

Fall 2016 Update

for

Ferguson, Gray, and Davis

An Analysis of Recorded Crime Incidents
and Arrests in Baltimore City,
March 2010 through ~~December 2015~~ **October 2016**

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November 15, 2016

This document can be downloaded from this link:

<http://socweb.soc.jhu.edu/faculty/morgan/papers/MorganPally2016FallUpdate.pdf>

The original report can be downloaded from this link:

<http://socweb.soc.jhu.edu/faculty/morgan/papers/MorganPally2016.pdf>

See also for the Fall 2016 update:

- Updated Appendix 2 for the comprehensive analysis of crime incidents:
<http://socweb.soc.jhu.edu/faculty/morgan/papers/MorganPally2016Appendix2FallUpdate.pdf>
- Updated Appendix 3 for the comprehensive analysis of arrests:
<http://socweb.soc.jhu.edu/faculty/morgan/papers/MorganPally2016Appendix3FallUpdate.pdf>

See also for the original report:

- Appendix 1 for details of the coding of arrest groups:
<http://socweb.soc.jhu.edu/faculty/morgan/papers/MorganPally2016Appendix1.pdf>
- Appendix 2 for the comprehensive analysis of crime incidents:
<http://socweb.soc.jhu.edu/faculty/morgan/papers/MorganPally2016Appendix2.pdf>
- Appendix 3 for the comprehensive analysis of arrests:
<http://socweb.soc.jhu.edu/faculty/morgan/papers/MorganPally2016Appendix3.pdf>

Original Report (March 15, 2016)

Morgan, Stephen L. and Joel A. Pally. 2016. "Ferguson, Gray, and Davis: An Analysis of Recorded Crime Incidents and Arrests in Baltimore City, March 2010 through December 2015." A Report Prepared for the 21st Century Cities Initiative at Johns Hopkins University. Baltimore, MD: Johns Hopkins University.
(URL: <http://socweb.soc.jhu.edu/faculty/morgan/papers/MorganPally2016.pdf>)

Updated Findings (November 15, 2016)

All of the conclusions from the original report hold, but in this Fall 2016 Update I am able to draw additional conclusions from the analysis of crime and arrest data from January 1st, 2016 through October 30th, 2016. The conclusions are:

1. During the period between the appointment of Kevin Davis as Interim Police Commissioner in July 2015 and his confirmation as the 38th Police Commissioner of Baltimore in October 2015, crime rates decreased substantially from the levels that prevailed in the months following the April 2015 death of Freddie Gray while in police custody.

Adjusting for the seasonality of crime, shootings and homicides decreased by 64% and 26%, respectively, between Monday, July 13, 2015 and Sunday, October 18, 2015. Street robbery, commercial robbery, and aggravated assault declined by 16%, 66%, and 11%.

In this same period, most categories of property crime changed only modestly. Although automobile theft declined by 15%, burglary and larceny from automobiles declined by only 2%, while other types of larceny increased by 4%.

2. During the first full year of Kevin Davis' five-year term as the 38th Police Commissioner of Baltimore, progress on reducing both violent and property crime was substantial in many categories but uneven overall.

Homicides declined by an additional 23% for the one-year interval beginning on October 19, 2015, in comparison to the transition period before it, and after adjusting for seasonal differences. However, in this same time period, shootings did not decline. In addition, street robbery and residential robbery increased by 9% and 18% while carjacking soared by 117%.

In contrast, property crime declined consistently. Automobile theft declined by 25%, burglary by 5%, larceny from automobiles by 15%, and other types of larceny by 11%.

3. Even after the progress in many categories of crime during the first year of Kevin Davis' appointment, violent crime remained much higher than before the national dialogue on policing began in the summer of 2014. The absolute level of violent crime presents a continuing challenge for Baltimore, its police, and its residents.

Averaged over a year from October 19, 2015 onward, and in comparison to levels of crime that prevailed before the national dialogue on policing began in the summer of 2014, violent crime rates remained much higher. Homicides remained at 140% of prior levels, and shootings at 190%. Street robbery, commercial robbery, and aggravated assault stood at 127%, 137%, and 132% of prior levels. And, finally, carjacking soared to 313% of prior levels.

4. The fall-off in arrests of 31% during the period following the death of Freddie Gray was turned around by an increase of 23% during the transition period when Kevin Davis was Interim Police Commissioner. Levels of arrests then changed very modestly during the first full year of Kevin Davis' term as the 38th Police Commissioner of Baltimore, declining by 4% during the year. As of the end of his first year, the arrest level stood at 67% of its prior level before the national dialogue on policing began, with most of the decline explained in the original report.

Additional Detail on These Findings

The results in the original report were based on crime and arrest data, released by the Baltimore Police Department, through December 2015. In this Fall 2016 Update, I offer models that incorporate additional data through Sunday, October 30th, 2016.

On the pages that follow, I offer updated tables and figures from the original report that reflect the same basic analysis but that include the additional 10 months of data. Comprehensive results are available in two online appendices:

Appendix 2 for the comprehensive analysis of crime incidents:

<http://socweb.soc.jhu.edu/faculty/morgan/papers/MorganPally2016Appendix2FallUpdate.pdf>

Appendix 3 for the comprehensive analysis of arrests:

<http://socweb.soc.jhu.edu/faculty/morgan/papers/MorganPally2016Appendix3FallUpdate.pdf>

As shown in the online appendices, and as revealed in the tables and figures below, the analysis strategy is the same as in the original report. I first model the prevailing cyclical crime and arrest trends through August 10, 2014, which I continue to label as the “pre-Ferguson” period. I then use that estimated model to predict counterfactual trends, as if the protest events and any changes in police practice from August 11, 2014 onward had not occurred. Finally, I estimate period effects as average differences between observed and counterfactual values from August 11, 2014 onward in distinct time intervals.

Unlike the original report, with the availability of additional data it is reasonable to now divide the interval after Police Commissioner Anthony Batts was fired into (1) a transition period while Kevin Davis was the Interim Police Commissioner and (2) a final period after Kevin Davis was sworn in as Batts’ permanent replacement and with a five-year contract as the city’s 38th Police Commissioner. The transition period begins with the week of Monday, July 13, 2015 and ends on Sunday, October 18, 2015. The period for Davis as commissioner encompasses the first full year of his term, from the week of Monday, October 19, 2015 (10/19/15 to 10/25/15) through the week of Monday, October 24, 2016 (10/24/16 to 10/30/16). These two intervals are labeled “Transition Period” and “Davis Period” in the tables below.

In addition, for this update, I do not offer results for arrests that separate those arrests by type of arrest. The primary reason is that the BPD changed its categorization for the reporting of arrests at the end of July, 2016. Although it will be possible to develop a revised method for sorting arrests into categories similar to the categories used for the original report (since most of the changes appear to be different choices on the capitalization of words), for this updated report I have not done so. The reasoning is contained in the introduction to Appendix 3. In short, an analysis of arrest data from January through July 2016 suggested that the most important findings on arrests are already captured in the original report, and thus that the results on total arrests in this updated report are sufficient for now.

