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Collective Efficacy and Violence in Chicago Neighborhoods: A Reproduction

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Abstract

This research tests the reproducibility of the neighborhood-level effects of social composition and collective efficacy on community violence that Sampson, Raudenbush, and Earls reported in a *Science* article entitled "Neighborhood and Violent Crime: A Multilevel Study of Collective Efficacy." Based upon data from a resident survey, the U.S. Census, and official homicide reports from Chicago, Sampson et al. found that neighborhood collective efficacy directly affects perceived neighborhood violence, household victimization, and homicide rates. In addition, they reported that the relationship between residential stability and concentrated disadvantage with each measure of violence is mediated after adding their collective efficacy measure to the regression models. This article uses Earls, Brooks-Gunn, Raudenbush, and Sampson's archived data collection and other archived data collections to assess the extent to which Sampson et al.'s core substantive findings are independently reproducible. While the reanalysis identified some differences between the archived data and the information provided in Sampson et al., the reanalysis produced findings in the same reported direction and statistical significance for virtually all of Sampson et al.'s core substantive outcomes. This confirmation of their key conclusions provides added confidence in their collective efficacy thesis and enhances the prospects for extending it by assessing the degree to which it also affects other crime types and whether these effects persist over time. **[AQ: 1]**

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[AQ: 2]

For many years, scientists have speculated about and tested the extent by which variations in the social composition of neighborhoods lead to different crime outcomes (Kornhauser, 1978; Shaw & McKay, 1942; Skogan, 1990). The most current thesis in this area of criminology is that collective efficacy is a key social process by which cohesion among residents coupled with their willingness to intervene influences the quantity of criminal behavior (Sampson, 2012). While a correlated concept, self-efficacy, has been used for some time (Bandura, 1986), interest in a collective efficacy process surged following the publication of Sampson, Raudenbush, and Earls (1997)'s "Neighborhood and Violent Crime: A Multilevel Study of Collective Efficacy" article. This article reports that community violence is less frequent and that the impact of neighborhood structural disadvantage in Chicago is diminished by neighbors' willingness to intervene when their shared expectations are violated or at risk. Since their article's publication, other empirical evidence has attested to the relevance of collective efficacy in explaining the variation in violence across Chicago's neighborhoods and elsewhere.

In terms of the size of the correlation across macro-level predictors of crime, Pratt and Cullen (2005) ranked the "collective efficacy" concept sixth largest among 31 established meta-correlates. With a mean effect size of 0.30 produced by 13 studies, Pratt and Cullen (2005) reported that its adjusted mean effect size was just smaller than the incarceration correlation coefficient (–0.33) and just larger than the racial heterogeneity effect (0.29). Besides explaining variations in crime rates, the degree of collective efficacy also has implications for crime control policy. Both community policing and crime prevention programs often operate with an implicit assumption about how formal government programs depend upon community mobilization and organization for the purposes of crime control (Cancino, 2005; Serewicz, 2009; Wells, Schafer, Varano, & Bynum, 2006). Moreover, other scientists have linked collective efficacy to other outcomes like overall well-being and educational outcomes (Cohen, Finch, Bower, & Sastry, 2005; Kirk, 2009; Maimon & Browning, 2010; Sampson, 2003; Sampson, Morenoff, & Earls, 1999; Simons, Simons, Burt, Brody, & Cutrona, 2005; Vega, Ang, Rodriguez, & Finch, 2011), as well as to intermediate processes such as motivation to start projects and persistence once engaged (Bandura, 2000).

Sampson et al.'s Collective Efficacy Measure

Sampson et al.'s (1997) innovative conceptualization of collective efficacy emphasizes links between cohesion, social trust, shared expectations, and the willingness of neighborhood residents to act in support of these values to address a task such as neighborhood safety. Sampson (2004) argues that the "key casual mechanism in collective efficacy theory is social control enacted under conditions of social trust" (p. 108). Triplett (2007) contends that this hypothesis remains grounded in works such as

Shaw and McKay (1942)'s community sources of delinquency theories because it connects factors such as residential stability and ethnic diversity with a neighborhood's capability to address criminal behavior. Thus, Sampson et al.'s (1997) collective efficacy concept remains connected with other contemporary theories about how community structures and organizations are linked to crime rates (e.g., Bursik & Grasmick, 1993; Elliott et al., 1996; Skogan, 1990).

Sampson et al. (1997) also articulated an innovative approach to measuring and then testing the direct and indirect effects of collective efficacy on criminal behavior. Based on their 1995 survey of Chicago residents, Sampson et al. (1997, p. 920) used individual-level responses to ten questions to construct two scales that they labeled "informal social control" and "social cohesion." They then combined these two scales at the neighborhood level using an item response model to produce a single measure that they labeled "collective efficacy." This measure captured what they argued was the degree of "linkage" between a neighborhood's "mutual trust" and its "willingness to intervene for the common good." In more concrete language, Sampson et al. (1997) asserted that the "collective efficacy of residents is a critical means by which urban neighborhoods inhibit the occurrence of interpersonal violence" (p. 919).

From the same community survey, Sampson et al. (1997, p. 921) also created two measures of community violence. The first measure of violence was a scale based on five questions about the respondent's perceptions of violence in their neighborhood in the past 6 months. The second measure was based on one question about whether the respondent or anyone in their family had experienced violence in their current neighborhood. Sampson et al. (1997) also used a third measure of violence derived from Chicago Police Department's homicide records for parts of 1995. In addition, Sampson et al. (1997, p. 920) used 1990 U.S. Census data to construct measures of concentrated disadvantage, immigrant concentration, and residential stability to capture the relevant social compositions of Chicago's neighborhoods.

