American Slaughterhouses and the Need for Speed: An Examination of the Meatpacking-Methamphetamine Hypothesis

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Abstract:

In Fast Food Nation, Eric Schlosser argues that slaughterhouse workers use methamphetamines to manage the harsh physical and emotional demands of the meatpacking industry. Similar ideas have been raised elsewhere; however, empirical tests of this hypothesis are in short supply. In this article, we elaborate on theoretical mechanisms that may explain why the meatpacking industry encourages methamphetamine use and provide a macro-level test of the meatpacking–methamphetamine hypothesis using 11 years (2001-2012) of hospital admission data and information from annual livestock slaughter reports. Decomposition modeling is used to examine variations across states and within states over time. Results show only modest support for the hypothesis. Specifically, a combined measure of meat is positively and statistically significantly associated with methamphetamine use both within and across states. However, the relationships are not consistently positive or statistically significant across all types of meat. In other words, the meatpacking–methamphetamine relationship is varying and complex.

Keywords: methamphetamines | meatpacking | animal slaughter | hybrid panel analysis

Article:

In his provocative critique of the American fast food industry, Eric Schlosser (2001) makes an explicit connection between methamphetamine use and employment that involves the killing and processing of animals in U.S. slaughterhouses:

> The unrelenting pressure of trying to keep up with the line has encouraged widespread methamphetamine use among meatpackers. Workers taking “crank” feel charged and self-confident, ready for anything. Supervisors have been known to sell crank to their

> workers or to supply it free in return for certain favors, such as working a second shift. (Schlosser, 2001, p. 179)

Similar ideas regarding the compatibility between meatpacking and methamphetamines have been raised elsewhere. In 1997, the Office of the President of the United States held its annual National Methamphetamine Drug conference, during which one panel member declared that "methamphetamine use appears to follow the meat-packing industry. Employees are using it initially to survive on the job or to work two or three jobs" (Bloom, 1997). Despite its intellectual appeal, few studies have been conducted that can validate the meatpacking–methamphetamines hypothesis. However, some studies suggest links between employment in slaughterhouses and substance use more generally (e.g., Broadway, 1990; Ehman, Yildiz, Bez, & Kingir, 2012; Macnair, 2002). Moreover, increases in meat production among local slaughterhouses are at least partially responsible for a number of subsequent community problems, including housing shortages, demands for social assistance, and increases in violent crime and property offenses (Broadway, 2000; Grey, 1998a, 1998b; Fitzgerald, Kalof, & Dietz, 2009; Horowitz & Miller, 1999; Stull & Broadway, 2004).

In our study, we provide a macro-level examination of the meatpacking–methamphetamine hypothesis. Using hospital admission data from the Department of Health and Human Services and livestock slaughter reports from the U.S. Department of Agriculture, we test whether state-level variations in commercial meat production are associated with hospital admissions for methamphetamines over a time span of 11 years from 2001 to 2012. To examine variations across states and within the same state over time, we rely on decomposition modeling, a technique that avoids the limitations of fixed and random effects models.

Prior to describing the study design, we first discuss trends of methamphetamine use, followed by a brief history of the meatpacking industry. We extend previous "sociology of the slaughterhouse" arguments (York, 2004) by highlighting the slaughterhouse industry's potential connection to trends in methamphetamine use. Although Schlosser's (2001) critique focused on methamphetamine use among slaughterhouse employees, our macro-level analysis examines the meatpacking–methamphetamine hypothesis as an aggregated phenomenon. In doing so, we rely on previous ecological scholarship, which emphasizes how structural and cultural characteristics influence individual behavior (e.g., Bursik & Grasmick, 1993; Sampson & Groves, 1989; Shaw & McKay, 1942).

Methamphetamines in the United States

Amphetamine was available in the United States without a prescription until 1951 (Maxwell & Brecht, 2011; Miller, 1997). In the decades that followed, methamphetamine—sometimes referred to as crank, ice, crystal, or crystal meth—was manufactured by illicit producers using over-the-counter cold medicines and other chemicals (Bianchi, Shah, Rogers, & Mrazik, 2005; Maxwell & Rutkowski, 2008). Throughout the 1980s and early 1990s, illicit methamphetamine production was dominated by small, independent laboratories; however, by the mid-1990s, large "super labs" were distributing and producing higher purity methamphetamine (Miller, 1997). Known for being a stimulant, which results in feelings of

euphoria, increased alertness and confidence, and appetite suppression, methamphetamines have relatively long-acting effects (Volkow, 2013; Weisheit & White, 2009).

By the mid to late 1990s, methamphetamine use was spreading across the United States, and public and political attention on the drug increased (Ling, Rawson, & Shoptaw, 2006). Although media accounts often exaggerate and sensationalize methamphetamine use (Chitwood, Murphy, & Rosenbaum, 2009; see also Sommers & Baskin, 2006), reported use did increase from the mid-1990s to the mid-2000s (Johnston, O'Malley, & Bachman, 2003; National Institute on Drug Abuse, 2003). Beginning in the mid-2000s, methamphetamine use saw a steady decline largely because of newly developed laws limiting access of pseudoephedrine products. In more recent years, however, methamphetamine use is on the rise. In 2009, persons reporting past month methamphetamine use increased as did the number of first-time users (Substance Abuse and Mental Health Services Administration [SAMHSA], 2010). Extant work has cited this cyclical trend, noting that decreases in methamphetamine use tend to be short lived and are followed by rather significant increases (e.g., Cunningham & Liu, 2003, 2005; Cunningham, Liu, & Callaghan, 2009; Dobkin & Nicosia, 2009; Maxwell & Brecht, 2011).

