

Exhibit 1 – Curriculum Vitae of Gary Kleck

CURRICULUM VITAE

GARY KLECK

(Updated March 3, 2016)

PERSONAL

Place of Birth: Lombard, Illinois

Date of Birth: March 2, 1951

Address: College of Criminology and Criminal Justice
306 Hecht House
The Florida State University
Tallahassee, Florida 32306-1127

Telephone Numbers: Office: (850) 644-7651
Office FAX: (850) 644-9614
Home: (850) 894-1628

e-mail Address: gkleck@fsu.edu

CURRENT POSITION

David J. Bordua Professor of Criminology, Florida State University

COURTESY APPOINTMENT

Professor, College of Law, Florida State University

PROFESSIONAL MEMBERSHIPS

American Society of Criminology

Academy of Criminal Justice Sciences

EDUCATION

A.B. 1973 - University of Illinois, with High Honors and with Distinction in Sociology

A.M. 1975 - University of Illinois at Urbana, in Sociology

Ph.D. 1979 - University of Illinois at Urbana, in Sociology

ACADEMIC HONORS

National Merit Scholar, 1969

Freshman James Scholar, University of Illinois, 1969

Graduated from University of Illinois with High Honors and with Distinction in Sociology, 1973

University of Illinois Foundation Fellowship in Sociology, 1975-76

1993 Winner of the Michael J. Hindelang Award of the American Society of Criminology, for the book that made "the most outstanding contribution to criminology" (for Point Blank: Guns and Violence in America).

Awarded Named Professorship, Florida State University, 2012.

Nominated for University Teaching Award, Florida State University, 2014.

TEACHING POSITIONS

Fall, 1991 to present	Professor, College of Criminology and Criminal Justice, Florida State University
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Fall, 1984 to Spring, 1991	Associate Professor, School of Criminology, Florida State University.
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Fall, 1979 to Spring, 1984	Assistant Professor, School of Criminology, Florida State University.
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Fall, 1978 to Spring, 1979	Instructor, School of Criminology, Florida State University.
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COURSES TAUGHT

Criminology, Applied Statistics, Regression, Introduction to Research Methods, Law Enforcement, Research Methods in Criminology, Guns and Violence, Violence Theory Seminar, Crime Control, Assessing Evidence, Survey Research, Research Design and Causal Inference.

DISSERTATION

Homicide, Capital Punishment, and Gun Ownership: An Aggregate Analysis of U.S. Homicide Trends from 1947 to 1976. Department of Sociology, University of Illinois, Urbana. 1979.

PUBLICATIONS (sole author unless otherwise noted)

BOOKS

- 1991, Point Blank: Guns and Violence in America. Hawthorne, N.Y.: Aldine de Gruyter.
2005 Winner of the 1993 Michael J. Hindelang award of the American Society of Criminology. Republished in 2005 in paperback by Transaction Publishers.

Reviewed in Contemporary Sociology, American Journal of Sociology, Social Forces, Journal of Criminal Law and Criminology, The Criminologist, The Public Interest, Criminal Law Forum, Social Science Review, Criminal Justice Abstracts, Crime, Criminal Justice and Law Enforcement, Newsletter of Public Policy Currents, Commonweal, Choice, and others.

- 1997 Targeting Guns: Firearms and their Control. Hawthorne, N.Y.: Aldine de Gruyter.
1997 The Great American Gun Debate: Essays on Firearms and Violence (with Don B. Kates, Jr.). San Francisco: Pacific Research Institute for Public Policy.
2001 (with Don B. Kates) Armed: New Perspectives on Gun Control. N.Y.: Prometheus Books.

Selected to Choice: Current Reviews for Academic Libraries' 39th annual "Outstanding Academic Title List," awarded for "excellence in scholarship and presentation, the significance of their contribution to their field, and their value as an important treatment of their topic." Awarded to less than one percent of books.

RESEARCH MONOGRAPH

- 1979 Bordua, David J., Alan J. Lizotte, and Gary Kleck. Patterns of Firearms Ownership, Use and Regulation in Illinois. A Report to the Illinois Law Enforcement Commission, Springfield, Illinois.

ARTICLES IN PEER-REVIEWED JOURNALS

- 1979 "Capital punishment, gun ownership, and homicide." American Journal of Sociology 84(4):882-910.
1981 "Racial discrimination in criminal sentencing: A critical evaluation of the evidence with additional evidence on the death penalty." American Sociological Review 46(6):783-804.
1982 "On the use of self-report data to determine the class distribution of criminal

- behavior." American Sociological Review 47(3):427-33.
- 1983 (with David Bordua) "The factual foundation for certain key assumptions of gun control." Law and Policy Quarterly 5(3):271-298.
- 1985 "Life support for ailing hypotheses: modes of summarizing the evidence on racial discrimination in criminal sentencing." Law and Human Behavior 9(3):271-285.
- 1986 "Evidence that 'Saturday Night Specials' not very important for crime." Sociology and Social Research 70(4):303-307.
- 1987 "American's foreign wars and the legitimation of domestic violence." Sociological Inquiry 57(3):237-250.
- 1988 "Crime control through the private use of armed force." Social Problems 35(1):1-21.
- 1988 "Miscounting suicides." Suicide and Life-Threatening Behavior 18(3):219-236.
- 1990 (with Susan Sayles) "Rape and resistance." Social Problems 37(2):149-162.
- 1991 (with Karen McElrath) "The effects of weaponry on human violence." Social Forces 69(3):669-92.
- 1993 (with Miriam DeLone) "Victim resistance and offender weapon effects in robbery." Journal of Quantitative Criminology 9(1):55-82.
- 1993 (with E. Britt Patterson) "The impact of gun control and gun ownership levels on violence rates." Journal of Quantitative Criminology 9(3):249-287.
- 1993 "Bad data and the 'Evil Empire': interpreting poll data on gun control." Violence and Victims 8(4):367-376.
- 1995 "Guns and violence: an interpretive review of the field." Social Pathology 1(1):12-47.
- 1995 "Using speculation to meet evidence." Journal of Quantitative Criminology 11(4):411-424.
- 1995 (with Marc Gertz) "Armed resistance to crime: the prevalence and nature of self-defense with a gun." Journal of Criminal Law & Criminology 86(1):150-187.
- 1996 "Crime, culture conflict and sources of support for gun control: a multi-level application of the General Social Surveys." American Behavioral Scientist 39(4):387-404.

- 1996 (with Chester Britt III and David J. Bordua) "A reassessment of the D.C. gun law: some cautionary notes on the use of interrupted time series designs for policy impact assessment." Law & Society Review 30(2):361-380.
- 1996 (with Chester Britt III and David J. Bordua) "Avoidance and misunderstanding." Law & Society Review 30(2):393-397.
- 1997 (with Marc Gertz) "The illegitimacy of one-sided speculation: getting the defensive gun use estimate down." Journal of Criminal Law and Criminology 87(4):1446-1461.
- 1997 (with Tomislav Kovandzic and Marc Gertz) "Defensive gun use: vengeful vigilante imagery vs. reality: results from the National Self-Defense Survey." Journal of Criminal Justice 26(3):251-258.
- 1998 (with Marc Gertz) "Carrying guns for protection: results from the National Self-Defense Survey." Journal of Research in Crime and Delinquency 35(2):193-224.
- 1998 "What are the risks and benefits of keeping a gun in the home?" Journal of the American Medical Association 280(5):473-475.
- 1998 (with Charles Crawford and Ted Chiricos) "Race, racial threat, and sentencing of habitual offenders." Criminology 36(3):481-511.
- 1999 (with Michael Hogan) "A national case-control study of homicide offending and gun ownership." Social Problems 46(2):275-293.
- 1999 "BATF gun trace data and the role of organized gun trafficking in supplying guns to criminals." St. Louis University Public Law Review 18(1):23-45.
- 2001 "Can owning a gun really triple the owner's chances of being murdered?" Homicide Studies 5:64-77.
- 2002 (with Theodore Chiricos) "Unemployment and property crime: a target-specific assessment of opportunity and motivation as mediating factors." Criminology 40(3):649-680.
- 2004 "Measures of gun ownership levels for macro-level crime and violence research." Journal of Research in Crime and Delinquency 41(1):3-36.
- 2004 (with Jongyeon Tark) "Resisting crime: the effects of victim action on the outcomes of crimes." Criminology 42(4):861-909.
- 2005 (with Brion Sever, Spencer Li, and Marc Gertz) "The missing link in general deterrence research." Criminology 43(3):623-660.

- 2006 (with Jongyeon Tark and Jon J. Bellows) "What methods are most frequently used in research in criminology and criminal justice?" Journal of Criminal Justice 34(2):147-152.
- 2007 "Are police officers more likely to kill African-American suspects?" Psychological Reports 100(1):31-34.
- 2007 (with Shun-Yung Wang and Jongyeon Tark) "Article productivity among the faculty of criminology and criminal justice doctoral programs, 2000-2005." Journal of Criminal Justice Education 18(3):385-405.
- 2008 (with Jongyeon Tark, Laura Bedard, and Dominique Roe-Sepowitz) "Crime victimization and divorce." International Review of Victimology 15(1):1-17.
- 2009 "The worst possible case for gun control: mass shootings in schools." American Behavioral Scientist 52(10):1447-1464.
- 2009 (with Shun-Yung Wang) "The myth of big-time gun trafficking and the overinterpretation of gun tracing data." UCLA Law Review 56(5):1233-1294.
- 2009 (with Tomislav Kovandzic) "City-level characteristics and individual handgun ownership: effects of collective security and homicide." Journal of Contemporary Criminal Justice 25(1):45-66.
- 2009 (with Marc Gertz and Jason Bratton) "Why do people support gun control?" Journal of Criminal Justice 37(5):496-504.
- 2011 (with James C. Barnes) "Article productivity among the faculty of criminology and criminal justice doctoral programs, 2005-2009." Journal of Criminal Justice Education 22(1):43-66.
- 2011 (with Tomislav Kovandzic, Mark Saber, and Will Hauser). "The effect of perceived risk and victimization on plans to purchase a gun for self-protection." Journal of Criminal Justice 39(4):312-319.
- 2013 (with Will Hauser) "Guns and fear: a one-way street?" Crime and Delinquency 59:271-291.
- 2013 "Gun control after Heller and McDonald: what cannot be done and what ought to be done." Fordham Urban Law Journal 39(5):1383-1420.
- 2013 (with J. C. Barnes) "Deterrence and macro-level perceptions of punishment risks: is there a "collective wisdom?" Crime and Delinquency 59(7):1006-1035.
- 2013 (with Tomislav Kovandzic and Mark Schaffer) "Estimating the causal effect of

- gun prevalence on homicide rates: A local average treatment effect approach." Journal of Quantitative Criminology 28(4):477-541.
- 2014 (with Jongyeon Tark) "Resisting rape: the effects of victim self-protection on rape completion and injury." Violence Against Women 23(3): 270-292.
- 2014 (with J. C. Barnes) "Do more police generate more crime deterrence?" Crime and Delinquency 60(5):716-738.
- 2015 "The impact of gun ownership rates on crime rates: a methodological review of the evidence." Journal of Criminal Justice 43(1):40-48.
- 2016 (with Bethany Mims) "Article productivity among the faculty of criminology and criminal justice doctoral programs, 2010-2014." Journal of Criminal Justice Education. Published online 3-11-16. DOI: 10.1080/10511253.2016.1146008.
- 2016 (with Dylan Jackson) "Adult unemployment and serious property crime: A national case-control study." Journal of Quantitative Criminology. In press.
- 2016 (with Will Hauser) "Confidence in the police and fear of crime: do police force size and productivity matter?" American Journal of Criminal Justice. In press.
- 2016 (with Dylan Jackson) "Does crime cause punitiveness?" Crime & Delinquency. In press.

OTHER PUBLISHED ARTICLES

- 1985 "Policy lessons from recent gun control research." Law and Contemporary Problems 49(1):35-62.
- 1992 "Assault weapons aren't the problem." New York Times September 1, 1992, p. A15. Invited Op-Ed page article.
- 1993 "The incidence of violence among young people." The Public Perspective 4:3-6. Invited article.
- 1994 "Guns and self-protection." Journal of the Medical Association of Georgia 83:42. Invited editorial.
- 1998 "Using speculation to meet evidence: reply to Alba and Messner." Journal on Firearms and Public Policy 9:13-49.
- 1998 "Has the gun deterrence hypothesis been discredited?" Journal on Firearms and Public Policy 10:65-75.