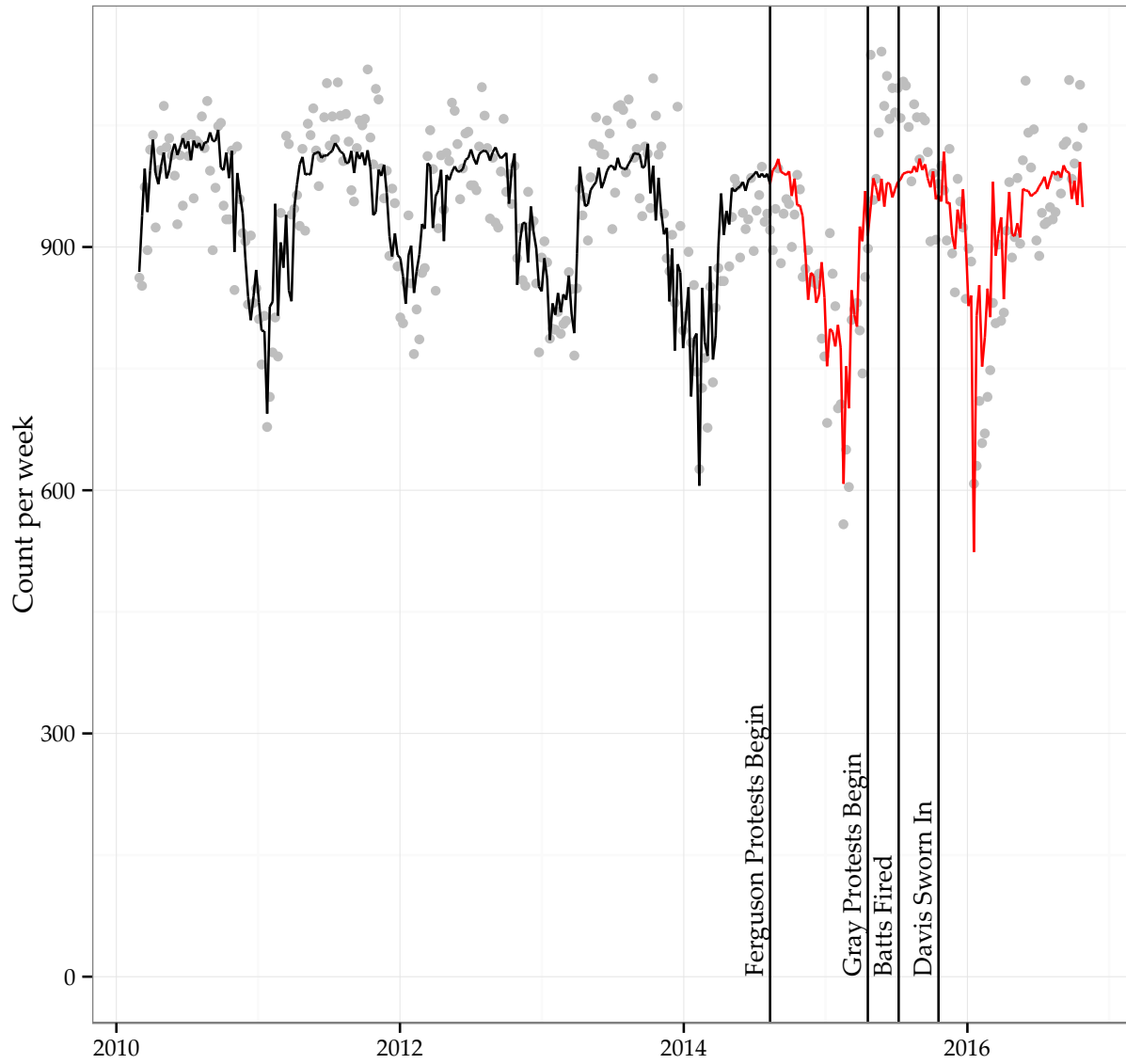


Figure 1. Total Weekly Recorded Crime Incidents (gray dots) with Predicted Values from the Model Before the Ferguson Protests Began (black line) and Extrapolated Counterfactual Values After the Ferguson Protests Began (red line)

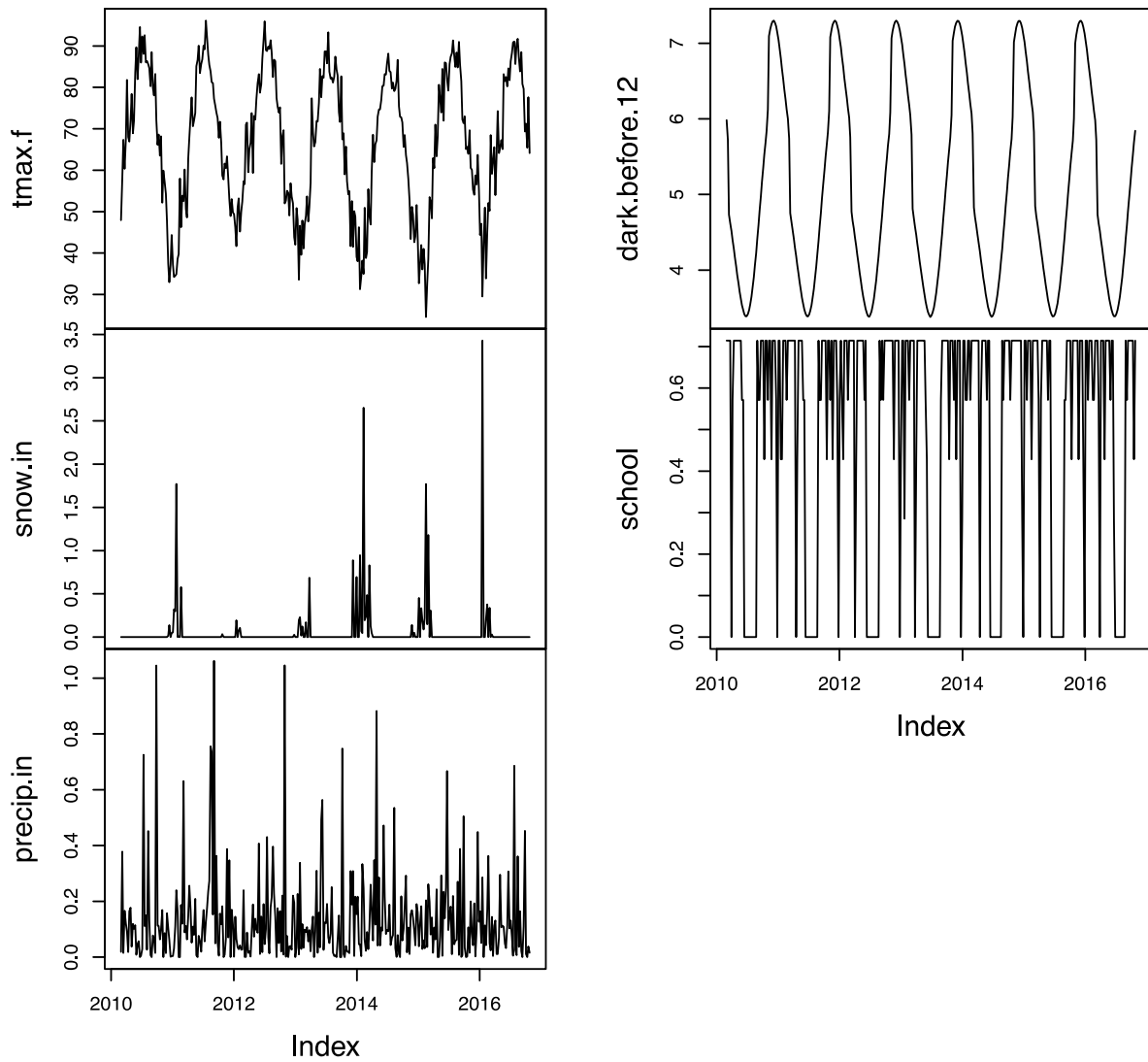


Figure 2. Seasonal Adjustment Variables Utilized in Subsequent Models

Table 1. Coefficients from Three Models for Total Weekly Recorded Crime Incidents

	3/1/2010 – 8/10/2014 Model	Preferred Model	Alternative Model
Time Counter (in weeks)	-0.14		-0.13
After Ferguson Protests Begin (week of 8/11/14 onward)		-36.62	-38.29
After Gray Protests Begin (week of 4/20/15 onward)		117.57	113.97
Unrest and National Guard (during week of 4/27/15)		106.68	118.16
After Batts Fired (week of 7/13/15 onward)		-44.00	-44.38
After Davis Sworn In (week of 10/19/15 onward)		-48.00	-46.68
Average Maximum Temperature to 50 Degrees	4.69		4.65
Plus Degrees in the 50s	4.75		5.11
Plus Degrees in the 60s	-2.69		-3.31
Plus Degrees in the 70s	-4.35		-1.50
Plus Degrees Greater Than 80	-0.92		-3.23
Snowfall (inches)	-65.84		-57.39
Precipitation (inches)	-25.98		-23.23
Darkness Before Midnight (hours)	20.82		24.22
School Days (proportion of week)	-5.18		20.77
Observations (weeks)	232	348	348
Proportion of variance explained (R-squared)	0.67	0.15	0.72

Notes: The outcome variable for the first and third columns is the same – the total weekly recorded crime count – but the R-squared values cannot be compared across the two columns because the weeks for the model differ. Relatedly, the outcome for the second column is a residualized total weekly crime count, and as such the R-squared value of 0.13 cannot be meaningfully compared to either 0.67 or 0.71 in the first and third columns, even though the models in the second and third columns are estimated for the same weeks.

