Firearms Offending and Re-Offending: FINAL REPORT

MICHIGAN STATE UNIVERSITY | School of Criminal Justice

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Jason Rydberg
Edmund F. McGarrell
Alaina De Biasi

Michigan Justice Statistics Center
School of Criminal Justice
Michigan State University

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Michigan Justice Statistics Center

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About the Authors

Jason Rydberg is an Associate Professor in the School of Criminology and Justice Studies at the University of Massachusetts Lowell. He received his Ph.D. from the School of Criminal Justice at Michigan State University and has led a number of studies for the MI-SAC. Dr. Rydberg's research interests include prisoner reentry, sex offenders and offenses, community supervision, and program evaluation. Recent articles have appeared in the *Journal of Experimental Criminology, Journal of Quantitative Criminology, Sexual Abuse, Criminal Justice and Behavior,* and *Justice Quarterly.*

Edmund F. McGarrell is Professor and Director Emeritus in the School of Criminal Justice at Michigan State University. He is also the former Director of the Michigan Justice Statistics Center that serves as the Statistical Analysis Center for the state of Michigan. McGarrell's research focuses on communities and crime with a specific focus on violence prevention and control. Recent articles appear in *Crime and Delinquency, Criminology and Public Policy, Journal of Criminal Justice*, and *Journal of Experimental Criminology*.

Alaina De Biasi is an Assistant Professor in the Department of Criminology and Criminal Justice at Wayne State University. She received her Ph.D. in Criminal Justice from Michigan State University and completed a two-year postdoctoral fellowship at the California Firearm Violence Research Center at the University of California-Davis. Her research interests include understanding the causes and consequences of firearm violence, leveraging law enforcement agency data systems to contribute to crime gun intelligence, evaluating the effectiveness of violence prevention initiatives, conducting community-engaged research, and exploring the geography of crime. Through her work, she seeks to develop new and better policies and practices aimed at violence prevention. Her research appears in the *Journal of Quantitative Criminology, Journal of Urban Health, Journal of Research in Crime and Delinquency, and British Journal of Criminology.*

EXECUTIVE SUMMARY

Background

Firearms crime remains a significant state and national crime and public health issue. Since spring 2020 with the impact of the COVID-19 pandemic as well as the period of social unrest following the in-custody death of George Floyd in Minneapolis, many cities have experienced an increase in firearms violence (Rosenfeld & Lopez, 2022). Prior Michigan Statistical Analysis Center (MI-SAC) studies identified significant variation in the levels of risk for firearms crime victimization in the state of Michigan. These risk factors include being male, young, and African American, with community risk factors including being in urban cities.

The current study sought to extend this line of important public policy research through analysis of offending patterns among firearms-arrestees using state criminal history records. The basic question was whether prior arrests involving a firearm increases the risk of future offending involving a firearm.

Methods

The data utilized in the study were provided by the Michigan State Police. The first step involved drawing a sample from the population of all arrestees in the state for an annual year (2017). We then identified all those arrested on a firearms-related charge (N=1,587). We developed a comparison group of arrestees whose charges involved a violent crime charge but that did not include firearms related charges (N=9,900).

Findings

The key finding was that a history of a firearms-related arrest was predictive of future firearms offending. Specifically, having a prior firearms-related arrest was predictive of a 2017 firearms-related arrest. Similarly, the 2017 firearms arrest was predictive of a future firearm related arrest.

Conclusions and Recommendations

Given these findings, enforcement, intervention, and prevention strategies that focus on illegal firearms possession and use are warranted in the effort to reduce levels of firearms-related crime.

INTRODUCTION

Although firearms violence nationally and in Michigan has declined since peak levels in the early 1990s, firearms crime remains a significant state and national crime and public health issue. More troubling, since spring 2020 with the impact of the COVID-19 pandemic as well as the period of social unrest following the in-custody death of George Floyd in Minneapolis, many cities have experienced an increase in firearms violence (Rosenfeld & Lopez, 2022). In Michigan, cities such as Benton Harbor, Detroit, Flint, and Saginaw have some of the highest violent crime rates in the U.S., with a significant portion of this violent crime involving firearms.

