100{,}000}\right)$$

The first thing to notice in the PCM formula is that the "per 100K" operation drops out when calculating percentage change in prison rates. (This happens when you get to the division sign in the top formula.) This

[25] ZIMRING & HAWKINS, *supra* note 3, at 121.

means that per-capita information is algebraically removed from the result. The disappearing act can be seen in a simplified statement of the percentage change formula (performing the division ahead of time):

$$\boldsymbol{Percentage\ change\ in\ prison\ rate\ from\ Time\ 1\ to\ Time\ 2\ (simplified)}$$

$$\left(\frac{Prisoners\ at\ Time\ 2\ -\ Prisoners\ at\ Time\ 1}{Prisoners\ at\ Time\ 1}\right) \times 100$$

The ACM result, in contrast, retains the "per 100,000" term we found so useful when looking at cross-sectional measures of prison scale.

To me, this is a large point in favor of the ACM over the PCM. The PCM works at a higher level of abstraction than the ACM, and carries no information about the portion of the human population we're talking about. If we report a state's growth in prison rates as 20 percent over a specified period of time, we know neither the starting nor finishing incarceration rates in the state—*and* we have no idea how big a slice of the state's population was caught up by the 20-percent growth increment. The social meaning of "20-percent growth" could be just about anything.

Like the PCM, the ACM does not indicate starting and finishing incarceration rates—a shared weakness—but we *are* given important information about the human scale of the growth increment. We can envision what additional share of the population has been "hit" when carceral intensity increases between Time 1 and Time 2 (or what portion has been relieved by a drop in intensity). For example, by worldwide standards most experts would agree that a standing imprisonment rate of 400 per 100,000 is a high rate that carries considerable social impact. In the same way, if we are told that a state's prison rate has *increased* over 20 years by 400 per 100,000, an informed person can tell that the increment of change was a major societal event. The PCM would not give us the same insight into human scale if it stated, for example, that the increase was 55 percent of the starting rate.

If we are keeping score, the ACM continues to pull ahead.

PART 3. REALITY CHECKS

A supremely useful reality check of the PCM and ACM is to refer to two-dimensional representations of prison-rate changes in two or more jurisdictions—so long as we stipulate that all trendlines in the 2D chart must be shown on the same scale.[26] A 2D portrayal is superior to either the PCM or ACM—except for the crucial fact that it cannot be distilled to

[26] *See supra* Figure 2. If you are interested in changes in the intensity of a phenomenon across populations, beware 2D graphics that normalize all starting values to 100, or otherwise use more than a single y-axis scale.

a single value for purposes of statistical ranking. 2D graphs show us the starting points, endpoints, and winding growth curves for each jurisdiction—all of which are missing or simplified in calculations from two datapoints. Further, a 2D graph sacrifices none of the information captured in the PCM or ACM. We can visualize both percentage and absolute changes in prison rates at the same time and without tradeoffs.

Figure 3. Prison Rate Trends in Texas, Florida, New Hampshire, and North Dakota, 1972 to 2008[27]

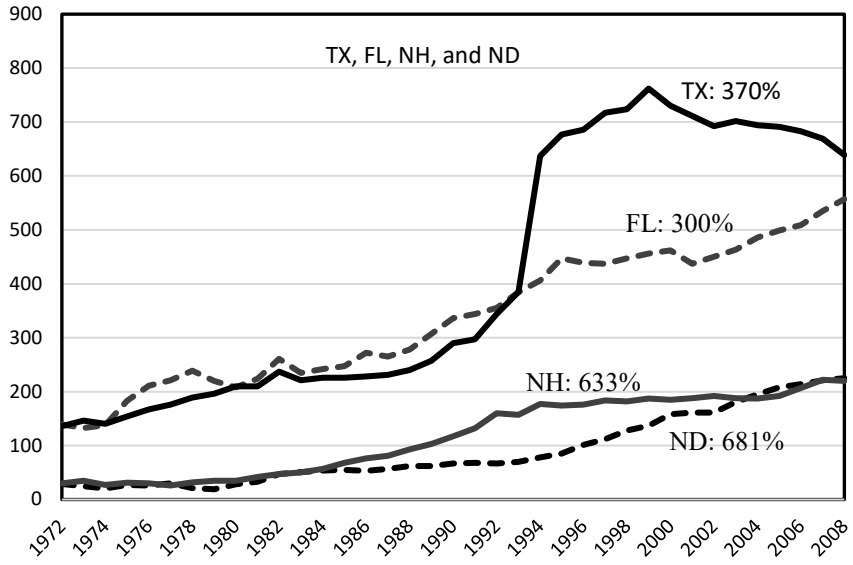

Figure 3 displays the prison-rate changes in four states from 1972-2008: Texas, Florida, New Hampshire, and North Dakota. At the peak of the buildup period, looking to 2008 "static" prison rates, Texas had the fourth highest prison rate in the country and Florida had the seventh highest. Given our sense of mass incarceration as a historic phenomenon of unprecedented scale, these are impressive "standings." North Dakota and New Hampshire were 46th and 47th among all states, near the bottom in 2008 prison rates.

Measured in percentage growth, however, North Dakota and New Hampshire had far more prison growth than Florida and Texas during the buildup years. Per the PCM, North Dakota and New Hampshire both had more than twice as much prison-rate growth as Florida, and nearly twice

[27] *See supra* note 12.

as much as Texas. The ACM flips these observations on their heads. The absolute difference in prison rates for the four states was Texas (503), Florida (418), North Dakota (196), and New Hampshire (190). Now it is Texas and Florida that had more than twice as much prison-rate growth as the other two states. Just as in Figure 2, the PCM results are more-than-diametrically-opposed to the ACM results.

This is because the PCM is held captive by its choice of denominator. There can only be one denominator for the entire PCM calculation of prison-rate change, no matter how sweeping a period of time we are assessing. In Figures 2 and 3, years of prison-growth history is expressed with reference to a single data point—each state's 1972 prison rate—which does double duty as a starting point *and* unmovable denominator.

The message communicated by the PCM has high manipulability depending on the rules used for selection of the denominator. This might be called the "sleight of hand of denominators." For example, we can reframe the PCM question as follows: What percentage of a state's prison rate in 2008 (the peak of the 50-state buildup) was the product of prison-rate growth since 1972 (the beginning of the buildup)? The answers for the four states in Figure 3 are:

Texas: 79 percent (of 639 per 100K)
Florida: 75 percent (of 557 per 100K)
North Dakota: 87 percent (of 225 per 100K)
New Hampshire: 86 percent (of 220 per 100K)

The "backwards-running" PCM numbers do not make the prison-growth histories of the four states look as starkly different as the forward-running calculations. Starting in 2008 and looking back, an average of 82 percent of each state's prison rate was due to growth between 1972 and 2008. New Hampshire and North Dakota are still ranked somewhat higher in prison-rate growth than Texas and Florida, but we do not get the impression that they experienced twice as much growth. (If we are allowed to peek at the 2008 denominators shown in parentheses above, any such impression is obliterated.)