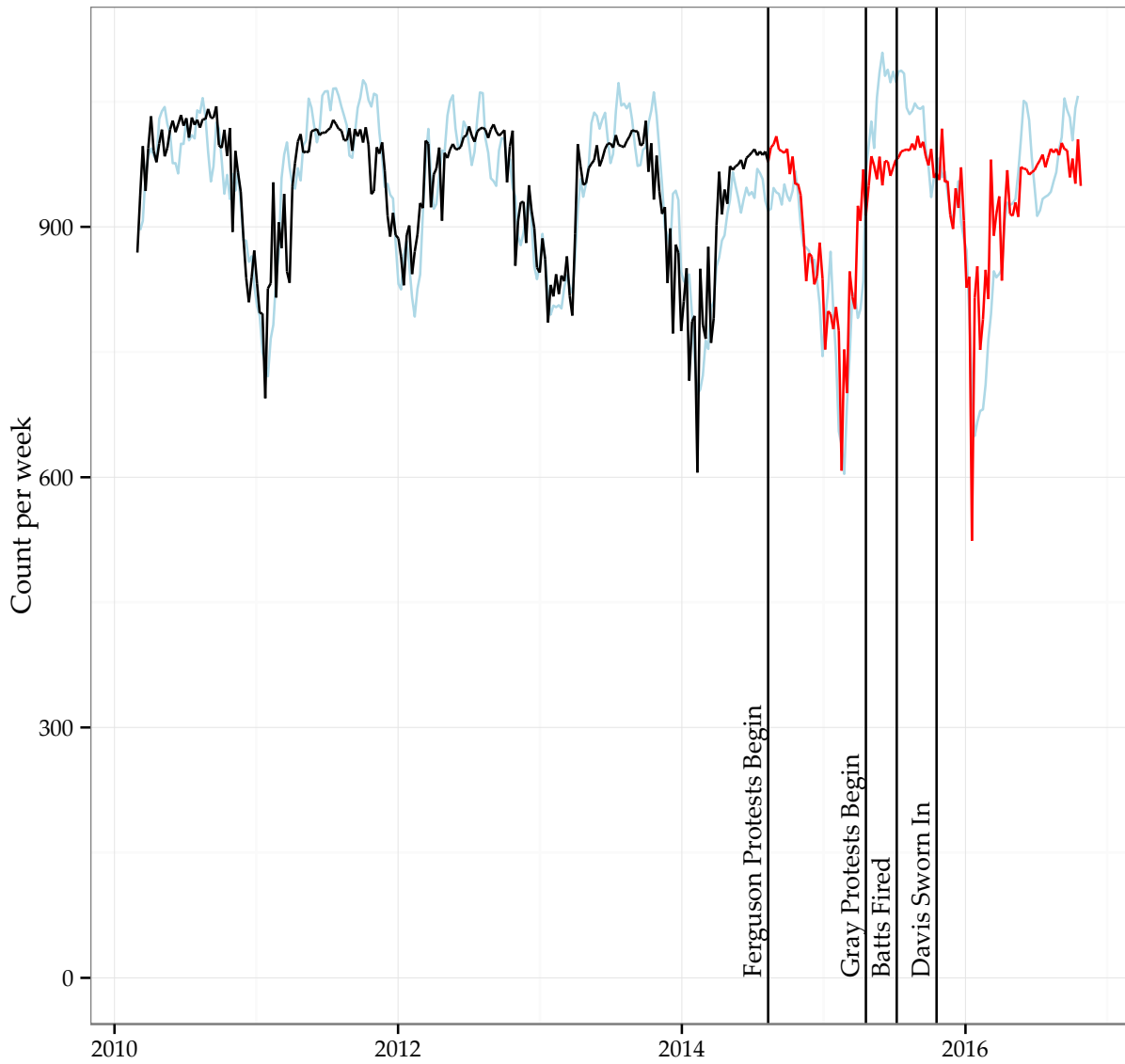


Figure 3. Total Weekly Recorded Crime Incidents (three-week moving average, blue line) with Predicted Values from the Model Before the Ferguson Protests Began (black line) and Extrapolated Counterfactual Values After the Ferguson Protests Began (red line)

Table 2. Baseline and Percentage Change in the Weekly Count of Recorded Crime Incidents

	Baseline Count Per Week	Ferguson Period (percent change)	Gray Period (percent change)	Unrest Period (percent change)	Transition Period (percent change)	Davis Period (percent change)
Homicide	4.3	-3.5	92.8	19.8	-26.4	-22.7
Shooting	7.1	13.6	139.8	-39.4	-64.2	0.5
Rape	5.3	-1.6	26.2	-34.0	-35.6	17.5
Robbery (carjacking)	2.6	66.7	35.6	389.6	-6.0	117.1
Robbery (street)	51.3	0.8	32.4	-32.3	-15.5	9.2
Robbery (commercial)	11.0	20.1	87.1	-6.3	-65.5	-4.4
Robbery (residence)	9.8	-11.3	19.2	12.7	-26.9	17.6
Aggravated assault	82.1	6.2	30.1	57.0	-11.1	6.5
Assault by threat	10.9	-4.4	4.8	-63.8	20.9	-5.0
Common assault	157.3	-12.4	1.6	-30.6	-2.4	5.5
Burglary	138.6	0.0	12.5	190.2	-1.9	-4.5
Larceny from auto	123.0	3.3	12.0	-54.7	-1.9	-14.8
Larceny	224.4	-11.2	-15.1	-25.5	4.3	-10.9
Auto theft	85.5	-6.2	54.5	-49.4	-15.0	-25.0
Arson	4.3	18.0	21.8	648.5	8.5	-5.5
Total	917.5	-4.0	12.8	11.6	-4.8	-5.2

Table 3. Baseline Weekly Count of Recorded Crime Incidents and Estimated Cumulative Percentage of the Baseline Weekly Count in Subsequent Periods

	Baseline Count Per Week	Ferguson Period (percent)	Gray Period (percent)	Unrest Period (percent)	Transition Period (percent)	Davis Period (percent)
Homicide	4.3	96.5	189.3	--	162.9	140.2
Shooting	7.1	113.6	253.3	--	189.1	189.7
Rape	5.3	98.4	124.6	--	89.0	106.5
Robbery (carjacking)	2.6	166.7	202.2	--	196.3	313.4
Robbery (street)	51.3	100.8	133.1	--	117.6	126.8
Robbery (commercial)	11.0	120.1	207.2	--	141.7	137.4
Robbery (residence)	9.8	88.7	108.0	--	81.1	98.7
Aggravated assault	82.1	106.2	136.2	--	125.1	131.6
Assault by threat	10.9	95.6	100.4	--	121.4	116.4
Common assault	157.3	87.6	89.1	--	86.7	92.2
Burglary	138.6	100.0	112.4	--	110.6	106.1
Larceny from auto	123.0	103.3	115.3	--	113.4	98.6
Larceny	224.4	88.8	73.7	--	78.0	67.1
Auto theft	85.5	93.8	148.3	--	133.3	108.3
Arson	4.3	118.0	139.8	--	148.2	142.7
Total	917.5	96.0	108.8	--	104.0	98.8

Notes: The unrest period is modeled with a “spike” specification, and this modeling choice removes it from the calculation of cumulative change. The Gray period is therefore an artificial period with the week of unrest removed, and subsequent periods do not incorporate the week of unrest in the calculation of cumulative change.

