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The Impact of Drivers' Race, Gender, and Age During Traffic Stops: Assessing Interaction Terms and the Social Conditioning Model

Rob Tillyer[1] and Robin S. Engel[2]

Abstract

Recent research has demonstrated that minority drivers receive disparate traffic stop outcomes compared with similarly situated White drivers. This research, however, is often not grounded within a theoretical framework and fails to examine specific combinations of driver demographics. This study addresses those shortcomings by examining research questions based on the social conditioning model and investigating the relationship between specific combinations of drivers' race/ethnicity, gender, and age, and traffic stop outcomes. Using alternative measures of stop outcomes and robust official traffic stop data collected from a state law enforcement agency, the results demonstrate that warnings and citations, but not arrests, are differentially issued to young, Black male drivers. The findings also confirm the influence of legal factors on police decision making during traffic stops. Research and policy implications are discussed.

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Introduction

Understanding the factors that influence police decision making has been the subject of extensive research over the past half century and has generally demonstrated that legal variables are consistently the most influential factors on police behavior (Gottfredson & Gottfredson, 1988; Klinger, 1994). To a lesser extent, some extralegal factors also affect officer decision making; in particular, citizen demographics have been identified as correlated with some coercive outcomes (National Research Council, 2004; Riksheim & Chermak, 1993). In particular, analyses of traffic stop data have consistently identified a relationship between drivers' race/ethnicity and officer behavior during traffic stop encounters (Tillyer, Engel, & Cherkauskas, 2010).

Despite repeated documentation of these disparities in various jurisdictions, limited theoretical explanations were offered to explain the reason for these patterns (Engel, Calnon, & Bernard, 2002). Moreover, methodological and analytical criticisms of this research began to develop; in particular, limitations associated with utilizing benchmarks to determine disparities in minority vehicle stops were identified (Ridgeway & MacDonald, 2009; Tillyer, Engel, & Wooldredge, 2008; Walker, 2001). As a result, emphasis has shifted toward studying vehicle stop outcomes (e.g., warnings, citations, arrests, searches, etc.) that offered the ability to employ more robust analytical techniques, including multivariate analysis, to examine racial/ethnic disparities. Despite improvements, this body of research still has considerable room for theoretical and analytic growth. Most importantly, the relationship between drivers' characteristics and traffic stop outcomes is still poorly understood.

Our research further examines the impact of drivers' characteristics on police decision making during the disposition of a traffic stop. Heeding calls by Engel et al. (2002), we employ the social conditioning model (M. Smith & Alpert, 2007) to assist in developing testable research hypotheses and interpreting our findings. We also explore a relatively uncharted area of research in traffic stop studies—the creation of interaction terms to model the impact of specific demographic groups and their experience within traffic stops. These models offer an ability to assess the combined effect of drivers' demographics (i.e., age, gender, and race/ethnicity) while controlling for the direct effect of those characteristics. We operationalize traffic stop outcomes by the most severe outcome, an issue that has not been fully addressed in past research. Such decisions have distinct

implications for study results, as a considerable number of traffic stops result in more than one outcome (i.e., a warning and a citation). Without consideration of this issue, the substantive interpretation of results may be biased because of analyzing the same traffic stop across multiple analytic models. Using hierarchical linear modeling, this research offers new theoretically grounded findings regarding the relationship between drivers' characteristics and traffic stop outcomes using a robust data set from a Midwest state police agency. Our study also contributes to the larger body of research focused on understanding the relationship between specific combinations of citizen demographics and decision making in the criminal justice system (e.g., sentence length; see Farrell, 2004; Spohn & Holleran, 2000; Steffensmeier & Demuth, 2006).

Past Research on Traffic Stop Outcomes

A growing body of literature has emerged to inform our understanding of traffic stop outcomes, and in particular, the relationship between driver demographics (i.e., race/ethnicity, gender, and age) and the likelihood of being warned, cited, or arrested. The majority of traffic stop analyses seek to predict warnings, citations, and arrests through the use of data collected by law enforcement agencies or systematic social observation data. Most of these analyses have reported racial/ethnic, gender, and age disparities.

Research findings regarding the impact of drivers' demographic characteristics on receiving verbal or written warnings during traffic stops vary in both direction and intensity. For example, studies have reported that Black and Hispanic drivers were *less* likely to be warned compared with White drivers in Arizona and Pennsylvania (Engel, Calnon, Liu, & Johnson, 2004; Engel et al., 2005; Engel, Tillyer, Cherkauskas, & Frank, 2007). In contrast, some studies have found that Black drivers were *more* likely than Whites to receive verbal and written warnings (Alpert Group, 2004; Schafer, Carter, Katz-Bannister, & Wells, 2006), particularly for speeding infractions (Engel et al., 2004, 2005). When gender was examined, studies more consistently demonstrated that female drivers were *more* likely to be warned compared with male drivers, although the substantive effect was marginal (Alpert Group, 2004; Engel et al., 2004, 2005). Studies also consistently indicated that older drivers were *more* likely to receive a warning compared with younger drivers (Alpert Group, 2004; Engel et al., 2004, 2005; Schafer et al., 2006). The substantive effect of the age variable was small in most cases, which may be the result of using a metric measure of age within the regression models.