Note that I am not recommending that we should run the PCM backwards as a way to cure its defects. It is a problematic method no matter which direction we go, because there is no common denominator across the four states in 1972 or in 2008. The distortion of nonuniform denominators is merely reduced if we start in 2008 and go backwards.[28]

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[28] The prison rates of Texas and Florida in 1972 (both beginning at the same point) were

The ACM gives *the exact same* measurements running forward and backward. How much growth did Texas have in its prison rates from 1972-2008? 503 per 100,000. Looking back from 2008, how much of Texas's finishing prison rate was the product of growth since 1972? 503 per 100,000. This is a comforting symmetry.

A. PCM-ACM Divergences Across All 50 States

The above examples are not freakish misrepresentations of how the PCM and ACM perform. As a matter of framing perceptions, identifying policy priorities, and passing judgment, switching between the PCM and ACM regularly yields inconsistent outcomes. Table 2 shows the disparate rankings of all 50 states in prison-rate growth from 1972-2008 according to the ACM (left-hand columns) and PCM (right-hand columns).

Table 2. State Rankings by Change in Prison Rates 1972-2008, Absolute Change Method (ACM) v. Percentage Change Method (PCM)[29]

Absolute change per 100K	ACM Rank	State	PCM Rank	Percentage change
531	4	**Alabama**	23	513
369	19	**Alaska**	15	605
490	6	**Arizona**	13	637
431	8	**Arkansas**	22	536
383	16	**California**	28	457
386	15	**Colorado**	25	474
348	24	**Connecticut**	17	586
414	11	**Delaware**	2	839

about 4.5 times higher than those in New Hampshire and North Dakota (both beginning at the same point). By 2008, there were still appreciable discrepancies in denominators, but they had shrunk. New Hampshire and North Dakota ended up at about the same prison-rate level in 2008, but Florida stood at 2.5 times their shared rate and Texas was down to 2.9:1. *See infra* Appendix Table 5.

[29] *See supra* note 12.

418	10	**Florida**	43	300
366	20	**Georgia**	48	210
293	31	**Hawaii**	8	756
424	9	**Idaho**	1	856
301	30	**Illinois**	16	596
369	18	**Indiana**	24	507
246	36	**Iowa**	21	540
230	39	**Kansas**	40	312
403	12	**Kentucky**	29	450
761	1	**Louisiana**	4	825
105	50	**Maine**	46	226
264	34	**Maryland**	49	189
186	46	**Massachusetts**	19	579
394	14	**Michigan**	31	420
145	49	**Minnesota**	32	419
652	2	**Mississippi**	5	784
434	7	**Missouri**	18	581
329	27	**Montana**	3	832
184	47	**Nebraska**	44	293
365	21	**Nevada**	42	301
190	45	**New Hampshire**	14	633
226	40	**New Jersey**	41	312
260	35	**New Mexico**	26	467
243	37	**New York**	34	380

208	41	**North Carolina**	50	130
196	43	**North Dakota**	11	681
309	29	**Ohio**	47	221
584	3	**Oklahoma**	7	756
287	32	**Oregon**	38	340
340	25	**Pennsylvania**	12	647
204	42	**Rhode Island**	20	565
398	13	**South Carolina**	39	328
361	22	**South Dakota**	10	708
354	23	**Tennessee**	30	432
503	5	**Texas**	35	370
181	48	**Utah**	37	353
230	38	**Vermont**	6	767
383	17	**Virginia**	36	360
195	44	**Washington**	45	253
272	33	**West Virginia**	27	460
329	26	**Wisconsin**	9	733
311	28	**Wyoming**	33	411

There are many discrepancies in the rankings produced by the two measures. All 50 states change in rank when switching from the ACM to the PCM, and 29 states out of 50 shift by more than 10 positions.

One pattern emerges from Table 2: States with relatively low prison rates throughout the period 1972-2008 tend to be "penalized," *i.e.*, scored as higher-growth jurisdictions by the PCM. The states with the most upward movement in rank when switching from ACM to PCM are North Dakota and Vermont (both up 32 positions), New Hampshire (up 31), and Massachusetts (up 27). The PCM's opprobrium does not look justified when we consult 50-state cross-sectional measurements at Time

1 and Time 2. All four states were in the bottom ten for *static* prison rates (based on one-day counts) in both 1972 and 2008.[30]

The PCM can likewise be an unduly "forgiving" measure when applied to high-incarceration states. The states that move down in rank most dramatically when switching from ACM to PCM are Florida (down 33 positions), Texas (down 30), Georgia (down 28), and South Carolina (down 26). All four of these states were in the top ten for *static* prison rates in both 1972 and 2008.

When one works with PCM statistics, any number of oddities pop up. For example, in rankings by static incarceration rate, Minnesota went from 46th in 1972 to 49th in 2008. It could hardly have dropped further in relation to other states. Yet the PCM says all of the following states had *less* prison growth than Minnesota over the period: Florida, Georgia, Nevada, Ohio, South Carolina, Texas, Virginia, and ten others.[31] (The ACM places Minnesota at 49th in prison-rate growth from 1972-2008, with only Maine lower in the ranking.)

Table 2 suggests that the PCM regularly produces absurdities when generating rankings of prison-rate change. The ACM does not.[32]

PART 4. ASSESSING THE BENEFITS OF THE PERCENTAGE-CHANGE MEASURE

Percentage-change measurements are often useful, and it is fair to ask what advantages of the PCM this article has been overlooking.

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[30] *See infra* Appendix Table 5. In 1972 these were the bottom four states in static prison rate. Minnesota (up 17 per the PCM) was the fifth lowest in 1972 and the second lowest in 2008.

[31] Four of the named states are ranked in the top ten of prison growth from 1972-2008 by the ACM.