Prior Michigan Statistical Analysis Center (MISAC) research has shed light on different aspects of this violent crime. For example, a study of homicide, aggravated assault, and robbery using Michigan's incident-based reporting system (Michigan Incident Crime Reporting) data revealed distinct risk patterns across the state. These risk patterns followed individual and community patterns. Specifically, young Black males and females were at significantly elevated risk for violent crime victimization. For example, African American men had a violent crime victimization rate that was 7.5 times that of other residents and for homicide the victimization rate was 16 times the rate of other Michigan residents. Additionally, this risk was dramatically increased in a small number of cities, including those listed above. The community patterns were associated with concentrated disadvantage. This research suggested the need for targeted enforcement and prevention as well as victim services (Rydberg, Stone, & McGarrell, 2016; Rydberg & McGarrell, 2014).

The current study sought to extend this line of important public policy research through analysis of offending patterns among firearms-arrestees using state criminal history records.

Related Research

Although the topic of firearms crime receives considerable research attention, there is limited research on offending patterns of firearms offenders. One of the more extensive studies of offending among firearms related offenders was conducted by the Illinois Criminal Justice Information Authority. This study focused on recidivism and included mortality data along with criminal re-offending. The study began with nearly 400,000 individuals arrested in 2003. From this population, over 4,000 first time firearms-related arrestees and a matched comparison group of over 4,000 first time non-firearms-related arrestees were identified for follow-up. The large sample, comparison group, and long-term follow-up for re-offending and mortality were key strengths of this study (Devitt Westley, Kang, Sheridan, & Specker, 2018).

An initial research question of the Illinois study related to the outcome of the 2003 arrest. A key finding was that firearm-related arrestees were more likely to be convicted (48%) compared to non-firearm-related arrestees (34%). Approximately 12 percent of both groups were incarcerated.

A second research question related to recidivism. The study found that firearms-involved arrestees were more likely to be re-arrested for any offense (67 vs. 41%). The firearms-related arrestees were much more likely to be re-arrested for another firearms charge with 45 percent of these arrestees being for a violent offense with a firearm. Similar findings emerged for new convictions and incarceration. Overall, the results suggested an escalation in offending among first-time firearms-related arrestees (Devitt Westley, Kang, Sheridan, & Specker, 2018).

The results were further confirmed through the use of survival analysis techniques that took into account potential censoring effects due to time in incarceration (and thus not being at risk for re-offending). These results strongly indicated that firearms offenders were at higher risk of re-offending. Indeed, the daily risk of being re-arrested for a firearm-related charge was 800 times greater for first-time firearm-related offenders compared to non-firearm-related first arrestees. An additional interesting finding was that jurisdiction (particularly Cook County compared to other parts of the state) did not have impact once taking into account firearms vs. non-firearms arrest status (Devitt Westley, Kang, Sheridan, & Specker, 2018).

Finally, the study considered whether there were differences in mortality for the two groups of first-time arrestees. The mortality data revealed that 448 individuals in the sample had died in the 10-year follow-up period. Most of these involved deaths from accidents and natural causes. However, 12 percent of the deaths were from homicide. Firearms arrestees had approximately twice the likelihood of death by homicide than non-firearms related arrestees (Devitt Westley, Kang, Sheridan, & Specker, 2018).

Michigan Study of Firearms and non-Firearms Violent Crime Arrestees

The current study systematically examined the criminal histories of individuals arrested in Michigan. As with the above-mentioned Illinois study, the study compared firearms arrestees to a matched sample of non-firearms arrestees. Distinct from Illinois, the study included all firearms arrestees, including those with prior firearms arrests. The overall research questions included:

Question 1: Does criminal history predict a 2017 firearm charge?

Question 2: Does a 2017 firearm charge predict future recidivism?

The data utilized in the study was provided by the Michigan State Police. The first step involved drawing a sample from the population of all arrestees in the state for an annual year (2017). We then identified all those arrested on a firearms-related charge. We developed a comparison group of arrestees whose charges involved a violent crime charge but that did not include firearms related charges.

The follow-up period for the sample consisted of the duration from the date of their originating 2017 arrest, up until January 27th, 2023 (the date of the data extraction). This produced a maximum possible follow-up time of 2,217 days, or just over 6 years.