More attention has been focused on the relationship between driver demographics and citations. The bulk of these findings demonstrate some racial/ethnic

disparities in citations; however, the direction of these findings is mixed. Some studies indicate that minority drivers were *more* likely to be cited (Engel, Tillyer, Cherkauskas, et al., 2007; Ingram, 2007; Smith et al., 2003), whereas others indicate that Black drivers were *less* likely to be cited compared with White drivers (Alpert et al., 2006; Alpert Group, 2004; Engel et al., 2005; Engel, Tillyer, Stoddard, & Johnson, 2007; Lovrich, Gaffney, Mosher, Pickerill, & Pratt, 2005). The effects of gender are more consistent, with the majority of research reporting that male drivers are *more* likely to be cited compared with female drivers (Engel et al., 2004, 2005; Engel, Tillyer, Cherkauskas, et al., 2007; Gumbhir, 2004; Ingram, 2007; Lovrich et al., 2005; Lovrich, Gaffney, Mosher, Pickerill, & Smith, 2003). In addition, drivers' age has demonstrated a consistent influence over citation rates, with most studies reporting that younger drivers were significantly *more* likely to receive a citation compared with older drivers (e.g., Alpert et al., 2006; Gumbhir, 2004; Ingram, 2007; Moon & Corley, 2007).

Minority drivers have also been disproportionately arrested during traffic stops compared with White drivers. The research findings suggest that these disparities are more substantive, with minority drivers found between 1.5 and 2.6 times *more* likely to be arrested compared with White drivers (Alpert et al., 2006; Engel et al., 2004, 2005; M. Smith & Petrocelli, 2001; Withrow, 2004). In only a handful of studies, no relationship between race and arrest was reported (e.g., Alpert Group, 2004; Engel, Frank, Tillyer, & Klahm, 2006) or arrests of minority drivers were *less* likely compared with Whites (Gumbhir, 2004). Traffic stops of male drivers were consistently *more* likely to result in arrest compared with stops of female drivers, even when other relevant legal and extralegal factors were considered (Alpert et al., 2006; Alpert Group, 2004; Engel et al., 2004, 2005, 2006; Engel, Tillyer, Cherkauskas, et al., 2007; Gumbhir, 2004; M. Smith & Petrocelli, 2001). In contrast, drivers' age has shown an intermittent relationship with arrest. In some studies, older drivers were *more* likely to be arrested (Engel et al., 2004, 2005), whereas other studies report that older drivers were *less* likely to be arrested (Alpert et al., 2006; Engel et al., 2006; Gumbhir, 2004; M. Smith & Petrocelli, 2001). Collectively, this research has demonstrated the importance of drivers' age as a factor in the likelihood of arrest.

Although the existing body of empirical research offers convincing evidence regarding the relationship between traffic stop outcomes and driver demographics, previous research has not consistently employed a theoretical framework for understanding this relationship. Traffic stop studies have also infrequently used theoretical frameworks to develop testable hypotheses and/or interpret the findings. A handful of theoretical models have been offered to explain officer decision making within the context of traffic stops (Klinger, 1997; Parker, MacDonald, Alpert, Smith, & Piquero, 2004; Petrocelli, Piquero, & Smith, 2003;

M. Smith & Alpert, 2007; Tomaskovic-Devey, Mason, & Zingraff, 2004; Warren, Tomaskovic-Devey, Smith, Zingraff, & Mason, 2006), but specific empirical hypotheses are rarely derived from these approaches. We address Engel et al.'s (2002) call for increased theoretical emphasis by grounding our study in the social conditioning model (M. Smith & Alpert, 2007).

Social Conditioning Model

One of the most recent and promising explanations of police behavior is the social conditioning model (M. Smith & Alpert, 2007). Imported from the social-psychological literature, this model offers an explanation for the findings of recent traffic stop studies by relying on the extensive research history of social psychology as the basis for its main tenets. In short, the model suggests that officer decision making is not only influenced by unconscious profiles that are primarily based on a drivers' race/ethnicity but may also be influenced by gender and age. According to M. Smith and Alpert (2007), these profiles—more commonly known as stereotypes (Allport, 1954; Lippman, 1922; Mackie, Hamilton, Susskind, & Rosselli, 1996), schemas (Drass & Spencer, 1987; Good & Brophy, 1990; Lurigio & Carroll, 1985), or scripts (Hill, Harris, & Miller, 1985; Huesmann, 1988)—are a form of cognitive shorthand to assist in decision making (Katz & Braley, 1933). These profiles are reinforced by social identity theory (Hinton, 1993; Tajfel & Turner, 1979), the illusory correlation (Chapman, 1967), and the ecological fallacy (Robinson, 1950). M. Smith and Alpert (2007) argued that these profiles reflect group differences within society and are reinforced through personal, vicarious, and media experiences with crime and violence.

Specific subgroups within society, often based on race/ethnicity, are sometimes linked with criminal activity through processes such as overt racism (Bobo, Kluegel, & Smith, 1997) or racial typification (Chiricos, Welch, & Gertz, 2004; Scheingold, 1984) and reinforced through vicarious experience and media exposure (Barlow, 1998; Entman, 1990, 1992). Not only do common citizens internalize these messages, but police officers are also exposed to these beliefs and adopt unconscious profiles regarding specific demographic groups in society.

For police, their experience further substantiates these profiles based on their increased exposure to criminal activity. M. Smith and Alpert (2007) argued that unlike other citizens, officers are more likely to be exposed to criminal situations; thus, they are regularly faced with negative and potentially dangerous situations. Previous research suggests that negative experiences are likely to have a stronger impact on the development of these unconscious profiles (Scaglion & Condon, 1980; Skogan, 2005; P. Smith & Hawkins, 1973). Moreover, as criminal activity

is concentrated among certain groups, officers who regularly confront criminal activity may have greater exposure to these groups, which results in associating these specific groups with crime and reinforcing these profiles. As a result, racial/ethnic differences in traffic stop outcomes derive from the influence of these unconscious cognitive profiles.