[32] *See* Marie Webster & Anthony N. Doob, *Penal Optimism: Understanding American Mass Imprisonment from a Canadian Perspective*, *in* AMERICAN EXCEPTIONALISM IN CRIME AND PUNISHMENT 169 n.7 (Kevin R. Reitz ed., 2018). Webster & Doob reached a similar conclusion:

> We include the "ratio" of the two rates [the PCM] for the sake of completeness. However, we do not believe that it is a very useful figure, in large part because it is driven so much by the starting rate in the early 1970s. This limitation is best illustrated by looking at the data for North Dakota—the state with the lowest 1971–1975 rate. Its "absolute change" in imprisonment is also fairly small. In fact, it has the tenth smallest increase in imprisonment in this 35-year period. But the ratio of the late 2000s rate over the early 1970s rate is the second largest in the United States. This description does not seem to portray what happened in North Dakota when one considers that its rate was the fifth smallest for the period 2006–2010.

Id.

Proponents of the PCM argue that it retains an important connection with each jurisdiction's starting incarceration rate at Time 1—not because it tells us what the starting point was—but because it standardizes the starting rates of all jurisdictions.[33] This in effect creates a different *y*-axis scale for every state. When Time 1 is the year 1972, it requires the *y*-axis values to vary by as much as 6:1 from one state to another.[34]

The best supporting argument for the PCM's standardization of starting rates is the claim that a state's prison rate at any given time reflects the history, context, culture, and existing prison capacity of that state—and such factors are likely to influence future changes in incarceration scale in proportion to their effects in the past.[35] To the extent this is true, we cannot expect a low-IS state's prison rate to change at the same *absolute* pace as a high-IS state's. Baseline expectations of change should instead be on a telescoping scale from state to state—and (according to the PCM) the scale we use in each instance is locked in by a state's earliest prison rate during the time period under examination. For the expansionist era of 1972-2008, it is a single data-point for each state—its prison rate in 1972—that determines that state's specific scale-of-measurement for the next 36 years.

Concededly, the absolute-change formula makes no attempt to control for states' different starting positions. In this respect, the ACM is unmoored when compared with the PCM. The question becomes whether the PCM's standardization of starting prison rates is beneficial—and *more*

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[33] *See* Lappi-Seppälä, *supra* note 6, at 262 n.25:

> The ratio approach [PCM] and the absolute-change approach are complementing perspectives on the same phenomenon. . . . In [some] instances the ratio-change perspective could well be more advisable. This is the case, for example, with comparisons that wish to convey a correct message about the relative magnitude of policy changes in two jurisdictions conducting very dissimilar penal policies. Thus, an increase of 50 prisoners per 100,000 inhabitants would signify only a modest increase for the United States, but in Finland it would double the number of prisoners. For a US reader an absolute change of 50 prisoners/population would not be deemed worth mentioning. An increase of 100 percent (only 50 prisoners/population) would mean a total catastrophe for the Finnish prison service, whereas in the United States this probably would be a matter of minor adjustment.

[34] *See infra* Appendix Table 5.

[35] *See* Franklin E. Zimring, *The Complications of Penal Federalism: American Exceptionalism or 50 Different Countries?*, *in* AMERICAN EXCEPTIONALISM IN CRIME AND PUNISHMENT 181, 190–91 (Kevin R. Reitz ed., 2018) ("When the growth in each state's rate of incarceration is not linked to previous rates of incarceration, . . . an important measure of the long-term propensity and capacity to imprison is taken off the table. The percentage change adds more information and is thus presumptively preferable.").

beneficial than the retention of per-capita carceral intensity information in the ACM.

Standardization of starting rates is justifiable if states are likely to experience similar *pro-rata* prison growth (or shrinkage) from their Time 1 baselines. The PCM includes an embedded assumption that a state with a 760 per 100,000 prison rate is just as likely to experience a 10 percent increase in rate over the next *x* years as a state beginning with a rate of 130 per 100,000. In other words, the higher-IS state would be just as likely to add 76 new prisoners per 100,000 in the next five years as the lower-IS state is likely to add 13 per 100,000. If both were to occur, it would be an equally remarkable or unremarkable event in both jurisdictions.

No one claims that the prison rate at Time 1 has a direct generative property that is linked to its subsequent growth (such as the amount of capital when investing in the stock market). The starting prison rate is instead used as a *proxy* for the multitude of causes that produced it. When we measure all later changes using the starting position as a denominator, we hang our hat on the idea that the past collection of causal forces (which got us to Time 1) can be expected to exert ongoing and proportional pushes and pulls on a state's prison rate into the future.

To explore this idea with a simplified example: If we believe there are sixteen important forces that have determined states' prison rates at Time 1, we would expect to see overall greater presences of those factors in a high-incarceration state than in a low-incarceration state. Moving forward from Time 1, perhaps for several decades, the PCM's baseline predicts that all sixteen factors (in combination) would continue to have the same relative horsepower in both states that they had prior to Time 1.

Similarly, the PCM predicts that, if there is decline in imprisonment, states with the highest starting rates should experience the largest absolute declines. (This makes my head hurt.) The baseline expectation is that a state like Louisiana is poised to go both up *and* down in outsized ways. For example, if a high-IS state starting with a prison rate of 760 per 100K were to show a drop of 76 per 100K, this would be "scored" the same as a reduction of 13 per 100K in a low-IS state starting with a prison rate of only 130 per 100K.

On this view, each state has its own *bandwidth* of anticipated carceral intensity, both up and down, and the forces fueling that intensity operate within similarly-proportioned bandwidths. If so, comparative measurements of the change should be corrected for—or squashed within—each jurisdiction's particular bandwidth. On this reasoning, we actually do want the *y* axes for some states to be set at one-sixth the scale as the *y* axes for other states.

The need-to-squash argument holds persuasive force for many people. There is considerable evidence that low-incarceration states tend to remain in the lower rungs over time.[36] A fair summary, however, is that the evidence is mixed. Webster and Doob noted both sides of the story in a 2018 study:

> Treating each of the states as a unit, there is a reasonably high correlation between the imprisonment rate of the states in the early 1970s and their imprisonment rate 35 years later (r = +.61).[37]

Yet Webster and Doob also found that this "reasonably high correlation" falls flat in some cases. For instance, they found the following pattern difficult to explain:

> [S]ix states (Massachusetts, Minnesota, Hawaii, Rhode Island, Montana, and Vermont) with almost identical 1971-1975 imprisonment rates (ranging from 37 to 43) ended up, 35 years later, with imprisonment rates ranging from 182 to 369.[38]

Table 3 below tests the need-to-squash hypothesis by tallying the 50 states from highest to lowest static prison rates in 1972, and then asking whether their 2008 rankings remained similar to their 1972 orderings, as the bandwidth theory predicts. The table shows each state's movement in the 50-state ladder over that 36-year period (positive numbers indicate movement toward higher incarceration rates relative to other states).