One of the challenges in this study was how to account for people being incarcerated following their initial 2017 charge. The data did not include an actual indicator whether the individual was incarcerated following the originating offense, nor did it include information on how long any such incarceration was. Instead, for each charge there is a text field detailing the possible minimum and maximum sentence lengths. To account for time that each individual may have been incarcerated, and thus unable to re-offend in the community, we developed an estimate based on a prior study in Michigan (Huebner et al., 2014). For each person that was incarcerated, we computed the total minimum incarceration time (jail + prison). The prior study (Huebner et al., 2014) demonstrated that parolees served an average of 50% of the minimum sentence before release. Consequently, we multiplied the total estimated incarceration time by 0.5 and subtracted that amount from the time at risk. Although there is likely error in individual cases, the errors should be randomly distributed across both samples and the estimate time at risk

should be a reasonable estimate. Additionally, the findings were consistent with an unadjusted estimate based on minimum sentences.

Findings

Descriptive Analysis

Table 1 provides basic descriptive statistics for the sample. Over 11,000 people were arrested on violent crime charges in 2017. Males were over-represented among the arrestees (85.5%) and just over half the sample were white (51.3%), with blacks comprising 45 percent, and other comprising just over three percent of the sample. For the full sample, the most common charge was assault (53.6%) followed by a weapons offense (28.5%), home invasion (9.5%), sex offenses (8.7%), and robbery (6.6%). Just under 14 percent (N-=1,587) of these included a firearms charge.

Over one-third of the sample had been charged with a new offense (36.8%). These included 10 percent for a new violent crime charge, 28 percent for a new non-violent crime charge, and 4 percent for a new firearm charge.

In terms of their criminal history prior to the 2017 arrest, over one-quarter had been arrested as a juvenile (28%), just over 20 percent had been charged before the age of 18, and they averaged just under four prior arrests (mean = 3.7).[2] Only four percent had a prior firearm charge.

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[2] Caution should be exercised in analyzing the juvenile arrests and charges. The reported data do not include arrests or charges that were expunged from court records for youth who complied with juvenile court conditions for expungement.

Table 1. Descriptive Statistics (N = 11,487)			
Variable	**n (%)**	**Mean (SD)**	**Range**
Grouping Variable			
Firearm offense charge	1,587 (13.82)		
Dependent Variables			
Any new charge	4,228 (36.81)		
Time to any new charge (days)		1,495.29 (719.45)	1 – 2,217
New violent crime charge	1,151 (10.02)		
Time to new violent charge		1,837.54 (483.05)	1 – 2,217
New non-violent crime charge	3,247 (28.27)		
Time to new non-violent charge		1,595.87 (680.84)	1 – 2,217
New firearm charge	460 (4.00)		
Time to new firearm charge		1,921.83 (344.70)	1 – 2,217
Instant Offense Charge			
Weapons offense	3,227 (28.53)		
Assault	6,151 (53.55)		
Robbery	755 (6.57)		
Home invasion	1,087 (9.46)		
Sex offense	999 (8.70)		
Other violent	651 (5.67)		
Criminal History			
Prior arrest instances		3.68 (4.16)	0 - 54
Prior weapons arrests		0.14 (0.45)	0 - 6
Age of first arrest		23.47 (10.13)	0 – 94.75
Arrested prior to age 18	3,213 (27.97)		
Prior charge instances		2.40 (3.15)	0 - 34
Prior firearm charge	485 (4.22)		
# Prior firearm charges		0.06 (0.34)	0 - 5
Prior assault charge	2,215 (19.28)		
Prior robbery charge	671 (5.84)		
Prior home invasion charge	881 (7.67)		
Prior sex offense charge	365 (3.18)		
Prior other violence charge	291 (2.53)		
Prior drug charge	1,921 (16.72)		
Charged prior to age 18	2,360 (20.54)		
Motor theft prior to 18	203 (1.77)		
Demographics			
Race			
White	5,889 (51.27)		
Black	5,194 (45.22)		
Other	404 (3.52)		
Female	1,670 (14.54)		

Age (as of 01/01/2017)		32.39 (12.19)	10 - 94
Body Mass Index (BMI)		26.47 (5.59)	13 - 100

Table 2 presents a comparison of those whose arrest included a firearm charge (N=1,587) with those arrested for a violent crime but that did not include a firearm charge (N=9,900). The firearm charges group were more likely to be black (64%), whereas those without a firearms charge were more likely to be white (54%). Although, as mentioned above, the sample was overwhelmingly male (85%), females were more likely to be in the non-firearms charge group. The firearms charge group was slightly older.