Numerous studies have linked methamphetamine use to harmful health risks such as sleep deprivation, acute psychosis, malnutrition, unprotected sex and sexually transmitted infections, and violence, thus justifying the need for research that explores etiological factors that contribute to its misuse (Bolding, Hart, Sherr, & Elford, 2006; Cohen et al., 2003; Farrell, Ali, & Ling, 2002; Fernandez et al., 2007; C. Harris, 2003; Hirshfield, Remien, Walavalkar, & Chiasson, 2004; Zule & Desmond, 1999). However, most research on contributing factors to methamphetamine use is at the individual level (Jenkot, 2008; Oetting et al., 2000; Sattah et al., 1997) and do not examine larger social or contextual forces that might influence misuse. Below, we provide a theoretical discussion that locates demands for productivity as a key factor for explaining methamphetamine use among slaughterhouse workers.

The American Meatpacking Industry

In colonial America, hogs and cattle were raised, killed, and processed on family farms. Without refrigeration technology, meatpacking was done seasonally, as animals were slaughtered and processed in the coldest months, and meat was preserved in barrels of brine and transported in the spring (Curnutt, 2001). It was not until settlements began to emerge in the Ohio River Valley in the early 19th century that the nation saw the first efforts toward a systematic and organized meatpacking industry. Cincinnati, Ohio, once referred to as "Porkopolis," was one of the country's first centralized meat processing centers; animals were transported there for slaughter and then salted and shipped by river or canal back east (Gordon, 1990). By the end of the 1800s, the proliferation of railroads allowed cities further west to establish processing centers. The Chicago Union Stock Yards became the nation's foremost animal processing hub (Azzam, 1998), with its favorable proximity to railroads and water channels. A new industrialized system of meat processing pioneered in Chicago's meatpacking district used conveyor belts to move meat from the initial slaughter to the final stages of processing while workers remained stationary, performing specialized tasks successively throughout the day (Patterson, 2002; Stull & Broadway, 2004). Several of the largest Chicago-based meatpacking plants eventually opened regional processing centers in Missouri, Iowa, and Minnesota, and by the turn of the century, a

handful of large companies (i.e., the "Beef Trust") dominated the industry, working collusively to fix prices and divide geographic territories (Russell, 1905).

Upton Sinclair's (1905/1946) *The Jungle* painted a grim picture of Chicago's Union Stock Yard where meatpacking workers lived in polluted, impoverished, and overcrowded conditions directly behind massive slaughterhouse complexes. Children and immigrants were commonly employed at these plants, forced to work long hours for little pay in dangerous conditions plagued by injuries and disease. There were few mechanisms in place that encouraged sanitary work practices, and the meat produced in these plants was often contaminated by dirt; animal parts or feces; and human hair, sweat, and blood. The details in Sinclair's novel ultimately inspired former President Theodore Roosevelt to support the creation of regulations for the meatpacking industry, including the Meat Inspection Act and the Pure Food and Drug Act of 1906. Starting in the 1930s, unions such as the United Packinghouse Workers of America organized and initiated improvements in pay and working conditions for meatpacking workers (Halpern, 1997). However, despite these efforts, meatpacking remained one of the nation's most dangerous and unsanitary industries for decades to come.

Large-scale changes beginning in the 1950s revolutionized meatpacking. The rise of interstate trucking and hard-surfaced roads eliminated Chicago's geographical advantage and thereby instigated a period of industry decentralization. Several large corporation processing centers positioned along railroads or in urban centers shut down, giving way to smaller processing plants located in close proximity to livestock feedlots. Technological innovations that included power saws and mechanical knives helped to produce quicker and more efficient assembly lines (Halpern, 1997; Horowitz, 1997). Later, newer companies such as Iowa Beef Processors automated more of the meatpacking process and eliminated the need for skilled labor. They produced meat products at lower prices, narrowing profit margins and hinging the lucrativeness of the business on low wages, product volume, and quick production lines. Embracing the core tenets of the disassembly line process, every task was reduced to a mindless and repetitive hand and arm motion. Small and local companies, unable to compete, were forced to close or were bought out by industry powerhouses. By the 1990s, a handful of industry leaders accounted for half of all poultry and pork production and 80% of beef production in the United States (Stull & Broadway, 2004).

Slaughter, Meth, and the "Good Worker"

Sociological research often conceptualizes work as a pro-social activity that increases commitment to conventional life (e.g., Laub & Sampson, 1993; Sampson & Laub, 1990; Uggen, 2000). However, some research indicates that paid work itself may not be enough to deter participation in deviant activities, including drug use. Wright and Cullen (2004) find that employment does not consistently reduce illicit drug use. Rather, they reveal that specific elements of employment—job stability and coworker disapproval—produce decreased illicit substance use. Others have also noted employment's inconsistent effects on drug misuse (e.g., Dollar & Ray, 2013; Dollar & Hendrix, 2015; Kandel & Yamaguchi, 1987). In short, evidence suggests that the *quality* and *context* of work are important matters to consider.

Above, we described the modern-day meatpacking industry as one that thrives on the mass, speed, and efficiency of the production line. With slender profit margins, most slaughterhouses operate around the clock to maximize profits, equating to thousands of animals that are killed and processed by the hour. Accordingly, workers are under pressure to slaughter a great number of animals in the least amount of time possible. Indeed, the speed of the production line is one of the most common complaints among industrial slaughterhouse employees (Dillard, 2008; Eisnitz, 1997; Human Rights Watch, 2004). Unfortunately for the meatpacking industry, a range of human imperatives can interfere with the profit potential of the production line. Specifically, we argue that human biological needs and psychological or emotional reactions to animal slaughter can hamper the speed and efficiency of the meatpacking process, but methamphetamines *may* allow individuals to circumvent these prerequisites and fulfill the promise of hypercompliance and unremitting productivity (Schlosser, 2001).