Table 3. Changes in State Rankings by Highest to Lowest Prison Rates, 1972-2008[39]

State	Change in Rank
Idaho	22
Delaware	20
Oklahoma	17
Arizona	16
Mississippi	14

[36] *See* ZIMRING & HAWKINS, *supra* note 3, at 151 (using data from 1980-1987).
[37] Webster & Doob, *supra* note 33, at 132.
[38] *Id*.
[39] *See supra* note 12. For state-by-state incarceration rates in 1972 and 2008, *see infra* Appendix Table 5.

State	Change in Rank
Missouri	13
Wisconsin	13
Montana	12
South Dakota	12
Louisiana	11
Hawaii	10
Arkansas	9
Alaska	7
Pennsylvania	7
Vermont	7
Connecticut	6
Alabama	5
Indiana	5
Illinois	4
North Dakota	4
Texas	2
Iowa	1
Kentucky	1
New Hampshire	1
Rhode Island	1
Colorado	0
Massachusetts	-1
South Carolina	-1
California	-2

State	Change in Rank
Florida	-3
Michigan	-3
Minnesota	-3
New Mexico	-3
West Virginia	-3
Virginia	-4
Tennessee	-5
Wyoming	-5
Georgia	-7
Nevada	-8
New York	-9
Maine	-10
Utah	-10
New Jersey	-12
Kansas	-13
Nebraska	-14
Oregon	-16
Ohio	-17
Washington	-20
Maryland	-21
North Carolina	-30

Table 3 should be read with caution,[40] but it makes one irrefutable

[40] The importance of each increment of movement is not uniform throughout the 50-state ranking. For example, Texas is shown in Table 2 as having moved up two slots from 1972-2008. However, Texas began in 1972 with the sixth highest prison-rate of all states.

point: Quite a few states shifted substantially in their positions relative to other states from 1972-2008. Twenty-one states moved by more than 10 positions. North Carolina, the most extreme of all, dropped 30 slots from the second highest prison rate in 1972 down to number 32 in 2008 (but only after moving up to first position in 1979-1980).[41] Idaho shot upward by 22 positions.

The affirmative case for the PCM loses traction if the actual experiences of states over long periods of time do not reliably fall within the bandwidths predicted at the starting line. Table 3 undercuts the notion that this is a *highly*-reliable expectation. Instead, borrowing from Webster and Doob, we might say it is more-often-than-not reliable. The bandwidth theory deserves regard in the IS field, but its blooper reel is too long to trust it as the standard baseline for measurement of prison growth.

PART 5. AN ALTERNATIVE BASELINE

If we believe a measure of prison-rate change should include *some* form of baseline expectation about future prison growth, there are tenable candidates other than proportional squashing based on a single data-point. Perhaps we should measure prison-rate change against expectations of *regression toward the mean* (RTM). Over substantial periods of time, one version of RTM would predict that states at the high and low fringes of the IS distribution would drift inward to look more and more like the average state.

There is reason to treat RTM as a credible baseline.[42] According to widely-accepted research findings, it ought to be harder for high-IS states to expand their prison rates than low-IS states, and vice versa. As Zimring and Hawkins pointed out in *The Scale of Imprisonment*, if all else

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From the beginning, Texas's upward change was limited to a maximum of five places. Any upward movement at all within the top 6 might be seen as a notable event. Similarly, Minnesota started in 46th position in 1972, so its potential downward change could not be more than four slots. Nothing that happened in Minnesota, including the closing of all its prisons, could have competed with North Carolina's 30-slot drop.

[41] BUREAU OF JUSTICE STATISTICS, *supra* note 12, at 605 tbl. 6.56.

[42] *See* Webster & Doob, *supra* note 33, at 132–33 (noting RTM as a plausible model, but dismissing the approach as contrary to the history of U.S. prison growth when the reference point is a fixed average of prison rates in the early 1970s):

> In intuitive terms, while all states might increase, a state that was anomalously low for some reason in the early 1970s would be expected to increase more than a state that was already very high simply because it had, after all, more "room" to increase. In contrast, a state that was already very high might be expected to increase less as it was already imprisoning large numbers of people. . . . This statistical phenomenon is *not* what happened.

is equal, high-imprisonment states have dipped "lower" into the supply of offenders to populate their prisons than low-incarceration-rate states:

> [The data show] that robbers and burglars in California prisons report robbery rates four times as high, and rates of burglary more than twice as high, as robbers and burglars in Texas prisons. The reason for this difference is that Texas has a much higher rate of imprisonment so that high-rate offenders make up a larger proportion of the California prison population than of the Texas prison population. . . . *Texas had already watered down its prison stock when the survey was taken by mixing in a greater number of low-rate offenders*. . . . As long as most high-rate offenders are already in prison, offenders at the margin will have much lower average crime rates than those already in prison.[43]

Bert Useem and Anne Morrison Piehl offered a similar argument:

> Arguing against further prison expansion, at whatever level, is the principle of diminishing returns to scale. If the most serious offenders are already in prison, prison growth requires the criminal justice system to reach deeper into the pool of prison-eligible offenders, such that increases in incarceration are less and less cost effective.[44]

I would add that, from a retributive perspective, the continuing expansion of prison rates in an already-high-prison-rate jurisdiction can be expected to reach offenders of ever-decreasing blameworthiness. The higher a state's prison rate, in theory, the harder it is to justify further expansion on utilitarian *and* desert grounds.

The diminishing-returns argument has several corollaries: It should be less costly in recidivism risk for high-IS states to reduce their prison rates than low-IS states, and reductions in high-IS states should draw less resistance based on retributive sentiment. Also, it should be more difficult for low-IS states to reduce their prison rates than high-IS states, because their average consequential and retributive costs would be

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[43] ZIMRING & HAWKINS, *supra* note 3, at 99–100 (emphasis added) (analyzing table from JAN M. CHAIKEN & MARCIA R. CHAIKEN, VARIETIES OF CRIMINAL BEHAVIOR (1982)). For a more recent statement to the same effect, *see* THE GROWTH OF INCARCERATION IN THE UNITED STATES: EXPLORING CAUSES AND CONSEQUENCES, NATIONAL RESEARCH COUNCIL 143 (Jeremy Travis, Bruce Western, & Steve Redburn eds., 2014) ("[B]ecause most of the high-rate offenders will already have been apprehended and incarcerated [in a jurisdiction with an already-high incarceration rate], there will be relatively few of them at large to be incapacitated by further expansion of the prison population.").