Less than 20 percent of those whose charge did not involve a firearm, did have a weapons charge but absent an indication of a firearm. Those whose charges did not include a firearm were more likely to be charged with assault, home invasion (perhaps surprisingly), sex offenses, and other violent offenses. Those charged with a firearm were slightly more likely to be charged with robbery.

In terms of their prior criminal histories, those with firearm charges had more prior arrests, prior firearms arrests, were slightly younger at first arrest, were more likely to have been arrested before age 18, more likely to have a prior firearm charge and more firearm charges, and more likely to have prior charges for robbery, drug, and motor vehicle theft charges. There were no statistically significant differences between the two groups of arrestees for the number of prior charge instances, assaults, home invasion, sex offense, and other violent crime charges.

Several interesting patterns emerged in terms of new arrests and charges. The no firearm group was more likely to face new charges, including a new violent crime charge and a new non-

violent crime charge. In contrast, the firearms charge group had a shorter time to new charges,

and were more likely to face a new firearm charge.

We now turn to the two key research questions.

Multivariate Analysis

Table 2. Descriptive Statistics and Differences for Firearm and Non-Firearm Offense Groups (N = 11,487)			
Variable	**Firearm Charge in 2017 (N = 1,587)**	**No Firearm Charge in 2017 (N = 9,900)**	**Difference χ² or t (p)**
Dependent Variables	**n (%) / M (SD)**	**n (%) / M (SD)**	
Any new charge	470 (29.62)	3,758 (37.96)	40.94 (<.001)
Time to any new charge (days)	1,584.71 (654.98)	1,480.95 (728.26)	5.77 (< .001)
New violent crime charge	113 (7.12)	1,038 (11.33)	18.73 (< .001)
Time to new violent charge	1,856.20 (425.25)	1,834.54 (491.63)	1.84 (.066)
New non-violent crime charge	379 (23.88)	2,868 (28.97)	17.46 (< .001)
Time to new non-violent charge	1,642.32 (627.32)	1,588.42 (688.78)	3.13 (.002)
New firearm charge	117 (7.37)	343 (3.46)	54.33 (< .001)
Time to new firearm charge	1,850.72 (430.58)	1,933.22 (327.44)	-7.30 (< .001)
Instant Offense Charge			
Weapons offense	1,587 (100.00)	1,690 (17.07)	4,609.30 (< .001)
Assault	478 (30.12)	5,673 (57.30)	406.31 (< .001)
Robbery	122 (7.69)	633 (6.39)	3.73 (.054)
Home invasion	81 (5.10)	1,006 (10.16)	40.84 (< .001)
Sex offense	8 (0.50)	991 (10.01)	155.65 (< .001)
Other violent	73 (2.71)	608 (6.14)	30.13 (< .001)
Criminal History			
Prior arrest instances	4.20 (3.89)	3.60 (4.20)	5.41 (< .001)
Prior weapons arrests	0.34 (0.67)	0.11 (0.40)	13.08 (< .001)
Age of first arrest	22.59 (9.74)	23.61 (10.13)	-3.85 (< .001)
Arrested prior to age 18	523 (32.96)	2,690 (27.17)	22.71 (< .001)
Prior charge instances	2.50 (2.76)	2.38 (3.21)	1.56 (0.119)
Prior firearm charge	180 (11.34)	305 (3.10)	230.84 (< .001)
# Prior firearm charges	0.18 (0.55)	0.05 (0.29)	9.33 (< .001)
Prior assault charge	323 (20.35)	1,892 (19.11)	1.36 (.244)
Prior robbery charge	142 (8.95)	529 (5.34)	32.31 (< .001)
Prior home invasion charge	133 (8.38)	748 (7.56)	1.31 (.252)
Prior sex offense charge	43 (2.71)	322 (3.25)	1.31 (.252)
Prior other violence charge	43 (2.71)	248 (2.51)	0.232 (.630)
Prior drug charge	467 (29.43)	1,454 (14.69)	213.37 (< .001)
Charged prior to age 18	354 (22.31)	2,006 (20.26)	3.50 (.061)
Motor theft prior to 18	45 (2.84)	158 (1.60)	12.11 (<.001)
Demographics			
Race			
White	528 (33.27)	5,361 (54.15)	275.32 (< .001)
Black	1,023 (64.46)	4,171 (42.13)	