Human workers have biological requirements that may hinder the number of animals slaughtered or the quickness by which their meat is processed, including needs for rest, lunch/dinner breaks, or trips to the bathroom. Some workers may request time away from the production line when they become fatigued by persistent pressures for speed or the monotonous nature of their labor. Unless slaughterhouse managers have reserve workers to take the place of employees away from the production line, human biological prerequisites can chip away at profits incurred by meat processing corporations. Some workers may perceive the use of methamphetamines as a means of setting themselves apart from other employees and earning the label of the exemplary worker. Qualitative studies suggest that methamphetamine users perceive the drug to facilitate better concentration and focus, work faster and more effectively, and perform longer without sleep or other types of breaks (e.g., see Bungay et al., 2006; Lende, Leonard, Sterk, & Elifsonc, 2007; Reback, 1997; Sherman et al., 2008; Von Mayrhauser, Brecht, & Anglin, 2001). Hence, methamphetamines may help transfigure unrealistic industry demands into attainable goals for workers on the production line.

Emotional or psychological responses to the act of slaughter also have the potential to disrupt the productivity of the meatpacking process. Although the American public may wish to remain ignorant about how their meat is produced (Vialles, 1994; Williams, 2008), persons working in industrialized meat plants not only confront animal slaughter daily but actively participate in the killing and dismembering of living beings. Observing or facilitating the cutting, skinning, and boiling of conscious or unconscious animals may take a psychological toll on slaughterhouse workers who feel remorse for their actions. For example, Macnair (2002) suggests links between work in slaughterhouses and perpetration-inducted traumatic stress disorder, a form of posttraumatic stress disorder that sometimes develops when subjects actively participate in the creation of a traumatic situation. In some respects, modern-day mechanized methods of slaughter have reduced human–animal interaction; however, research continues to suggest that workers internalize a sense of conflict between work requirements that demand killing living beings while at the same time appreciating that mortal beings should be protected (e.g., Smith, 2002). In turn, negative psychological reactions may lead to worker absenteeism, employee turnover, or hesitation during the act of slaughter, issues that might undercut anticipated corporate profits (Ehman et al., 2012).

Some research suggests that slaughterhouse workers who feel tormented by the nature of their work seek out ways to emotionally "check out" or to put their work "out of mind," so that they can return to being productive laborers (Dillard, 2008; Macnair, 2002; Richards, Signal, & Taylor, 2013; Vialles, 1994). Methamphetamines may be one way that workers can bypass negative psychological and emotional reactions that otherwise might interfere with their productivity. Indeed, common internal reasons for initiating and continuing the use of methamphetamines cited in the literature are its "mind-numbing" capabilities and utility for disassociating or distracting from one's life problems (Barrett et al., 1995; Boeri, Harbry, & Gibson, 2009; Bungay et al., 2006; Kurtz, 2005; Sherman et al., 2008; Von Mayrhauser et al., 2001). Likewise, several qualitative studies with methamphetamine users suggest that one of the more desirable qualities of the drug is that it makes users feel hyperconfident, powerful, and fearless (Anglin, Burke, Perrochet, Stamper, & Dawud-Noursi, 2000; Bungay et al., 2006). Hence, the euphoric high offered by methamphetamines may not only allow users to dodge the remorse or guilt they might normally feel after assisting in the death of an animal, carrying out the killing may reinforce feelings of power and superiority and convert the act of killing from something painful and undesirable into a pleasurable, gratifying experience.

Beyond the acts of killing or processing of animal meat, employment in the slaughterhouse industry is in many other ways an undesirable mode of paid labor. Workers who are cognizant of the numerous risks associated with meatpacking may be less motivated to perform as expected or to continue working in the industry, therefore slowing down the production line or instigating the need to hire new workers who require training before they can become productive laborers. Research has suggested that slaughterhouse workers are at high risk for developing musculoskeletal disorders and disabilities that develop from labor requiring fast-paced, forceful, and repetitive body movements (Fitzgerald, 2010; Frost, Andersen, & Nielsen, 1998; Hansen & Bernard, 1982; Leclerc, Chastang, Niedhammer, Landre, & Roquelaure, 2004; Sundstrup et al., 2013; Viikari-Juntara, 1983). They are also at heightened risk for contracting viruses, bacterial infections, and skin diseases (Aziz, Bahamdan, & Moneim, 1996; Gabal & el Geweily, 1990; Gilbert et al., 2012; Mergler, Vezina, & Beauvis, 1982; Mulders et al., 2010; Van Cleef et al., 1998). Based on research demonstrating its emotion-deadening and benumbing capabilities, methamphetamines may help slaughterhouse workers to further maximize their productivity by enabling them to block out or disregard the extensive harm their bodies are subject to by performing this type of labor.