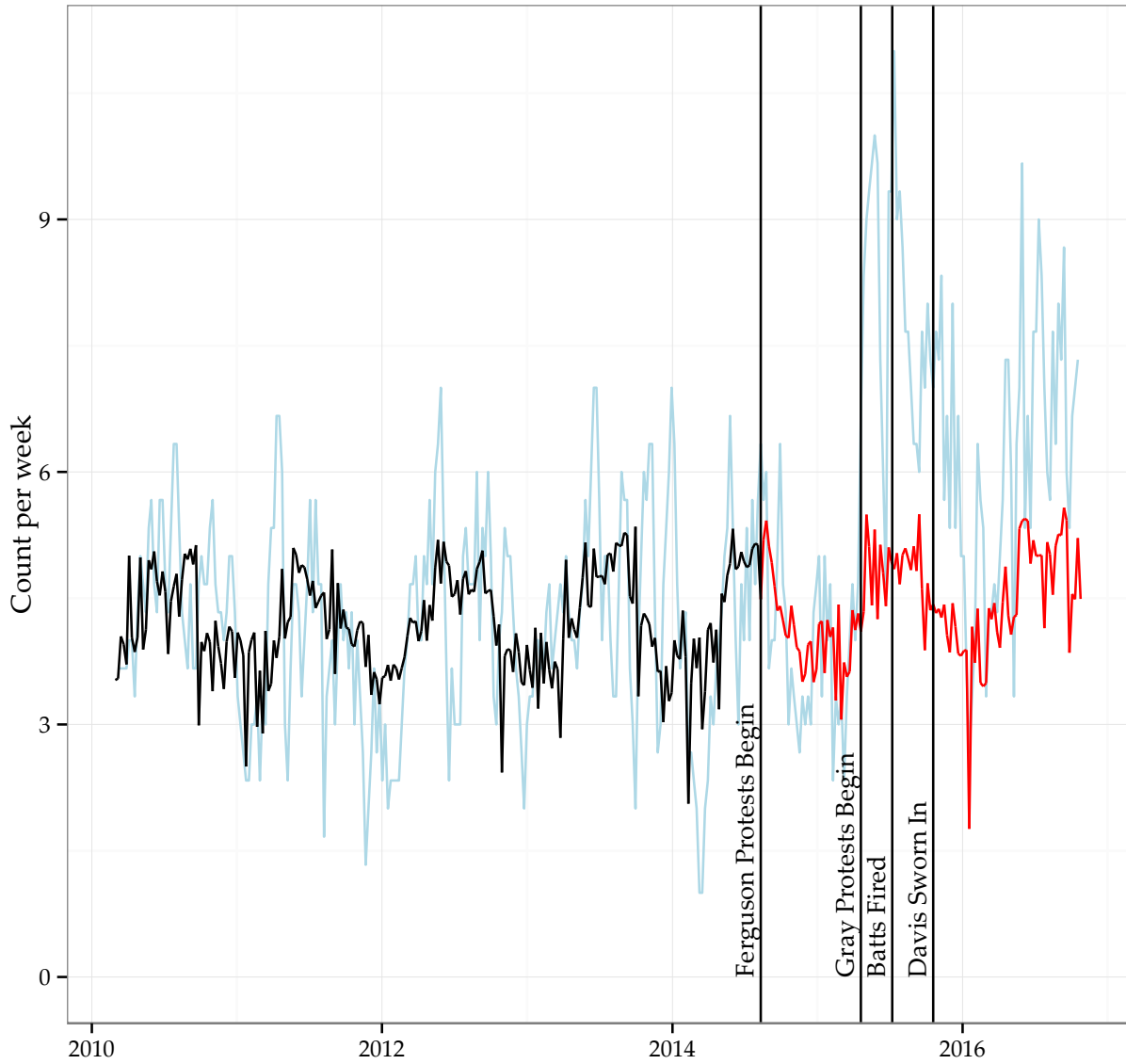


Figure 4. Total Weekly Homicide Count (three-week moving average, blue line) with Predicted Values from the Model Before the Ferguson Protests Began (black line) and Extrapolated Counterfactual Values After the Ferguson Protests Began (red line)

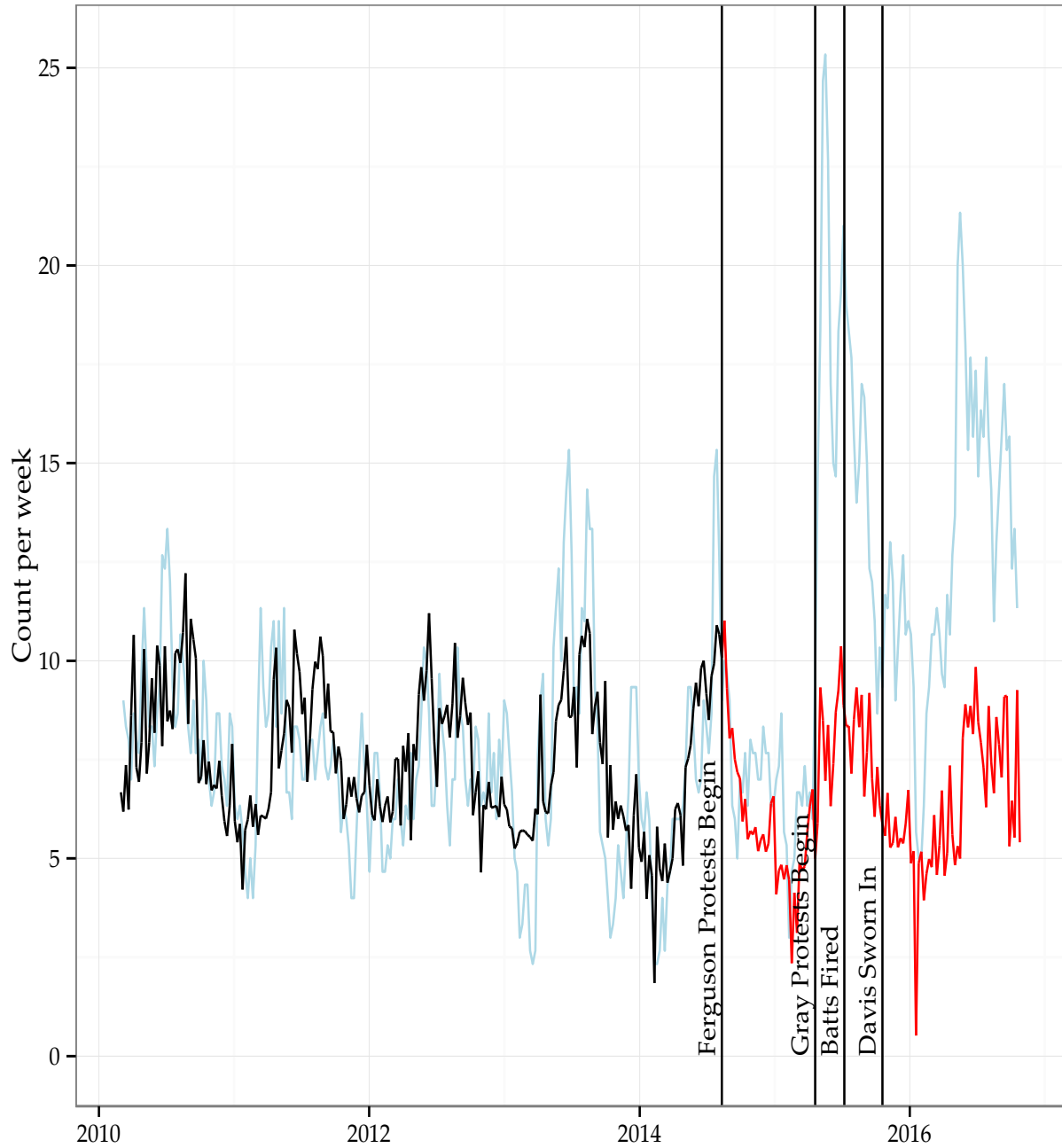


Figure 5. Total Weekly Shootings Count (three-week moving average, blue line) with Predicted Values from the Model Before the Ferguson Protests Began (black line) and Extrapolated Counterfactual Values After the Ferguson Protests Began (red line)