[44] BERT USEEM & ANNE MORRISON PIEHL, PRISON STATE: THE CHALLENGE OF MASS INCARCERATION 80 (2008) (surveying the extant research; the authors' own study showed "not just declining marginal returns but *acceleration* in the declining marginal return to scale").

higher. And finally: The diminishing-returns hypothesis predicts that low-IS states have more to gain in crime-reduction through marginal increases in their prison rates than high-IS states, and greater moral justification for doing so.

Alongside diminishing benefits, percentage changes in prison scale have skewed per-capita costs in high- and low-incarceration states. Per-capita costs multiply as benefits shrink. A high-prison-rate state is already spending more tax dollars per person on its prisons than a low-prison-rate state. All else being equal, the ceiling of taxpayer resistance should be nearer (or is more likely to be exceeded) in a high-IS state than in a low-IS state. More than this, identical *percentage* increases in IS are more costly in the already-high-IS state. If *State A* with six times the prison rate of *State B* increases its prison rate by an additional 10 percent, the cost per taxpayer is six times greater than in *State B* to pay for the "same" percentage increase. Say that the average taxpayer in *State A* is already paying $12 to sustain the state's prison system, but the average taxpayer in *State B* pays $2. A ten percent increase in prison populations—all else being equal—will cost each taxpayer in *State A* something on the order of $1.20 more than they were previously paying, but in *State B* the comparable increase will be about 20 cents.[45]

Indeed, all forces that tend to inhibit prison growth have been strained six times more in *State A* than in *State B*. If all other factors are equal, we can expect some or all of the following dynamics to exist: The carceral intensity in *State A* as experienced by minority communities is six times that in *State B*. Claims of racial injustice should also be more forceful. The percentage of families directly affected by *State A*'s prison policies is six times greater than in *State B*. By population, six times as many sites are already occupied by prisons in *State A*—or else *State A* is making use of mega-prisons more than *State B*. The density of lawsuits over prison crowding and related conditions is likely to be greater in *State A*. In sum, the higher a jurisdiction's incarceration rate, the greater the likely outrage and mobilization of all constituencies who are inclined to resist further growth.

These dynamics in theory should push low-IS states toward higher prison rates (or make reductions less likely), and should pull high-IS states downward (or make growth less likely), especially at the extreme ends of the IS distribution. This provides strong theoretical support for RTM as a

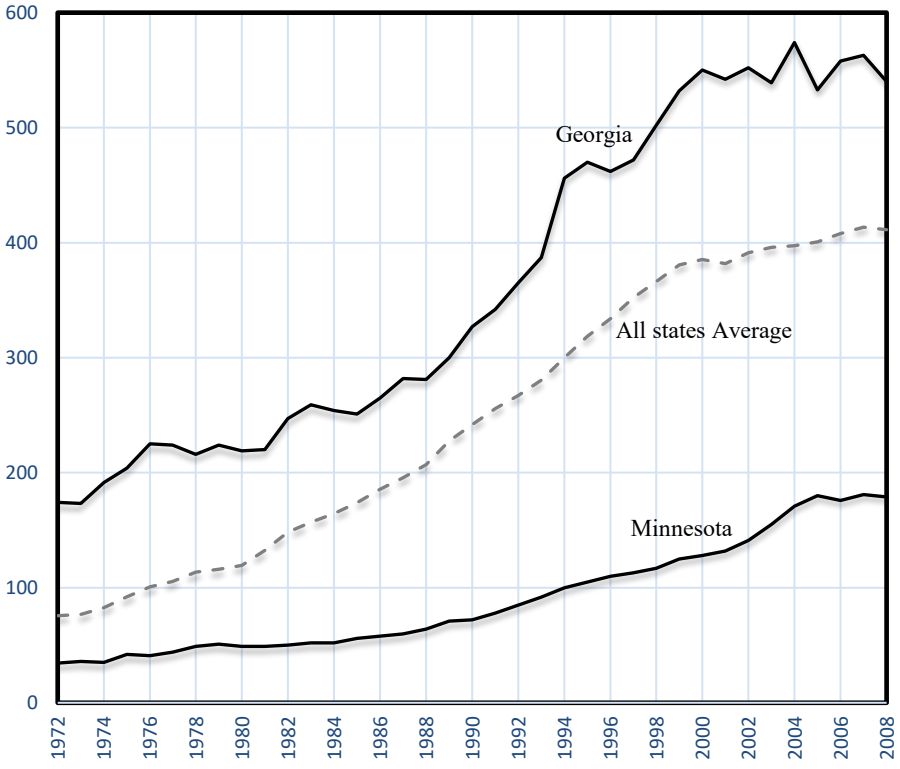
[45] Similarly, the per-capita taxpayer savings of PCM reductions in prison scale in *State A* are six times greater than the same PCM reductions in *State B*. Budgetary considerations should be pushing *and* pulling prison rates downward in high-IS states.

baseline for expectations of prison-rate growth across states, and it is arguably a more plausible account than the defense of the squashed-bandwidth approach.

To experiment with the RTM thesis, Figure 4 reproduces Figure 2 with the addition of a new data series showing the average prison rate among all 50 states for each year from 1972-2008.[46] The new figure permits us to ask: From 1972-2008, did Georgia and Minnesota become more or less similar to the average American state in their scales of imprisonment?

Georgia did in fact regress toward the 50-state average prison rate in most years from 1972 to 1988, but then pulled away from 1988, ever more rapidly, until 2004. From 2004 to 2008, Georgia again regressed

Figure 4. Prison Rate Change: Georgia, Minnesota, and Allstates Average, 1972-2008[47]



[46] This is an unweighted average because we are drawing comparisons in carceral intensity among the states regardless of their population sizes.

[47] *See supra* note 12.

toward the average rate. Speaking broadly, Georgia defied the expectation of regression toward the mean just as often as it met the expectation. Overall, Georgia's prison rate was further above the all-states mean in 2008 than in 1972 (129 per 100K above in 2008, 98 per 100K above in 1972). By this calculation, there was no regression across the full period. Indeed, the increment by which Georgia diverged (upward) from the mean in 2008 was 32 percent greater than in 1972.

These RTM-based observations can be translated into policy judgments. Because of its high starting position in 1972, and failure to regress downward, we might say that Georgia's prison rate grew by more than "expected." If we consider prison-rate growth to be *per se* undesirable, and if we think the average growth curve for all 50-states is already shocking, we would say that Georgia's performance was egregiously poor.

This assessment is at war with the verdict based on percentage growth. On the PCM's 50-state list from 1972-2008, Georgia is 48th out of 50. If our bias is against incarceration growth, we would commend Georgia for holding the line better than nearly every other state.