Schlosser (2001, p. 179) argues that "supervisors have been known to sell crank to their workers." We are unaware of empirical research demonstrating the validity of this claim, but there have been recent high-profile reports in the media that allude to the existence of clandestine methamphetamine operations within some of the nation's slaughterhouses. For instance, although allegations were eventually determined to be unfounded, a raid of the Agriprocessors, Inc. kosher slaughterhouse in Postville, Iowa, in 2008 by the Department of Homeland Security (i.e., the "Postville Raid") was based on suspicions that a methamphetamine laboratory was being operated inside of the plant. However, not knowing how commonly slaughterhouse workers are provided with methamphetamines by their employers does not prevent us from recognizing the possibility that it does occur, even if such occurrences often go undetected. Much like other sectors of agriculture, meat processing workers are predominantly people of color from low-income and low-education backgrounds, often born outside of the United States

and in many cases are undocumented workers (Human Rights Watch, 2004). Hence, slaughterhouse workers often have low levels of job security and few alternative options for employment and are therefore easily exploitable by supervisors or other members of management. Consequently, in instances in which methamphetamine use becomes common in the meatpacking plant and even expected of its workers, some employees may be too afraid to refuse it or speak out about it for fear of losing their jobs. We can therefore appreciate the possibility that methamphetamines can be used as a coercive instrument through which people are manipulated in the interest of productivity by an industry preoccupied by profit and the volume, speed, and efficiency of slaughter.

Beyond Slaughter Workers: Meatpacking and Methamphetamines in the Local Community

The prior section elaborated on potential explanations for why employment in an animal slaughterhouse may lead to methamphetamine use among workers; however, sociological research finds that criminogenic factors are often place-based. Such findings emphasize the importance of understanding structural and cultural neighborhood effects that may encourage participation in deviant drug behaviors. Shaw and McKay's (1942) social disorganization model is perhaps the most well-known area-level explanation of delinquency. They argue that physical deterioration, economic segregation, and high population turnover encourages the dissolution of conformity and the emergence of cultural (mal)adaptations, which results in higher crime rates. More recently, scholars have argued that areas with consistent residential turnover and a large percentage of low-wage, unskilled workers experience greater disorder because it hinders the development of strong prosocial networks within and beyond the local community (e.g., Bursik & Grasmick, 1993; Kasarda & Janowitz, 1974; Kubrin & Weitzer, 2003; Sampson, Morenoff, & Gannon-Rowley, 2002).

Reflecting these arguments, research suggests that the deleterious effects of the slaughterhouse industry may not be exclusive to its workers and can spillover into surrounding communities or even encourage socially undesirably behaviors among local residents. Building from research on "boomtowns," Fitzgerald et al. (2009) contend that established links between the slaughterhouse industry and violent crime may be a function of population influx and a succeeding loss in social cohesion. Geographic areas in which slaughterhouses are built or relocated may attract an incursion of people seeking employment, bringing new or alternative value structures that conflict with current residents or that interrupt existing support systems and social networks. Consistent with Shaw and McKay's (1942) social disorganization theory, population heterogeneity can work to reduce the strength of informal social control mechanisms, increase anonymity, and ultimately allow for more instances of crime and deviance (including illicit drug use) to occur.

It has also been argued that the slaughterhouse industry can promote crime and deviance at the community level because it stimulates patterns of local under- and unemployment. Because of its heavy physical and psychological demands and often unsafe or unsanitary work conditions, the meatpacking industry experiences high worker turnover (Cudworth, 2011; Ehman et al., 2012; Human Rights Watch, 2004), and some have suggested that the loss of employment among former slaughterhouse workers may drive them to commit crime or engage in unproductive

behaviors such as illicit drug use (Eisnitz, 1997). Given research demonstrating that many individuals begin using methamphetamines as a way of coping with personal loss, unemployment cycles are also a plausible mechanism explaining links between the slaughterhouse industry and methamphetamine use among members of the general population. We rely on this contextual approach in the present analysis. Although Schlosser (2001) focused on explaining methamphetamine use among slaughterhouse workers, we examine this hypothesis at the aggregate. Our hope is that this analysis will spark additional investigations that highlight the complexity of the meatpacking–methamphetamine relationship.

Data and Method

Data Sources and Measures

The goal of the present study is to test the hypothesis that there is a positive relationship between the meatpacking industry and methamphetamine use (Bloom, 1997; Schlosser, 2001). Our data span 11 years, from 2001 through 2012. This time period includes substantial increases and decreases in illicit methamphetamine use (SAMHSA, 2014). The data come from various sources, including the Treatment Episode Data Set State Admissions to Substance Abuse Treatment Services, which is compiled by the Department of Health and Human Services, SAMHSA, and the Livestock and Poultry Slaughter summary reports, which is compiled by the U.S. Department of Agriculture. Unfortunately, we were unable to obtain actual state-level slaughter estimates for the six New England states, so we combined those states into a single unit. Specifically, we combined data for Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont and report the data as a single "New England state." This categorization reflects the Division 1 regional division used by the U.S. Census Bureau.

Dependent Variable

Our dependent variable is methamphetamine use. We operationalize this variable using a measure of hospital admissions for methamphetamine use. This variable is calculated by the number of hospital admissions for methamphetamine use for persons aged 12 and older, by year and state, and is based on administrative data reported to Treatment Episode Data Set by all reporting states and jurisdictions. Although we acknowledge that this variable may not fully capture the rate of methamphetamine use, it is a less conservative estimate than official (police) reports contain. In fact, we examined a supplemental methamphetamine variable, obtained from the U.S. Department of Justice that measured the number of methamphetamine incidents reported by the Drug Enforcement Administration. This supplemental measure captures methamphetamine laboratory-related incidents that came to the attention of law enforcement in a given year, including the presence of laboratories, "dumpsites," or chemical and glassware seizures. This measure has relatively few instances in many states and therefore appears to largely underestimate methamphetamine use.

Independent Variable

Our key independent variables include measures of commercial land animals slaughtered annually for each state. Data used to calculate these measures were obtained from U.S.