- 1999 "There are no lessons to be learned from Littleton." Criminal Justice Ethics 18(1):2, 61-63. Invited commentary.
- 1999 "Risks and benefits of gun ownership - reply." Journal of the American Medical Association 282(2):136-136.
- 1999 "The misfire that wounded Colt's." New York Times October 23, 1999. Invited Op-Ed page article.
- 1999 "Degrading scientific standards to get the defensive gun use estimate down." Journal on Firearms and Public Policy 11:77-137.
- 2000 "Guns aren't ready to be smart." New York Times March 11, 2000. Invited Op-Ed page article.
- 2000 (with Chester Britt III and David J. Bordua) "The emperor has no clothes: Using interrupted time series designs to evaluate social policy impact." Journal on Firearms and Public Policy 12:197-247.
- 2001 "School lesson: armed self-defense works." Wall Street Journal March 27, 2001. Invited opinion article.
- 2001 "Impossible policy evaluations and impossible conclusions: a comment on Koper and Roth." Journal of Quantitative Criminology 17(1):75-80.
- 2001 "Absolutist politics in a moderate package: prohibitionist intentions of the gun control movement." Journal on Firearms and Public Policy 13:1-43.
- 2002 "Research agenda on guns, violence, and gun control." Journal on Firearms and Public Policy 14:51-72.
- 2006 "Off target." New York Sun January 5, 2006. Invited opinion article.
- 2009 "How not to study the effect of gun levels on violence rates." Journal on Firearms and Public Policy 21:65-93.
- 2011 "Mass killings aren't the real gun problem --- how to tailor gun-control measures to common crimes, not aberrant catastrophes." Wall Street Journal January 15, 2011. Invited opinion article.
- 2011 "The myth of big-time gun trafficking." Wall Street Journal May 21, 2011. Invited opinion article.
- 2015 "Defensive gun ownership is not a myth: why my critics still have it wrong." Politico Magazine, February 17, 2015. Online at Politico.Com.

- 2016 Kleck, Gary. "The impact on crime of state laws allowing concealed weapon carrying among 18-20 Year-olds." To appear in Fall 2016 issue of the Journal on Firearms and Public Policy.

BOOK CHAPTERS

- 1984 (with David Bordua) "The assumptions of gun control." Pp. 23-48 in Don B. Kates, Jr. (ed.) Firearms and Violence: Issues of Regulation. Cambridge, Mass.: Ballinger.
- (Also appeared in Federal Regulation of Firearms, report prepared by the Congressional Research Service, Library of Congress, for the Committee on the Judiciary, United States Senate, 1982).
- 1984 "The relationship between gun ownership levels and rates of violence in the U.S." Pp. 99-135 in Kates, above.
- 1984 "Handgun-only gun control: a policy disaster in the making." Pp. 167-199 in Kates, above.
- 1996 "Racial discrimination in criminal sentencing." Pp. 339-344 in Crime and Society, Volume III – Readings: Criminal Justice, edited by George Bridges, Robert D. Crutchfield, and Joseph G. Weis. Thousand Oaks, Calif.: Pine Forge Press.
- 1996 "Gun buy-back programs: nothing succeeds like failure." Pp. 29-53 in Under Fire: Gun Buy-Backs, Exchanges and Amnesty Programs, edited by Martha R. Plotkin. Washington, D.C.: Police Executive Research Forum.
- 2000 "Firearms and crime." Pp. 230-234 in the Encyclopedia of Criminology and Deviant Behavior, edited by Clifton D. Bryant. Philadelphia: Taylor & Francis, Inc.
- 2001 (with Leroy Gould and Marc Gertz) "Crime as social interaction." Pp. 101-114 in What is Crime?: Controversy over the Nature of Crime and What to Do About It, edited by Stuart Henry and Mark M. Lanier. Lanham, Md.: Rowman and Littlefield.
- 2003 "Constricted rationality and the limits of general deterrence." Chapter 13 in Punishment and Social Control: Enlarged Second Edition, edited by Thomas G. Blomberg. New York: Aldine de Gruyter.
- 2004 "The great American gun debate: what research has to say." Pp. 470-487 in The Criminal Justice System: Politics and Policies, 9th edition, edited by George F. Cole, Marc Gertz, and Amy Bunger. Belmont, CA: Wadsworth-Thomson.

- 2008 "Gun control." Article in The Encyclopedia of Social Problems, edited by Vincent N. Parrillo. Thousand Oaks, CA: Sage.
- 2009 "Guns and crime." Invited chapter. Pp. 85-92 in 21st Century Criminology: A Reference Handbook, edited by J. Mitchell Miller. Thousand Oaks, CA: Sage.
- 2012 Kovandzic, Tomislav, Mark E. Schaffer, and Gary Kleck. "Gun prevalence, homicide rates and causality: A GMM approach to endogeneity bias." Chapter 6, pp. 76-92 in The Sage Handbook of Criminological Research Methods, edited by David Gadd, Susanne Karstedt, and Steven F. Messner. Thousand Oaks, CA: Sage.
- 2012 (with Kelly Roberts) "What survey modes are most effective in eliciting self-reports of criminal or delinquent behavior?" Pp. 415-439 in Handbook of Survey Methodology, edited by Lior Gideon. NY: Springer.
- 2013 "Deterrence: actual vs. perceived risk of punishment. Article in Encyclopedia of Criminology and Criminal Justice. Berlin: Springer Verlag.
- 2013 "An overview of gun control policy in the United States." Pp. 562-579 in The Criminal Justice System, 10th edition, Edited by George F. Cole and Marc G. Gertz. Wadsworth.

BOOK REVIEWS

- 1978 Review of Murder in Space City: A Cultural Analysis of Houston Homicide Patterns, by Henry Lundsgaarde. Contemporary Sociology 7:291-293.
- 1984 Review of Under the Gun, by James Wright et al. Contemporary Sociology 13:294-296.
- 1984 Review of Social Control, ed. by Jack Gibbs. Social Forces 63: 579-581.
- 1985 Review of Armed and Considered Dangerous, by James Wright and Peter Rossi, Social Forces 66:1139-1140.
- 1988 Review of The Citizen's Guide to Gun Control, by Franklin Zimring and Gordon Hawkins, Contemporary Sociology 17:363-364.
- 1989 Review of Sociological Justice, by Donald Black, Contemporary Sociology 19:261-3.
- 1991 Review of Equal Justice and the Death Penalty, by David C. Baldus, George G. Woodworth, and Charles A. Pulaski, Jr. Contemporary Sociology 20:598-9.

- 1999 Review of Crime is Not the Problem, by Franklin E. Zimring and Gordon Hawkins. American Journal of Sociology 104(5):1543-1544.
- 2001 Review of Gun Violence: the Real Costs, by Philip J. Cook and Jens Ludwig. Criminal Law Bulletin 37(5):544-547.
- 2010 Review of Homicide and Gun Control: The Brady Handgun Violence Prevention Act and Homicide Rates, by J. D. Monroe. Criminal Justice Review 35(1):118-120.

LETTERS PUBLISHED IN SCHOLARLY JOURNALS

- 1987 "Accidental firearm fatalities." American Journal of Public Health 77:513.
- 1992 "Suicide in the home in relation to gun ownership." The New England Journal of Medicine 327:1878.
- 1993 "Gun ownership and crime." Canadian Medical Association Journal 149:1773-1774.
- 1999 "Risks and benefits of gun ownership." Journal of the American Medical Association 282:136.
- 2000 (with Thomas Marvell) "Impact of the Brady Act on homicide and suicide rates." Journal of the American Medical Association 284:2718-2719.
- 2001 "Violence, drugs, guns (and Switzerland)." Scientific American 284(2):12.
- 2002 "Doubts about undercounts of gun accident deaths." Injury Prevention Online (September 19, 2002). Published online at <http://ip.bmjournals.com/cgi/eletters/8/3/252>.
- 2005 "Firearms, violence, and self-protection." Science 309:1674. September 9, 2005.

UNPUBLISHED REPORT

- 1987 Violence, Fear, and Guns at Florida State University: A Report to the President's Committee on Student Safety and Welfare. Reports results of campus crime victimization survey and review of campus police statistics on gun violence (32 pages).

RESEARCH FUNDING

- 1994 "The Impact of Drug Enforcement on Urban Drug Use Levels and Crime Rates." \$9,500 awarded by the U.S. Sentencing Commission.

- 1997 "Testing a Fundamental Assumption of Deterrence-Based Crime Control Policy."
\$80,590 awarded by the Charles E. Culpeper Foundation to study the link
between actual and perceived punishment levels.

PRESENTED PAPERS

- 1976 "Firearms, homicide, and the death penalty: a simultaneous equations analysis."
Presented at the annual meetings of the Illinois Sociological Association,
Chicago.
- 1979 "The assumptions of gun control." Presented at the Annual Meetings of the
American Sociological Association, New York City.
- 1980 "Handgun-only gun control: A policy disaster in the making." Presented at the
Annual Meetings of the American Society of Criminology, Washington, D.C.
- 1981 "Life support for ailing hypotheses: Modes of summarizing the evidence on
racial
discrimination." Presented at the Annual Meetings of the American Society of
Criminology, Toronto.
- 1984 "Policy lessons from recent gun control research." Presented at the Duke
University Law School Conference on Gun Control.
- 1985 "Policy lessons from recent gun control research." Presented at the Annual
Meetings of the American Society of Criminology, San Diego.
- 1986 "Miscounting suicides." Presented at the Annual Meetings of the American
Sociological Association, Chicago.
- 1987 (with Theodore G. Chiricos, Michael Hays, and Laura Myers) "Unemployment
and crime: a comparison of motivation and opportunity effects." Annual
meetings of the American Society of Criminology, Montreal.
- 1988 "Suicide, guns and gun control." Presented at the Annual Meetings of the Popular
Culture Association, New Orleans.
- 1988 (with Susan Sayles) "Rape and resistance." Presented at the Annual Meetings of
the American Society of Criminology, Chicago, Ill.
- 1989 (with Karen McElrath) "The impact of weaponry on human violence."
Presented at the Annual Meetings of the American Sociological Association, San
Francisco.
- 1989 (with Britt Patterson) "The impact of gun control and gun ownership levels on

city violence rates." Presented at the Annual Meetings of the American Society of Criminology, Reno.

- 1990 "Guns and violence: a summary of the field." Presented at the Annual Meetings of the American Political Science Association, Washington, D.C.
- 1991 "Interrupted time series designs: time for a re-evaluation." Presented at the Annual Meetings of the American Society of Criminology, New Orleans.
- 1993 (with Chester Britt III and David J. Bordua) "The emperor has no clothes: Using interrupted time series designs to evaluate social policy impact." Presented at the Annual Meetings of the American Society of Criminology, Phoenix.
- 1992 "Crime, culture conflict and support for gun laws: a multi-level application of the General Social Surveys." Presented at the Annual Meetings of the American Society of Criminology, Phoenix.
- 1994 (with Marc Gertz) "Armed resistance to crime: the prevalence and nature of self-defense with a gun." Presented at the Annual Meetings of the American Society of Criminology, Miami.
- 1995 (with Tom Jordan) "The impact of drug enforcement and penalty levels on urban drug use levels and crime rates." Presented at the Annual Meetings of the American Society of Criminology, Boston.
- 1996 (with Michael Hogan) "A national case-control study of homicide offending and gun ownership." Presented at the Annual Meetings of the American Society of Criminology, Chicago.
- 1997 "Evaluating the Brady Act and increasing the utility of BATF tracing data." Presented at the annual meetings of the Homicide Research Working Group, Shepherdstown, West Virginia.
- 1997 "Crime, collective security, and gun ownership: a multi-level application of the General Social Surveys." Presented at the Annual Meetings of the American Society of Criminology, San Diego.
- 1998 (with Brion Sever and Marc Gertz) "Testing a fundamental assumption of deterrence-based crime control policy." Presented at the Annual Meetings of the American Society of Criminology, Washington, D.C.
- 1998 "Measuring macro-level gun ownership levels." Presented at the Annual Meetings of the American Society of Criminology, Washington, D.C.
- 1999 "Can owning a gun really triple the owner's chances of being murdered?" Presented at the Annual Meetings of the American Society of Criminology,

Toronto.

- 2000 "Absolutist politics in a moderate package: prohibitionist intentions of the gun control movement." Presented at the Annual Meetings of the American Society of Criminology, San Francisco.
- 2001 (with Tomislav V. Kovandzic) "The impact of gun laws and gun levels on crime rates." Presented at the Annual Meetings of the American Society of Criminology, Atlanta.
- 2001 "Measures of gun ownership levels for macro-level violence research." Presented at the Annual Meetings of the American Society of Criminology, Atlanta.
- 2001 "The effects of gun ownership levels and gun control laws on urban crime rates." Presented at the Annual Meetings of the American Society of Criminology, Chicago.
- 2003 (with Tomislav V. Kovandzic) "The effect of gun levels on violence rates depends on who has them." Presented at the Annual Meetings of the American Society of Criminology, Denver.
- 2003 (with Kyubeom Choi) "Filling in the gap in the causal link of deterrence." Presented at the Annual Meetings of the American Society of Criminology, Denver.
- 2004 (with Tomislav Kovandzic) "Do violent crime rates and police strength levels in the community influence whether individuals own guns?" Presented at the Annual Meetings of the American Society of Criminology, Nashville.
- 2004 (with Jongyeon Tark) "Resisting crime: the effects of victim action on the outcomes of crime." Presented at the Annual Meetings of the American Society of Criminology, Nashville.
- 2004 (with Jongyeon Tark) "The impact of self-protection on rape completion and injury." Presented at the Annual Meetings of the American Society of Criminology, Nashville.
- 2004 (with Kyubeom Choi) "The perceptual gap phenomenon and deterrence as psychological coercion." Presented at the Annual Meetings of the American Society of Criminology, Nashville.
- 2005 (with Jongyeon Tark) "Who resists crime?" Presented at the Annual Meetings of the American Society of Criminology, Toronto.
- 2005 (with Jongyeon Tark and Laura Bedard) "Crime and marriage." Presented at the Annual Meetings of the American Society of Criminology, Toronto.