To test their two main hypotheses, Sampson et al. (1997) formulated three statistical models. To model the dependent measure of perceived violence, they specified a three-level hierarchical linear model (hierarchical linear model(ing) [HLM]) with the individual questions at the first level, the 11 individual respondent demographics characteristics at the second level, and the neighborhood measures of collective efficacy, concentrated disadvantage, immigrant concentration, and residential stability at the third level. Their modeling approach for the measure of experienced violence was to specify a two-level HLM with the one victimization question and the individual demographic characteristics at the first level and the four neighborhood factors specified at the second level. Their approach to analyzing the homicide data was to specify in *HLM* a Poisson regression model with overdispersion and with the logged homicide rate and the four neighborhood factors at the same level (p. 922).

Sampson et al.'s Key Collective Efficacy Results

Sampson et al. (1997) first reported the impact of their three neighborhood-level social composition factors on each of their three measures of violence. Based upon their

initial analysis, they report that neighborhoods with more concentrated disadvantage have significantly higher levels of all three forms of violence. Similarly, they report that higher levels of immigrant concentration are associated with statistically significant increases in both perceived and experienced violence; however, they did not find that immigrant concentration influenced homicide rate. They also reported that neighborhoods with higher residential stability are associated with less perceived and experienced violence, but was associated with an increase in the homicide rate. In this initial analysis, the three social composition measures collectively accounted for 71% of the variation between neighborhoods in perceived violence, 12% of the variation in violent victimizations, and 56% of the variation in homicides.

In the second step of their analyses, Sampson et al. (1997) added their measure of collective efficacy to their three regression analyses. This analysis produced a direct, large, and statistically significant negative effect of collective efficacy across all three measures of violence. In addition, the inclusion of collective efficacy mediated the effects of concentrated disadvantage and immigrant concentration on perceived and experienced violence and partially mediated their effects on homicides. With the addition of collective efficacy in their models, Sampson et al. (1997) reported that the explained variation in perceived violence across neighborhoods increased from 71% to 78%. The explained variation for violent victimization increased from 12% to 44%, and the explained variation for homicide rate increased from 56% to 62%. These findings challenged existing research that had emphasized social composition as the key component for explaining variations of violent crimes in particular areas (e.g., Skogan, 1990).

Sampson et al. (1997) produced rigorous, multivariate, multi-level tests of long-standing and continuingly relevant theories explicating the role of the social composition of neighborhoods as well as individual-level personal values on the level of criminal behavior. With more than 9,800 citations in the scientific literature found by Google Scholar in 2018, Sampson et al.'s (1997) article is widely read and continues to influence criminology, sociology, and other related fields of social inquiry. The quality of their research and its use of innovative methods and measures warrant the high regard with which this research is held. However, at the time of its publication, Sampson et al. (1997) acknowledged that their tests of this theory have limitations. First, their findings have limited generalizability because their analyses were based on data from one city. That potential limitation could best be addressed by replicating their data analyses with newly collected surveys and demographic data from a different jurisdiction. A second limitation that Sampson et al. (1997) acknowledged is that their theory is dynamic—changes in collective efficacy lead to changes in crime—but the data they used were cross-sectional, not longitudinal. Sampson et al. (1997) addressed this latter issue by adding to their model a neighborhood-level measure of violence prior to 1995—the average number of homicides in Chicago neighborhoods for 1988, 1989, and 1990. In this test, the effects of collective efficacy measured in 1995 remained statistically significant, and the size of their negative association with crime was undiminished across all three measures of violence (see p. 923, Table 925).

These potential limitations do not, in themselves, point to flaws in Sampson et al.'s (1997) data or their analyses; however, they do suggest that our understanding of the

extent to which a neighborhood's social composition and the impact of its collective efficacy on criminal behavior is incomplete. Since Sampson et al.'s (1997) publication, others have sought to collect new data to replicate their findings elsewhere (e.g., Gerell & Kronkvist, 2017; Mazerolle, Wickes, & McBroom, 2010; Sutherland, Brunton-Smith, & Jackson, 2013) or to address some of their noted limitations, such as their reliance on cross-sectional models (e.g., Hipp & Wickes, 2017).

One limitation not previously addressed in the subsequent scholarship on collective efficacy is the uncertainty about whether the strong and consistent findings reported by Sampson et al. (1997) supporting both direct and indirect effects of collective efficacy on violent crime can be reproduced by independent researchers. Like the ability to replicate, the capacity to reproduce is too a crucial test of scientific reliability. Unlike replications, a reproduction does not require the collection of new data, but it does require access to data used in the original analyses and a complete description of the analytical procedures applied to those data.

Research Design

The process of conducting a reproduction study in criminology and other social sciences typically requires the completion of four tasks: (a) obtaining access to the original data, (b) identifying the variables used in the original analysis, (c) understanding and implementing the data management and statistical analyses conducted, and (d) comparing the results to the published findings. We followed each of these steps and each of them provided their own set of challenges.