The social conditioning model suggests that stereotypes or cognitive scripts likely differ based on race/ethnicity and are influenced by the combination of other status characteristics, including gender and age. This model, although not directly tested by our research, is used as a foundation for the development of specific research hypotheses regarding the relationship between specific citizen groups and traffic stop outcomes.

Research Hypotheses

Previous traffic stop research has not thoroughly specified the relationship between race/ethnicity, gender, and age of the citizen and the likelihood of warning, citation, or arrest, despite its relevance at other junctures of the criminal justice system. For example, Steffensmeier, Ulmer, and Kramer (1998) reported that young, Black males (YBMs) received harsher criminal sentences compared with other race/gender/age subgroups. More recent research has confirmed the importance of studying interaction terms to better understand decision making by criminal justice actors (Farrell, 2004; Spohn & Holleran, 2000; Steffensmeier & Demuth, 2006). Within traffic stop research, Moon and Corley (2007) offered initial evidence that such interactions may exist.

We add to this initial work by assessing whether specific subgroups, such as young, minority males, are treated differently during traffic stops. In their original discussion of the social conditioning model, M. Smith and Alpert (2007) focused primarily on race/ethnicity as the key variable, but other work on the formation of suspicion by officers has identified the importance of gender (M. Smith, Makarios, & Alpert, 2006). As noted by M. Smith and Alpert (2007), the reliance on a variety of individual factors has long been a tradition within policing research (Bittner, 1970; Skolnick, 1966). Thus, we extend the basic principles of the social conditioning model to test for the existence of a relationship between traffic stop outcomes and specific demographic groupings, including race/ethnicity, gender, and age.

Controlling for relevant stop, officer, vehicle, and other driver characteristics, the following specific hypotheses are tested:

- Young, minority males are *more* likely to receive *warnings* compared with other age/race/gender combinations, net of other factors.

- Young, minority males are *less* likely to receive *citations* compared with other age/race/gender combinations, net of other factors.
- Young, minority males are *more* likely to be *arrested* compared with other age/race/gender combinations, net of other factors.

The direction of these relationships may seem contradictory to previous research but are supported by two independent justifications. First, we suggest that drivers' race/ethnicity is the most salient demographic characteristic in regard to potentially influencing officer decision making. On the basis of the legal and social history of racial profiling (see Harris, 2006; *State of New Jersey v. Soto*, 1996; Walker, 2001; *Wilkins v. Maryland State Police*, 1993), it is plausible to suggest that if drivers' demographics are related to officer decision making, race/ethnicity may have the most pronounced influence. Moreover, drivers' race/ethnicity is likely to be the paramount demographic from the perspective of law enforcement because the media often emphasizes the relationship between race/ethnicity and criminal activity (Barlow, 1998; Entman, 1990, 1992). Thus, law enforcement agents are likely to focus on drivers' race/ethnicity more intently rather than gender or age.

Second, if unconscious profiles are formed and influence decision making, officers may rely on these stereotypes (in combination with legal factors) as pretextual reasons to initiate a police–citizen encounter and investigate *perceived* criminal activity. Importantly, the social conditioning model does not suggest that these unconscious stereotypes are accurate but rather that they simply explain disparities in traffic stop outcomes. Using unconscious stereotypes that link minorities to criminal activities, it is hypothesized that officers may initiate traffic stops but fail to discover additional criminal activity during the encounter. In these situations, warnings are issued for the legal violation to validate the original reason for the encounter. Moreover, officers, cognizant of the current social climate, may be less likely to pursue a more severe sanction (i.e., a citation) against minority drivers for fear of increased scrutiny. Applying this theoretical framework, one would expect that young, male minorities would be *more* likely to be warned and *less* likely to be cited compared with other race/gender/age combinations. Finally, the extant research has identified the heightened likelihood of arrest for minority drivers (Alpert et al., 2006; Engel et al., 2004, 2005; M. Smith & Petrocelli, 2001; Withrow, 2004), male drivers (Alpert et al., 2006; Alpert Group, 2004; Engel et al., 2004, 2005, 2006; Engel, Tillyer, Cherkauskas, et al., 2007; Gumbhir, 2004; M. Smith & Petrocelli, 2001), and younger drivers (Alpert et al., 2006; Engel et al., 2006; Gumbhir, 2004; M. Smith & Petrocelli, 2001). Moreover, it is consistent with the social conditioning model to expect that groups fitting a "criminal stereotype," as perpetrated by

the media or direct experience, are most likely to receive the most severe poststop outcome (i.e., arrest).

Method

Data used in these analyses were collected as the result of a multiyear study to assess patterns of traffic stop outcomes within a full service, state law enforcement agency that focuses primarily on traffic enforcement functions. Hereafter, this agency will be referred to as the Midwest State Police/Patrol (MWSP) for confidentiality purposes. Official data of this type offer insight into officer decision making by recording information regarding the traffic stop, driver, vehicle, and officer characteristics (Alpert et al., 2006; Tomaskovic-Devey et al., 2006). Moreover, official data have made significant contributions in identifying patterns of disparities in traffic stops and outcomes in previous research.

The MWSP initiated 283,827 traffic stops between January 1, 2006 and December 31, 2006, the 5th year of data collection. Data auditing procedures have been in place throughout the data collection process, and data from this year had an error rate of 2.5%. Officers either used their Mobile Data Terminal (MDT) to record these data and electronically transfer this information to a central repository for analysis or recorded the identical information on paper forms, which were later scanned into electronic data. Slightly more than 1% of the traffic stops were removed from the analyses due to missing data ($n = 3,260$). An examination of the excluded cases demonstrates a random pattern of missing information that should not affect the findings. The remaining data represent "officer-initiated" traffic stops; traffic stops resulting from a citizen or dispatcher request are not recorded.