- 2006 (with Shun-Yang Kevin Wang) “Organized gun trafficking, ‘crime guns,’ and crime rates.” Presented at the Annual Meetings of the American Society of Criminology, Los Angeles.
- 2006 “Are police officers more likely to kill black suspects?” Presented at the Annual Meetings of the American Society of Criminology, Los Angeles.
- 2007 (with Shun-Yang Kevin Wang) “The myth of big-time gun trafficking.” Presented at the Annual Meetings of the American Society of Criminology, Atlanta.
- 2007 (with Marc Gertz and Jason Bratton) “Why do people support gun control?” Presented at the Annual Meetings of the American Society of Criminology, Atlanta.
- 2008 (with J.C. Barnes) “Deterrence and macro-level perceptions of punishment risks: Is there a “collective wisdom?” Presented at the Annual Meetings of the American Society of Criminology, St. Louis.
- 2009 “The myth of big-time gun trafficking.” Presented at UCLA Law Review Symposium, “The Second Amendment and the Right to Bear Arms After DC v. Heller.” January 23, 2009, Los Angeles.
- 2009 (with Shun-Yung Wang) “Employment and crime and delinquency of working youth: A longitudinal study of youth employment.” Presented at the Annual Meetings of the American Society of Criminology, November 6, 2009, Philadelphia, PA.
- 2009 (with J. C. Barnes) “Do more police generate more deterrence?” Presented at the Annual Meetings of the American Society of Criminology, November 4, 2009, Philadelphia, PA.
- 2010 (with J. C. Barnes) “Article productivity among the faculty of criminology and criminal justice doctoral programs, 2005-2009.” Presented at the annual Meetings of the American Society of Criminology, November 18, 2010, San Francisco, CA.
- 2010 (with Will Hauser) “Fear of crime and gun ownership.” Presented at the annual Meetings of the American Society of Criminology, November 18, 2010, San Francisco, CA.
- 2010 “Errors in survey estimates of defensive gun use frequency: results from national Internet survey experiments.” Presented at the annual Meetings of the American Society of Criminology, November 19, 2010, San Francisco, CA.
- 2010 (with Mark Faber and Tomislav Kovandzic) “Perceived risk, criminal

- victimization, and prospective gun ownership.” Presented at the annual Meetings of the American Society of Criminology, November 19, 2010, San Francisco, CA.
- 2011 (with Shun-young Wang) “The impact of job quality and career commitment on delinquency: conditional or universal?” Presented at the annual Meetings of the American Society of Criminology, November 17, 2011.
- 2011 (with Moonki Hong) “The short-term deterrent effect of executions on homicides in the United States, 1984-1998.” Presented at the annual Meetings of the American Society of Criminology, November 16, 2011.
- 2011 (with Kelly Roberts) “Which survey modes are most effective in getting people to admit illegal behaviors?” Presented at the annual Meetings of the American Society of Criminology, November 17, 2011.
- 2011 (with Will Hauser) “Pick on someone your own size: do health, fitness, and size influence victim selection?” Presented at the annual Meetings of the American Society of Criminology, November 18, 2011.
- 2011 (with Tomislav Kovandzic) “Is the macro-level crime/punishment association spurious?” Presented at the annual Meetings of the American Society of Criminology, November 18, 2011.
- 2012 (with Dylan Jackson) “Adult unemployment and serious property crime: a national case-control study.” Presented at the annual Meetings of the American Society of Criminology, November 15, 2012.
- 2013 (with Will Hauser) “Confidence in the Police and Fear of Crime: Do Police Force Size and Productivity Matter?” Presented at the annual Meetings of the American Society of Criminology, November 22, 2013.
2013. (with Dylan Jackson) “Adult unemployment and serious property crime: a national case-control study.” Presented at the annual Meetings of the American Society of Criminology, November 22, 2013.
- 2014 (with Dylan Jackson) “Does Crime Cause Punitiveness?” Presented at the annual Meetings of the American Society of Criminology, November 20, 2014.
- 2015 “The effect of large capacity magazines on the casualty counts in mass shootings.” Presented at the annual Meetings of the American Society of Criminology, November 18, 2015.
- 2015 (with Bethany Mims) “Article productivity among the faculty of criminology and criminal justice doctoral programs, 2010-2014.” Presented at the annual Meetings of the American Society of Criminology, November 20, 2015.

CHAIR

- 1983 Chair, session on Race and Crime. Annual meetings of the American Society of Criminology, Denver.
- 1989 Co-chair (with Merry Morash), roundtable session on problems in analyzing the National Crime Surveys. Annual meetings of the American Society of Criminology, Reno.
- 1993 Chair, session on Interrupted Time Series Designs. Annual meetings of the American Society of Criminology, New Orleans.
- 1993 Chair, session on Guns, Gun Control, and Violence. Annual meetings of the American Society of Criminology, Phoenix.
- 1994 Chair, session on International Drug Enforcement. Annual meetings of the American Society of Criminology, Boston.
- 1999 Chair, Author-Meets-Critics session, More Guns, Less Crime. Annual meetings of the American Society of Criminology, Toronto.
- 2000 Chair, session on Defensive Weapon and Gun Use. Annual Meetings of the American Society of Criminology, San Francisco.
- 2002 Chair, session on the Causes of Gun Crime. Annual meetings of the American Society of Criminology, Chicago.
- 2004 Chair, session on Protecting the Victim. Annual meetings of the American Society of Criminology, Nashville.

DISCUSSANT

- 1981 Session on Gun Control Legislation, Annual Meetings of the American Society of Criminology, Washington, D.C.
- 1984 Session on Criminal Sentencing, Annual Meetings of the American Society of Criminology, Cincinnati.
- 1986 Session on Sentencing, Annual Meetings of the American Society of Criminology, Atlanta.
- 1988 Session on Gun Ownership and Self-protection, Annual Meetings of the Popular Culture Association, Montreal.
- 1991 Session on Gun Control, Annual Meetings of the American Statistical

Association, Atlanta, Ga.

- 1995 Session on International Drug Enforcement, Annual Meetings of the American Society of Criminology, Boston.
- 2000 Session on Defensive Weapon and Gun Use, Annual Meetings of the American Society of Criminology, San Francisco.
- 2004 Author-Meets-Critic session on Guns, Violence, and Identity Among African-American and Latino Youth, by Deanna Wilkinson. Annual meetings of the American Society of Criminology, Nashville.
- 2007 Session on Deterrence and Perceptions, University of Maryland 2007 Crime & Population Dynamics Summer Workshop, Aspen Wye River Center, Queenstown MD, June 4, 2007.
- 2009 Session on Guns and Crime, at the DeVoe Moore Center Symposium On The Economics of Crime, March 26-28, 2009 .
- 2012 Panel discussion of news media coverage of high profile crimes
Held at the Florida Supreme Court On September 24-25, 2012, sponsored by the Florida Bar Association as part of their 2012 Reporters' Workshop.

PROFESSIONAL SERVICE

Editorial consultant -

American Sociological Review
American Journal of Sociology
Social Forces
Social Problems
Law and Society Review
Journal of Research in Crime and Delinquency
Social Science Research
Criminology
Journal of Quantitative Criminology
Justice Quarterly
Journal of Criminal Justice
Violence and Victims
Violence Against Women
Journal of the American Medical Association
New England Journal of Medicine
American Journal of Public Health
Journal of Homicide Studies

Grants consultant, National Science Foundation, Sociology Program.

Member, Gene LeCarte Student Paper Committee, American Society of Criminology, 1990.

Area Chair, Methods Area, American Society of Criminology, annual meetings in Miami, November, 1994.

Division Chair, Guns Division, American Society of Criminology, annual meetings in Washington, D.C., November, 1998.

Dissertation evaluator, University of Capetown, Union of South Africa, 1998.

Division Chair, Guns Division, American Society of Criminology, annual meetings in Washington, D.C., November, 1999.

Member of Academy of Criminal Justice Sciences selection committee for Editor of Justice Quarterly, 2007.

Outside reviewer of Dr. J. Pete Blair for promotion to Full Professor in the School of Criminal Justice at Texas State University, San Marcos, 2014.

PUBLIC SERVICE

Television, radio, newspaper, magazine, and Internet interviews concerning gun control, racial bias in sentencing, crime statistics, and the death penalty. Interviews and other kinds of news media contacts include Newsweek, Time, U.S. News and World Report, New York Times, Washington Post, Chicago Tribune, Los Angeles Times, USA Today, Boston Globe, Wall Street Journal, Kansas City Star, Philadelphia Inquirer, Philadelphia News, Atlanta Constitution, Atlanta Journal, Arizona Republican, San Antonio Express-News, Dallas Morning News, Miami Herald, Tampa Tribune, Jacksonville Times-Union, Womens' Day, Harper's Bazaar, Playboy, CBS-TV (60 Minutes; Street Stories) ABC-TV (World News Tonight; Nightline), NBC-TV (Nightly News), Cable News Network, Canadian Broadcasting Company, National Public Radio, Huffington Post, PolitiFact.com, and many others.

Resource person, Subcommittee on Crime and Justice, (Florida House) Speaker's Advisory Committee on the Future, February 6-7, 1986, Florida State Capitol.

Testimony before the U.S. Congress, House Select Committee on Children, Youth and Families, June 15, 1989.

Discussant, National Research Council/National Academy of Sciences Symposium on the Understanding and Control of Violent Behavior, April 1-4, 1990, Destin, Florida.

Colloquium on manipulation of statistics relevant to public policy, Statistics Department,

Florida State University, October, 1992.

Speech to faculty, students, and alumni at Silver Anniversary of Northeastern University College of Criminal Justice, May 15, 1993.

Speech to faculty and students at Department of Sociology, University of New Mexico, October, 1993.

Speech on the impact of gun control laws, annual meetings of the Justice Research and Statistics Association, October, 1993, Albuquerque, New Mexico.

Testimony before the Hawaii House Judiciary Committee, Honolulu, Hawaii, March 12, 1994.

Briefing of the National Executive Institute, FBI Academy, Quantico, Virginia, March 18, 1994.

Delivered the annual Nettler Lecture at the University of Alberta, Edmonton, Canada, March 21, 1994.

Member, Drugs-Violence Task Force, U.S. Sentencing Commission, 1994-1996.

Testimony before the Pennsylvania Senate Select Committee to Investigate the Use of Automatic and Semiautomatic Firearms, Pittsburgh, Pennsylvania, August 16, 1994.

Delivered lectures in the annual Provost's Lecture Series, Bloomsburg University, Bloomsburg, Pa., September 19, 1994.

Briefing of the National Executive Institute, FBI Academy, Quantico, Virginia, June 29, 1995.

Speech to personnel in research branches of crime-related State of Florida agencies, Research and Statistics Conference, sponsored by the Office of the State Courts Administrator, October 19, 1995.

Speech to the Third Annual Legislative Workshop, sponsored by the James Madison Institute and the Foundation for Florida's Future, February 5, 1998.

Speech at the Florida Department of Law Enforcement on the state's criminal justice research agenda, December, 1998.

Briefing on news media coverage of guns and violence issues, to the Criminal Justice Journalists organization, at the American Society of Criminology annual meetings in Washington, D.C., November 12, 1998.

Briefing on gun control strategies to the Rand Corporation conference on "Effective

Strategies for Reducing Gun Violence," Santa Monica, Calif., January 21, 2000.

Speech on deterrence to the faculty of the Florida State University School of Law, February 10, 2000.

Invited address on links between guns and violence to the National Research Council Committee on Improving Research Information and Data on Firearms, November 15-16, 2001, Irvine, California.

Invited address on research on guns and self-defense to the National Research Council Committee on Improving Research Information and Data on Firearms, January 16-17, 2002, Washington, D.C.

Invited address on gun control, Northern Illinois University, April 19, 2002.

Invited address to the faculty of the School of Public Health, University of Alabama, Birmingham, 2004.

Invited address to the faculty of the School of Public Health, University of Pennsylvania, March 5, 2004.

Member of Justice Quarterly Editor Selection Committee, Academy of Criminal Justice Sciences, Spring 2007

Testified before the Gubernatorial Task Force for University Campus Safety, Tallahassee, Florida, May 3, 2007.

Gave public address, "Guns & Violence: Good Guys vs. Bad Guys," Western Carolina University, Cullowhee, North Carolina, March 5, 2012.

Invited panelist, Fordham Law School Symposium, "Gun Control and the Second Amendment," New York City, March 9, 2012.

Invited panelist, community forum on "Students, Safety & the Second Amendment," sponsored by the Tallahassee Democrat.

Invited address at University of West Florida, Department of Justice Studies, titled "Guns, Self-Defense, and the Public Interest," April 12, 2013.

Member, National Research Council Committee on Priorities for a Public Health Research Agenda to Reduce the Threat of Firearm-related Violence, May 2013.

Invited address at Davidson College, Davidson, NC, April 18, 2014. Invited by the Department of Philosophy .