Department of Agriculture and are operationalized by the live weight in 1,000 pounds. The measures include several animals, including pigs, cows, bison, buffalo, chickens, turkeys, ducks, sheep, and lamb. We created four meat-specific categories: pork, poultry, beef, and sheep/lamb as well as a summation score that accounts for the total annual poundage of animals slaughtered. Our analysis separately analyzes these five measures of annual poundage.

Control Variables

We control for several other covariates. First, we include a state-level measure of official crime rate and number of full-time sworn police officers, which likely reflect the rate of other area-level illicit activities.[1] Crime rate estimates were obtained from the Uniform Crime Reports. Estimates for number of sworn officers come from the Federal Bureau of Investigation's annual Law Enforcement Officers Killed and Assaulted reports. We also include a measure of the U.S. Census Bureau's annual state population size. Finally, a time invariant regional measure is included with the Midwestern region serving as the reference category because of its more consistent relationship to official measures of methamphetamine use.

Statistical Methods

The present analysis seeks to examine longitudinal fluctuations in meat processing effects on methamphetamine use; however, there is also reason to expect across state or between-unit variation. To estimate both of these effects, we employ decomposition modeling (also known as hybrid panel analysis). Decomposition models resolve issues common to fixed effects and random effects time series models (Allison, 2005). For example, this modeling technique allows for the identification of observed time-invariant variable parameters, which is not possible with fixed effect models (i.e., fixed effect models estimate longitudinal effects but leave across-unit effects as fixed). Decomposition models separately estimate within-unit and across-unit variation by decomposing their respective effects in a single model (Allison, 2005).[2] The within-location component estimates effects of a particular unit of analysis over a specific time lag, which is the general purpose of longitudinal studies; the across-location component provides across-unit comparisons and is generally comparable to cross-sectional analysis (Phillips, 2006; Zhou, 2011).

Hybrid panel model takes the following form:

$$Yjt=\alpha+\beta Xj+\eta(xjt-Xj)+vj+\varepsilon jtYjt=\alpha+\beta Xj+\eta(xjt-Xj)+vj+\varepsilon jt$$

where *Yjt* represents the dependent variable for unit *j* and year *t*; α indicates the intercept or constant; β represents the parameter estimate of across-unit mean differences, *Xj*; η signifies the effects of within-unit differences; *xjt* represents the predictor for region *j* at time *t; vj* represents the unit-specific error term; and ϵjt signifies the model error term, which controls for unique unit-specific characteristics as it contains random variation within units over time.

Results

Table 1 presents descriptive statistics for all variables. We present the data cross-sectionally so that annual data are easily comparable. As shown in Table 1, methamphetamine admissions to

hospitals increased substantially from 2001 to 2007, and while they steadily decreased until 2011, admissions increased in 2012. Our findings are consistent with prior research, which shows methamphetamine use as following a cyclical pattern (e.g., Cunningham & Liu, 2003; Maxwell & Brecht, 2011). Meat processing has remained relatively stable across the time points examined. Some years show slight increases in the pounds of meat states process annually, but a comparison of the means across each year reveal relative stability, although the standard deviation and minimum scores are generally smaller in more recent years.

Table 1. Descriptives of All Variables, by Year.

Variable	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Meth admits	2223	2856	3039	3334	3994	3794	3490	2954	2715	2703	2650	2057
	[6113]	[8977]	[9268]	[9117]	[10130]	[10855]	[10544]	[8956]	[7489]	[6961]	[6383]	[6760]
	(48-39910)	(80-59247)	(57-62130)	(72-60334)	(173-67068)	(189-71151)	(119-69000)	(129-59258)	(114-49931)	(69-45931)	(71-41665)	(153-43629)
Meat	3,535,996	3,232,245	3,244,331	3,769,059	3,804,714	4,140,624	4,163,000	3,168,927	3,566,990	3,740,213	3,759,340	3,775,027
	[3,097,315]	[3,060,152]	[3,300,264]	[3,318,163]	[3,359,970]	[3,445,778	[321,200	[3,183,302]	[2,966,065]	[3,012,619]	[3,044,723]	[2,908,941]
	(649,287-10,638,359)	(709,340-10,904,882)	(697,004-10,994,451)	(668,083-10,844,191)	(641,217-11,052,742)	(667,689-11,436,368)	(697,278-10,971,698)	(79,530-12,007,135	(559,851-36,961,229)	(90,227-12,137,657)	(74,724-12,250,662)	(70,352-11,800,821)
Population	6,463,510	6,523,909	6,580,434	6,641,762	6,703,396	6,768,391	6,833,109	6,898,039	6,958,620	7,016,391	7,067,472	7,120,079
	[6,582,863]	[66,549,228]	[6,722,738]	[6,785,257]	[6,840,534]	[6,900,819]	[6,954,769]	[7,023,245]	[7,093,100]	[7,164,546]	[7,233,966]	[7,304,565]
	(193,504-5,965,962)	(500,017-34,871,843)	(503,453-35,253,159)	(509,106-35,574,576)	(514,157-35,827,943)	(522,667-36,021,202)	(534,876-3,625,011)	(546,043-36,604,337)	(559,851-36,961,229)	(564,367-37,334,410)	(567,356-37,683,933)	(576,412-38,041,430)
Crime rate	4144	4102	4038	3948	3881	3773	3672	3598	3408	3286	3253	3229
	[947]	[974]	[951]	[936]	[895]	[839]	[847]	[797]	[731]	[674]	[665]	[618]
	(2,326-6,077	(2,280-6,575	(2,177-5,858)	(2,051-5,577	(1,946-5,351)	(1,890-5,128)	(1,821-4,959)	(1,981-4,946)	(1,988-4,584)	(2,009-4,507)	(2,113-4,517)	(2,204-4,393)
Sworn officer	2.32	2.30	2.34	2.34	2.33	2.34	2.36	2.36	2.36	2.34	2.41	2.30
	[0.57]	[0.49]	[0.57]	[0.57]	[0.56]	[0.58]	[0.56]	[0.57]	[0.55]	[0.54]	[0.75]	[0.56]
	(1.6-4.2)	(1.6-3.9)	(1.6-4.1)	(1.6-4.0)	(1.5-4.0)	(1.6-4.0)	(1.6-4.0)	(1.6-4.0)	(1.6-4.0)	(1.6-4.0)	(1.5-6.0)	(1.5-4.0)
Midwest	0.25 [0.43] (0-1)	—	—	—	—	—	—	—	—	—	—	—
South	0.34 [0.47] (0-1)	—	—	—	—	—	—	—	—	—	—	—
West	0.30 [0.30] (0-1)	—	—	—	—	—	—	—	—	—	—	—