Sources of Data

The primary data sources for this study are two data files produced by the *Project on Human Development in Chicago Neighborhoods* (PHDCN) and released by the Inter-university Consortium for Political and Social Research (ICPSR) in 2007 (see Earls, Brooks-Gunn, Raudenbush, & Sampson, 2007). Part 1 of this data collection contains community respondent-level information collected in 1995 through face-to-face household interviews with 8,782 subjects over the age of 17 years. This part contains the variables Sampson et al. (1997) used to create their collective efficacy, perceived violence, and experienced violence measures as well as a numeric code to identify the respondent's neighborhood cluster (NC). Sampson et al. (1997) report that they constructed their measure of collective efficacy based upon the responses of 7,729 individuals who responded to at least one of the 10 survey questions used to create that measure. While Part 1 does not include a variable that explicitly identifies the respondents used by Sampson, et al. (1997), our examination of the survey responses identified 7,729 respondents who answered one or more of the 10 survey questions that are used to measure social cohesion, social control, and collective efficacy. Part 1 of the archived data also included information from the community survey about the respondent's sex, marital status, home ownership, race and ethnicity, age, length of residency in the neighborhood, education, income, and occupational prestige, as well as

a measure of the respondent's socioeconomic status (SES) that is based on the respondent's education, income, and occupational prestige. Several key demographic variables in the Part 1 file had missing responses that varied from 7% for the mobility question to 34% for family income.

Part 2 of Earls et al.'s (2007) PHDCN data collection contains 342 records and 72 variables. Each record corresponds to a NC created by the PHDCN research team. While the Sampson et al. (1997) article reported that they had constructed 343 NCs across Chicago, their NC-level data file contains just 342 records. While we could not locate an explanation for this missing NC, we did find that in the Part 1 data, 15 of the 8,782 respondents lived in the missing NC, and up to eight of them provided valid responses to at least one more of the 10 collective efficacy questions, the one victimization question, and the five violence questions.

The variables in the Part 2 file are constructed from three sources: the 1995 resident survey, the 1990 U.S. Census, and the Chicago Police Department. This part also includes Sampson et al.'s (1997) three social composition measures, four of five of their key NC composite measures were produced from the respondent data, and variables with data about the number of officially reported homicides in Chicago for the year 1995 and for the years 1988 to 1990. These latter variables include the count of murders and homicides for 1995 for each NC, and the log-transformed homicide rates for years 1988 to 1990 and for 1995.

While Earls et al.'s (2007) data collection contains many of the same variables at both the individual (Part 1) and neighborhood (Part 2) levels, these two data sources did not include the original census variables that Sampson et al. (1997) used to construct the three social composition measures. More importantly, the archived data did not include the neighborhood-level measure of collective efficacy. Because of these missing measures, the published multi-level tests of the effects of collective efficacy on criminal behavior reported by Sampson et al. (1997) cannot be reproduced relying solely on Earls et al.'s archived data files.

Therefore, it was necessary to supplement Earls et al.'s (2007) archived data collection. For example, the census tract level variables used by Sampson et al. (1997) were added from the 1990 Census of Population and Housing (United States Department of Commerce, Bureau of the Census, 1993). Using the neighborhood identification codes, the census tract level data ($n = 847$) were aggregated to the NC level ($n = 343$), and then, factor analysis was used to reproduce Sampson et al.'s (1997) three neighborhood-level social composition measures.

Using data that were archived, the individual- and neighborhood-level measures of collective efficacy were produced using the five survey questions about social cohesion and the five questions about informal social control. Sampson et al. (1997) collected data from survey respondents about variables education, income, and employment prestige. Because ICPSR archive staff masked Earls et al.'s (2005) employment prestige variable, our effort created a proxy measure of SES using the employment status measure. Finally, because data on Chicago homicides were not archived as part of this project, this research obtained data on Chicago homicides for

the years 1988 to 1990 from Block and Block's (2005) *Homicide in Chicago* and aggregated homicide rates at the neighborhood level.[1] [AQ: 3]

Selection and Production of the Dependent Measures

Sampson et al. (1997) used three measures of violent crime. The survey item asking about whether any member of the household experienced one or more types of violence in the neighborhood was a simple dichotomous variable in the Part 1 file. The second measure was created by combining the answers to five questions about the respondent's perceptions of frequency of violent events in their neighborhood. Using a scale that ranged from "never" to "often," survey respondents were asked how frequently in the past 6 months their neighborhood had experienced a fight with a weapon, a violent argument between neighbors, a gang fight, a rape or sexual assault, or a robbery or mugging. The responses to these five questions produced an individual-level average that ranged from one to four. The average for each person within a neighborhood was summed to create a neighborhood measure of the perceptions of violence. The aggregation of data from responses of individuals to neighborhoods was completed within the context of a three-level multi-level modeling (see Raudenbush & Sampson (1999) for more details about how these measures were produced). [AQ: 4]

Identifying the third measure of violence in the PHDCN data file was not as straightforward. Sampson et al. (1997, p. 922) initially described their homicide variable as "1995 homicide counts," but on the same page, they describe this variable as "the homicide rate per 100,000 people in the neighborhood." The archived data included a count variable and the log of a rate variable, and this latter variable appears to be the one that Sampson et al. (1997) used in their analyses.