OTHER ITEMS

Listed in:

Marquis Who's Who, 2009
Marquis Who's Who in the South and Southwest, 25th edition
Who's Who of Emerging Leaders in America, 1st edition
Contemporary Authors
Directory of American Scholars, 10th edition, 2002
Writer's Directory, 20th edition, 2004.

Participant in First National Workshop on the National Crime Survey, College Park, Maryland, July, 1987, co-sponsored by the Bureau of Justice Statistics and the American Statistical Association.

Participant in Second National Workshop on the National Crime Survey, Washington, D.C., July, 1988.

Participant, Seton Hall Law School Conference on Gun Control, March 3, 1989.

Debater in Intelligence Squared program, on the proposition "Guns Reduce Crime." Rockefeller University, New York City, October 28, 2008. Podcast distributed through National Public Radio. Further details are available at <http://www.intelligencesquaredus.org/Event.aspx?Event=36>.

Subject of cover story, "America Armed," in Florida State University Research in Review, Winter/Spring 2009.

Grants reviewer, Social Sciences and Humanities Research Council of Canada, 2010.

Named one of "25 Top Criminal Justice Professors" in the U.S. by Forensics Colleges website (<http://www.forensicscolleges.com/>), 2014.

Exhibit 2 – Review of Case-Control Studies of the Effect of Gun Ownership on Suicide

Case-Control Studies of the Effect of Gun Ownership on Suicide and the Failure to Control Confounders

Gary Kleck

Public health scholars have claimed that all case-control studies have found a significant effect of gun ownership on suicide (e.g., Miller and Hemenway 1999, p. 73). This is not true. As the review summarized in Table 1 shows, at least *six* out of 16 published case-control studies of suicides found no significant association between gun ownership and suicide:

- (1) Miller (1978) found no guns/suicide association whatsoever in his sample of elderly men.
- (2) Brent et al. (1988) found no significant guns/suicide association once suicidal intent was controlled.
- (3) Bukstein et al. (1993) found no significant guns/suicide association in a sample of adolescent substance abusers.
- (4) Brent et al. (1994) found no significant guns/suicide association in a sample of “affectively ill” adolescents.
- (5) Beautrais et al. (1996) found no significant guns/suicide association among 499 suicides (and 1,225 control subjects), using what at the time was the largest sample of suicides ever used to study this association.
- (6) Conwell (2002) found no significant guns/suicide association among females.

As it happens, it would scarcely matter even if all of the case-control studies really had found a positive guns/suicide association, since this body of research is far too weak to support any conclusions. The primary problem facing researchers trying to discover whether gun

ownership actually causes an increased risk of suicide is to separate the effects of guns from the effects of other factors, called “confounders” or confounding variables, correlated with guns. In this context, a confounder is a factor that affects suicide risk, but also has a significant correlation with gun ownership. Unless the researcher measures and statistically controls for all the likely confounders, s/he will confuse the purported effects of gun ownership with the effects of the uncontrolled confounders.

Unfortunately, as Table 1 indicates, most of those who have done case-control studies on this topic have generally devoted little or no effort to controlling for likely confounders. Fourteen of the 16 studies controlled for no more than four confounders, and eight of them controlled for *no* confounders at all, giving the researchers no ability whatsoever to separate the effects of gun ownership from the effects of other factors that affect the likelihood of committing suicide and are associated with gun ownership.

Some Known or Likely Confounders

Merely controlling for variables, if they are not confounding variables, does nothing to improve the estimate of one variable’s causal effect on another. Confounders have both of two properties: they affect the dependent variable (the phenomenon being explained) and are correlated with the independent variable of interest (a suspected cause of the phenomenon). In this area of research, only control variables that both affect suicide risk and are correlated with gun ownership are confounders. The following are partial lists of some of the likely confounders that should be controlled in case-control studies, but almost never are. We can start with a list of some variables that are known to be associated with both gun ownership and suicide. We will then consider variables known to be related to gun ownership, for which there also are strong

theoretical reasons to expect that they affect suicide, but no empirical evidence testing the proposition.

Known Confounders of the Guns/Suicide Association

The first set of variables are those that have associations with both gun ownership or possession and suicide that have been documented in empirical research.

(1) Strength of suicidal intent (in studies that compare completed suicides vs. attempts). No one disputes that persons more determined to kill themselves are more likely to do so - the proposition is virtually a tautology. It is also true, however, that people more intent on committing suicide are more likely to choose more lethal suicide methods such as shooting or hanging to attempt suicide, and some will acquire guns specifically for the purpose of using them to commit suicide. Supporting these ideas, Brent et al. (1988) initially found a significant positive guns/suicide association, but once they controlled for strength of suicidal intent, no significant association remained.

(2) Age. Middle-aged persons are more likely to own guns (Kleck 1997, p. 101) and more likely to commit suicide (Wiebe 2003, p. 777).

(3) Sex. Males are more likely to own guns (Kleck 1997, p. 101) and more likely to commit suicide (Wiebe 2003, p. 777) .

(4) Race. African-Americans are less likely to own guns than whites (Kleck 1997, p. 101), and less likely to commit suicide (Centers for Disease Control and Prevention 2016).

(5) Region. People living in the Northeast part of the U.S. are less likely to own guns than people in other regions (Kleck 1997, p.101), and less likely to commit suicide (Wiebe 2003, p. 779).

(6) Marital status. Married people are more likely to own guns than unmarried people (Kleck 1997, p.101), and are less likely to commit suicide (Wiebe 2003, p. 779).

(7) Income. Poor people are less likely to own guns than middle- or upper-income people (Kleck 1997, p. 101), but more likely to commit suicide (Wiebe 2003, p. 777).

(8) Living alone. People who live alone are less likely to own guns than persons who live with others (Kleck 1997), and (surprisingly) are also less likely to commit suicide (Wiebe 2003, p. 779).

(9) Education. College graduates are less likely to own guns (Kleck 1997, p.102), and less likely to commit suicide (Wiebe 2003, p. 777).

(10) Population size of place of residence. People who live in places with larger populations are less likely to own guns (Kleck 1997, p. 102), and less likely to commit suicide than people who live in places with smaller populations (Wiebe 2003, p. 779).

(11) Alcoholism or heavy drinking. Alcohol abuse and heavy drinking is positively associated with gun ownership (Brent 2001; Hemenway/Miller) and positively associated with suicide (Brent, Perper, and Allman 1987; Kellermann 1992; Rivara et al. 1997; Brent 2001

(12) Illicit drug use. Illicit drug use is positively associated with firearm ownership (Carter, Walton, Newton, Cleary, Whiteside, Zimmerman and Cunningham 2013; Rivara et al. 1997), and positively associated with suicide (Kellermann 1992; Brent 2001).

(13) Gang membership. Gang members are more likely to own guns than other youth (Callahan and Rivara 1992, p. 3042) and are more likely to commit suicide (Knox and Tromanhauser 1999).

(14) Experience as a victim of violent crime, especially sexual assault. Experience as a victim of violent crime is positive associated with gun ownership (Kleck 1997) and positively associated with suicide (Bryan, Mcnaughton-Cassill, Osman, and Hernandez 2013).

(15) Sociability. Diener and Kerber (1979) found that gun owners are less sociable than nonowners. Those who are more socially isolated and who have less social support are more likely to commit suicide (Trout 1980).

Likely Confounders of the Guns/Suicide Association

The following are variables known to be related to gun ownership, and for which there is sound theoretical reasons to believe that they would affect suicide, but as yet no empirical evidence testing such effects.

(16) Self-reliance/self-blame. Gun owners are known to be more self-reliant (Feagin 1970), and there are sound reasons to believe this makes people more prone to suicide. A person possessing a personality that emphasizes self-reliance and that they are in charge of their own fate is also more likely to believe that they are likely to blame for their own problems when things go wrong. A person who blames themselves for their problems is more likely to commit suicide.

(17) Residence in a high crime neighborhood. Living in high-crime places makes people more likely to acquire guns for self-protection, especially handguns (Kleck 2015, p. 44), and the many life stresses common to such places are likely to make suicide more likely.

(18) Perception of the world as a hostile place. People who believe they are surrounded by threats of victimization are more likely to own guns for self-protection (Kleck 1997), but also

more likely to believe there are few people around them who would be willing to help them with their problems. This lack of felt social support is likely to raise the risk of suicide.

(19) Drug dealing. Drug dealing is positively associated by possession of firearms (Sheley and Wright 1992), and is likely to be positively correlated with suicide due to both the misery produced by the drug addiction that commonly accompanies drug dealing and the intense emotional stress produced by the ongoing risk of arrest, imprisonment, or death at the hands of one's customers and competitors.

This list should not be considered to be comprehensive. Readers could no doubt add still more variables to the list. Controlling for these 19 variables should instead be seen as the start of a serious effort to identify the causal effect of gun ownership on suicide. One distinct pattern evident among these confounders should be stressed: almost all are factors that are positively correlated with both gun ownership and suicide. The effect of failing to control for such a variable is to bias the estimate guns/suicide association upward, i.e. to make it larger and more positive than it should be. Analysts failing to control for a variable like this will wrongly attribute to gun ownership the suicide-elevating effects of the confounder. The more confounders of this type the researcher fails to control, the worse the distortion.

Case-Control Studies of the Gun/Suicide Association

With these considerations in mind, let us examine the full body of case-control research on the effect of gun ownership on suicide. In Table 1, the strength of association between gun ownership and suicide is measured with an odds ratio (OR), which expresses how much higher or lower the odds of committing suicide are for persons with a gun in their household. For

example, if the OR were 2.7, it would mean that the odds of a person committing suicide are 2.7 times higher if there is a gun in the household than if there is not, and that the guns/suicide association is positive – suicide risk is higher for gun owners. On the other hand, if OR were 0.2, it would mean that the odds of suicide for persons with a household gun are only 0.2 or 20% of the odds for persons without a household gun, and the association is negative – suicide risk is lower for gun owners. An OR of 1 would represent no relationship in either direction – the odds of suicide are the same for persons with a gun and for a person without one. The “odds” of a gun owner committing suicide equals the number of gun owners who committed suicide divided by the number of gun owners who did *not* commit suicide. Likewise, the “odds” of a nongun owner committing suicide equals the number of nongun owners who committed suicide divided by the number of nongun owners who did *not* commit suicide. The odds ratio would be the ratio of the odds of suicide for gun owners, divided by the odds of suicide for nonowners.

The crude OR is the simple bivariate odds ratio, without any controls for confounding variables, and thus is not meaningful as a measure of the causal effect of gun ownership on suicide. The adjusted OR (“adj OR”) is the odds ratio when controlling for other possible confounding variables. If the variables controlled truly are confounders, the adjusted OR generally gives a better picture of the causal effect of gun ownership on suicide. On the other hand, if the analysts merely controlled for variables that either did not affect suicide or were not correlated with gun ownership, the adjusted OR would be unchanged from the crude OR.

Finally, the numbers under **p** in Table 1 are levels of statistical significance. They represent the probability that the observed association could be entirely the product of random chance factors, such as which subjects happened to be selected for a study or random measurement error, rather than being reflective of an actual causal effect. Customarily, a p under

.05 is considered acceptably significant. When the authors only reported that the association was nonsignificant, this is denoted in Table 1 with “n.s.”

(Table 1 about here)

If an association is spurious, and thus *not* reflective of an actual causal effect, controlling for confounding variables will cause the odds ratio to weaken to the point where it is no longer significantly different from one, the value representing no association. We need not speculate what happens to the guns/suicide association once suicidal intent (SI) is controlled, because Brent and his colleagues (1988) measured SI and controlled for it while estimating the suicide/guns association. Before controlling for SI, there was a strong, significant association (crude odds ratio=4.5, $p<.025$). Once the researchers introduced a control for SI, the association was no longer significantly different from one, indicating no association. The finding was later replicated in another analysis of a somewhat larger overlapping sample by the same group of researchers. When they introduced the control for SI, the guns/suicide association was halved, dropping from an odds ratio of 4.5 to 2.1 (Brent et al. 1991).

To illustrate how important controlling for confounders is, consider one of the confounders, suicidal intent (SI). No one disputes that having a stronger desire or motivation to kill one's self makes it more likely that the person will actually do so. A stronger SI, however, is also likely to induce some people to acquire a gun for the purpose of carrying out the suicide attempt. Even if possessing or using a gun did not actually influence whether a person attempted suicide or whether an attempt was fatal, one would still find higher gun ownership among those who killed themselves, i.e. one would find a positive guns/suicide association. Indeed, one would find an especially strong positive association between suicide and a *recent* gun purchase, a finding obtained in a California cohort study. But this would be a noncausal “spurious”

association between guns and suicide. Having a gun did not cause a higher risk of suicide; rather, having a stronger SI caused the higher risk of suicide, and also caused a higher likelihood of gun ownership (to provide the means for committing suicide), creating a noncausal association between gun ownership and suicide.

To take another example, *no* researchers have controlled for self-reliance/self-blame, yet this too could be a powerful confounder. Surveys have established that gun owners are more self-reliant than other people – for example people who believe they must rely on their own efforts to protect themselves and their families are more likely to own guns (Feagin 1970). Unfortunately, people who see themselves as master of their own fate are also more likely to hold themselves responsible for their troubles, rather than blaming other people – a disposition that could make suicide more likely. Thus, if self-blame is the dark side of self-reliance, it would both increase gun ownership and increase the risk of suicide, creating a spurious guns/suicide association. We have no direct empirical test of this hypothesis, however, since no researcher in this area has measured and controlled for self-blame/self-reliance.