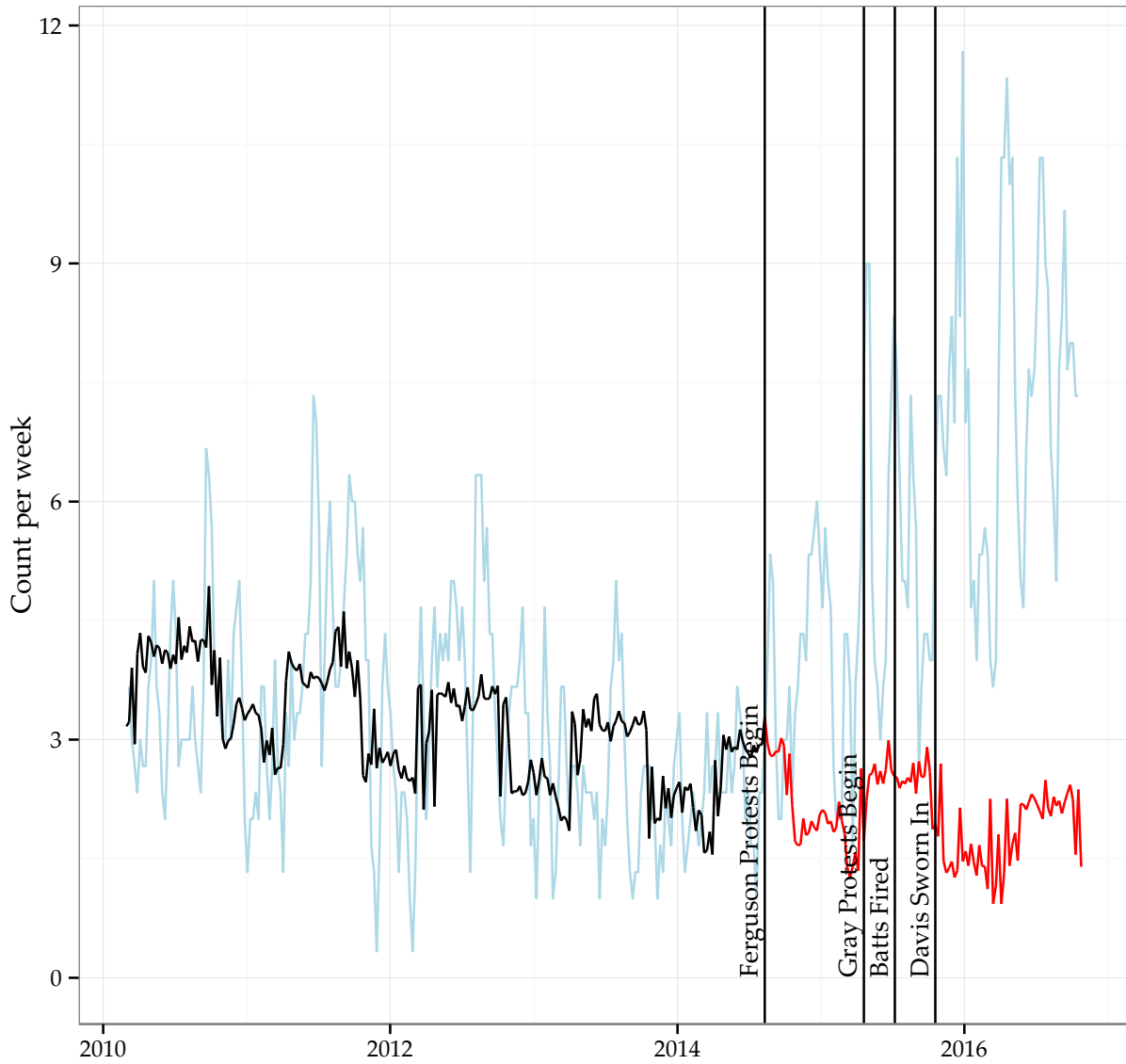


Figure 6. Total Weekly Carjacking Count (three-week moving average, blue line) with Predicted Values from the Model Before the Ferguson Protests Began (black line) and Extrapolated Counterfactual Values After the Ferguson Protests Began (red line)

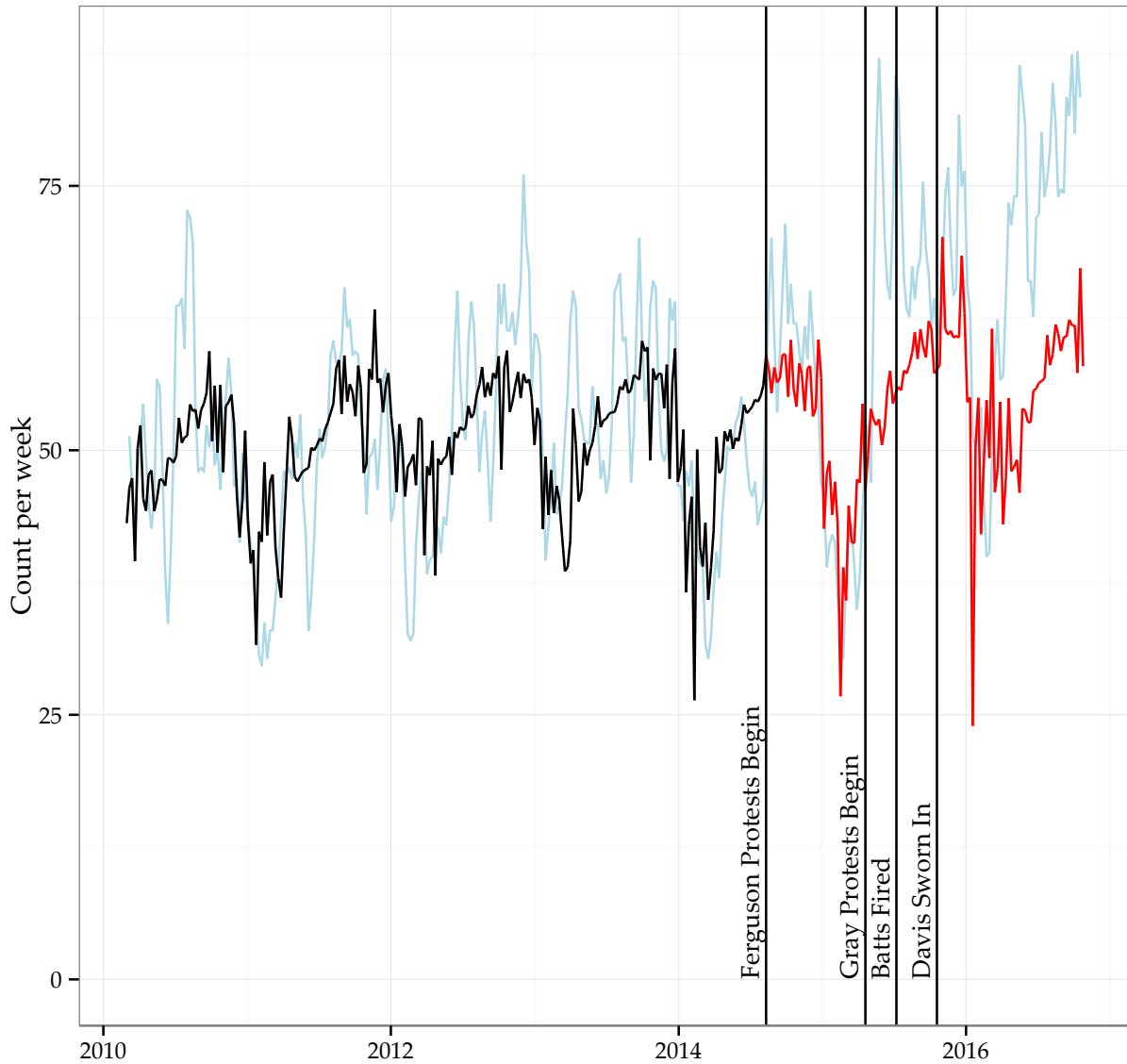


Figure 7. Total Weekly Street Robbery Count (three-week moving average, blue line) with Predicted Values from the Model Before the Ferguson Protests Began (black line) and Extrapolated Counterfactual Values After the Ferguson Protests Began (red line)