Measures

Information was collected on a variety of driver, stop, officer, and vehicle characteristics and modified into dichotomous variables for analysis, except where noted below. Three dependent variables were examined: (a) warnings (written only; verbal warnings are not permitted), (b) citations, and (c) arrests. A single traffic stop may involve more than one outcome (e.g., a citation and an arrest). For analysis purposes, cases were categorized by their *most serious outcome*, resulting in dichotomous variables that are mutually exclusive. The coding rule was only applied to traffic stops that resulted in more than one outcome. Note that this mutually exclusive measurement approach differs from most previous research that examined whether an outcome was received,

regardless of other outcomes. This is an important distinction for two reasons. First, the mutually exclusive approach allows us to understand whether specific driver demographics are related to the likelihood of receiving the most severe outcome during a traffic stop. Second, the alternative approach artificially inflates the number of encounters that ended in a particular outcome. For example, a traffic stop that results in a warning and an arrest would be considered in both the warning and arrest model. Although this is not a statistical limitation, as most multivariate analyses involve several independent models, it may distort the substantive meaning of these analyses.

As reported in Table 1, of the 280,567 traffic stops analyzed, 12.1% resulted in a warning as the most serious outcome; 86.4% ended with a citation as the most serious outcome; and 1.5% concluded with an arrest. Drivers' race/ ethnicity was recorded based on officer perceptions and categorized as White, non-Hispanic (84.5%); Black, non-Hispanic (8.5%); Hispanic (3.5%); and Other (3.6%), which includes Asian/Pacific Islander, Middle Eastern, Native Americans, and unknown. Drivers' gender was also recorded from the perspective of the officer, and 68.8% of all traffic stops involved a male driver. Drivers' year of birth was obtained from drivers' licenses and transformed into three dichotomous variables representing drivers aged 15 to 29 years (43.4%), 30 to 49 years (40.0%), and 50 years or older (16.6%). These categories were determined based on the natural distribution of the variable. Two-way interaction terms were developed by multiplying race and gender variables together to create separate measures of Black males (5.9%) and Hispanic males (2.8%). In addition, three-way interaction terms were formed by multiplying the dichotomous variables of interest together to produce variables capturing (a) YBMs (2.3%) and (b) Young, Hispanic males (YHMs; 1.3%).

Other drivers' characteristics included dichotomous variables indicating whether the driver lived within the county or state where they were stopped. These factors may affect the likelihood of a driver contesting a ticket, thereby affecting the likelihood of receiving such an outcome. Traffic stop characteristics included the time, day, and location of the stop; reason for the stop; discovery of contraband during vehicle or driver searches; and the number of passengers in the vehicle, all of which have been documented as important factors in previous research (Alpert et al., 2006; Engel et al., 2004, 2005; Engel, Tillyer, Cherkauskas, et al., 2007; Ingram, 2007; Lovrich et al., 2003; Meehan & Ponder, 2002). Traffic stops conducted on interstate highways were also captured with a dichotomous variable (compared with state highways, county, and local roads).

The initial reason for the stop dictates the degree of autonomy available to the officer (Batton & Kadleck, 2004; Klinger, 1996), and extant research has demonstrated a clear relationship between the reasons for the initial stop and

Table 1. Descriptive Statistics (*N* = 280,567)

	Minimum	Maximum	Mean	Standard Deviation
Dependent variables				
Warning only	0	1	0.121	0.326
Citation (most severe)	0	1	0.864	0.343
Arrest (most severe)	0	1	0.015	0.123
Independent variables				
Driver characteristics				
White driver	0	1	0.845	0.362
Black driver	0	1	0.085	0.279
Hispanic driver	0	1	0.035	0.183
Other race driver	0	1	0.036	0.185
Male driver	0	1	0.688	0.463
Drivers' aged 15-29	0	1	0.434	0.496
Drivers' aged 30-49	0	1	0.400	0.490
Drivers' aged 50 and over	0	1	0.166	0.372
BM	0	1	0.059	0.234
HM	0	1	0.028	0.165
YBM	0	1	0.023	0.150
YHM	0	1	0.013	0.114
County resident	0	1	0.357	0.479
State resident	0	1	0.752	0.432
Stop characteristics				
Daytime stop	0	1	0.704	0.457
Weekday stop	0	1	0.713	0.452
Summer stop	0	1	0.232	0.422
Interstate stop	0	1	0.475	0.499
Speeding is reason for stop	0	1	0.700	0.458
Moving violation is reason for stop	0	1	0.185	0.389
Equipment violation is reason for stop	0	1	0.121	0.326
Preexisting information is reason for stop	0	1	0.004	0.060
Registration violation is reason for stop	0	1	0.063	0.243
License violation is reason for stop	0	1	0.047	0.212
Special traffic enforcement is reason for stop	0	1	0.008	0.087

(continued)

Table 1. (continued)

	Minimum	Maximum	Mean	Standard Deviation
Other reason for stop	0	1	0.000	0.020
Number of reasons for stop	1	7	1.135	0.393
Contraband discovered during stop	0	1	0.004	0.064
Number of passengers	0	9	0.643	0.987
Vehicle characteristics				
State registration	0	1	0.777	0.416
Officer characteristics				
Male officer	0	1	0.970	0.171
White officer	0	1	0.919	0.273
Officer with less than 5 Years experience	0	1	0.404	0.491
Officer's education (1 = *some high school*; 2 = *some college*; 3 = *2-year degree*; 4 = *4-year degree*; 5 = *some graduate school*; 6 = *2 or more years graduate school*)	1	6	2.955	1.321
Patrol assignment	0	1	0.976	0.154

Note: BM = Black male; HM = Hispanic male; YBM= young, Black male; YHM = young, Hispanic male.

traffic stop outcomes (Alpert, MacDonald, & Dunham, 2005). The MWSP data collection form allowed for the capture of eight different reasons for an officer-initiated traffic stop, including speeding, moving violation, equipment violation, preexisting information, registration violation, and so on. These reasons were not mutually exclusive, as multiple reasons could be indicated for a single stop, but each was dichotomized. Speeding (70.0%) was the most common reason for officer-initiated traffic stops and used as the reference category for analysis. In addition, a cumulative measure representing the total number of reasons for the stop was also developed, as previous research indicated a relationship between number of violations and traffic stop outcomes (Engel & Calnon, 2004).