All but the last two studies summarized in Table 1 controlled for four or fewer likely confounders. Most variables that were controlled were not likely confounders, either because the authors of the study did not present any evidence that they had a significant effect on suicide or because they have no known association with gun ownership. Controlling for such variables does not help isolate the effect of gun ownership on suicide. For example, Kellermann et al (1992) controlled for ten variables (four by matching, six by statistical controls), but only six of these were significantly related to suicide risk, and of these six, only four have a documented significant association with gun ownership, and thus were actual confounders. Nevertheless,

controlling for four confounders was far better than has been done in any but a handful of other case-control studies.

Of the 19 likely confounders we listed above, no researcher in this area has ever controlled for even half of them. Wiebe (2003) made a more serious effort to control for confounders than anyone else in the area, controlling for eight variables, some of which might well be confounders, but even he did not control for even half of these likely confounders, presumably because he analyzed a preexisting dataset that did contain measures of most of these variables.

Further, it is evident that none of the researchers in this field have even made an earnest effort to identify confounders. Doing so would necessarily require reviewing research on the correlates of gun ownership, not just the determinants of suicide. Yet none of meta-analyses cite even a single wide-ranging review of gun ownership patterns (e.g. Wright and Rossi 1986; Sheley and Wright 1995; Kleck 1997), and usually do not discuss whether their control variables are correlated with gun ownership. Unless authors are being unusually modest about their scholarly efforts, failing to report their reviews of gun correlates, they could not have made a systematic search for confounders since this necessarily would have required knowing the correlates of gun ownership. Instead, the common practice appears to be to simply toss into the analysis whatever correlates of suicide have been identified by prior suicide researchers, regardless of whether they are correlated with gun ownership.

Conclusions

Some scholars appear to believe that the sheer number of case-control studies finding a guns/suicide association must point to a causal effect of gun ownership (e.g., Miller and Hemenway 1999) . Unfortunately, this appearance of replication may reflect little more than the

repetition of the same methodological errors, producing the same erroneous findings, in study after study. All studies in this body of research failed to control for the same confounders, which bias the guns/suicide association in a positive direction.

Even the adjusted odds ratios in these studies are probably largely, and possibly entirely, reflective of a spurious association between gun access and suicide, rather than a causal effect of access to firearms. Unfortunately, this must remain a speculation until researchers make a more serious effort to identify, measure, and control for variables that confound the guns/suicide association. Future case-control research will not begin to usefully contribute to our understanding of the guns/suicide link until researchers measure and control for a larger share of the known or likely confounding variables.

This will require gathering original data, not merely relying on existing datasets gathered for other purposes, such as the 1993 Mortality Followback study, because no existing dataset includes data on all or even most of the required variables. Until such research is done, the gun/suicide associations found in the numerous existing case-control studies should be assumed, as a rebuttable assumption, to be spurious, implying nothing credible about a causal effect of gun ownership on suicide.

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Table 1. Case-Control Studies of Access to Firearms and Suicide

Study	Sample/Dataset	Number of		Control Vars		Number of Likely Confounders ^c	Findings			
		n	Suicides ^a	Total	Signif ^b		Crude OR	p	Adj OR	p
Miller 1978	Elderly white males	60	30	0	0	0	1.0	n.s.	-	-
Brent et al. 1988 ^d	W. PA adolescents (A)	65	27	3	3	2 (age, suicidal intent)	2.7	<.025	n.s.	>.025
	W. PA adolescents (B)	83	27	2	2	1 (age)	-	-	3.4	<.025
Brent et al. 1991 ^d	W. PA adolescents (A)	94	47	2	2	1 (suicidal intent)	4.5	.001	2.1	<.0001
	W. PA adolescents (B)	94	47	1	1	0	4.2	.001	2.2	.001
Kellermann et al 1992	In-home suicides, 3 urban counties	720	360	10	6	4 (sex, age, race, lives alone)	3.2	<.025	4.8	<.025
Brent et al. 1993a	W. PA adolescents	45	7	0	0	0	-	.04	-	-
Brent et al. 1993b	W. PA adolescents	134	67	3	3	0	3.3	.004	4.4	<.025
Bukstein et al. 1993	W. PA adolescents, substance abusers	35	23	0	0	0	Any guns:		-	n.s.
							Handguns:		-	<.001
							Long guns:		-	n.s.
Brent et al. 1994	W. PA adolescents, affectively ill	86	63	0	0	0	-	.0001	n.s.	>.025
Beautrais et al. 1996	Canterbury NZ adults	1225	499	0	0	0	1.4	>.05	-	-
Cummings et al. 1997	WA handgun purchasers	2109	353	4	0	3 (age, sex, Zip code)	Males only:		0.93	>.90
									1.9	<.025
Bailey et al. 1997	Female subsample of Kellermann 1992	240	120	3	3	1 (living alone)	-	-	4.6	<.025
Shah et al. 2000	CO adolescents	44	26	3	2	0	2.60	<.05	3.91	<.05
Conwell et al. 2002	Rochester area NY, age 50+	172	86	3	0	3 (age, sex, race)	Males:		4.17	.0006
							Females:		0.50	.32
									4.30	.004
									1.02	.985

Table 1 (continued)

Study	Sample/Dataset	Number of		Control Vars		Number of Likely Confounders ^c	Findings			
		n	Suicides ^a	Total	Signif ^b		Crude OR	p	Adj OR	p
Kung et al. 2003	1993 Mortality Followback	9855	1463	5	5	6 (sex, race, alcohol use, marijuana use, depression, use of mental services)	Males: 2.59 Females: 2.71	<.025 <.025	6.05 6.99	.025 <.025
Weibe 2003	1993 Mortality Followback	3918	1959	8	5	8 (age, sex, race, region, marital status, income, live alone, pop. size)	3.32	-	3.44	<.025
Dahlberg et al. 2004	1993 Mortality Followback	1584	1049	13	1	8 (age, sex, race, education, marital status, region, alcohol use, drug use)	Males: Females:	10.4 2.3	<.025 =.025	

Notes:

- Unweighted number of completed suicide victims in multivariate analysis. Sample size (n) includes cases (suicides) and controls.
- Number of control variables documented as being significantly associated with suicide at .05 (1-tailed) level. If no significance levels were shown for control variables, they were classified as nonsignificant.
- A likely confounder is a variable that affects suicide and is also significantly correlated with gun ownership. We counted the maximum number of confounders controlled in any analysis in a given study, whether controlled by matching or by multivariate statistical controls.
- The analyses labeled A involved a comparison of completers (cases) with attempters (controls), while those labeled B involved a comparison of suicide completers (cases) with psychiatric inpatients (controls).

Abbreviations: Crude OR = bivariate odds ratio (no controls for other variables), adj OR = adjusted (multivariate) odds ratio, p = 2-tailed significance.

Exhibit 3 –The Relative Lethality of Firearms and Other Suicide Methods

Firearms and the Lethality of Suicide Methods

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Abstract

What would happen to suicide rates if gun control laws succeeded in making firearms unavailable to some suicide-prone persons? Recent evidence suggests that possession of firearms has no effect on the likelihood of people attempting suicide. Therefore, the most likely effect of gun availability is that it could make it more likely a suicide attempt would be fatal. Gun use appears to make criminal assaults more lethal, so it is reasonable to expect the same with suicide attempts. This paper reviews the evidence on the method most likely to be substituted in suicide attempts if firearms were not available, and on the relative lethality of the method compared with suicide attempts by shooting.

The Rationale for a Causal Effect of Gun Possession on the Risk of Suicide - Greater Lethality of Shooting as the Suicide Method

Availability of firearms has no documented effect on whether people attempt suicide (Watkins and Lizotte 2011) and is unrelated in macro-level studies to rates of depression or suicidal thoughts (Hemenway and Miller 2002). As far as any scholar has established, owning a gun does not cause depression, mental illness, or suicide attempts, nor have those who believe that gun ownership somehow increases the risk of suicide claimed that these are the mediators that link gun possession with a higher risk of dying from suicide. Most authors do not even explicitly state a reason why gun ownership would increase suicide risk, almost as if it were self-evidence that the gun's greater lethality is the reason (e.g., Kellerman et al. 1992; Miller and Hemenway 1999). And when a reason is explicitly cited, the purported greater lethality of shooting attempts is almost always the sole rationale offered (e.g., Kubrin and Wadsworth 2009).

There are, of course, many methods for committing suicide besides shooting one's self, so the absence of gun would not prevent any kind of a suicide attempt. The materials needed to carry out a suicide attempt by hanging (rope or similar material and a sturdy support for a noose) are more widely available than the object needed to commit an attempt by shooting (a firearm). Indeed, these materials are probably universally available, whereas less than half of U.S. households have a firearm (Gallup 2015). Even prison inmates are capable of committing suicide by hanging, so surely persons in the free world would be at least as likely to have access to the materials needed to hang themselves.

Further, the suicide method that is most commonly used, after shooting, is hanging (Table 2). It is currently a distant second behind shooting in the U.S., but this is irrelevant to an

analysis of what is likely to happen if firearms were not available. This demonstrates that there are already many American suicides willing and able to commit suicide by hanging.

The crucial issue is whether available substitute methods would be as lethal as attempts with a gun. Not surprisingly, people who use guns in suicide attempts are more strongly motivated to kill themselves than those who use other methods (Brent et al. 1988; Brent et al. 1991, p. 2992; studies reviewed in Kleck 1997, pp. 272-273). Therefore, if no firearms were available, they would be likely to substitute methods perceived to be similarly lethal. Denied firearms, suicide attempters would substitute the method that was available and most in accord with the attempter's lethality of intentions. The suicide method most similar to shooting with regard to its lethality is hanging, as will be shown later.

In criminal assaults, it is clear that attacks with guns are more likely to result in the victim's death than attacks using other weapons, such as knives. This is partly a function of the relatively limited range of lethal weapons that can be used by one person to kill another. In contrast, there are a far wider range of feasible substitute methods for committing suicide, at least partly because there is no resisting victim.

Prior Research

Is a suicide attempt by shooting significantly more likely to result in the attempter's death than an attempt by hanging? All of the published studies providing fatality rate data for both shooting attempts and hanging attempts are summarized in Table 2. With the exception of the study by Spicer and Miller (2000), they all indicate little difference in fatality rates of shooter and hanging attempts. Two of the eight studies even indicated lower fatality rates for shooting attempts than for hanging attempts.

These studies were all based on relatively small samples of suicides, drawn from limited geographical areas, usually covering short periods of time. There could be variation in fatality rates due to differences in quality and availability of medical care, differences in the specific attributes of available methods (lethality of guns, height of buildings, etc.) and other features peculiar to study locations. Therefore it would be useful to have data covering a large set of suicides and attempts, applying to an entire nation over a long period of time.

A New Analysis of National Suicide Data

Fatality rates by method can be computed for the entire U.S. for the period 2001-2014 by combining mortality data from the Centers for Disease Control and Prevention with estimates of nonfatal suicide attempts based on data from probability samples of the nation's emergency rooms. Data on nonfatal suicide attempts by methods were obtained from the WISQARS program at <http://webappa.cdc.gov/sasweb/ncipc/nfirates2001.html>, while data on (fatal) suicides by method were obtained from the WONDER program at <http://wonder.cdc.gov/mortSQL.html>.

The numbers of suicides are complete counts, based on death certificates reporting the cause of death as suicide, and thus are not subject to sampling error. On the other hand, the estimates of nonfatal attempts are subject to sampling error, which is computed and available on the WISQARS website. Table 3 therefore displays three estimates of the number of nonfatal attempts: the point estimate, the lower 95% confidence interval limit, and the upper 95% confidence interval limit. Each of these is used in computing method-specific suicide fatality rates, i.e. $\text{Fatal attempts} / [\text{fatal attempts} + \text{nonfatal attempts}]$.

(Table 3 about here)

Table 3 shows the fatality rates for all the major methods of committing suicide in the U.S., based on the largest set of suicides and suicide attempts ever employed. The data indicate

that there is no significant difference in the fatality rates of suicide attempts by shooting and attempts by hanging. While the point estimate of the shooting fatality rate is 1.09 times higher than the hanging fatality rate, there is heavy overlap between the confidence intervals surrounding estimates of the two fatality rates. This result should not be considered surprising, since it is exactly what the set of eight smaller-scale studies reviewed in Table 2 indicated. Further, another national-scale study indicated that in 1992 there were 18,169 firearm suicides and an estimated 5,197 nonfatal firearm suicide attempts (Annest et al. 1995, p. 1752), implying fatality of only 77.8% for shooting attempts – lower than the hanging fatality rate for 2001-2014.

Even this slight difference between hanging and shooting fatality rates may be an artifact of limits in the classification of suicide methods. In earlier versions of the International Classification of Diseases, hanging suicide deaths were distinguished from other kinds of suffocation death involving what are probably less lethal suicide methods, while the current version lumps these together. For example, suicides by placing one's head in a plastic bag are lumped in with hanging suicides. Grouping lower lethality versions of suffocation suicide with the higher lethality hanging methods has the effect of lowering the overall fatality rate. Data from a period when an earlier version of the ICD was used indicate that only about 5% of suffocation suicides are other than hanging suicides (xx), so the problem is not a huge one, but it does not have to be very large to account for the slight difference in point estimate fatality rates.