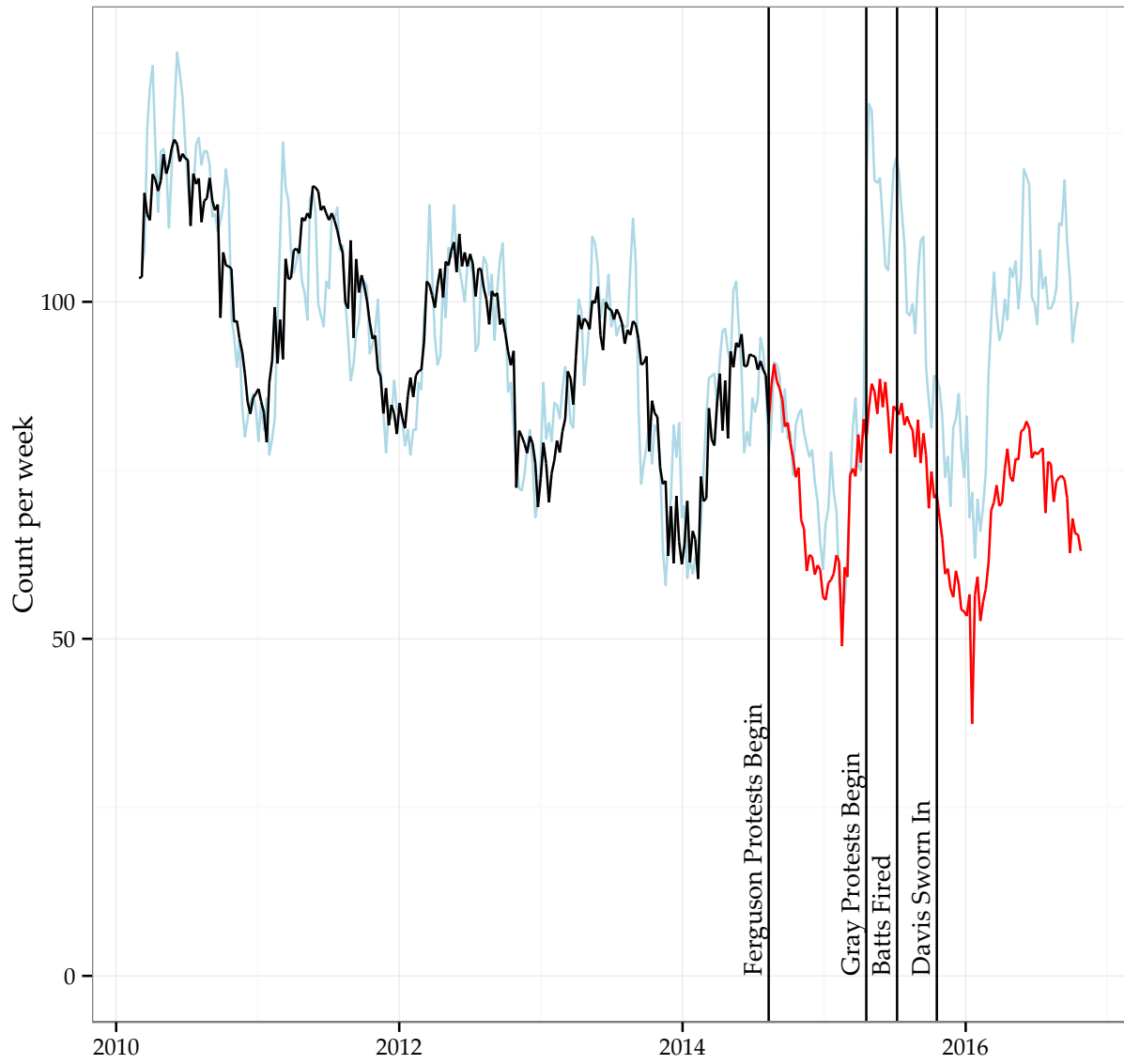


Figure 8. Total Weekly Aggravated Assault Count (three-week moving average, blue line) with Predicted Values from the Model Before the Ferguson Protests Began (black line) and Extrapolated Counterfactual Values After the Ferguson Protests Began (red line)

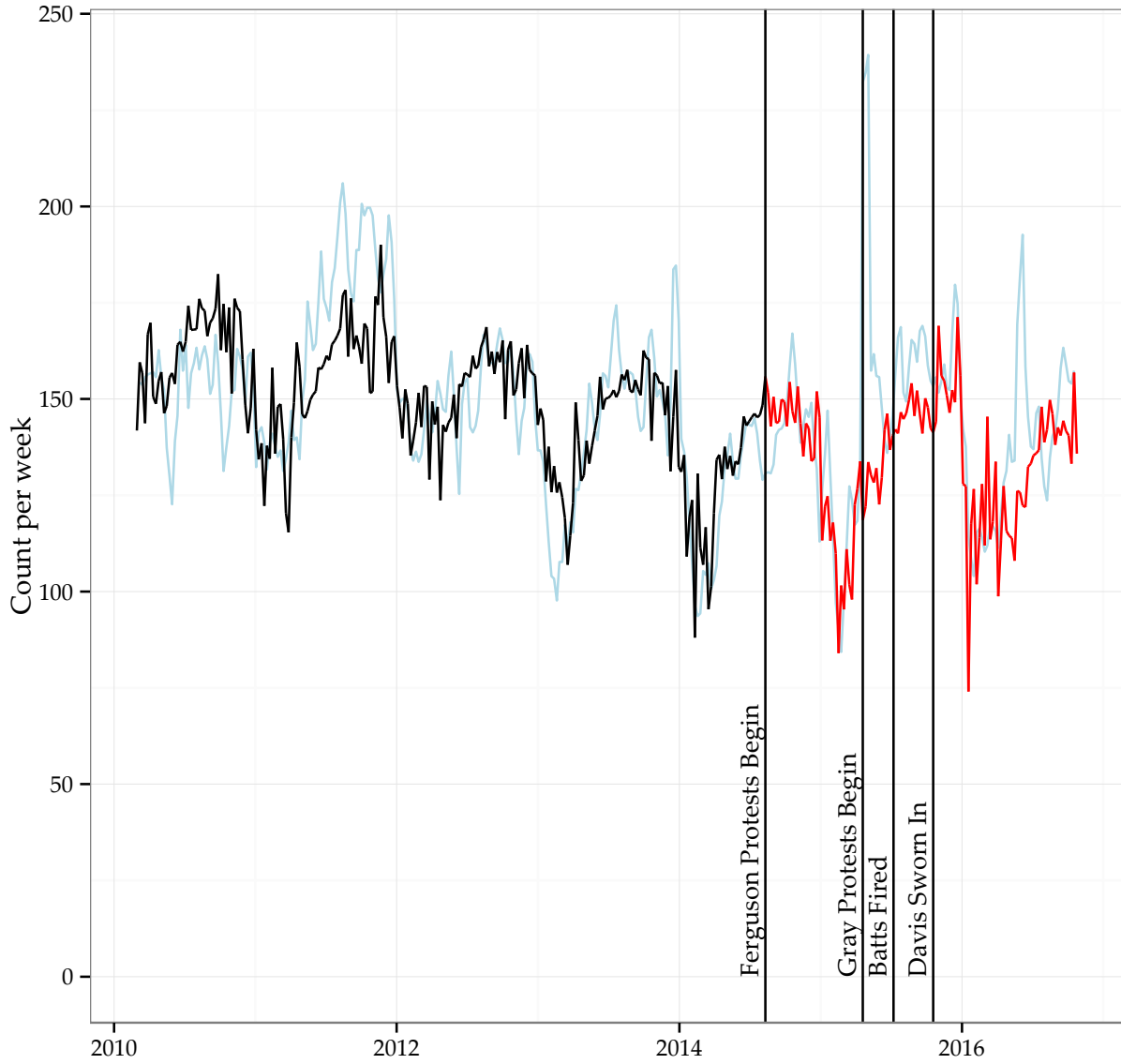


Figure 9. Total Weekly Burglary Count (three-week moving average, blue line) with Predicted Values from the Model Before the Ferguson Protests Began (black line) and Extrapolated Counterfactual Values After the Ferguson Protests Began (red line)