The number of passengers in the vehicle was measured as a continuous variable ranging from 0 to 9 to assess if arrests were correlated with the presence of bystanders (Engel, Sobol, & Worden, 2000). Discovery of any contraband during traffic stop searches of the vehicle, driver, and/or passengers was also measured as a dichotomous variable. Previous research suggests that vehicle

characteristics are also important to consider because officers may use these factors in their decision making (Alpert et al., 2006; Ramirez, McDevitt, & Farrell, 2000). The only available measure, vehicle registration, was included as a dichotomous variable. Officer characteristics were also included, as previous research has documented the importance of these factors (Alpert et al., 2005, 2006; Batton & Kadleck, 2004). These include dichotomous measures of officer gender, race/ethnicity, assignment, experience, and education.

Analytical Technique

All analyses were computed using multilevel, Bernoulli models computed in HLM 6 with the significance level preset at 0.0001 due to the size of the sample (N = 280,567). Multilevel statistical models are the appropriate analytical technique for data collected across different units of aggregation (Raudenbush & Bryk, 2002), such as traffic stop data. This technique distinguishes between the effects occurring at level one (e.g., traffic stop characteristics) and those located at a higher unit of analysis (Luke, 2004), such as the officer or organizational unit.

   Ideally, officer characteristics would be modeled at Level 2; however, these data do not allow for this option. During the data collection process, officer characteristics were initially merged into the data set and linked to each traffic stop. Once these variables were merged, the unique officer identifiers were removed (per the contractual arrangement with the agency to maintain officers' confidentiality). Without these unique identifiers, officer characteristics could not be included at Level 2 because of the inability to aggregate based on officer identifier. On the basis of the merging process, however, the unidentified officer's characteristics were still linked to each traffic stop and able to be modeled at Level 1.

   Although all predictors were located at Level 1, the possibility of correlated error across cases remained because of organizational effects. The MWSP is organized into 89 posts throughout the state; thus, a station identifier was used in the multilevel model to ensure unbiased estimates. This method addressed the potential of correlated error developing from individual officers' characteristics and behaviors coalescing at the station (Klinger, 1997) and introducing an aggregate impact on police–citizen encounters[1].

   Statistical tests were performed to examine multicollinearity, but all levels were found to be within acceptable parameters. The warning and arrest models required a correction for overdispersion, which occurs when the standard error of the dependent variable is larger than the mean of that variable (Hanushek & Jackson, 1977). The Level 1 coefficients for all models were fixed with the

intercept left to vary randomly across Level 2 units because the research hypotheses did not predict that these effects would differ significantly in magnitude across the Level 2 units (Raudenbush & Bryk, 2002). All Level 1 units were group mean centered for analysis. Group mean centering allows for interpretation within aggregates units by controlling for contextual effects across Level 2 units (Raudenbush & Bryk, 2002). This approach follows recent research on traffic stop outcomes that used multilevel modeling (see Engel, Tillyer, Stoddard, et al., 2007; Ingram, 2007) and reports the coefficients and standard errors for all variables and the odds ratio for statistically significant variables. For any negative statistically significant relationship, the odds ratio was inverted for ease of interpretation.

Results

Cross-tabulations were initially computed to explore the relationships between drivers' race/ethnicity, gender, age, and interaction terms, and traffic stop outcomes. White drivers were warned most frequently (12.5%), whereas Hispanic drivers were cited and arrested most often (88.3% and 2.2%, respectively). Female drivers were warned more frequently (12.7%) than male drivers; however, male drivers were cited and arrested more often (86.4% and 1.8%, respectively). Older drivers received more warnings, whereas younger drivers were cited and arrested more frequently. Finally, Black male drivers were warned at the highest rate of any group, whereas YHM drivers were cited and arrested most often.

Thereafter, a series of multilevel models were computed for warnings, citations, and arrests. All noninteraction term variables were initially included, with subsequent models including interaction terms. Two-way interaction terms examining race/ethnicity and gender effects were estimated, followed by models examining three-way interaction effects (i.e., race/ethnicity, age, and gender). Table 2 below summarizes the coefficients, standard errors, and odds ratios for all variables in the final three-way interaction models.

The warning model demonstrated Hispanic drivers were 1.3 times *less* likely to be warned, and drivers classified as "Other" were 1.4 times *less* likely to be warned compared with White drivers. Male drivers were 1.2 times *less* likely to be warned compared with female drivers, and drivers below the age of 30 were 1.5 times *less* likely to be warned compared with drivers aged 30 or older. Other statistically significant variables that were positively related to warnings include weekday traffic stops, reasons for the traffic stop (e.g., moving violation, equipment violation, preexisting information, registration, and special traffic enforcement), and number of passengers. Variables that possessed a negative relationship with warnings include daytime traffic stops, traffic stops

Table 2. Multilevel Analyses of Police–Citizen Encounters (n = 280,567)