Is Hanging the Method Most Likely to be Substituted for Shooting?

We operate under the assumption that people who want X but cannot get it, will seek the most similar thing remaining available. People who cannot afford a \$50,000 car but who can afford one costing \$40,000 will substitute the \$40,000 vehicle, not one costing \$10,000. A

shopper going into a store during a cold snap seeking a heavy winter coat, but not finding one quite as warm as they would like is more likely to buy the heaviest coat available, not a sweater or light jacket.

By the same token, a suicide attempter who otherwise would have used a firearm but who could not access one is likely to seek the substitute method that is most similar to shooting, among the methods available to them. As shown in Table 3, the suicide method most similar in lethality is hanging. Further, suicide by hanging requires neither obscure knowledge or rare materials to carry it out – one needs only rope or something similar with which to fashion a noose, and a sturdy support to which one can secure the noose. Prison inmates manage to fashion nooses from their bedclothes and hang themselves from their cell's bars, so it is unlikely that persons in the free world could not secure the necessary materials for a hanging suicide.

Suicide attempters differ in the strength of their desire to die. At one end of the spectrum, there are persons who are determined to die not matter what, while at the other end there are attempters who do not want to die, but rather are merely making a suicidal gesture, a “cry for help” that communicates to those around them the depth of their unhappiness (Shneidman and Farberow 1961). It is reasonable to suppose that those who do not want to die would not place the barrel of a loaded firearm in their mouth and pull the trigger, while many of those determined to die would do just that. Thus, it is unlikely that suicide attempters select suicide methods randomly or solely on the basis of availability. Note that this is a matter of strength of motivation, *not* a matter of impulsiveness or premeditation. A person could be powerfully motivated to kill themselves, but only for a few hours, while another could be casually considering suicide over a period of months or years. And because powerful motivations to self-destruction may last only a few hours or days, one would expect that many of

those who survived an initial attempt would not make another attempt – notwithstanding the strength of the initial urge

Going beyond common sense, there is considerable empirical evidence indicating that suicide attempters who use firearms are more seriously motivated to kill themselves than attempters using other methods. First, even among those who survived gun suicide attempts, almost all the gunshot wounds were inflicted on vital areas of the body, such as the head, chest, or abdomen. One study of 30 firearms suicide attempt survivors found that all 30 had shot themselves in the head, chest, or abdomen (Peterson, Peterson, O'Shanick, and Swann 1985). Thus, the locations of the gunshot wounds strongly suggests that, at the moment of the attempt, the attempter most likely wanted to die.

Although most persons who survive suicide attempts in general do not subsequently attempt suicide again, those who survive attempts using the more lethal methods like shooting, hanging, or drowning, are more likely to subsequently kill themselves (Tuckman and Youngman 1963; 1968; Eisenthal, Farberow, and Schneidman 1966). This supports the view that, although *most* suicide attempters do not have sufficiently persistent suicidal motivations to commit suicide after an initial attempt failed, this is nevertheless more common among the minority of attempters who use shooting or hanging as their method of suicide.

This view was confirmed by a different kind of evidence – the statements of suicide survivors. Fox and Weissman (1975) asked survivors of nonfatal suicide attempts whether their intentions were serious and they truly wanted to die at the time of the attempt. They found that attempters who used the more “violent” methods, which included shooting, “had greater intent to kill themselves” and made less impulsive attempts (p. 34).

This greater strength of suicidal motivation among those who use guns in suicide attempts has two implications. First, those who would prefer to commit suicide by shooting if a firearm were available but who are somehow denied access to a gun are especially likely to still attempt suicide by substituting some alternative method. Second, they are likely to substitute a similarly lethal method, that is, one that is commensurate with their lethal intentions. Certainly there are historical anecdotes suggesting widespread substitution of alternative methods when one method was blocked. After Great Britain detoxified its domestic gas supplies, and domestic gas suicides declined, there was an immediate increase in the use of motor vehicle carbon monoxide in suicides, beginning in 1970 - right at the time when domestic gas had reached nontoxic levels (Clarke and Lester 1987, p. 116; Kleck 1997, p. 278). Likewise, after Australia passed strict gun control laws in the 1990s, gun suicides among males decreased, but suicides by hanging increased at a virtually identical rate, during the same period from 1994 to 1998 (DeLeo, Dwyer, Firman, and Neulinger 2003). These statistical anecdotes are not strong tests of the proposition that methods substitution occurs, but are nevertheless supportive of the proposition.

Why Do Case Control Studies Find Strong Associations between Gun Ownership and Suicide?

Many case-control studies have found an individual-level association between gun ownership and suicide risk, and the sole reason the authors of these studies offer for why the association exists – when they offer any explanation at all - is that suicide attempts with firearms are more likely to be fatal than attempts with other methods that are likely to be substituted if firearms are not available. As we have seen, the best available evidence does not support this view. There is no sound foundation for expecting that the number of completed (fatal) suicide

attempts would decline if firearms were not available among those who otherwise would have used guns to attempt suicide and such persons substituted hanging. Thus, the standard lethality rational for why gun ownership could increase the risk of suicide becomes less supportable, and it becomes correspondingly less clear why so many case-control studies have found strong, even enormous, associations between suicide and access to firearms. For example, Dahlberg et al. (2004) obtained, for males, an adjusted odds ratio on the gun ownership variable of 10.4, meaning that the odds of committing suicide were 10.4 times higher for males living in a household with a gun than for those in homes without a gun. If shooting is no more lethal a suicide method than the method most likely to be substituted if a firearm were not available (or is only 1.09 times more lethal), what could possibly account for such an enormous adjusted odds ratio?

One likely explanation is that these strong associations are spurious, attributable to antecedent variables that affect suicide, are correlated with gun ownership, but were not controlled in these studies. Even the best case-control studies have not controlled for a small minority of known or likely confounders, instead controlling largely for variables that either do not affect suicide risk or are not significantly correlated with gun ownership. Indeed, many case-control researchers in this area did not control for *any* variables, whether confounders or not (e.g., Brent et al. 1993; 1994; Bukstein et al. 1993; Beautrais 1996; Cummings et al. 1997), while others controlled for a few variables but none of them were significantly related to suicide (e.g., Conwell et al. 2002). Among the minority studies that did control for a few significant correlates of suicide, it is unlikely that more than a handful of these variables were also correlated with gun ownership, and thus were genuine confounders. For example, Kellermann and his colleagues (1992) controlled for ten variables (3 by matching, 7 by multivariate statistical

controls), but only six of these were significantly related to suicide, and of these six, only 2-4 are known to be correlated with gun ownership.

The result of leaving so many confounding variables uncontrolled in a nonexperimental study like a case-control study is that even the adjusted odds ratios in these studies may largely or entirely reflect a spurious association between gun access and suicide, rather than a causal effect of access to firearms. Unfortunately, this must remain a speculation until researchers begin to make serious efforts to identify, measure, and control for variables that actually confound the guns/suicide association, rather than just tossing an arbitrarily selected handful in their analyses. It is clear that, so far, case-control researchers have made no serious effort to identify confounders. Researchers typically do not even offer any specific rationale for their choices of control variables. More specifically, they do not cite any reviews of the correlates of gun ownership, leaving readers to wonder how they could have known what variables were likely to be confounders (e.g., Miller et al. 2002). Their selections of control variables appear to be almost totally arbitrary, guided by little more than the fact that previous suicide researchers have controlled for the same variables. With grossly inadequate controls for known confounders, the guns/suicide associations found in case-control studies are almost certainly at least partially, and quite possibly entirely, spurious. Certainly they do not reflect the causal effect of any significantly higher lethality of firearm attempts compared with hanging attempts.

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Table 1. Methods Used in U.S. Suicides, 1999-2014

<u>Rank</u>	<u>Method of Suicide</u>	<u>Number</u>
1	Firearm	291,571
2	Suffocation	129,187
3	Poisoning	96,079
4	Fall	12,132
5	Cut/Pierce	9,700
6	Drowning	5,938
7	Other specified, classifiable	5,787
8	Fire/Flame	2,595
9	Other specified, not elsewhere classified	2,237
10	Other land transport	2,017
11	Struck by or against	20
12	Hot object/substance	5

Source: Centers for Disease Control and Prevention. WONDER website at <http://wonder.cdc.gov/cmfi-icd10.html>.

Table 2. Relative Lethality of Shooting and Hanging as Methods of Suicide in Prior Research

<u>Study</u>	<u>Area</u>	<u>Years</u>	% Attempts Fatal		Ratio fatality rates, <u>Shooting/Hanging</u>
			<u>Hanging</u>	<u>Shooting</u>	
Schneidman & Farberow (1961)	Los Angeles County	1957	78.7	77.1	0.979
Card (1974)	Allegheny County, PA	1969-70	77.5	91.6	1.181
Sayer et al. (1991)	New South Wales, Australia	1991-1993	82	75	0.915
Spicer & Miller ^a (2000)	8 U.S. states	1989-1997	61.4	82.5	1.344
			85.5	89.6	1.043
Miller et al. (2004)	7 NE U.S. states	1996-2000	82.4	90.8	1.102
Shenassa et al. (2007)	Illinois	1990-1997	90	96	1.067
Elnour & Harrison (2008)	Australia	1993-2003	83.4	90.4	1.083

Note:

- a. The figures in the upper row for this study are based on the full sample of nonfatal suicide attempts recorded in hospital discharge records (concerning persons admitted to hospitals, then discharged) and emergency department (ED) records (concerning persons with no injuries serious enough to merit admission to the hospital). The figures in the lower row are confined to only nonfatal suicide attempts recorded in hospital discharge records, thereby excluding the less serious cases commonly found in ED records.

Table 3. Fatality Rates^a of Suicide Methods, U.S. 2001-2014

<u>Suicide Method</u>	<u>_____ Estimate of Nonfatal Attempts</u>				<u>% Fatal, Using _____</u>		
	<u>Deaths</u>	<u>Point</u>	<u>Lower CI^b</u>	<u>Upper CI</u>	<u>Point</u>	<u>Upper CI</u>	<u>Lower CI</u>
Firearm	258,386	50,237	12,680	87,794	83.7	74.6	95.3
Hanging, other suffocation	118,072	35,941	22,601	49,281	76.7	70.6	83.9
Cut/Pierce ^c	8,913	1,190,583	975,675	1,405,490	0.7	0.6	0.9
Drowning	5,306	2,588	1,254	3,923	67.2	57.5	80.9
Fall ^d	10,832	32,335	22,047	42,623	25.1	20.3	32.9
Fire/flame	2,262	24,720	18,412	31,027	8.4	6.8	10.9
Poisoning	86,327	3,324,926	2,777,990	3,871,861	2.5	2.2	3.0
Other land transport ^e	1,827	2,317	1,066	3,568	44.1	33.9	63.2
Struck by or against	15	182,411	153,261	211,560	0.0	0.0	0.0

Notes:

- Fatal attempts (deaths)/[fatal attempts + nonfatal attempts]
- Lower CI = Lower 95% confidence interval limit; Upper CI = Upper 95% confidence interval limit
- E.g., the attempter slashes her wrists
- Jumping from a high place, etc.
- Jumping in front of a train, etc.

Sources: Deaths – WONDER website at <http://wonder.cdc.gov/mortSQL.html>; Nonfatal attempts - WISQARS website at <http://webappa.cdc.gov/sasweb/ncipc/nfirates2001.html>.

Kleck Exhibit 4 – Review of Macro-level Studies of the Effect of Firearm Prevalence on Suicide Rates

A Methodological Critique of Macro-level Research on the Effect of
Firearms Prevalence on Suicide Rates

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The Issue

Does more widespread gun ownership cause more suicide? No one disputes that availability of a gun is a logical necessity for committing a *gun* suicide, or that more widespread gun ownership is therefore likely to cause a higher share of suicides to be committed with guns. The issue that matters from the standpoint of the public's well-being, however, is whether higher gun prevalence causes more people to kill themselves. This issue is, of course, intimately tied up with the issue of gun control, whose advocates assert that stricter guns will reduce suicide because they will reduce gun availability to suicide-prone persons, causing fewer of them to die.

Strictly speaking, reducing *firearms* suicides is not, in and of itself, a public benefit. If a strong gun law were enacted and caused the number of firearms suicides to decline by 50, but also caused the number of suicides committed by hanging to increase by 50, there would be no net savings in lives. And unless one were willing to argue that there is public benefit in getting people to kill themselves by hanging instead of shooting, there would be no suicide-related benefit from this law. Consequently, it is relatively inconsequential, by itself, if more guns cause more *gun* suicides, but very important if more guns cause more *total* suicides.

Methodological Issues

The macro-level research on the effect of gun rates on suicide rates has been afflicted by at least three major problems: (1) use of invalid or contaminated measures of gun ownership, (2) the use of very small samples of macro-level units, and, most importantly, (3) the failure to control any significant number of confounding variables.