Other	36 (2.27)	368 (3.72)	
Female	114 (7.18)	1,556 (15.72)	80.22 (< .001)
Age (in 2017)	33.66 (12.04)	32.19 (12.20)	4.46 (< .001)
Body Mass Index (BMI)	26.83 (5.68)	26.42 (5.58)	2.76 (.006)

Research Question 1: Does criminal history predict a 2017 firearm charge?

To address the question of whether criminal history predicts a firearm charge, we employ Bayesian Binary Logit Regression techniques. This technique is appropriate for analysis that involves a binary outcome such as a firearm charge compared to a non-firearm charge. It also has the advantage of providing an odds ratio (posterior mean), the likelihood of a firearm or non-firearm charge, that is readily interpretable as well as providing confidence intervals for the estimates. The results of the analysis are presented in Table 3.

Several key findings emerge. Having a prior firearm charge is strongly associated with having a 2017 firearm charge. The average marginal effect (AME) suggests that the probability of a 2017 firearm charge is 13.2 percentage points higher for those with a prior firearm charge (+2.5 times the odds). Similarly, having a prior drug charge is strongly associated with a 2017 firearm charge (+7.9 percentage points, 1.9 times the odds). Compared to white individuals, black individuals are more likely to have a 2017 firearm charge (+9.6 percentage points, 2.3 times the odds).

Research Objective 2: Does a 2017 firearm charge predict future recidivism?

We took two different approaches to analyzing the likelihood of future recidivism. The first involved what is known as Unconditional Bayesian Discrete Time Survival Models (see Table 4). The survival measures, typically used in medical research, analyze the time to failure (a new

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arrest or new charge), or alternatively thought of as the likelihood of survival (e.g., absence of a new arrest). The analytical models are built upon what are known as "life tables" that measure the passage of time and indicators of success or failure.

The Unconditional Bayesian Discrete Time Survival models are based on binomial regressions which directly model the life table, using a categorical parameterization for time. This was done to allow the hazard and survival functions to be estimated and graphed along with their uncertainties (see Figure 2). These models do not control for criminal history or demographics.

In terms of key findings, for any new charge, a new violent charge, and new non-violent charge, a 2017 firearm offense is associated with LOWER odds of recidivism. For instance, those with a 2017 firearm charge have 0.72 times the odds (28% lower odds) of having any new charge, compared to those without a 2017 firearm offense. In contrast, those with a 2017 firearm offense have **nearly double** the odds (1.9 times) of a future firearm charge. Although this is only a difference of +3 percentage points, for such a rare event that's quite a large difference.

To further examine the research question, we then employed that is known as Multivariate Continuous Time Survival Models – Cox Proportional Hazards (see Table 5). One advantage is these models is that they allow for the inclusion of criminal history and demographic characteristics as control variables. The findings are very consistent with the prior Bayesian unconditional models. A 2017 firearm charge is associated with lower hazard of recidivism for any new charge, a new violent charge, or a new non-violent charge. Having observed this, a 2017 firearm charge is associated with higher hazard of firearm recidivism. The log hazard is 1.6 times that of an individual without a 2017 firearm charge.

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Thus, the interesting pattern that emerges is that having a firearms charge in 2017 was associated with a reduced overall likelihood of re-offending, but an increased likelihood of a future firearms charge.