Variables	Warnings			Citations			Arrests		
	Coefficient	SE	Odds Ratio	Coefficient	SE	Odds Ratio	Coefficient	SE	Odds Ratio
Intercept	−2.22	0.09	—	2.08	0.09	—	−5.50	0.12	—
Citizen demographics									
Black	−0.00	0.05	—	0.00	0.04	—	0.02	0.08	—
Hispanic	−0.26*	0.06	1.30	0.21*	0.05	1.23	0.18	0.11	—
Other race	−0.30*	0.05	1.35	0.34*	0.05	1.40	−0.75	0.21	—
Male	−0.17*	0.02	1.19	0.11*	0.02	1.10	0.50*	0.08	1.65
Young	−0.40*	0.02	1.49	0.41*	0.02	1.49	−0.29*	0.06	1.33
Citizen characteristics									
County resident	0.09	0.03	—	−0.16*	0.03	1.18	0.49*	0.06	1.64
State resident	−0.06	0.04	—	0.04	0.04	—	0.16	0.18	—
Encounter characteristics									
Daytime	−0.41*	0.04	1.52	0.62*	0.04	1.79	−1.88*	0.15	6.67
Weekday	0.10*	0.02	1.10	0.05	0.02	—	−0.84*	0.04	2.33
Summer	−0.00	0.03	—	−0.00	0.03	—	0.05	0.07	—
Interstate	−0.36*	0.08	1.43	0.38*	0.07	1.47	−0.41	0.12	—
Moving violation	0.71*	0.08	2.04	−0.88*	0.07	2.44	1.48*	0.10	4.41
Equipment	1.56*	0.08	4.78	−1.48*	0.08	4.35	0.22	0.13	—
Preexisting information	0.89*	0.18	2.44	−1.13*	0.16	3.13	1.32*	0.21	3.76
Registration	0.73*	0.07	2.08	−0.64*	0.07	1.89	−0.05	0.12	—
License	0.18	0.08	—	−0.30*	0.07	1.45	0.40	0.11	—

(continued)

Table 2. (continued)

Variables	Warnings			Citations			Arrests		
	Coefficient	SE	Odds Ratio	Coefficient	SE	Odds Ratio	Coefficient	SE	Odds Ratio
Special traffic enforcement	1.33*	0.16	3.78	−1.35*	0.17	3.85	1.05*	0.24	2.87
Other reason	−0.02	0.47	—	−1.14*	0.29	3.13	2.45*	0.36	11.64
No. of reasons for stop	−1.38*	0.08	4.00	1.21*	0.07	1.44	−0.00	0.10	—
Evidence discovered	−0.56	0.18	—	−2.61*	0.12	14.29	4.65*	0.16	87.61
No. of passengers	0.03*	0.01	1.04	−0.02	0.01	—	−0.11*	0.02	1.11
Vehicle characteristics									
State registration	−0.00	0.04	—	−0.05	0.05	—	0.20	0.19	—
Officer characteristics									
Male	0.07	0.10	—	−0.11	0.09	—	0.27	0.24	—
White	0.18	0.10	—	0.05	0.20	—	−1.18	0.57	—
< 5 Years experience	−0.09	0.07	—	0.07	0.07	—	0.19	0.26	—
Education scale	0.03	0.02	—	−0.05	0.03	—	0.13	0.08	—
Patrol assignment	−1.35*	0.24	3.85	1.34*	0.23	3.81	−0.42	0.21	—
Interactions									
YBM	0.27*	0.06	1.31	−0.23*	0.06	1.25	−0.14	0.17	—
YHM	0.16	0.08	—	−0.25	0.07	—	0.27	0.17	—
Model chi-square	17891.91*			22323.79*			11907.72*		

Note: YBM= young, Black male; YHM = young, Hispanic male. Two-way interaction models demonstrated similar results for Black male and Hispanic male citizens. The strength of the three-way coefficient terms was improved indicating added explanatory power by adding the dimension of citizen age.
*$p \leq .0001$.

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conducted on the interstate, the number of reasons for the stop, and patrol assignment.

YBMs were significantly *more* likely to be issued warnings during traffic stops after controlling for the direct effects of race/ethnicity, gender, and age of the driver. Moreover, there was a slight increase in the explanatory power of the YBM variable compared with the Black male variable (two-way interaction model, not shown). YHM drivers were not more or less likely to receive a warning. Thus, the warning model offers partial support for the research hypotheses.

As expected, the models for citations generally produced coefficients in the opposite direction of those in the warning models. Hispanic drivers or those who were classified as "Other" race were 1.2 and 1.4 times *more* likely to be cited compared with White drivers. Male drivers (1.1 times) and drivers below the age of 30 (1.5 times) were both *more* likely to be cited compared with female drivers and drivers above the age of 30, respectively. Other variables that demonstrated statistical significance in the reverse direction of those reported in the warning model included daytime traffic stops, interstate traffic stops, all the reason for the stop variables, the number of reasons for the stop, and patrol assignment. The citation model also produced statistically significant results for county residents (1.2 times *less* likely to be cited) and discovery of evidence (14.3 times *more* likely to be cited).

The YBM variable was negatively related to receiving a citation as hypothesized and demonstrated a stronger correlation than the Black male variable (two-way interaction model, model not shown). Contrary to expectations, there was no effect for YHM drivers in the final model. The two-way interaction model did report a lower likelihood for Hispanic male drivers to receive a citation (two-way interaction model, model not shown), but this effect was not sustained with the inclusion of driver age. Collectively, these findings offer partial support for the research hypotheses.