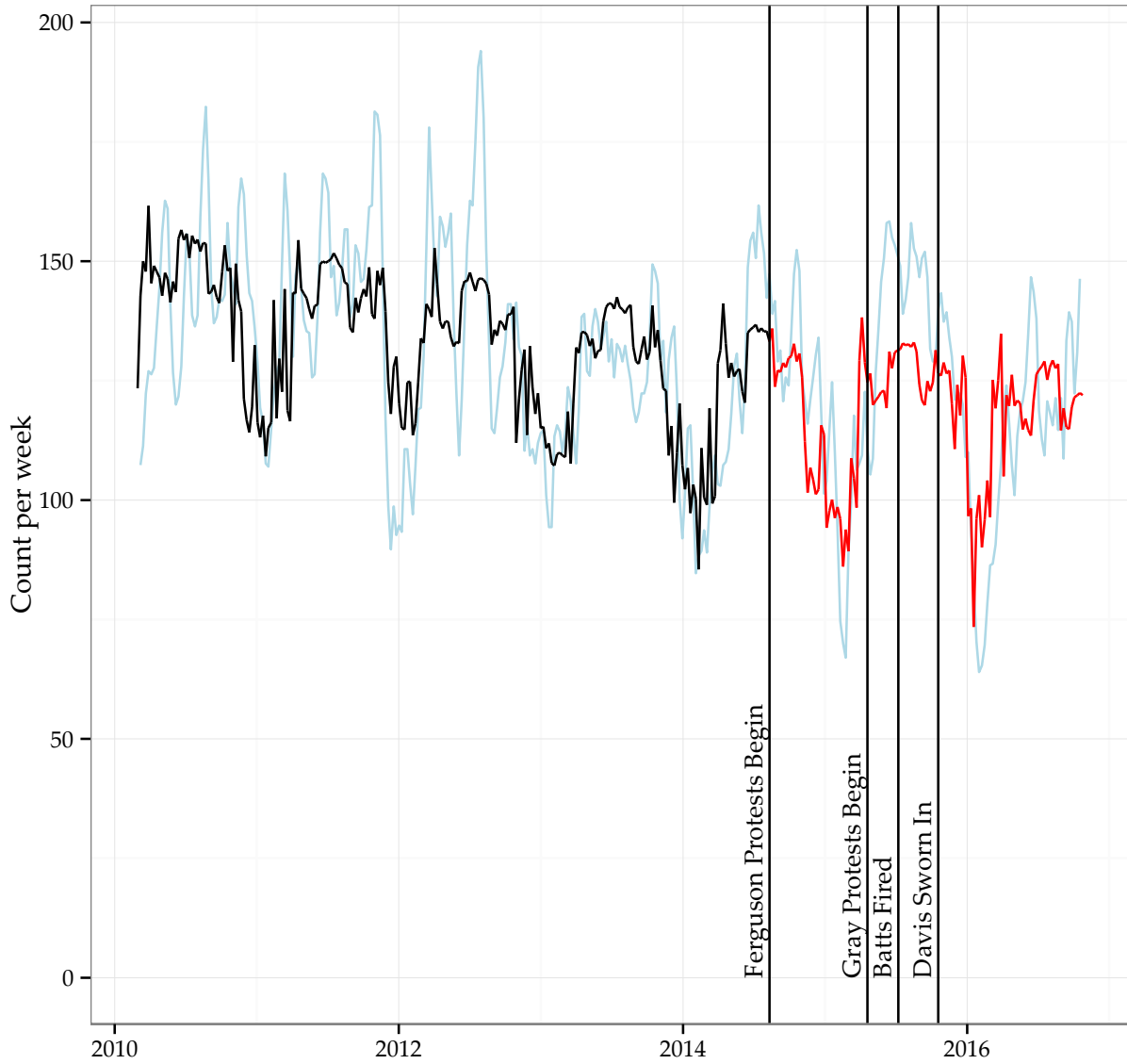


Figure 10. Total Weekly Larceny from Automobiles Count (three-week moving average, blue line) with Predicted Values from the Model Before the Ferguson Protests Began (black line) and Extrapolated Counterfactual Values After the Ferguson Protests Began (red line)

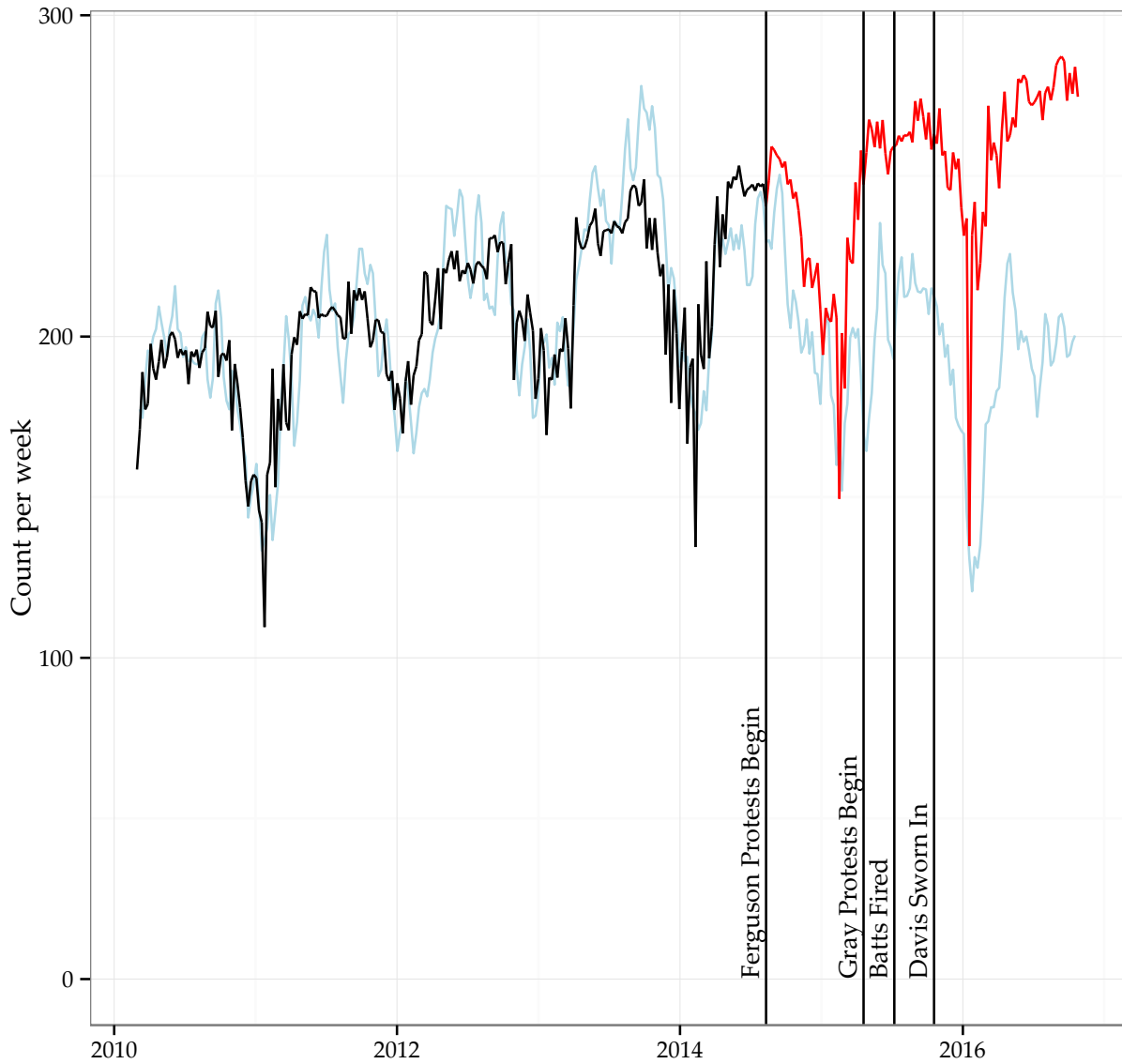


Figure 11. Total Weekly Larceny Count (three-week moving average, blue line) with Predicted Values from the Model Before the Ferguson Protests Began (black line) and Extrapolated Counterfactual Values After the Ferguson Protests Began (red line)