Collective Efficacy

The core concept in Sampson et al. (1997) is collective efficacy, which they defined as "social cohesion among neighbors combined with their willingness to intervene on behalf of the common good" (p. 918). For Sampson et al. (1997), collective efficacy is a combination of two other concepts: informal social control and social cohesion and trust. These two concepts are each measured by five questions on the resident survey. Sampson et al. (1997) stated that because the values of these two measures are significantly correlated when their values were aggregated to the neighborhood level, they "combined the two scales into a summary measure" (p. 920) which they call collective efficacy. Sampson et al. (1997) pooled the 10 questions into their collective efficacy measure using an item response technique within an HLM framework. Any respondent who responded to at least one of these 10 questions was included in the measure of collective efficacy. A more detailed description of the processes that we followed to build their community-level measures from the survey responses is provided in Sampson et al. (1997), Raudenbush and Sampson (1999), and Raudenbush and Sampson (1999).

Reproducing Sampson et al. (1997)

A traditional effort to test whether the findings from published research are reproducible would initially involve the comparison of the descriptive statistics for the variables used in the study's statistical analyses followed by a comparison of the publication's core statistical findings with those from the reproduction effort. However, Sampson et al. (1997) and their related publications do not provide descriptive statistics for any of the variables in their HLM analyses. Fortunately, Part 1 of the archived data includes the individual-level survey variables that Sampson et al. (1997) used to create their measures of social control, social cohesion, violent victimization, and perceived neighborhood violence. Similarly, Part 2 of the archived data include their neighborhood-level measures of social cohesion, informal social control, all three social composition measures, and the homicide rate for 1995, but this data file did not include their measure of collective efficacy.

Table 1 reports our comparison of the composite measures included in the archived data and our reconstruction of those measures using the individual survey items, the census tract data, and individual-level homicide data. This is not the desired comparison between published and reproduced findings but the best comparison available that contrasts our composite measures (REPRO) with theirs (EBRS). In general, the comparisons in Table 1 show a close but imperfect match between these composite measures. The similarities can best be seen in the means and in the high correlation between our measures and their measures. At the individual level, three of their composite measures report values for 7,729 residents. Their measure of violent victimization is missing responses for 164 residents. We report the same number of subjects with valid violent victimization data, but 103 fewer subjects for the social cohesion measure and 439 fewer for the measure of perceived neighborhood violence. While 439 more cases have a perceived violence composite score, none of these subjects have valid responses across their individual items. In addition, while the correlations between the measures are all above 0.99, a paired *t* test shows that our perceived neighborhood violence measure is different from their corresponding measure. At the neighborhood level, all of the analyses are based on the 342 cases in the Part 2 file, and the correlations between our measures and theirs range from 0.92 to 0.99. The paired *t* test shows statistically significant differences in our and their measures of informal social control and social cohesion. Those differences and the lack of any direct comparison between our and their measure of neighborhood-level collective efficacy raises concerns that our reconstruction of these measures may impact our ability to reproduce their substantive findings.

Correlates of Collective Efficacy

Sampson et al. (1997) present a three-level, item response model of the correlates of collective efficacy with item variation within persons, person variation within neighborhoods, and variation between neighborhoods. In Table 2, we provide a direct comparison between their published findings from this statistical analysis and our

Table 1. Comparison Between Sampson, Raudenbush, and Earls (1997) and Reproduced Key Measures.

		N	*M*	*SD*	Minimum	Maximum	Correlation	Paired *T*
At the respondent level								
Collective efficacy	EBRS*						NA	NA
	Repro	7,729	3.42	0.71	1.0	5.0		
Informal social control	EBRS	7,729	3.46	0.93	1.0	5.0	.99	−0.41
	Repro	7,720	3.46	0.93	1.0	5.0		
Social cohesion	EBRS	7,729	3.37	0.68	1.0	5.0	.99	−0.11
	Repro	7,626	3.36	0.78	1.0	5.0		
Violent victimization	EBRS	7,565	0.113	0.34	1.0	2.0	1.00	NA
	Repro	7,565	0.13	0.34	0.0	1.0		
Perceived neighborhood violence	EBRS	7,729	1.81	0.79	1.0	4.0	.99	−7.48
	Repro	7,290	1.92	0.82	1.0	4.0		
At the neighborhood cluster level								
Collective efficacy	EBRS*						NA	NA
	Repro	342	3.62	0.28	2.88	4.41		
Informal social control	EBRS	342	3.88	0.30	3.08	4.72	.92	51.05
	Repro	342	3.46	0.38	2.43	4.63		
Social cohesion	EBRS	342	3.35	0.26	2.65	4.11	.93	−7.57
	Repro	342	3.41	0.34	2.53	4.45		
Concentrated disadvantage	EBRS	342	0.00	0.99	−1.65	3.81	.99	0.13
	Repro	342	0.00	0.99	−1.16	4.33		
Immigration concentration	EBRS	342	0.00	0.97	−1.63	3.07	.98	0.69
	Repro	342	0.00	0.90	−0.89	2.70		
Residential stability	EBRS	342	0.00	0.98	−2.18	2.33	.99	0.55
	Repro	342	0.00	0.87	−1.80	2.01		
Homicide count, 1988 to 1990	EBRS	342	6.56	7.23	0.00	42.00	.99	2.66
	Repro	342	6.45	7.12	0.00	42.00		
Homicide count, 1995	EBRS	342	2.32	2.68	0.00	15.00	.93	−1.46
	Repro	342	2.33	2.69	0.00	16.00		

Note. EBRS = measure available in Earls, Brooks-Gunn, Raudenbush, & Sampson (2007) archived data; Repro = measure computed by authors for the reproduction effort.

reproduced item response model. We used the survey items to create a measure of collective efficacy and the original variables for the 11 characteristics of the survey respondents. We addressed missing responses for the mobility, years in neighborhood and SES measures using *SPSS's* missing data routine to impute a single value when a valid response was missing. Our steps to reproduce Table 2 duplicated the analytical approaches outlined by Sampson et al. (1997) except we used version 6.8 of Raudenbush and Bryk's *HLM* statistical program. In the HLM models, the dependent variable was defined as normally distributed and it only estimated the Level 2 intercept by the Level 3 neighborhood measures. As noted by Sampson et al. (1997), the three-level model was estimated using maximum likelihood regression.