The final model explored correlates of arrest. None of the race/ethnicity variables achieved statistical significance, but male drivers were 1.7 times *more* likely to be arrested compared with female drivers, and young drivers were 1.3 times *less* likely to be arrested compared with older drivers. Other variables positively associated with the likelihood of arrest included residents of the county, traffic stops initiated for moving violations, preexisting information, special traffic enforcement or other reasons, and the discovery of evidence (the latter being the most powerful variable in the model). Traffic stops initiated during the daytime or on a weekday and the numbers of passengers in the vehicle were negatively related to the likelihood of arrest.

Inclusion of the two-way (model not shown) and the three-way interaction terms produced no variables that achieved statistical significance. One caveat

to this result is that young male drivers were 1.3 times *less* likely to be arrested (model not shown). None of the officer characteristics achieved a notable level of influence. Collectively, the arrest model does not offer support for the research hypotheses, but it does demonstrate that legal variables—regardless of drivers' demographics—have the strongest effect on arrest decisions.

Of primary interest to this research, the results indicate that YBM drivers were 1.3 times *more* likely to be warned and 1.3 times *less* likely to be cited compared with similarly situated drivers of different ages, races, and genders. These results are consistent with the research hypotheses and suggest that specific subgroups of drivers have different experiences with law enforcement. No effects were discovered for the interaction terms involving Hispanic drivers (with the exception of Hispanic male drivers being *less* likely to be issued a citations, model not shown), and no statistically significant effects for any interaction terms were evident within the arrest model. Further elaboration on these results is offered below.

Discussion

Research on officer decision making during traffic stops has recently flourished. In particular, the resolution of traffic stops has garnered considerable interest due to the patterns of racial/ethnic disparity reported across jurisdictions (Schafer et al., 2006; M. Smith & Petrocelli, 2001; W. Smith et al., 2003). This body of literature has been criticized, however, for its lack of theoretical foundation (Engel et al., 2002) and its methodological/analytical shortcomings (Tillyer, et al., 2008). This research partially addresses these shortcomings by (a) grounding its hypotheses in the social conditioning model; (b) exploring the interactive effect that drivers' race/ethnicity, gender, and age may possess on traffic stop outcomes, net of other factors; (c) using an alternative and more appropriate operationalization of traffic outcomes; and (b) examining a robust official data set collected after multiple years of reliability and validity testing.

The results indicate that, as hypothesized, the introduction of demographic-based interaction terms offer new insight into the processes at work within traffic stops. Although gender and age had significant independent effects, Black drivers were not significantly more or less likely to be issued warnings or citations. It was only when the combination of age, gender, and race were considered that the importance of these demographic characteristics became evident. YBMs have a *higher* likelihood of receiving a warning and a *reduced* likelihood of receiving a citation beyond the independent effects of drivers' age, race, and gender. Both of these findings are consistent with the research hypotheses and the social conditioning model.

Although this research does not directly test the social conditioning model, analyses of these data indicate the social conditioning model offers a reasonable and realistic mechanism from which to understand the findings related to the increased risk of warning and reduced risk of citations for YBMs during traffic stops. To fully test the social conditioning model, qualitative data would be necessary that details the perspective of officers and their view of different groups within society. These findings represent an initial step to better understand the impact of race, gender, and age combinations and offer valuable information to build a foundation for future exploration of how police officers perceive suspicious behavior by particular persons (Kennedy, 1997; Skolnick, 1966, 2007).

Contrary to the research hypotheses, the interaction terms for YHM drivers were not statistically significant. Instead, the independent effect of Hispanic significantly *reduced* the likelihood of being issued a warning and *increased* the likelihood of being issued a citation. Some have speculated that Hispanics are more likely to receive disparate treatment based in part on their social status (Geiger-Oneto & Phillips, 2003). Hispanic motorists may be more likely to drive vehicles in disrepair and therefore more likely to have multiple violations during a single traffic stop, thus, resulting in citations rather than warnings. Others have suggested that officer bias is at work, with officers more likely to issue more severe sanctions to minorities (Harris, 2002, 2006). This explanation, however, cannot account for why YBMs are significantly less likely to receive citations. Although the findings for Hispanics may seem contrary to the explanation offered by the social conditioning model, it is plausible and perhaps appropriate to differentiate between Black and Hispanic drivers.

Blacks in American society differ in history, culture, and image compared with Hispanics. The news and entertainment media often present an image of the Black community that is more closely associated with criminal activity compared with the Hispanic community (Gilliam, Valentino, & Beckmann, 2002; Weitzer & Tuch, 2004; Wilkes & Valencia, 1989). It is only recently that Hispanic citizens have become the predominant minority in American society, and cultural images of this group may still be forming. The social conditioning model suggests these societal images affect the development of stereotypes, and regardless of their accuracy, these schemas unconsciously influence behavior. In the context of police decision making, differences in the unconscious images and preconceptions of Black and Hispanic citizens may manifest themselves in disparate traffic stop outcomes. In other words, it may actually be consistent with the social conditioning model that no interactive effect was present for YHMs because they may not invoke the same unconscious image as YBM citizens.

These results also reiterate the importance of legal factors in understanding police decision making. In each statistical model, legal factors were the strongest

predictors of the outcomes motorists received. Furthermore, when presented with the most serious outcome (i.e., arrest), the interaction of drivers' race, gender, and age did not appear to impact officer decision making. Although there were slight differences in the issuing of warnings and citations for YBM drivers, the larger story revealed is that the importance of legal factors continues to be undervalued in most research. The importance of legal factors in officer decision making is not inconsistent with the explanation offered by the social conditioning model; rather, it suggests that the model may be most predictive in situations where officers have the highest amount of discretion. Similar to Kalven and Zeisel's (1966) liberation hypothesis, officers' behavior may be most influenced by unconscious stereotypes in situations where they feel most free to make decisions (i.e., when legal factors are not as salient).