Conclusions

At first glance, the differences between those whose arrest included firearms charges and those whose arrest did not involve a firearm were not large. However, this likely reflects the sampling frame that included the relatively homogenous group of people arrested for a violent crime. Had the comparison group included people arrested for non-violent offenses, the comparison to those firearms-related arrestees would likely have been more pronounced.

The striking difference between the two groups was the involvement of a firearm. Prior firearm charges were predictive of a 2017 arrest involving a firearm and were also predictive of future offending involving a firearm. In other words, the presence of a firearm in an arrest was a risk factor predictive of future arrests and charges involving a firearm. Given the heightened lethality of the presence of a firearm in violent crime offenses, this finding deserves attention.

One of the evidence-based strategies for gun crime prevention is the focused deterrence model (Braga, Weisburd, & Turchan, 2018). These findings suggest that arrestees in possession of or using a firearm, may be appropriate for inclusion in focused deterrence strategies. This may include the application of focused deterrence as part of re-entry programming that would focus on those with prior convictions involving firearms (e.g., Clark-Moorman, Rydberg, & McGarrell, 2018). It may also suggest focused enforcement strategies such as directed patrol,

and probation and parole home visits, as well as intervention strategies such as street outreach

violence interrupters, where the focus involves individuals with prior firearms related charges.[3]

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[3] These types of focused enforcement strategies have been supported prior research, although they have not consistently included the focus on people with prior firearms charges (see Sherman & Rogan, 1995; McGarrell et al., 2001).

Research Objective 1: Does criminal history predict a 2017 firearm charge?

| Table 3. Odds Ratio from Bayesian Logit Regression – Association between Criminal History and 2017 Firearm Charge Status				
	Posterior Mean	**95% Credibility Interval**		**Average Marginal Effect**
		Lower	**Upper**	
Criminal History				
Prior arrests	0.991	0.962	1.020	-0.001
Prior arrests^2	0.996	0.993	0.998	
Age at first arrest	0.972	0.957	0.987	-0.003
Age at first arrest^2	1.001	1.000	1.001	
Arrested prior to age 18	1.061	0.907	1.245	0.006
Prior firearm charge	2.501	2.027	3.078	0.132
Prior assault charge	0.777	0.665	0.899	-0.027
Prior robbery charge	1.033	0.835	1.268	0.004
Prior home invasion charge	0.920	0.744	1.130	-0.009
Prior sex offense charge	0.744	0.533	1.024	-0.030
Prior other violent charge	0.856	0.597	1.209	-0.016
Prior drug charge	1.867	1.622	2.159	0.079
Motor vehicle theft prior to 18	1.342	0.944	1.913	0.036
Demographics				
Race (ref = white)				
Black	2.345	2.081	2.646	0.096
Other / Unknown	1.056	0.735	1.487	0.005
Female	0.499	0.403	0.614	-0.065
Age	1.029	1.020	1.038	0.003
Age^2	0.999	0.999	1.000	
Body Mass Index	1.007	0.997	1.017	-0.000