Table 2.[AQ: 10] Published and Reproduced Correlates of Collective Efficacy.

	Published			Reproduction			Reproduction tests		
Variables	b^1	*SE*	*t*	b^2	*SE*	*t*	$(b^1 - b^2)$	Direction and $p < .05$ match	Clogg's *Z*-value
Intercept	3.523	0.013	263.2	3.319	0.048	69.3	0.204	Same	4.11
Person-level predictors									
Female	−0.012	0.015	−0.76	−0.014	0.015	−0.89	0.002	Same	0.08
Married	−0.005	0.021	−0.25	0.001	0.022	0.04	−0.006	Same	−0.19
Separated or divorced	−0.045	0.026	−1.72	−0.038	0.027	−1.39	−0.007	Same	−0.20
Single	−0.026	0.024	−1.05	−0.024	0.025	−0.10	0.002	Same	−0.05
Homeowner	0.122	0.020	6.04	0.139	0.020	6.90	−0.017	Same	−0.60
Latino	0.042	0.028	1.52	−0.038	0.031	−1.23	0.080	Same	1.92
Black	−0.029	0.030	−0.98	0.022	0.028	0.78	−0.051	Same	−1.24
Mobility	−0.025	0.007	−3.71	−0.028	0.007	−4.08	0.003	Same	0.31
Age	0.000	0.001	3.47	0.001	0.001	2.34	0.001	Same	−1.43
Years in neighborhood	0.001	0.001	0.78	0.000	0.001	0.05	0.000	Same	0.20
SES	0.004	0.008	4.64	0.001	0.000	2.27	0.002	Same	0.32
Neighborhood-level predictors									
Concentrated disadvantage	−0.172	0.016	−10.74	−0.186	0.016	−11.50	0.014	Same	0.63
Immigrant concentration	−0.037	0.014	−2.66	−0.045	0.014	−3.12	0.008	Same	0.39
Residential stability	0.074	0.130	5.61	0.074	0.014	5.42	0.000	Same	0.00

Variance component		Var. comp.	Var. comp.
Intercept	Within neighborhoods	0.320	0.321
	Between neighborhoods	0.026	0.027
Variance explained			
	Within neighborhoods	3%	3%
	Between neighborhoods	70%	71%

Note. SES = socioeconomic status.

Table 2 reports the regression coefficients, standard errors, and *t* tests published by Sampson, et al. (1997) and our reproduction of their findings about the correlates of collective efficacy. We compare the published and reproduced findings in three ways. First, for each variable, we report differences in the size of the published and reproduced regression coefficients. Second, we list indicators of whether the correlation for the published and reproduced variables are (a) in the same direction (positive or negative) and (b) consistent with the reported p value <.05 standard for statistical significance. Our third comparison of the published and reproduced findings is a statistical test for differences in the size of the regression coefficients.

If reproduction by independent researchers was akin to merely running a statistical algorithm a second time, the reproduction of reported findings to a third decimal place might be a reasonable standard for success. However, that standard may be less appropriate for a reproduction of more complex, multivariate, multi-level statistical models described in a seven-page journal article and based on a combination of original data, proxy measures, and alternative data sources. Our second criterion for successful reproduction is to determine the extent to which the reproduced findings are consistent with the published findings in size, direction, and level of statistical significance. These considerations are commonplace in qualitative literature reviews to assess the extent to which prior research does and does not produce consistent findings. Our third criterion for successful reproduction is based upon Clogg's *Z*-score formula (Clogg, Petkova, & Haritou, 1995) that others have used in criminological research (e.g., Paternoster, Brame, Mazerolle, & Piquero, 1998) to systematically test for differences in the size of published and reproduced coefficients. While related, these three criteria provide a multidimensional standard for assessing whether published findings have or have not been reproduced.

The similarities between the original published findings and our reproduction in Table 2 are strong. While none of the coefficients match exactly at three decimal points, the differences are small and both the direction of the effect and whether it exceeds the p value <.05 test match for all the 11 person-level characteristics and all three measures of social composition of the neighborhoods. Sampson et al. (1997) reported that respondents who own their home, who are older, have a higher SES, who live longer in a neighborhood, and who live in a stable neighborhood are associated with increased collective efficacy. Moreover, neighborhoods with more concentrated disadvantage and more immigrant concentrations are associated with less collective efficacy. Our efforts produced the same substantive findings. In addition, based on Clogg's Z-score for similarities between regression coefficients, there are no statistical differences between Sampson et al.'s (1997) measures and our measures, except for the intercept. Furthermore, the estimates of variances explained within neighborhoods (3% for both) and between neighborhoods (70% v. 71%) for their published findings and our reproductions are nearly identical. These consistent findings provide some confidence that the archived data provide a reasonable basis for retesting the direct and indirect effects of collective efficacy on community violence rates.