North east	0.11 [0.32] (0-1)	—	—	—	—	—	—	—	—	—	—	—

Note. Data presented are mean, standard deviation [in brackets], range (in parenthesis).

As expected, the mean population of each state has grown over time, and as demographers predict, the U.S. population continually increases (e.g., Passel & Cohn, 2008). The data also confirm what criminologists have previously noted: crime rate continues to decrease. Interestingly, the number of police does not directly follow this trend as shown by the fluctuating mean number of sworn officers. Finally, we report the percentage of states in each region. Although we were unable to gather state-level data from the six New England states, we retain the representativeness of our U.S. sample by region (see the appendix). Specifically, our data reflect the South as having the largest number of states (34%), followed by the West (30%), Midwest (25%), and Northeast (11%).

Table 2 presents the results of our first hybrid panel or decomposition model, which includes the summation score of annual animal slaughter. The within-state or longitudinal results reveal a slight positive association between meat processing and methamphetamine use (b= .0002, p < .05). Despite the effect size being small, our findings indicate that increases in meat production are related to increases in methamphetamine use over time, which is consistent with our hypothesis. Coefficients for state population size and number of sworn officers are positive, yet statistically nonsignificant, while the effect of crime rate on methamphetamine use is negative but also not statistically significant.[3]

Table 2. Hybrid Models Predicting Methamphetamine Use, 2001 to 2012.

Within state	
Combined meat processing	0.0002* [0.0001] (2.06)
Population size	0.0001 [0.0001] (1.47)
Sworn officers	270.25 [411.08] (0.66)
Crime rate	−0.24 [0.20] (−1.16)
Across state	
Combined meat processing	0.0008* [0.0003] (2.04)
Population size	0.0005* [0.0009] (5.96)
Sworn officers	1092.84 [1200] (0.91)
Crime rate	−3.05* [1.16] (−2.63)
Time invariant	
Northeast	−7591.90* [2862.33] (−2.65)
South	−2211.35 [1865.73] (−1.19)
West	15016.98* [3041.02] (4.94)
R^2 (overall)	.66

Note. Data are unstandardized regression coefficients, standard error [in brackets], z-statistic (in parentheses). *p < .05.

The across-state estimators reveal similar patterns of direction and meat processing remains a statistically significant predictor of methamphetamine use (b = .0008, p < .05). Thus, although population size, number of sworn officers, and crime rate have varying influence of statistical

significance depending on whether we examine within-state or across-state differences, meat processing remains positive and statistically significant when examining across state variations and changes within state over time. Although effect sizes are small, these results suggest that meat processing is a relatively consistent predictor of methamphetamine use net of other relevant time-varying and time-invariant factors.

Meat-Specific Findings

Given changes in meat preferences over time (Daniel, Cross, Koebnick, & Sinha, 2011; U.S. of Agriculture, National Agricultural Statistics Service, 2000) and the relatively weak effect size of the total meat slaughter variable, we conducted additional analysis that separately examines the meat processing-methamphetamine link by particular types of animal slaughter.

As shown in Table 3, we find that methamphetamine and meat processing is differentially related across types of meat. Indeed, the models highlight the complexity in linking methamphetamines to animal slaughter. The relationships between pork or poultry slaughter and methamphetamine use are positive in direction within the same state over time (b = .0004, b = .0005, for pork and poultry, respectively) and across states (b = .0007, b = .0006, for pork and poultry, respectively) but rarely statistically significant. In fact, a statistically significant association is found only in between-state models of poultry processing and methamphetamine. Interestingly, although the effect size remains weak across each of the models, the models explain a relatively large amount of variance (r^2 = .64, r^2= .69, for pork and poultry, respectively).

Table 3. Hybrid Models Predicting Methamphetamine Use, 2001 to 2012.