Figure 1. Predicted Probability of a 2017 Firearm Charge based on select Criminal History Variables
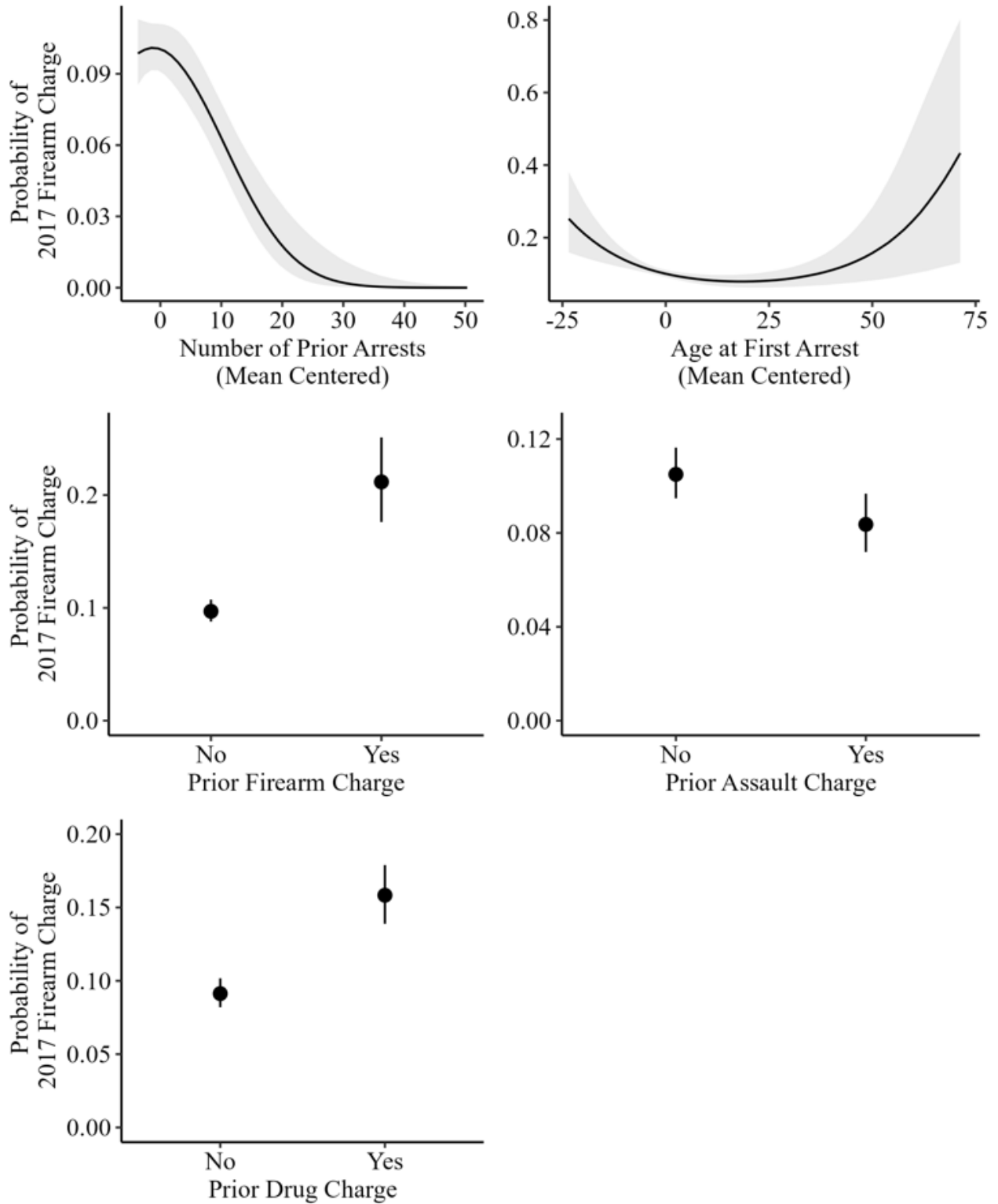
Note: Shaded regions and vertical lines represent 95% credibility intervals

Research Objective 2: Does a 2017 firearm charge predict future recidivism?
Unconditional discrete-time estimates

Table 4. Odds ratios describing difference in hazard between those with and without a 2017 firearm charge (N = 11,487)				
Outcome	Posterior Mean	95% Credibility Interval		Average Marginal Effect
		Lower	Upper	
Any new charge	0.722	0.657	0.793	-8.33%
New violent charge	0.633	0.522	0.760	-3.22%
New non-violent charge	0.779	0.698	0.869	-5.07%
New firearm charge	1.907	1.558	2.325	+3.10%