By "contaminated" measures, I mean variables intended to measure gun prevalence but that also contain large components that are also found in the dependent variable, the suicide rate. Suicides

can be, for our purposes, broken down into just two simple types: (1) gun suicides (GS) and (2) nongun suicides (NG). One measure often used in this body of research is the percent of suicides committed with guns (PSG), which can be computed as $FS/(FS+NG)$. This is an excellent measure to use in cross-sectional analyses of violence and crime rates other than suicide rates, but cannot be used in suicide analyses because it creates an overlap between the suspected cause, gun rates, and the effect, suicide rates. The dependent variable in models of the firearms suicide rate is $FS/\text{population}$, while the dependent variable in models of the total suicide rate is $(FS+NG)/\text{population}$. Thus, when researchers use the PSG measure ($FS/(FS+NG)$) as their measure of gun prevalence, it overlaps with the dependent variable for purely artificial reasons, as a result of the analyst's choice of a proxy measure of gun prevalence.

Thus, when the researcher is analyzing whether gun levels affect the firearm suicide rate, FS is the sole component in the numerator of the independent variable (gun prevalence) *and* is also the sole component of the numerator of the dependent variable (suicide rate). Even if there was no causal effect of gun prevalence on the gun suicide rate, any errors in counting up gun suicides would tend to create a positive association simply because the amount of error would be exactly the same in the two variables. The problem is only slightly less severe when the dependent variable is the total suicide rate. Because most U.S. suicides are committed with guns, FS is the *main* component of the dependent variable (the total suicide rate), as well as the sole component of the numerator of PSG, the measure of gun prevalence.

Miller et al. (2002a; 2002b) claimed to have shown that this is not really a problem, performing a Monte Carlo simulation that supposedly showed the common components problem does not distort estimates of the effect of gun prevalence on suicide rates. The National Research Council's

Committee to Improve Research Information and Data on Firearms (2005) reviewed the work of Miller and his colleagues and concluded that the authors had failed to provide enough information about how they conducted their simulation for anyone to replicate or evaluate it. The Committee then performed their own simulation, demonstrating that estimates of the effect of gun prevalence could indeed be distorted by use of the PSG measure in a suicide analysis, that its use could lead to “perverse results” or “purely spurious correlations” between PSG and suicide rates, and further concluded that it was not even certain in what direction the distorting effects could operate (pp. 169-170).

One thing is clear – using PSG to measure gun prevalence in an analysis of suicide rates is a bad idea. Some scholars have been careful to avoid the common components problem. E.g. Kleck and Patterson (1993) used a five-item index to measure gun prevalence, which ordinarily included PSG as one of its components when a crime rate (e.g. the homicide rate) was the dependent variable. When the dependent variable was the suicide rate, however, they took care to omit PSG (p. 263). Many other scholars, however, used PSG as their sole measure of gun prevalence (Miller et al. 2002d; Kubrin and Wadsworth 2009) or used it as one of two components in a combined measure (Miller et al. 2002b; Siegel and Rothman 2016), which does not solve the problem of the gun prevalence measure overlapping with the suicide rate.

It has also been repeatedly demonstrated that PSG has no validity whatsoever for measuring changes over time in gun prevalence (Kleck 2004; Kovandzic, Schaffer, and Kleck 2013). Therefore, it cannot be used in panel, time-series, or other longitudinal research designs. This has not stopped less rigorous researchers from using it in research using a panel design (Miller et al. 2002b; 2002d; Siegel and Rothman 2016).

Some have used strictness of gun control laws as proxies for gun prevalence but this is an

extremely indirect measure that has far too weak a correlation with direct survey measures of gun prevalence to serve as a proxy measure. For example, across states, Lester (1988a) found that an index of the strictness of gun control laws had only a -0.49 correlation with a survey-based measure of household gun prevalence, implying that only 24% of the variation in gun prevalence is shared with gun control strictness ($1 - [-0.49^2] = 0.24$). In a 1980 city-level dataset, the correlation was even lower: -0.20 (unpublished computation from dataset used in Kleck and Patterson 1992). Other measures used as proxies are also known to have only weak correlations with gun prevalence, such as the hunting license rate (Kleck 2004, p. 9; $r = .37$, $r^2 = .14$) or the rate of subscriptions to gun-related magazines ($r = .34$ to $.49$ – Kleck 2004, p. 14).

A better approach is to use multiple indicators of gun prevalence combined together in a factor score. Even if each one indicator has only a modest correlation with gun prevalence, a multi-item factor score can have a strong correlation. This is what Kleck (1991) and Kleck and Patterson (1993) did, combining (1) the percent of homicides committed with guns, (2) the percent of robberies committed with guns, (3) the percent of aggravated assaults committed with guns, and (4) the percent of stolen property dollar value attributable to stolen firearms into an index.

In sum, measures contaminated by inclusion of a count of suicides should not be used in any analyses of suicide rates, and the percent of suicides committed with guns (PSG) should not be used in panel studies and other longitudinal research. Survey-based measures of gun prevalence or indexes of multiple indicators known to be substantially correlated with gun prevalence are, other things being equal, more likely to be valid than those based on PSG, a combination of PSG with other measures, or the hunting rate.

Unfortunately, even survey-based measures are usually inadequate in panel studies because the

numbers of survey respondents in each area are inadequate to establish statistically significant changes in gun prevalence from one year to the next. For example, in the region-level panel studies conducted by Birckmayer and Hemenway (2002), Miller, Azrael and Hemenway (2002a), and Miller et al. (2002c), the average number of respondents per region each year in the General Social Surveys (GSS) was only about 111, so only a very unlikely change of 13 percentage points or more from one year to the next would be statistically significant. Authors using the GSS to measure gun levels in panel studies were probably mostly modeling statistical noise due to sampling and response error, rather than actual changes in gun prevalence.

(Table 1 about here)

Table 1 summarizes key methodological attributes of 32 analyses of the effect of gun levels on suicide rates, reported in 29 different studies. Of the 32 analyses, 20 used either survey measures of household gun prevalence or multi-item indexes devoid of contamination by inclusion of a suicide component. The remaining 12 analyses used proxy measures that were not reliable measures of gun prevalence (or changes in gun prevalence, in panel studies), (e.g. Miller et al. 2002b; 2002d; Siegel and Rothman 2016).

Small Samples of Highly Aggregated, Heterogeneous Cases

This body of research is remarkable for how many studies were based on sample sizes that, even compared with other macro-level studies, were extraordinarily small, even if one ignores subscientific studies that were entirely based on comparisons of a single pair of cases (e.g., Sloan et al. 1990; Killias 1990). Cross-sectional analyses of U.S. regions were based on just nine cases (Markush and Bartolucci 1984; Lester 1988a; Kaplan and Gering 1998), an analysis of Canadian provinces covered just nine provinces (Moyer and Carrington 1992), and cross-national studies were based on

just 14-21 nations (Lester 1990; Killias 1993; Killias et al. 2001; Smith and Stevens 2003). Miller, Azrael and Hemenway (2004) even analyzed a nonrandomly selected sample of just *seven* cases!

The problem with use of such tiny samples is that key results can change radically if just one or two cases had not been included in the sample, or just one or two additional cases *had* been included. For example, Killias, Kesteren, and Rindlisbacher (2001) found that the cross-national association between survey-based measures of household gun prevalence and the total suicide rate was a nonsignificant .10 in the full sample of 21 nations, but more than tripled to .36 when just a single nation was dropped from the sample (p. 436). Unfortunately, readers of these studies are virtually never informed as to just how unstable the results were, since their authors, unlike Killias et al. (2001), virtually never report any sensitivity checks.

Use of extremely small samples also makes it impractical for researchers to control for more than a very few potential confounding variables, because it reduces the number of degrees of freedom down to a minimum and makes estimates of coefficients wildly unstable. This problem will be discussed at greater length in the next section.

Authors of these studies might protest that their small samples are the product of their use of extremely highly aggregated units of analysis such as regions or nations; there are only nine Census regions in the U.S. and only a few nations for which surveys have asked questions about gun ownership. This argument is, however, disingenuous since the authors did not have to choose use such units.

High aggregation also introduces another problem, that of aggregation bias. Findings obtained at high levels of aggregation do not necessarily apply to lower levels of aggregation such as cities, counties, or individual persons. Thus, one might find that states with higher gun levels also have

higher suicide rates, even though analysis of counties would show that places with high gun ownership are not the places that also have high suicide rates. This is more likely to happen with very aggregated units because the higher the level of aggregation, the more internally heterogeneous the cases are. For example, the vast majority of people in cities live in urban environments and are similar to one another in that regard, while the residents of states are often quite different from one another in this regard, some living in highly urban places, some living in very rural places. The more heterogeneous the unit of analysis, the more room there is for making an erroneous inference about the effect of gun levels on suicide rates. Thus, the best units of analysis to use in macro-level analyses, if relevant data are available, would be cities, then counties, then metropolitan areas. States are less satisfactory in this regard, while regions and nations are the worst of all.

Table 1 shows that only three studies (Kleck 1991; Kleck and Patterson 1993; Kubrin and Wadsworth 2009) used cities or counties as units of analysis, while eight studies used the very large and heterogeneous U.S. regions (e.g., Birckmayer and Hemenway 2001; Miller et al. 2002a; 2002c; 2002d) and, worst of all, four studies analyzed nations (Lester 1990; Killias 1993; Killias et al. 2001; Smith and Stevens 2003).

Inadequate Controls for Confounding Variables

Probably the most consequential flaw in research in this area is the near-total failure to control for confounding variables. A confounder is a variable that has both of two properties: (1) it affects the dependent variable and (2) is correlated with the independent variable of interest. In this area of research, only control variables that both affect suicide risk and are correlated with gun ownership are confounders. Merely controlling for variables, if they are not confounding variables, does nothing to improve the estimate of one variable's causal effect on another. Nonexperimental researchers who fail

to control for confounder variables will obtain biased estimates of the effect of the target variable (gun ownership levels) on the dependent variable (suicide rates). They will erroneously attribute to gun levels effects on suicide rates that are actually produced by other variables that happen to be correlated with gun levels. The more confounders omitted, the worse the bias will be.

The summary of studies in Table 1 shows that in 26 of 32 analyses, the researchers did not control for a single significant confounder (e.g., Miller, Azrael, and Hemenway 2002c; 2004; 2006). Most of the remaining studies were only marginally better. E.g., Birckmayer and Hemenway (2001) controlled for a total of four variables, but only controlled for two variables significantly related to suicide rates, one of which (“education”) is not correlated with gun rates at the state level and thus is not a confounder. Thus, they actually controlled for just a single confounder. Likewise, Kubrin and Wadsworth (2009) controlled for five variables, but only one or two of them (depending on which model one examines) were significantly related to suicide rates, and one of these (“disadvantage”) is not correlated with gun rates and thus is not a confounder. Only two studies controlled for more than three variables significantly related to suicide rates (Kleck 1991; Kleck and Patterson 1993), while Lester (1988a) controlled for three variables significantly related to suicide rates. It is fair to say that, with these three exceptions, researchers in this area have almost completely failed to control for confounding variables, and that their estimates of the impact of gun levels on suicide rates are almost certainly biased.

Table 2 demonstrate just how profound the distorting effect of failures to control confounders in a macro-level model can be. Miller, Lippman, Azrael, and Hemenway (2007) reported controlling for six variables besides the gun ownership level, seeming to imply that they had controlled for six confounders. They did not, however, report the coefficients, standard errors, or significance levels for any of these control

variables. I reconstructed their dataset and estimated the same model of suicide rates that they did. I found that only *one* of the control variables was significantly related to suicide rates, and that one variable (use of illicit drugs other than marijuana) was not correlated with gun ownership rates ($r=-0.002$). Thus, the authors had done literally nothing to control for confounders, while giving their readers the impression that they controlled for as many as six confounders (Table 2, Model 1). When I re-estimated the model with no control variables at all included, i.e. with only the gun ownership variable, its coefficient was roughly the same (0.015) as what it was in the authors' model (0.019). That is, they might just as well have included none of their control variables for all the difference it made in their estimate of the effect of gun levels (Table 2, Model 2).

(Table 2 about here)

I then estimated a revised model in which I included five genuine confounders, i.e. variables significantly related to both suicide rates and gun ownership rates, but by no means a comprehensive set of likely confounders (Table 2, Model 3). Once actual confounders are controlled, any appearance that gun levels increase the total suicide rate disappears altogether – the coefficient for the gun ownership variable is not significantly different from zero, or even close to it.

Thus, the authors' principle finding was highly sensitive to which variables they controlled for, and their choice on control variables was about as poor as it could possibly have been. The appearance of an effect of gun levels on suicide rates was not a reflection of reality, but rather an artificial product of the authors' failure to control for any confounding variables. They did not report trying out other sets of control variables to check whether their findings were sensitive to their choice of control variables. Their description of their methods did not distinguish between control variables that are confounders and those that are not, nor did they explicitly claim that they had actually controlled for any confounders (an omission

characteristic of all of the studies by Miller, Azrael, and Hemenway listed in Table 1). They appear to have assumed that controlling for any old variable somehow improved their estimate of the gun effect – an assumption that was clearly wrong.