	Pork	Poultry	Beef	Sheep/lamb
Within state				
Meat processing	.0004	.0005	−.102	−1.58
	[.0006]	[.0004]	[.581]	[1.02]
	(.67)	(1.36)	(−0.18)	(−1.54)
Population size	−.0004	−.00002	−.0004	.0004*
	[.0002]	[.0002]	[.0002]	[.0001]
	(−1.56)	(−.08)	(−1.55)	(3.02)
Sworn officers	−159.82	1446.19	−153.73	−314.62*
	[432.81]	[871.68]	[402.24]	[159.09]
	(−.37)	(1.66)	(−.38)	(−1.98)
Crime rate	.050	−.135	.018	.166
	[.278]	[.402]	[.235]	[.109]
	(.18)	(−.34)	.08	(1.52)
Across state				
Meat processing	.0007	.0006*	.309	1.77
	[.0007]	[.0003]	[.582]	[2.27]
	(.98)	(1.98)	(.53)	(.78)
Population size	.0009*	0006*	.0009	0007*
	[.0001]	[.00008]	[.0001]	[.00005]
	(7.15)	(7.67)	(6.97)	(12.82)

Sworn officers	−155.33	1245.13	−292.00	−613.80
	[1814.45]	[1019.95]	[1790.87]	[729.04]
	(−.09)	(1.22)	(−.16)	(−.84)
Crime rate	−2.12*	−2.90*	−2.01	−1.17*
	[1.42]	[.928]	[1.40]	[.563]
	(−1.48)	(−3.13)	(−1.44)	(−2.09)
Time invariant				
Northeast	−7970.96*	−8811.81*	−8279.53	−6712.99*
	[3754.80]	[2367.72]	[3741.66]	[1455.12]
	(−2.12)	(−3.72)	(−2.21)	(−4.61)
South	−55.81	−2768.42	−212.51	−847.20
	[2660.97]	[1667.21]	[2759.67]	[1002.74]
	(−.02)	(−1.66)	(−.08)	(−.84)
West	7467.35*	15578.31	6739.08*	4495.80*
	[2774.41]	[2542.33]	[2803.43]	[983.28]
	(.49)	(6.13)	(2.40)	(4.57)
R^2 (overall)	.64	.69	.62	.37

Note. Data are unstandardized regression coefficients, standard error [in brackets], z-statistic (in parentheses). *p < .05.

Also shown in Table 3, models including beef and sheep/lamb slaughter show the expected positive relationship to state-level methamphetamine use but only when examining across-state variations (b = .309, b = 1.77, for beef and sheep/lamb, respectively). When examining longitudinal trends within the same state, the relationship operates contrary to our expectations (b = −.102, b = −1.58, for beef and sheep/lamb, respectively). We find no evidence of statistical significance when exploring beef or sheep/lamb processing effects on methamphetamine use.

Conclusion and Discussion

The notion that paid employment exerts a powerful influence on individuals and their behaviors has a long legacy in sociology. Over a century and a half ago, Karl Marx (1844/1964) described processes of alienation that manifest among individuals when work arrangements are dictated according to employers' pursuit of maximal surplus value and not according to the human requisite for meaningful work. Among many of Marx's fears were that dehumanizing work alienates individuals from the product of their labor, attenuates their capacities to develop profound relationships with others, and contributes to a state in which individuals become estranged from crucial aspects of their own human nature. Extant studies indicate some support for these suppositions. In fact, even when workers have experienced stable employment and increased occupational status, they often report feelings of discontent, isolation, powerlessness, and inadequacy (e.g., Leidner, 1993; Sennett & Cobb, 1972; Young, 2006).

Yet, criminological research often identifies work as a pro-social commitment that can propel people into participation in conforming life, including a lack of or desistance from anti-social behaviors. Indeed, studies have revealed paid work as a turning point that can encourage a discontinuance of deviant substance misuse (Laub, Nagin, & Sampson, 1998; Laub & Sampson, 1993, 2003; Sampson & Laub, 1990; Uggen, 2000). Although these studies focus on individual-

level transitions, similar arguments about the work's conforming influence are supported at the macro level (e.g., Bursik & Grasmick, 1993; Kasarda & Janowitz, 1974; Sampson, 1988).

Appreciating these conflicting viewpoints about how work *may* influence patterns of antisocial activities, we investigated a previously uncertified hypothesis that suggests a direct relationship between the slaughterhouse industry and methamphetamine use. We started by describing the slaughterhouse business model and argued that its emphasis on volume and speed invites little room for hesitation and compassion, which could encourage the use of methamphetamines to provide workers with a vehicle by which needs, thoughts, and emotions that interfere with productivity can be circumvented. This position parallels Kokaliari and Berzoff's (2008) argument about a recent rise in nonsuicidal self-injury among nonclinical populations (Walsh, 2006; Whitlock, Power, & Eckenrode, 2006). Kokaliari and Berzoff (2008) challenge the notion that self-injury is necessarily a function of psychopathology and instead view it as a reaction to social pressures for productivity within competitive Western societies (i.e., self-injury is understood as a mechanism by which women relieve painful or difficult emotions that get "in the way of their productivity"). Similarly, we view methamphetamine use as a self-imposed representation of worker oppression that reflects an irrational passion for dispassionate rationality (see J. Harris, 2000).

Going beyond this individualized perspective, we rely on earlier studies that find geospatial clustering of criminogenic factors. Such areas commonly include a variety of characteristics associated with a strong slaughterhouse industry—relatively high levels of residential turnover, un- or underemployment, low-wage work opportunities, and racial-ethnic minority populations. Indeed, the sociology of slaughterhouses argues for a comprehensive appreciation of how the exploitation and oppression in slaughter work influences our personal and social selves (Nibert, 2003; York, 2004), which is unavoidably informed by geosocial surroundings.