Figure 2. Bivariate Discrete-Time Hazard and Survival Estimates across 2017 Firearm Charge Groups (N = 11,487)
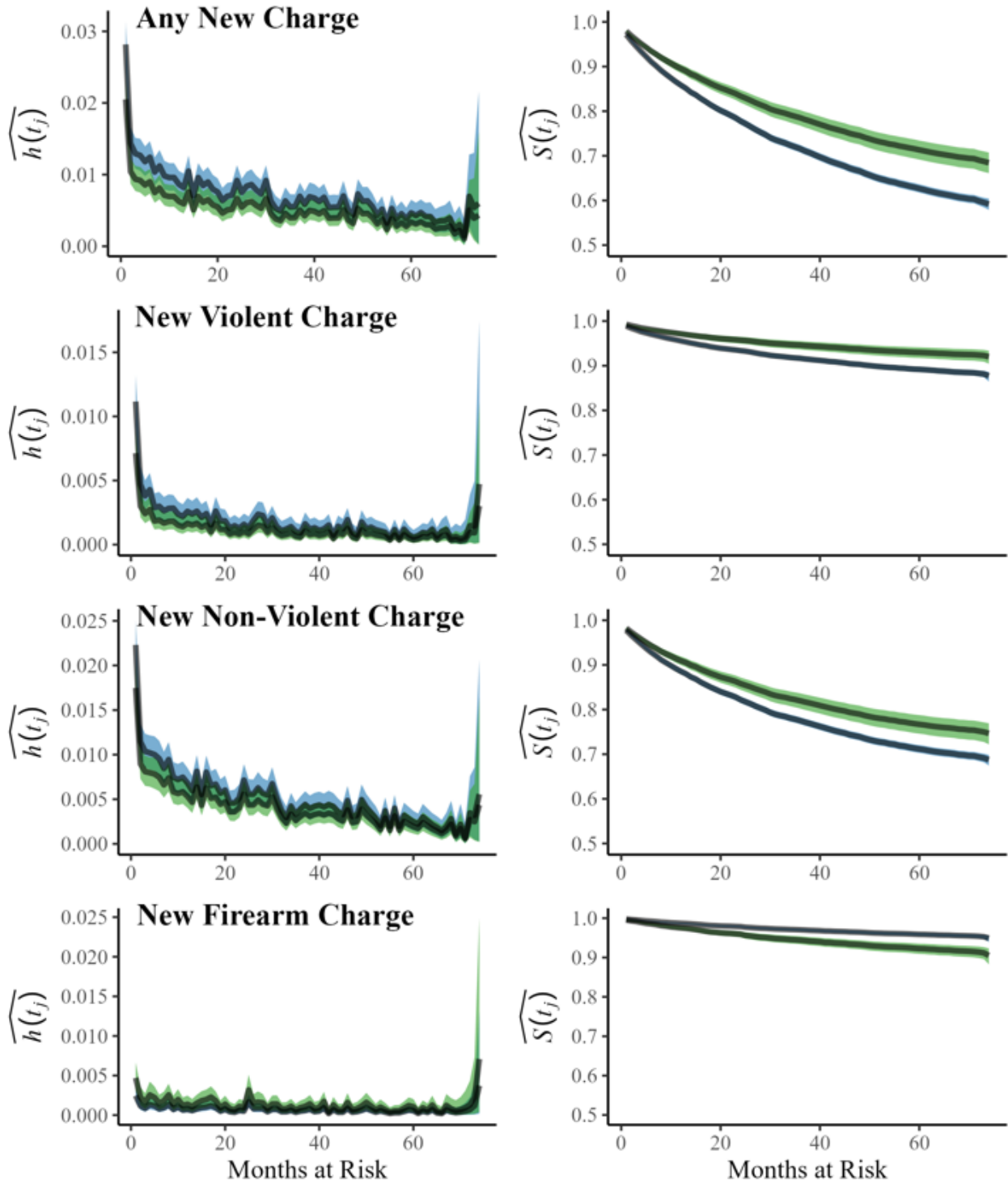
Non-Firearm 2017 Offense   Firearm 2017 Offense

Note: Lines represent posterior means, shaded areas 95% percentile intervals

Multivariate Continuous Time Estimates – controlling for criminal history and demographics

Table 5. Hazard ratios describing difference in log hazard between those with and without a 2017 firearm charge (N = 11,487)					
Outcome	Estimate (SE)		Hazard Ratio	95% Confidence Interval	
				Lower	Upper
Any new charge	-0.461	(0.101)	0.630	0.517	0.769
New violent charge	-0.716	(0.165)	0.489	0.354	0.675
New non-violent charge	-0.309	(0.092)	0.734	0.613	0.879
New firearm charge	0.490	(0.112)	1.633	1.310	2.035
Note: All models control for prior criminal history and demographics. When proportional hazards were violated, estimates and hazard ratios reflect the linear component					

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