Beyond the primary, substantive results, this study exemplified the advantages of using multilevel modeling to ensure that threats to the accuracy of the coefficients and standard errors from correlated error are minimized. A large portion of previous research on traffic stop outcomes had not utilized this analytic strategy and those results may be confounded by correlated error. For example, aggregate level variables, such as organizational factors, have not been fully explored in traffic stop research, but their importance has been suggested (Klinger, 1997). The characteristics of traffic stop data require that traffic stops be nested within a higher unit of analysis to allow for an exploration of these factors.

The importance of multilevel modeling was also demonstrated by examining officer characteristics. Across the multilevel models, officer assignment was the only officer variable consistently related to the traffic stop outcomes. These findings are in contrast to the results of identical logistic regression models (not displayed but available on request) where multiple officer variables were significant in the logistic regression models. This difference in results exemplifies the necessity of using the proper analytic technique to ensure the most accurate results.

This research further demonstrates the need to reconsider the operationalization of traffic stop outcome variables. We measured the most severe outcome received by motorists (mutually exclusive approach), rather than any outcome received (non-mutually exclusive approach). This operationalization of warnings, citations, and arrest allows for the substantive interpretation of these outcomes to be based on the most impactful action for citizens. The mutually exclusive approach allows analyses to mirror how citizens likely perceive traffic stops, that is, citizens are likely to recall their most serious experiences with the police. By analyzing the most serious outcome, models more closely represent this experience. Moreover, although each poststop outcome is analyzed

in its own model (i.e., warnings, citations, and arrests), the interpretation of officer decision making is usually conducted by discussing the effects across models. If a single traffic stop is represented differently in more than one model (i.e., a warning in one model and a citation in another model), the interpretation of this event is substantively altered. Conversely, the integrity of each model is maintained in the mutually exclusive approach.

Note, however, that despite the strengths of estimating hierarchical models using stronger measures of key outcome variables, there are still additional legal and extralegal factors not captured within these data (e.g., the seriousness of the traffic violation, the conduct of the driver and/or passengers, the previous record of the driver, etc.), thereby maintaining the possibility of model misspecification. Inclusion of such variables may change the reported results. Moreover, other interaction terms, based not only on driver demographics but also other relevant predictors such as driver demeanor, may prove to be relevant in future explanations of officer decision making during a traffic stop.

Future research should also examine the differential impact that drivers' demographics have over officer behavior in municipal compared with state agencies. State highway patrol and police agencies often are more concerned with traffic-related violations, such as speeding or Driving Under the Influence (DUI) enforcement, while performing fewer activities associated with crime control and calls for service. These differences may have implications for the social conditioning model. It is conceivable that unconscious stereotypes may form differently in officers who primarily work in a highway patrol function compared with officers who work in an urban environment. Officers working on interstates and state routes likely have different personal and vicarious experiences based on their interaction with specific groups, compared with officers assigned to inner city or even suburban beats. Although all in American society are exposed to criminal images involving young and minority males, the frequency of personal interactions is likely lower for officers working in state agencies compared with urban agencies. The difference in the number of encounters may impact the intensity of schemas and stereotypes developed, and therefore lead to less disparity in traffic stop outcomes. This hypothesis has yet to be examined by researchers.

Conclusion

These research findings have implications for future research on traffic stop outcomes and more broadly for law enforcement training and policy. The results demonstrate that the influence of drivers' race/ethnicity on officer decision making is more nuanced than previously reported. Race/ethnicity alone does

not explain disparities in traffic stop outcomes. Future research needs to consider that specific subgroups of citizens may receive disparate outcomes and that focusing solely on race/ethnicity does not tell the whole story. This supports findings in sentencing research that have consistently demonstrated that a combination of citizens' characteristics influence criminal justice outcomes (Harrington & Spohn, 2007; Mitchell, 2005; Steffensmeier, et al., 1998). The findings of this study confirm that researchers should no longer discuss the relationship between race/ethnicity and officer behavior in blanket terms.

In addition, research that identifies and reports results for specific combinations of citizens' demographics has applicability for law-enforcement policies, procedures, and training. Agencies should consider these findings when drafting training curriculum to ensure that current and future officers are cognizant of potential unconscious biases. Developing mechanisms to counteract these influential unconscious schemas may be challenging, but some focused efforts used in agencies across the country hold some promise. These findings further confirm the need for law-enforcement agencies to continue their focus on ensuring fair and equitable treatment for all citizens.

As evidenced by the mixed results of this study, understanding the relationship between drivers' characteristics and officer behavior is a challenging but not insurmountable research task. Given the frequency of mixed findings, and racial/ethnic impacts of modest magnitude reported in most studies, future research on police behavior will benefit from a continued emphasis on theoretical frameworks. Theoretical frameworks feed the development of new research questions and challenge researchers to examine issues in new ways. The maximum utility of analyzing traffic stop data without theory has been reached; it is now incumbent on the research community to begin explaining the racial/ethnic disparities in police behavior that are often reported. Theoretical frameworks, such as the social conditioning model, can inform and direct new avenues of research on officer behavior. Qualitative analyses may also be necessary to further expand our understanding of the role that driver demographics play in officer decision making during traffic stops. Despite progress in the past 15 years, there are numerous unanswered questions regarding the relationship between driver demographics and traffic stop outcomes. Grounding research in a theoretical framework is critical to improving our understanding of these disparities and working toward their continued reduction.

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Notes

1. Logistic regression models were initially estimated and then compared with the multilevel, Bernoulli models reported below. The logistic models demonstrated several statistically significant officer characteristics that did not achieve statistical significance in the multilevel models. Thus, we believe this demonstrates the importance of using multilevel models to properly estimate coefficients even when no predictor variables were entered at level two.

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Bios

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