Effects of Collective Efficacy on Community Violence

Sampson et al. (1997) assert two main hypotheses. The first hypothesis is that neighborhood-level collective efficacy is negatively correlated with neighborhood-level violence. Based on prior research reports showing that larger amounts of concentrated disadvantage and immigrant concentrations were associated with more violence and that residential stability was associated with less violence, Sampson et al.'s (1997) second hypothesis was that collective efficacy would reduce a substantial proportion of the violence correlated with the three measures of neighborhood social composition.

Using the three-level regression model specification used to determine the correlates of collective efficacy, the direct effects of collective efficacy on perceived violence were tested in a model that placed the five perceived violence questions at Level 1, the respondent-level variables are at Level 2, and the three NC measures at Level 3. In their final test of this model, Sampson et al. (1997) specified the homicide rate in Chicago for 1988, 1989, and 1990 at Level 3 to address "possible cofounding effects of prior crime" (p. 922). For the violent victimization analysis, Sampson et al. (1997) specified a two-level model because the dependent variable was measured with one question. Following Sampson et al.'s (1997) statistical procedures, this model specified the dependent variable as a Bernoulli or binary distribution and that the Level 2 intercept should be modeled by the Level 3 neighborhood measures. This model also included the prior homicide measures as a control entered at Level 2. For the 1995 homicide events' results, Sampson et al. (1997) specified a one-level, neighborhood-only model. Because the dependent measure was the rate of homicides per resident, they specified this model as a Poisson regression with overdispersion. Similar to the first two outcome regression models, their homicide regression model contained the three neighborhood-level structural measures and a measure for prior homicides.

The findings reported in Sampson et al. (1997) support the first hypothesis consistently across all three outcome measures: the collective efficacy coefficients were always negative and statistically significant. In their most comprehensive model which included the three measures of social composition as well as a measure of homicides for 1988 to 1990 to capture change overtime in the rate of violence, they report that the coefficients for collective efficacy were consistently large, negative, and statistically significant. As presented under the columns labeled "Published" in Table 3, the collective efficacy coefficients reported by Sampson et al. (1997) were −0.594, –1.176, and −1.107, and their corresponding t tests for collective efficacy exceed the p value <.05 standard for each measure of violence.

Following the procedures described above, we reproduced the analyses reported by Sampson et al. (1997) and report our findings in Table 3 under the columns labeled "Reproduction." Our reproduction finds that the coefficients for collective efficacy are also consistently large, negative, and statistically significant. The collective efficacy coefficients in the reproduction are −0.916, –1.549, and −1.309 and their associated t tests exceed the p value <.05 standard. In addition, the reproduced findings show a negative association with violent behavior that is 10% to 30% larger than Sampson

Table 3. Published and Reproduced Tests of Predictors of Neighborhood-Level Violence, Victimization, and Homicide.

	Published			Reproduction			Reproduction tests		
Perceived neighborhood violence	b^1	*SE*	*t*	b^2	*SE*	*t*	$(b^1 - b^2)$	Direction and $p < .05$ match	Clogg's *Z*-value
Intercept	3.772	0.379	9.950	5.517	0.328	16.808	−1.745	Same	−3.480
Concentrated disadvantage	0.157	0.025	6.380	0.111	0.026	4.217	0.046	Same	1.257
Immigrant concentration	0.020	0.016	1.205	0.008	0.016	0.504	0.012	Same	0.524
Residential stability	−0.054	0.016	−3.390	−0.016	0.015	−1.072	−0.038	Same	−1.764
Collective efficacy	−0.594	0.108	−5.530	−0.916	0.085	−10.783	0.322	Same	2.347
Prior homicide	0.018	0.014	1.270	0.009	0.028	−0.300	0.009	Same	0.300
Violent victimization									
Intercept	−2.015	0.042	−49.240	3.855	1.083	3.561	−5.870	Not Same	−5.418
Concentrated disadvantage	0.073	0.060	1.220	0.008	0.065	0.125	0.065	Same	0.730
Immigrant concentration	0.098	0.045	2.200	0.059	0.004	1.330	0.039	Same	0.865
Residential stability	−0.029	0.052	−0.560	−0.001	0.051	−0.020	−0.028	Same	−0.383
Collective efficacy	−1.176	0.251	−4.690	−1.549	0.253	−6.123	0.373	Same	1.047
Prior homicide	0.017	0.049	0.340	−0.037	0.095	−0.394	0.054	Not Same	0.508
1995 homicide rate									
Intercept	3.071	0.050	62.010	5.682	1.437	3.952	−2.611	Same	−1.816
Concentrated disadvantage	0.175	0.070	2.420	−0.012	0.105	−0.119	0.187	Not Same	1.482
Immigrant concentration	−0.034	0.044	−0.770	−0.067	0.054	−1.244	0.033	Same	0.479
Residential stability	0.229	0.043	5.380	0.235	0.052	4.557	−0.006	Same	−0.089
Collective efficacy	−1.107	0.272	−4.070	−1.309	0.319	−4.100	0.202	Same	0.483
Prior homicide	0.397	0.070	5.640	0.645	0.150	4.312	−0.248	Same	−1.503

et al.'s (1997) published findings. However, only the increased size of the collective efficacy coefficient associated with perceived violence exceeds Clogg's *Z*-test for statistical significant.