How does Minnesota fare under RTM analysis? In contrast to Georgia, Minnesota diverged away from the 50-state mean over most of the 36-year expansionist period—with the exception of mild regression in 2001-2005—in a distinctly downward direction. In 1972, the distance between Minnesota's prison rate and the national average was -41 per 100K. In 2008, it was -232 per 100K. The increment by which Minnesota's prison rate was below the mean in 2008 was 466 percent greater than 1972.

Minnesota's failure to regress upward toward the 50-state mean, and its overall downward drive away from the average growth curve, is unexpected under RTM assumptions, especially given its low prison-rate starting position. As opposed to Georgia's history, however, we are now surprised in a favorable direction (if we are treating prison-rate growth as undesirable). Minnesota's path from 1972-2008 looks like a success story compared with the bulk of other states. For the most part, the trend line in Minnesota was an increasing *drag* on the average prison rate across all 50 states over the full buildup period.

If we treat RTM as a reality check, the PCM once again looks like a faulty measure. Far from treating Minnesota as a comparatively successful state during the expansionist era, the PCM scored Minnesota's prison-rate growth as *twice* that of Georgia's. In the PCM 50-state ranking, Minnesota is placed in the middle of the pack at the 32nd position. The ACM ranks Minnesota 49th of 50—a position that lines up with the

favorable judgment of the RTM approach.

PART 6. MEASURING PERSON YEARS OF INCARCERATION

I will offer one more alternative measure of prison-rate growth that is more credible than the PCM, and relatively consonant with the ACM.

An incarceration statistic based on one-day counts misses the fact that the chief attribute of confinement as a criminal sanction is its duration—it relies on the passage of time as a means to achieve punitive or consequential effects. Thoreau wrote that "the cost of a thing is the amount of . . . life which is required to be exchanged for it."[48] An expression of confinement rates that includes an accounting for time served is more informative than the comparison of two snapshots. For this purpose, I have suggested the "person year" as a promising unit for describing the social impact of incarceration over time.[49]

To illustrate, if a state's prison population holds an average of 8,000 inmates for an entire year, the state's prisons have subtracted 8,000 person-years from the life of the free community. If we extend the example over five years, then 40,000 total person-years have been subtracted. The unique advantage of the PY is that it can cumulate the effects of carceral intensity over time.

Like most incarceration statistics, the PY does not tell us how many individuals have served the reported prison time. Two prison-years of confinement could be served by a single person, by 24 people who each served one month, etc. Because of this blind spot, it is best to think of the PY as an indicator of time subtracted from the life of the community rather than an individual-level measurement.

For comparative purposes, the person-year measure may be corrected for general population (or any other per-capita denominator). As discussed earlier, a per-capita approach should usually be preferred in IS statistics over raw numbers. A per-capita version of the PY allows us to visualize the carceral intensity of prison policy over months or years, instead of slicing off only a single day.

Some examples will illustrate the point.

If a state maintains an average incarceration rate of 750 per

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[48] HENRY DAVID THOREAU, WALDEN 43 (1910).

[49] *See* HENRY RUTH & KEVIN R. REITZ, THE CHALLENGE OF CRIME: RETHINKING OUR RESPONSE 21–22 (2003); Joan Petersilia & Kevin R. Reitz, *Sentencing and Corrections: Overlapping and Inseparable Subjects*, *in* THE OXFORD HANDBOOK OF SENTENCING AND CORRECTIONS 4–5 (Joan Petersilia & Kevin R. Reitz eds., 2012).

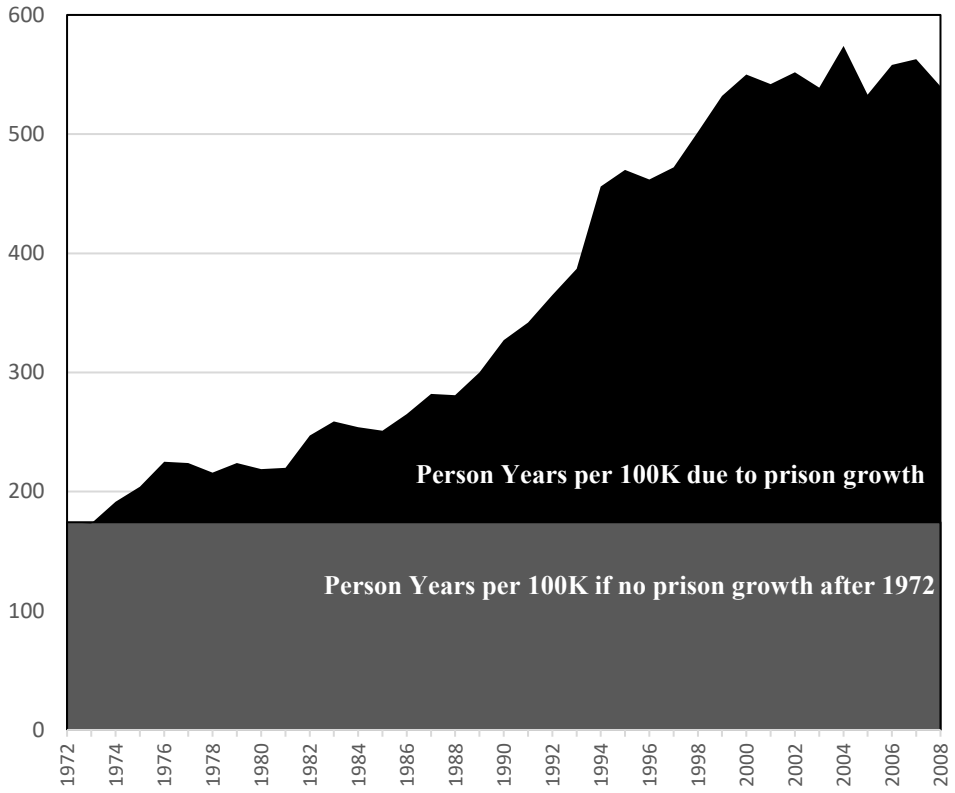
100,000 for an entire year, we can say that 750 person years of confinement have been meted out for every 100,000 individuals in the state over that single year. If the same average incarceration rate is maintained for ten years, the state has imposed 7,500 person years of incarceration per 100,000 over the full decade. That's 7.5 years for every 100 people in the state (with much higher counts for males in crime-prone age groups, minorities, and the poor).