Our results, which examine 11 years of data across all U.S. states, show that the meat processing-methamphetamine link differs across the type of meat being processed. Poultry slaughter is positively associated with methamphetamine use when examining relationships across states, and the amount of variance explained by this model is notable. Although relationships between pork or poultry slaughter and methamphetamine use are also positive in direction for within-state longitudinal models, the effects are statistically nonsignificant. Likewise, whereas relationships between beef or sheep/lamp slaughter and methamphetamine use are positive in direction for across-state models, they are negative in direction for within-state models and statistically nonsignificant. Given the exploratory nature of this study, we are uncomfortable speculating as to why we find these unexpected negative relationships within states over time; however, it is possible that the associations we find are confounded by unobserved variables. We hope that our findings will spark additional inquiry into this issue.

When combining all meat processing into a single indicator, we find modest support for the meatpacking–methamphetamine hypothesis for both within- and across-state analyses. In other words, as the level of total livestock slaughter increases within a given state, so do hospital admissions for methamphetamines; likewise, states that produce more meat also tend to have more methamphetamine-related hospital admissions. Thus, there does appear to be some support for the argument that methamphetamine use follows the slaughter house industry, and despite the

inconsistent outcomes of our meat-specific models, our analyses significantly expand knowledge regarding some of the social consequences of the American meatpacking industry and the larger social and contextual forces that explain patterns of illicit drug use in the contemporary United States.

There are interesting implications to our findings. For one, these results dovetail with past research demonstrating other harmful effects of the slaughterhouse industry for individuals and communities, such as increased crime rates and demands for social welfare (Broadway, 2000; Grey, 1998a, 1998b; Fitzgerald et al., 2009; Horowitz & Miller, 1999; Stull & Broadway, 2004). Additionally, these findings say something about employment in the contemporary United States. In a highly competitive society in which unskilled laborers are easily replaceable, persons and areas that desire paid work and financial growth may place the "needs" of the industry before their own. It is concerning that the logic of our argument could theoretically apply to any industry for which success is predicated on the volume of product, speed, and efficiency of production. Therefore, the effects of paid labor on illicit drug use are likely to transcend the boundaries of the American slaughterhouse.

Like any research, our study has limitations—some of which may help explain our unexpected findings. First, our analysis relied on state-level data to measure both slaughterhouse production and methamphetamine use over time. Accordingly, we cannot say whether the positive relationships that we identified for meatpacking and methamphetamines are relevant for slaughterhouse employees, members of the general population, or both. Hence, future research that is sensitive to these nuances is warranted. Second, the present analysis relies on hospital admissions data to operationalize methamphetamine use. We elected to use this variable because it was more inclusive and contained more complete data than any official measure of methamphetamine use. Nonetheless, this indicator may be limited in that it likely does not fully capture all methamphetamine use in a specified area.

In addition, it is possible that other variables, not included in our model, which might affect seeking medical treatment for drug-related injuries. Indeed, policies that make medical treatment more attainable, including "universal" health care and growth in drug-related harm reduction approaches, may result in more drug-related hospital visits. Notwithstanding this possibility, our analysis does not encompass a time in which a harm reduction approach to methamphetamine use was extensively implemented. Relatedly, we posit that any "universal" health care effect on drug-related hospital visits would be minimal or insignificant during the time period we examine here; nonetheless, this issue may need to be considered in future studies.

Third, although we employed a sophisticated analytical method for testing the meatpacking–methamphetamine hypothesis, approaching this issue using other analytic or methodological techniques could be insightful. Indeed, decomposition models are unable to control for unobserved time-varying variables, such as poverty, unemployment, and industrial transitions. Since these factors may influence links between methamphetamine use and the meat industry, estimating these effects would be helpful. Future research on this issue would also benefit from qualitative or historical analyses that focuses on communities where slaughterhouses have been recently constructed or relocated. Comparing pre (before the slaughterhouse was built/relocated) and post (after it was built) levels of methamphetamine use would provide important information

about how use may be related to industrialized meat slaughter. Finally, data limitations made it impossible to test the mechanisms that could help to explain the relationship between meat production and methamphetamine use. Where possible, subsequent research should explore the intervening variables, such as areal-based economic deprivation/affluence, for how meat production and methamphetamines are interconnected. It should also be considered a possibility that meat production mediates the relationship between industry-related variables, including work hours or geographic location, and methamphetamine use.

Nearly 100 years after the initial publication of *The Jungle* (Sinclair, 1905/1946), Schlosser's (2001) *Fast Food Nation* provided a scathing critique of the commercial food industry and helped to revive a widespread concern for how food is processed behind the scenes as well the effects of meat-processing industry on individuals and communities. Our interest in the present study was in an underexposed section of Schlosser's review in which he makes the point that many slaughterhouse workers turn to methamphetamines to manage the harsh physical and emotional demands of the meatpacking industry. We tested the meatpacking–methamphetamine hypothesis using administrative data and a macro-level analytical approach. Our results lend some support to the hypothesis.

Appendix Regional Divisions as Defined by the U.S. Census Bureau.

Region	States included
South	Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, Washington D.C., West Virginia
West	Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming
Midwest	Illinois, Indiana, Iowa, Kansas, Michigan, Ohio, Minnesota, Missouri, Nebraska, North Dakota, Wisconsin and South Dakota
Northeast	Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont

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Notes

1.The correlation coefficient between these variables indicates a weak association (r = .168). Accordingly, we treat these variables as conceptually and statistically distinct.

2.To conduct a hybrid panel analysis, we calculate and examine regressor effects for time-varying predictors by entering a component that represents within state variation (over time) and a component that represents between state variation (across place) in a random effects model along with time-invariant predictors.

3.In accordance with calls by the American Statistical Association (e.g., Wasserstein & Lazar, 2016), we report directional relationships as well as statistical significance. In doing so, we imply that the interpretation of parameter estimates should not be limited to discussions of statistical significance.

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