The Mediating Effects of Collective Efficacy

Sampson et al.'s (1997) second hypothesis is that neighborhood-level collective efficacy reduces the direct effects of a neighborhood's social composition on violent behavior. They tested this hypothesis by presenting the results of models showing the effects of concentrated disadvantage, immigrant concentration, and residential stability on violent behavior without a measure of collective efficacy (Model 1) and then with a measure of collective efficacy (Model 2). Using the same combination of three-, two-, and one-level HLM models presented in Table 3, our Table 4 presents Sampson et al.'s (1997) published findings about the direct and mediating effects of collective efficacy. Table 4 also presents the results of our reproduction of these findings. The top section reports their Model 1 results and our reproduction of their Model 1. The bottom section reports their Model 2 results and our reproductions of their Model 2.

Regarding the Social Composition model, the nine reproduced coefficients are in the same direction as Sampson et al.'s (1997) corresponding coefficients, and all nine coefficients that are statistically significant in Sampson et al.'s (1997) analysis are also significant in our analysis. For the models predicting perceived neighborhood violence and violent victimization, the differences in the published and reproduced coefficients are less than 0.01. In the model predicting homicide rates, the published and reproduced coefficients for the effects of concentrated disadvantage vary by a little more than 0.2 units. While the published and reproduced concentrated disadvantage coefficients are both positive and significant, the difference in the size of the two coefficients (0.727 vs 0.516) is significant (Clogg's *Z*-value; 3.054; *p* value = .01). Based on the similarities between the published and reproduced findings, we determined that Model 1 of Table 4 could be reproduced except that we produced a smaller coefficient for the effects of concentrated disadvantage than they report.

Model 2 of Table 4 shows the comparison between the published and reproduced analyses when collective efficacy was added to the regression model. Overall, all but one of the coefficient pairs were in the same direction. The coefficient for the immigrant concentration and homicide relationship that was not significant ($b = -0.078$; t value $= -1.45$) in the published article is now significant in the reproduced analysis ($b = -0.135$; t value $= -2.250$). In addition, the reproduced coefficient for the relationship between concentrated disadvantage and homicide remains significantly smaller (Clogg's *Z*-value = 2.226; *p* value = .01) than the published coefficient (0.491 vs. 0.254).

In Model 2, the impact of collective efficacy on violence is similar across the published and reproduced analysis of all three measures of violence. All three of the published and reproduced coefficients are negative and significant; however, the reproduced coefficients show a consistently larger negative correlation between collective efficacy and homicide than the published findings do, and our coefficient of the

Table 4. Published and Reproduced Tests of Social Composition and Collective Efficacy Correlates of Violence.

	Published			Reproduction			Reproduction tests		
	b^1	*SE*	*t*	b^2	*SE*	*t*	$(b^1–b^2)$	Direction and $p < .05$ match	Clogg's *Z*-value
Model 1. Social composition									
Perceived neighborhood violence									
Concentrated disadvantage	0.277	0.021	13.30	0.275	0.021	13.32	0.002	Same	0.068
Immigrant concentration	0.041	0.017	2.44	0.049	0.018	2.72	−0.008	Same	−0.327
Residential stability	−0.102	0.015	−6.95	−0.103	0.015	−7.05	0.001	Same	0.026
Violent victimization									
Concentrated disadvantage	0.258	0.045	5.71	0.249	0.044	5.59	0.009	Same	0.150
Immigrant concentration	0.141	0.046	3.06	0.132	0.045	2.95	0.009	Same	0.134
Residential stability	–0.143	0.050	−2.84	−0.146	0.050	−2.94	0.003	Same	0.038
1995 homicide rate									
Concentrated disadvantage	0.727	0.046	14.91	0.516	0.051	7.924	0.211	Same	3.054
Immigrant concentration	−0.022	0.057	−0.04	−0.083	0.065	−1.297	0.061	Same	0.700
Residential stability	0.093	0.042	2.18	0.108	0.064	2.243	−0.015	Same	−0.199

(continued)

Table 4. (continued)

	Published			Reproduction			Reproduction tests		
	b^1	*SE*	*t*	b^2	*SE*	*t*	$(b^1–b^2)$	Direction and $p < .05$ match	Clogg's *Z*-value
Model 2. Social composition and collective efficacy									
Perceived neighborhood violence									
Concentrated disadvantage	0.171	0.024	7.240	0.107	0.022	4.78	0.064	Same	1.960
Immigrant concentration	0.018	0.016	1.120	0.009	0.015	0.05	0.009	Same	0.426
Residential stability	−0.056	0.016	−3.490	−0.015	0.014	−1.06	−0.041	Same	−1.914
Collective efficacy	−0.618	0.104	−5.950	−0.912	0.085	−10.70	0.294	Same	2.188
Violent victimization									
Concentrated disadvantage	0.085	0.054	1.580	−0.009	0.057	−0.17	0.094	Same	1.207
Immigrant concentration	0.098	0.044	2.200	0.060	0.044	1.38	0.038	Same	0.607
Residential stability	−0.031	0.051	−0.600	0.000	0.051	0.01	−0.031	Same	−0.431
Collective efficacy	−1.190	0.240	−4.960	−1.533	0.246	−6.24	0.343	Same	0.999
1995 homicide rate									
Concentrated disadvantage	0.491	0.064	7.650	0.254	0.085	2.982	0.237	Same	2.226
Immigrant concentration	−0.078	0.050	−1.450	−0.135	0.060	−2.250	0.057	Not Same	0.727
Residential stability	0.208	0.046	4.520	0.217	0.054	4.038	−0.009	Same	−0.120
Collective efficacy	−1.471	0.261	−5.640	−1.641	0.310	−5.297	0.170	Same	0.419

impact of collective efficacy on homicide is statistically larger than the coefficient they report (Clogg's Z-value = 2.188; p value = .01). We did explore several computations that might have generated a collective efficacy measure that produced coefficients more similar to theirs, but none produced results closer than those reported in Table 4.