As with static prison rates, the *PYs-per-100,000* approach hits hardest when applied to subgroups who suffer disproportionately-high incarceration rates. For example, using the Pew Charitable Trusts' report that "1 in 9" black men aged 20–34 were in prison or jail on any given day in 2007,[50] we can calculate the aggregate subtraction of that group from the life of the community as follows: 11,111.1 person years per 100,000 each year, or 111,111 person years per 100,000 over each ten-year stretch. That's a 14-year total of more than 1.5 PYs of prison time per every black man who lives through the ages 20-34 under this incarceration policy.

As a matter of mathematical derivation, the number of PYs per capita over time equals *the area under the prison-rate-growth curve*. Figure 5 adapts Figure 1 to depict the area under Georgia's prison-rate growth curve from 1972-2008, using the Prisoners per 100,000 unit. Figure 6 does the same for Minnesota.

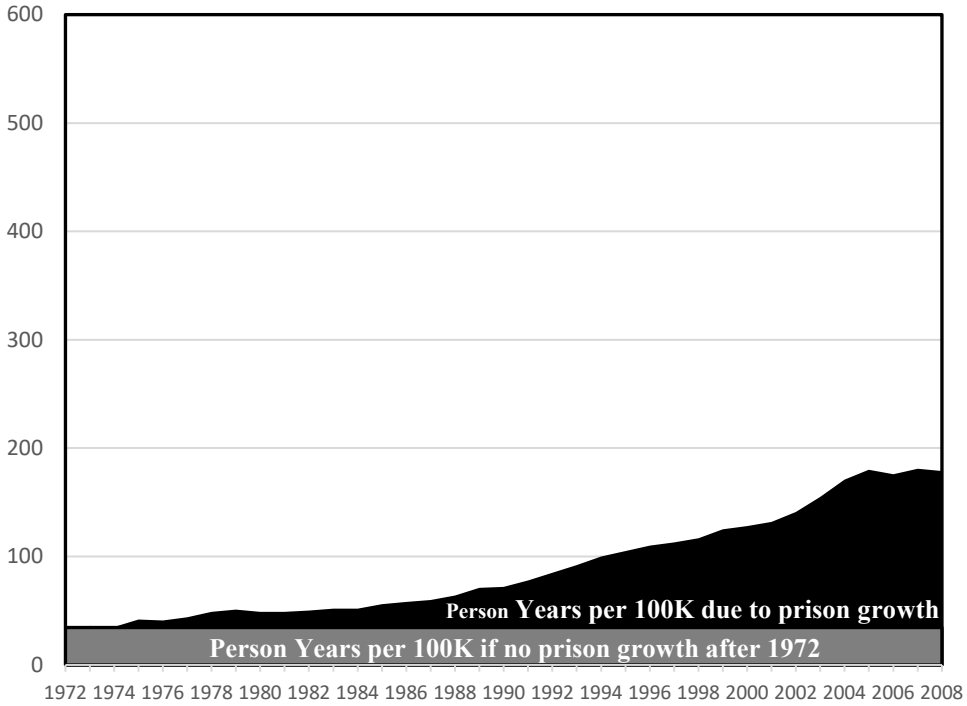
[50] *See* Pew Center on the States, *supra* note 1, at 6.

Figure 5. Georgia, Person Years of Imprisonment per 100,000 Population, 1972-2008, Segmented Into Area Assuming No Prison-Rate Growth After 1972 and Area Showing Additional Imprisonment Due to Prison Rate Growth Above 1972 Baseline[51]



[51] *See supra* note 12.

Figure 6. Minnesota, Person Years of Imprisonment per 100,000 Population, 1972-2008, Segmented Into Area Assuming No Prison-Rate Growth After 1972 and Person Years and Area Showing Additional Imprisonment Above 1972 Baseline[52]



In both charts, the shaded portions (in both black and grey) represent all PYs per 100,000 served in the states over the 36-year period. The areas-under-the-curve are divided into black and grey sections to indicate PYs per 100,000 that would have been served if there had been no change in state prison rates after 1972 (the grey areas) and the number of additional PYs per 100,000 that were served due to prison growth following 1972 (the black areas).

Table 4 calculates the AUCs in Figures 5 and 6. The column for "Total *PYs per 100K*" represents the entire areas under the growth curves in Figures 5 and 6 (above and below the white dividing lines). The second column shows what the total number of *PYs served per 100K* would have been if the states had experienced zero prison-rate growth after 1972 (below the white lines). The third column shows *PYs per 100K* that were attributable solely to prison growth in each state (above the white lines).

[52] *See supra* note 12.

Table 4. Person Years of Imprisonment per 100K for the 36-Year Period, 1972-2008: Georgia and Minnesota[53]

	Total *PYs per 100K*, 1972-2008[54]	Total *PYs per 100K* if no prison-rate growth from 1972-2008	Total *PYs per 100*K attributable to prison-rate growth from 1972-2008
Georgia	13,119	6,285	6,845
Minnesota	3,227	1,242	1,985

Over the full 36-year period from yearend 1972 to yearend 2008, more than four times the number of person years of incarceration per capita were served by Georgians than by Minnesotans. If we look only to the AUCs *attributable to prison growth* in the two states, the people of Georgia served 6,845 additional PYs per 100,000 due to prison growth, while Minnesotans served an additional 1,985 PYs per 100,000.

By this measure, from 1972-2008 the people of Georgia were invaded by 3.5 times more carceral intensity (per capita) than Minnesota *due solely to prison growth* during that period. This is even more than the 2.5:1 ratio of increased carceral intensity estimated by the ACM, and is in strong tension with the PCM's verdict that Minnesota had twice as much prison growth per capita as Georgia.

The use of the PY measure as a reality check is another nail in the coffin of the PCM.

CONCLUSION

In the early 21st century, we cannot afford to mislead ourselves about the realities of prison-rate change. We have entered a time when the policies of mass incarceration, and mass punishment more generally, have been called into question by large segments of both political parties. So far this new sentiment has produced more talk than action. Even if feelings

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[53] *See supra* note 12.

[54] All calculations above were performed by the best available formula for estimating AUC using an Excel spreadsheet. More sophisticated software would yield more precise calculations but, for the purposes of this article, they would be too small to be relevant. *See Practically Cheating Statistics Handbook*, STATISTICS HOW TO: STATISTICS FOR THE REST OF US!, (last visited Mar. 9, 2019) http://www.statisticshowto.com/how-to-find-the-area-under-a-curve-in-microsoft-excel/.

in favor of a punitive step-down are genuine and widespread, they will not take us far without good data and realistic blueprints for policy reform and implementation.[55]

States need information on how to control their prison and jail populations. Starting in the 1980s, a handful of states including Minnesota, Washington, Kansas, and North Carolina, made important strides in solving this problem, all using a similar institutional model.[56] More recently, California, New York, and Texas have had impressive accomplishments in planned prison-population reduction, albeit in three very different ways.[57] Most states continue to struggle, however, and the prospects for unwinding mass incarceration on the national level appear slim during most of our lifetimes.[58] Poorly-positioned states—such as the 16 that have seen continued prison growth even after the nationwide peak in 2007-08—find themselves in especially acute need of proven, workable ideas that have been tested against credible indicia of success.