Likely Confounders that Need to Be Controlled

Previous research provides only minimal guidance as to variables that are likely to be confounders of the guns/suicide relationship in macro-level research because so few analysts have made a serious to either control any variables or to test whether their control variables really are confounders. The best study in this respect was the one done by Kleck and Patterson (1993). Their city-level analysis found that the following were significantly related to suicide rates and significantly correlated with gun ownership rates: the divorce rate, % of the population that was transient (had moved in previous five years), rates of alcoholism, population density, percent who live alone, and whether there was a local or state requirement for gun dealers to have a license. Note that these city-level confounders are not necessarily confounders at the level of states, regions, or nations.

Using our dataset describing states as they were in 2000, we explored whether there were some additional likely confounders, by looking for variables that had significant correlations with both gun ownership levels and the total suicide rate. The results are shown in Table 3. Two kinds of variables are listed: (1) those likely to be confounders based on past research on suicide and gun ownership, and (2) those used as control variables (whether or not confounders) in the studies cited in Table 1. The bivariate correlations and their 2-tailed significance levels are shown. Those with significant correlations with both gun ownership levels and suicide rates are classified as likely confounders (labeled “yes”), those with near-significant correlations are classified as possible confounders (labeled “maybe”), and those that do not have significant or near-significant correlations with both gun ownership levels and suicide rates are classified as

not likely to be confounders (labeled “no”).

The last column indicates the likely biasing effect of failing to control for the variable. It is not possible to be certain what the effect would be in a fully-specified multivariate model, but these signs represent what the biasing effect would be in a model the included the gun ownership variable and that should also include the confounder. For example, suppose the divorce rate positively affected suicide rates and was also correlated with gun levels. A researcher who omitted the divorce rate from the model would wrongly attribute to gun levels a suicide-elevating effect that was actually due to the area’s higher divorce rate, biasing the estimated effect of gun levels upward (in a positive direction). A simple way to derive this prediction is to look at the signs (positive or negative) of the correlations of a given potential confounder with gun levels and with the suicide rate. If the signs are the same (both positive or both negative), the biasing effect will be positive (upward); if the signs are different, the biasing effect will be negative (downward).

Table 3, in combination with Table 1, indicates that there are many likely confounders that have not been controlled in prior research, and that many of the few potential confounders that have been controlled in prior research are probably not confounders. Further, the biasing effect of failing to control for the variables that probably are confounders is positive for nearly all of them. That is, failing to control them leads to estimates of the effect of gun levels that are too high. In this light, it is not surprising that the few studies that controlled for more than a few confounders find no significant association between gun levels and the total suicide rate – the association is probably spurious in the remaining studies. That is, the guns/suicide association found in some studies is probably a noncausal association that is due to the failure to control for confounding variables.

Overall Patterns of Findings

There are several patterns in the findings summarized in Table 1. First, the vast majority of analyses find a significant positive association between firearms prevalence and the rate of *firearms* suicide, consistent with the view that where guns are more widely available, more people will commit suicide with guns. That is, gun availability affects how often suicidal persons choose shooting as the method they use to kill themselves.

On the other hand, the literature is evenly split on the issue of whether firearm prevalence affects the total suicide rate, since 15 of 29 analyses did not find any significant association of firearms prevalence with the total suicide rate. This appearance of an evenly divided research literature, however, conceals a consistent pattern. Research done by Matthew Miller, Deborah Azrael, and David Hemenway (MAH) almost invariably (10 of 11 findings) yielded a significant positive association between gun levels and total suicide rates, while the rest of the research community has generally found *no* significant association. This stark contrast cannot be attributed to the superior character of the research done by MAH, since their methods are conspicuously primitive. They study very small samples (as small as $n=7$) of extremely large and heterogenous areas like regions or states, and make virtually no effort to control for confounders. As Table 1 shows, in seven of their eleven analyses they did not control for a single variable, while most of those that they did control in the remaining four analyses were probably not confounders (e.g., unemployment rates, poverty rates, alcohol abuse rates, and drug abuse rates - see Table 3). The remarkable contrast in findings between research done by MAH and other scholars could be attributable to MAH's failure to control for confounders, and their use of excessively large and heterogeneous units of analysis. If we exclude studies done by MAH, the research is overwhelmingly contrary to the proposition that more guns cause more people to kill themselves.

As a point of comparison, Kleck (1991, pp. 285-286) and Kleck and Patterson (1993) studied a far

larger set of more homogenous areas (170 cities), used a four-item index of validated proxies for gun ownership, and controlled for eight significant control variables. They obtained four estimates of the effect of gun levels on total suicide rates, depending on (1) whether they used a model that took account of the possibility of a two-way causal relationship, and (2) whether the suicide rate was logged. If people living in a household with a suicide-prone person become more reluctant to acquire or retain guns when they hear about suicides, the suicide rate would have a positive effect on the prevalence of firearms, rather than (or in addition to) the reverse. And regarding the other variation, it is not clear that the suicide rate should be logged. The usual reason for doing so is to make a positively skewed variable take on a more normal distribution, but in the city-level dataset suicide rates were already fairly normally distributed without using this transformation.

Of the four estimates yielded by these analyses, only one supported a significant positive effect of gun levels on total suicide rates, and that one was only marginally significant. When it was assumed that the occurrence of suicides could *not* affect whether people acquired or retained guns, and the suicide rate *was* logged, the coefficient for the gun level variable was marginally significant at the .034 level. Under the other three conditions, the estimates indicated no significant effect of gun levels on total suicide rates (Kleck 1991, p. 286).

Conclusion

In sum, the most technically sound research indicates that there is no effect of gun levels on total suicide rates, while the technically worst research indicates a significant positive effect. The customary scholarly practice is to tentatively accept the findings of the best available research.

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Table 1 Macro-level Studies of the Association Between Gun Ownership Levels and Suicide Rates^a

<u>Study</u>	<u>Sample</u>	<u>Number of Controls</u>		<u>Measure of Gun Levels^b</u>	<u>Significant Association with:</u>		<u>Significant Control Variables</u>
		<u>Total</u>	<u>Significant</u>		<u>Gun Suicide?</u>	<u>Total Suicide?</u>	
Markush & Bartolucci 1984	9 U.S. regions, 1973-77	0	0	S	Yes	No ^c	
Lester 1987	48 states, 1970	0	0	FGA, PHG	Yes	No	
Lester 1988a	9 U.S. regions, 1970	3	3	S	-	No	Divorce rate, % black, handgun controls
Lester 1988b	48 states, 1970	0	0	PSG, magazine subs	Yes	-	
Lester 1988c	6 Australian states	0	0	S	No	No	
Clarke & Jones 1989	13/26 years ^d	0	0	S	Yes ^e	No	
Lester 1989b	48 states, 1980	0	0	magazine subs	Yes	Yes	
Lester 1990	20 nations	0	0	PGH	Yes	No ^f	
Kleck 1991	170 cities	24	5	4-item index	No	No	Divorce rate, % transient, alcoholism, density, hospital beds
Moyer & Carrington 1992	10 Canada provinces	1	0	S	No	No ^g	
Killias 1993	16 nations	0	0	S	Yes	No	
Kleck & Patterson 1993	170 cities	21	7	4-item index	2-way: No 1-way: No/Yes	No ^h No/Yes ^h	Divorce rate, % transient, alcoholism, density, % live alone, %65+, gun dealer licenses
Kaplan & Geling 1998	9 regions	0	0	S	Yes	-	
Lester 2000	Canada, 26 years	0	0	FGA	No	No	
Birckmayer & Hemenway 2001	9 regions x 16 years	4	2	S	Yes	Yes	
Killias et al. 2001	21 nations	0	0	S	Yes	No	

Table 1 (continued)

<u>Study</u>	<u>Sample</u>	<u>Number of Controls</u>		<u>Measure of Gun Levels^b</u>	<u>Significant Association with:</u>		
		<u>Total</u>	<u>Significant</u>		<u>Gun Suicide?</u>	<u>Total Suicide?</u>	<u>Significant Control Variables</u>
Miller et al. 2002a	50 states x 10 years	3	0	S	Yes	Yes	
(5-14 yr. olds only)	9 regions x 10 years	0	0	S	Yes	Yes	
Miller et al. 2002b	50 states x 10 years	2	0	PSG/PHG	Yes	Yes	
(female suicide only)	9 regions x 10 years	0	0	S	Yes	No	
Miller et al. 2002c	9 regions x 10 years	0	0	S	Yes	Yes	
Miller et al. 2002d	9 regions x 10 years	0	0	S	Yes	Yes	
	50 states x 10 years	6	0	PSG			
Smith & Stevens 2003	14 nations	0	0	S	Yes	No	
Miller et al. 2004	7 NE states	0	0	S	Yes	Yes	
Miller et al. 2006	22 years, U.S.	0	0	S	Yes	Yes	
Miller et al. 2007	50 states	6	0	S	Yes	Yes	
Kubrin & Wadsworth 2009	179 U.S. cities	5	1-2	PSG	-	Yes	Northeast, disadvantage
Miller et al. 2013	44 metro areas	0	0	S	Yes	Yes	
Kpsowa et al. 2016	50 states, c. 2012	7	1-3	S	Yes	Yes	% religious, gun control strictness, long-term unemployment
Siegel & Rothman 2016	50 states x 33 years	14	0	PSG/Hunt	Males: Yes Females: Yes	Yes No	

Notes:

- a. . Table covers only studies in which gun ownership levels were actually measured. It does not include studies that merely assume a guns-suicide association but did not actually estimate one (e.g. Farmer and Rohde 1980; Boor 1981; Boyd 1983; Boyd and Mowscicki 1986; Wintemute 1987; Cantor and Lewin 1990; Dudley et al. 1992), nor does it cover studies that merely compared a single pair of nations or cities (e.g. Sloan et al. 1990; Killias 1990).
- b. S=survey measure of % of households with guns; Magazine Subs=subscription rates for gun magazines; PSG=% of suicides committed with guns; PGH=% of homicides committed with guns; FGA=fatal gun accident rate; Hunt= hunting license rate; O=other measure.

- c. Significant positive correlation was only obtained if eccentric weighting scheme was applied. Conventional unweighted results indicated no significant association.
- d. Time series dataset included 26 years total, but only thirteen had real data on gun ownership levels; the rest were interpolations.
- e. Handgun prevalence related to suicide rates, total gun prevalence unrelated.
- f. Lester did not report this result. It was computed from his published data.
- g. Both bivariate and multivariate associations of guns with total suicide were insignificant, for both sets of years authors used. Authors reported erroneous significance level for multivariate association for 1987-89 data - it was .08, not .008.
- h. Association was barely significant ($p=.04$) when (1) a one-way relationship was assumed, and (2) the suicide rate was logged; not significant when a two-way association was assumed, or the suicide rate was not logged.

Table 2. Effects of Failing to Control for Confounders: Results from Alternative Models of State Suicide Rates^a

Model Number: Variable	(1) <u>Miller et al. model</u>	(2) <u>Guns-only</u>	(3) <u>Improved Model</u>
% Households reporting guns, 2001	.019 (4.96)	.015 (6.83)	.003 (0.98)
% civilian labor force unemployed, 2000	-.002 (0.78)		
% living in urban areas, 2000	.002 (0.68)		
% under the poverty line, 2000	-.011 (-.82)		.025 (4.02)
% adults suffering from serious mental illness, 2002	-.015 (-.51)		
% reporting alcohol dependence in 2001	.001 (.02)		
% reporting illicit drug use besides marijuana, 2002	.182 (3.18)		
State is in West region			.101 (2.08)
% born in same state as current residence, 2000			-.011 (-7.27)
% Catholic, 1990			-.004 (-2.29)
% African-American, 2000			-.008 (-3.68)
% foreign born, 2000			-0.025 (-6.28)
constant	1.107	1.891	2.701
R _A ²	0.558	0.482	0.876

a. Dependent variable is natural log of total suicide rate for 1999-2002. Weighted least squares estimates, states weighted by sample mean of square root of population. Based on 50 states only – D.C. not included.

Table 3. Some Possible State-Level Confounders of the Guns/Suicide Relationship

<u>Variable</u>	<u>Correlation with:</u>		<u>Total Suicide Rate</u>		<u>Likely Confounder?</u>	<u>Likely Sign of Biasing Effect</u>
	<u>Gun Ownership</u>		<u>r</u>	<u>p</u>		
Divorce rate	.309	.029	.524	.000	Yes	+
Population density	-.747	.000	-.719	.000	Yes	+
% Foreign-born	-.718	.000	-.378	.007	Yes	+
% Catholic	-.655	.000	-.592	.000	Yes	+
% Urban	-.722	.000	-.364	.009	Yes	+
% Mentally ill	.599	.000	.434	.002	Yes	+
Northeast region	-.499	.000	-.500	.000	Yes	+
% Below poverty line	.371	.008	.227	.113	Maybe	+
% Moved past 5 years	.198	.168	.588	.000	Maybe	+
West region	.140	.332	.578	.000	No	+
% Live alone	.032	.824	-.062	.668	No	-
% age 65+	-.180	.212	-.260	.068	No	+
Unemployment	.146	.311	.193	.178	No	+
Veterans/100k pop	-.004	.975	.227	.113	No	-
Alcohol abuse	.187	.192	.259	.069	No	+
Serious drug use	-.002	.992	.335	.018	No	-