Perhaps more importantly, our reproduction shows the same consistent reductions in the impact of the concentrated disadvantage on all three measures of violence when collective efficacy is included in Model 2. These findings about concentrated disadvantage confirm their second hypothesis about the indirect effect of collective efficacy on violence. However, both their findings and our findings in Model 1 show that the impact of the other two measures of social composition do not conform to their expectations that immigrant concentration would be positively associated with more violence and that residential stability would be associated with less violence. Moreover, in Model 2, both sets of findings show positive and negative impacts that do not conform to the expected reductions in the association between social composition and violence.

Summary and Conclusion

Despite the attention that Sampson et al.'s (1997) *Science* article has received over the past 20 years, researchers and proponents of collective efficacy have not completed a thorough review and reproduction of its key findings. This article's purpose is to address this gap. Using Earls et al.'s (2007) data collection and Sampson et al.'s (1997) data analyses framework and an independent source for census and homicide data, we produced coefficients that are in the same direction and met or exceeded the same level of statistical significance as the substantive findings reported by Sampson and his colleagues. This pattern of reproduction was not just for the central concept of collective efficacy and for one set of analysis, but for all of their substantive results that they reported in their 1997 *Science* article.

Similar to Sampson et al.'s (1997) result, we found that about 70% of collective efficacy's explained variance is accounted for by the neighborhood's quantity of concentrated disadvantage, immigrant concentration, and residential stability. Besides the neighborhood factors, we also found a few respondent-level factors that helped to explain differences across the residents' perceptions of their neighborhood's level of collective efficacy. In particular, residents who owned their homes, moved less frequently, were older, and were wealthier reported higher levels of neighborhood collective efficacy.

In terms of a direct relationship between collective efficacy and violence, we reproduced the connection between Sampson et al.'s (1997) collective efficacy construct and their three measures of violence across the neighborhoods. Our final series of analyses illustrated that after adjusting for several neighborhood structural factors, the more residents reported a feeling of collective efficacy in their neighborhoods, the less violent victimizations they reported against themselves, the fewer violent criminal incidents they perceived in their neighborhoods, and their neighborhoods had fewer homicides per resident recorded by the Chicago Police.

We also reproduced Sampson et al.'s (1997) finding that collective efficacy impacts the direct link between concentrated disadvantage and violence. Our reanalysis show that when one compares the regression models without collective efficacy to those with collective efficacy, the coefficient of concentrated disadvantage is reduced substantially in size across the board. For example, the size of the coefficient between concentrated disadvantage and perceived neighborhood violence decreased by 70%, and the coefficient between concentrated disadvantage and violent victimization decreased from 0.249 to near zero. This change is a key finding because it suggests that informal social processes within a neighborhood could mediate the consequence of some systemic, structural factors that others have long believed influenced crime and delinquency across cities (see Sampson & Groves, 1989; Shaw & McKay, 1942).

While our empirical results are not identical to Sampson et al.'s (1997) findings, our pattern of outcomes parallels their results. The consistency between our findings and Sampson et al.'s (1997) published findings attests to the overall quality of their work. This effort to reproduce was possible only because the National Institute of Justice and the MacArthur Foundation provided supplemental financial support for documenting and archiving these data. While their effort exceeded common practices across social sciences during late 1990s, the inclusion of syntax programs written to select cases, calculate measures, and produce regression outcomes would have facilitated our effort to reproduce their results.

Our reproduction of Sampson et al. (1997) is imperfect for at least two reasons. First, while Earls et al. (2007) provided most of the original variables and imputed measures, what Sampson et al. (1997) did not provide was sufficient documentation that explained how they addressed the missing data beyond a discussion in another article about how their HLM framework adjusts for the missing data (see Raudenbush & Sampson, 1999). Had our substantive findings not been so close to their published findings, this omission may have been a bigger problem. The second reason our reproduction is imperfect is the absence of Sampson et al.'s (1997) collective efficacy measure in Earls et al. (2007). This omission would have been a limitation had their archived data not included the individual items that they assert are the basis for creating the collective efficacy measure. Sampson et al. (1997) were also unclear about how they combined these two latent measures to create their collective efficacy measure. As a result, our production of their measure of collective efficacy required us to explore numerous approaches to identify a close approximation of their measure.

The findings from our reproduction solidifies the reliability of Sampson et al.'s (1997) results. Sampson et al. (1997, p. 923) made three conclusions that have shaped more than a decade of criminological thinking. Their three conclusions were (a) "collective efficacy is an important construct that can be measured reliably at the neighborhood-level by means of survey research strategies," (b) collective efficacy . . . mediated a substantial portion of the association of residential stability and disadvantage with multiple measures of violence," and (c) "the combined measure of informal social control and cohesion and trust [is] a robust predictor of lower rates of violence." Based upon our review and reproduction of their research, we found no new evidence to dispute their three conclusions.

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Note

1. The homicide records that Sampson et al. (1997) used did not benefit from the improved geo-coding routines later used by Block and Block (2005) before they archived their data. Because Sampson et al. (1997) did not specify which types of homicide incidents they included in their measure, we combined murders, involuntary and reckless manslaughters, and justifiable homicide incidents to produce our 1995 homicide rate.

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