I do not claim to have solved the problem of how we should measure changes in incarceration scale over time, nor do I insist that there is only one answer for all purposes. I *do* claim, however, to have cast heavy disrepute on the percentage-change measure for purposes of comparative policy analysis. The PCM works from questionable baseline assumptions, includes no information about human scale, and is capable of delivering absurd results on a regular basis. Because the PCM has been the default measure in contemporary analyses of incarceration scale, its unsuitability is a big problem for the IS field as a whole.

The absolute-change measure, in contrast, contains no baseline assumptions about the causal forces of prison growth, provides

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[55] The American Law Institute's new *Model Penal Code: Sentencing* (approved 2017) was designed to be a comprehensive source of implementation recommendations for entire American sentencing systems, including incarceration and other forms of criminal punishment. *See* Kevin R. Reitz & Cecelia M. Klingele, *Model Penal Code: Sentencing—Workable Limits on Mass Punishment*, *in* CRIME AND JUSTICE: A REVIEW OF RESEARCH (Michael Tonry ed., 2019).

[56] RICHARD S. FRASE, JUST SENTENCING: PRINCIPLES AND PROCEDURES FOR A WORKABLE SYSTEM (2013).

[57] *See* FRANKLIN E. ZIMRING, THE INSIDIOUS MOMENTUM OF MASS INCARCERATION (Oxford University Press, forthcoming 2019) (California); Robert E. Weisberg, *What Explains Persistent Racial Disproportionality in Minnesota's Prison and Jail Populations?*, in Michael Tonry, ed. 48 CRIME AND JUSTICE: A REVIEW OF RESEARCH xxx (forthcoming, 2019) (California and Texas); Judith A. Greene & Vincent Schiraldi, *Better by Half: The New York City Story of Winning Large-Scale Decarceration while Increasing Public Safety,* 29 FED. SENT'G RPTR. 22 (2016) (New York).

[58] *See* Zimring, *supra* note 19.

comprehensible information about the human stakes of the measured change, and does not routinely yield absurd judgments. As a bonus, it is internally consistent, whether run forward or backwards in time. For my money, the ACM is a better and safer tool than the PCM.

For now, I do not advocate improvements on the ACM. Regression to the mean, as used in this article, is a half-baked baseline for measurement. For one thing, determination of the relevant mean is problematic. It is distressing that my use of moving averages from America's prison-expansion era treats rapid growth in the average state prison rate as normal. One could make the case that we should use international data to establish an average. Perhaps we should not be using moving averages at all . . . .[59] I find the RTM framework intriguing to think about, but do not offer it as a new gold standard.

The person-years approach has long seemed promising to me, but it has not gained popularity with other researchers. Fundamentally, the PY asks a different question than the ACM. It focuses equally across the full historical period it examines, with no particular emphasis on a jurisdiction's predicament at the end of the period. Indeed, a jurisdiction with a sudden rise followed by sharply decreasing rates could earn the same PY per 100K score as a mirror-image jurisdiction with slow increases followed by a sharp spike near the end. The ACM does a better job than PYs per 100K in telling us where a jurisdiction has ended up in relation to where it started. If our largest concerns are "where do we go from here" in U.S. incarceration policy, and "how will we know if we're getting there," the ACM is the best option on the table.

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[59] *See* Webster & Doob, *supra* note 33, at 132–33.

APPENDIX

Table 5. State Rankings by Prison Rates per 100,000 Population, 1972 and 2008[60]

1972			2008		
Rank		**Rate**	**Rank**		**Rate**
1	Georgia	174	1	Louisiana	853
2	North Carolina	160	2	Mississippi	735
3	Ohio	140	3	Oklahoma	661
4	Florida	139	4	Texas	639
5	Maryland	139	5	Alabama	634
6	Texas	136	6	Arizona	567
7	Nevada	121	7	Florida	557
8	South Carolina	121	8	Georgia	540
9	Virginia	106	9	South Carolina	519
10	Alabama	104	10	Arkansas	511
11	Michigan	94	11	Missouri	509
12	Louisiana	92	12	Kentucky	492
13	Kentucky	90	13	Virginia	489
14	California	84	14	Michigan	488
15	Oregon	84	15	Nevada	486
16	Mississippi	83	16	Idaho	474
17	Tennessee	82	17	California	467
18	Colorado	81	18	Colorado	467
19	Arkansas	80	19	Delaware	463
20	Arizona	77	20	Ohio	449

[60] *See supra* note 12.

1972			2008		
Rank		**Rate**	**Rank**		**Rate**
21	Oklahoma	77	21	Indiana	442
22	Washington	77	22	Tennessee	436
23	Wyoming	76	23	Alaska	430
24	Missouri	75	24	South Dakota	412
25	Kansas	74	25	Connecticut	407
26	Indiana	73	26	Maryland	403
27	New Jersey	72	27	Pennsylvania	393
28	New York	64	28	Wyoming	387
29	Nebraska	63	29	Wisconsin	374
30	Alaska	61	30	Oregon	371
31	Connecticut	59	31	Montana	368
32	West Virginia	59	32	North Carolina	368
33	New Mexico	56	33	Illinois	351
34	Pennsylvania	53	34	Hawaii	332
35	South Dakota	51	35	West Virginia	331
36	Utah	51	36	New Mexico	316
37	Idaho	50	37	New York	307
38	Illinois	50	38	Kansas	303
39	Delaware	49	39	New Jersey	298
40	Iowa	46	40	Iowa	291
41	Maine	46	41	Washington	272
42	Wisconsin	45	42	Vermont	260
43	Montana	40	43	Nebraska	247
44	Hawaii	39	44	Rhode Island	240

1972			2008		
Rank		**Rate**	**Rank**		**Rate**
45	Rhode Island	36	45	Utah	232
46	Minnesota	35	46	North Dakota	225
47	Massachusetts	32	47	New Hampshire	220
48	New Hampshire	30	48	Massachusetts	218
49	Vermont	30	49	Minnesota	179
50	North Dakota	29	50	Maine	151