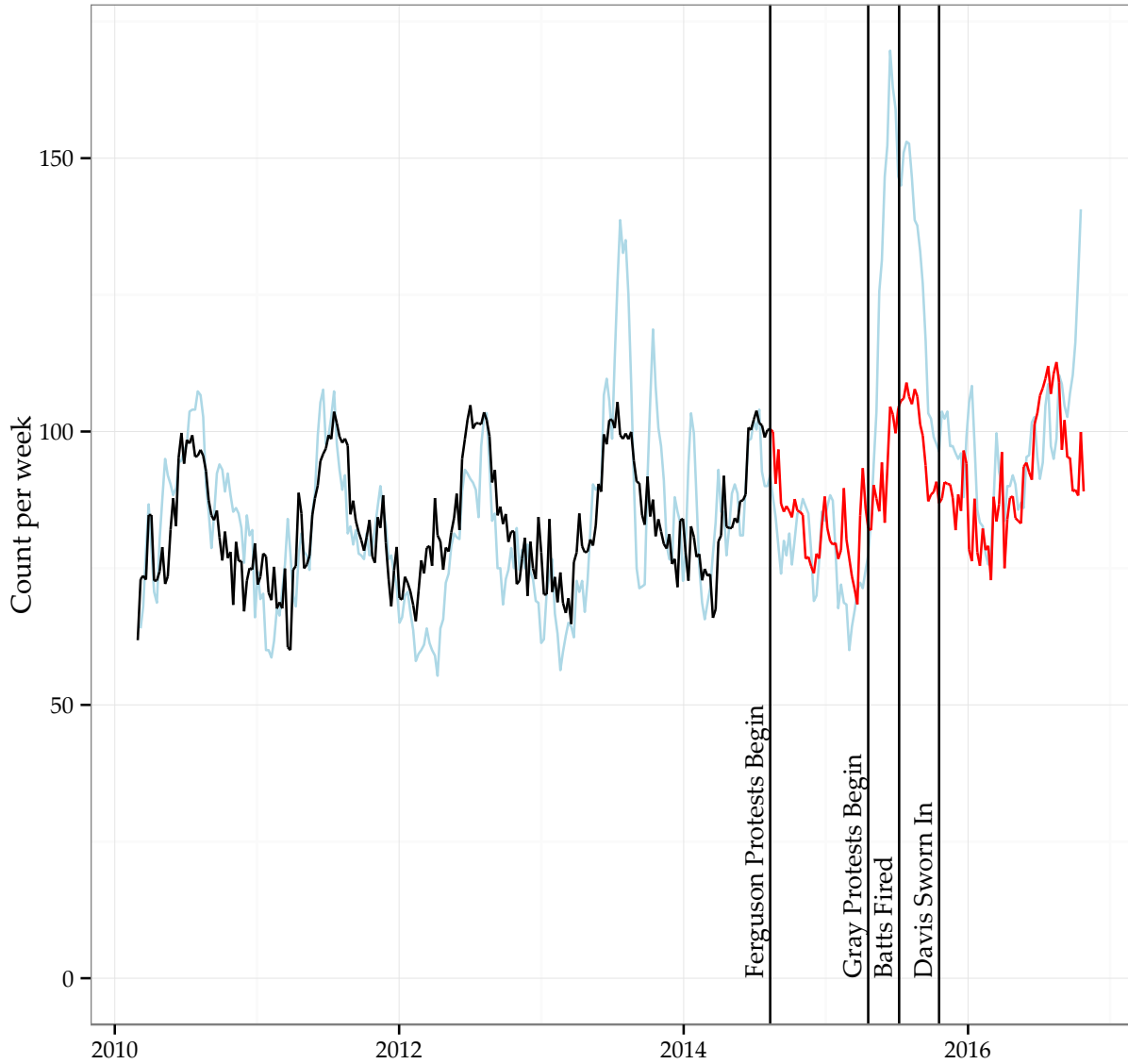


Figure 12. Total Weekly Automobile Theft Count (three-week moving average, blue line) with Predicted Values from the Model Before the Ferguson Protests Began (black line) and Extrapolated Counterfactual Values After the Ferguson Protests Began (red line)

Table 4. Baseline and Raw Change in the Weekly Count of Shootings and Homicides by Police District

	Baseline Count Per Week	Ferguson Period (raw change)	Gray Period (raw change)	Unrest Period (raw change)	Transition Period (raw change)	Davis Period (raw change)
Shootings						
Northwestern	0.7	0.5	0.1	3.0	0.4	-0.3
Northern	0.4	0.1	0.1	-0.4	1.0	-0.7
Northeastern	0.9	0.0	0.8	1.5	-0.4	0.4
Western	1.2	0.4	3.3	-2.7	-3.2	0.6
Central	0.5	-0.3	0.9	-0.9	-0.9	0.6
Eastern	1.1	0.0	3.1	-4.0	-2.4	0.4
Southwestern	1.0	0.2	0.5	0.4	0.9	-0.8
Southern	0.7	-0.1	1.0	-0.9	0.1	-0.2
Southeastern	0.5	0.1	0.2	1.3	0.0	0.0
Homicide						
Northwestern	0.6	-0.1	0.4	1.8	-0.2	-0.2
Northern	0.4	0.0	0.1	-0.2	0.2	-0.3
Northeastern	0.5	0.5	0.3	-1.1	-0.2	-0.1
Western	0.6	-0.2	1.0	0.5	0.1	-0.4
Central	0.3	-0.1	0.0	-0.5	0.1	-0.1
Eastern	0.6	-0.1	0.7	-1.3	-0.3	0.2
Southwestern	0.6	0.0	0.8	-0.2	-0.6	-0.2
Southern	0.4	-0.1	0.6	1.2	-0.3	0.1
Southeastern	0.3	-0.1	0.1	0.8	0.1	0.1

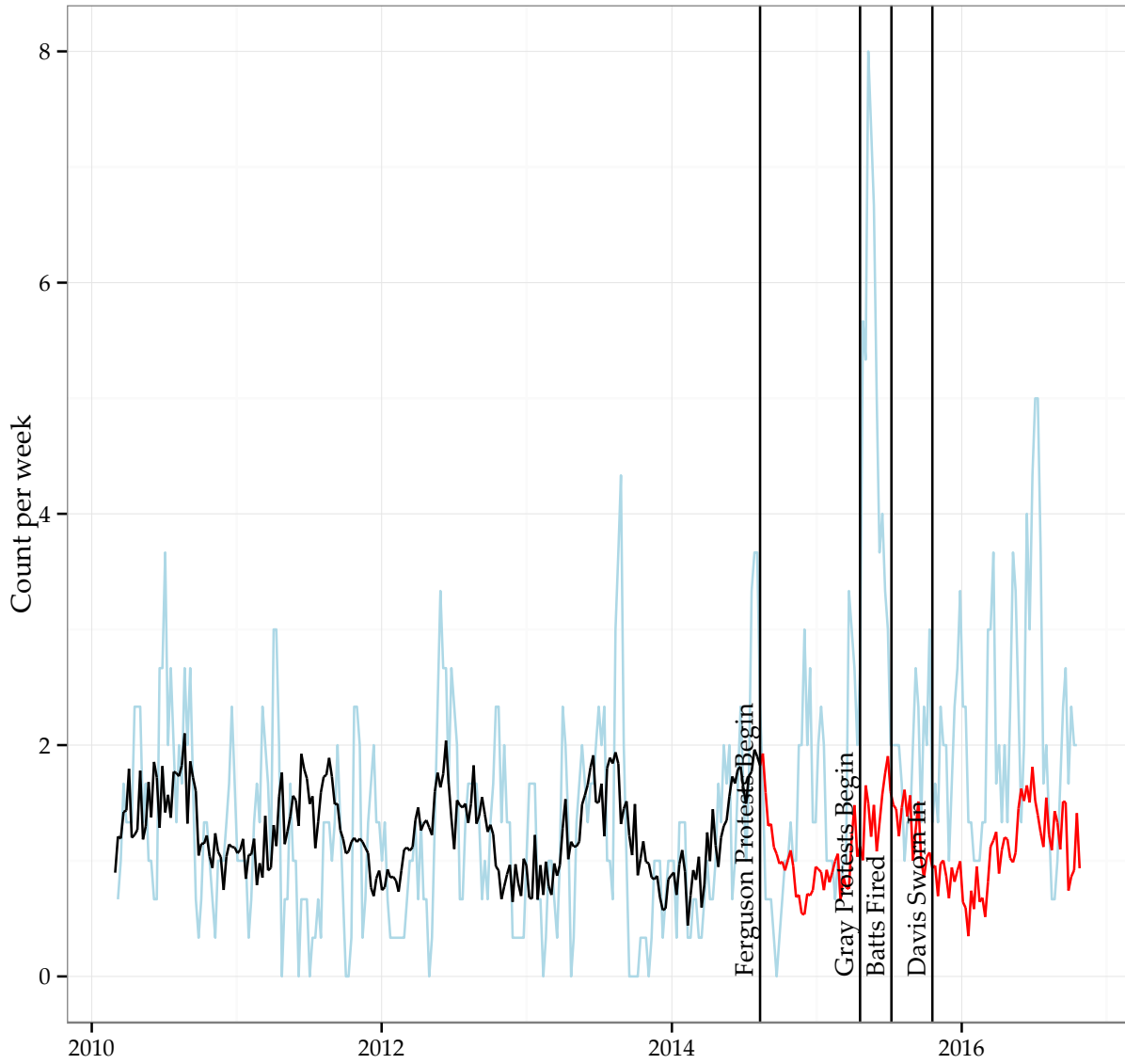


Figure 13. Total Weekly Shootings in the Western District (three-week moving average, blue line) with Predicted Values from the Model Before the Ferguson Protests Began (black line) and Extrapolated Counterfactual Values After the Ferguson Protests Began (red line)

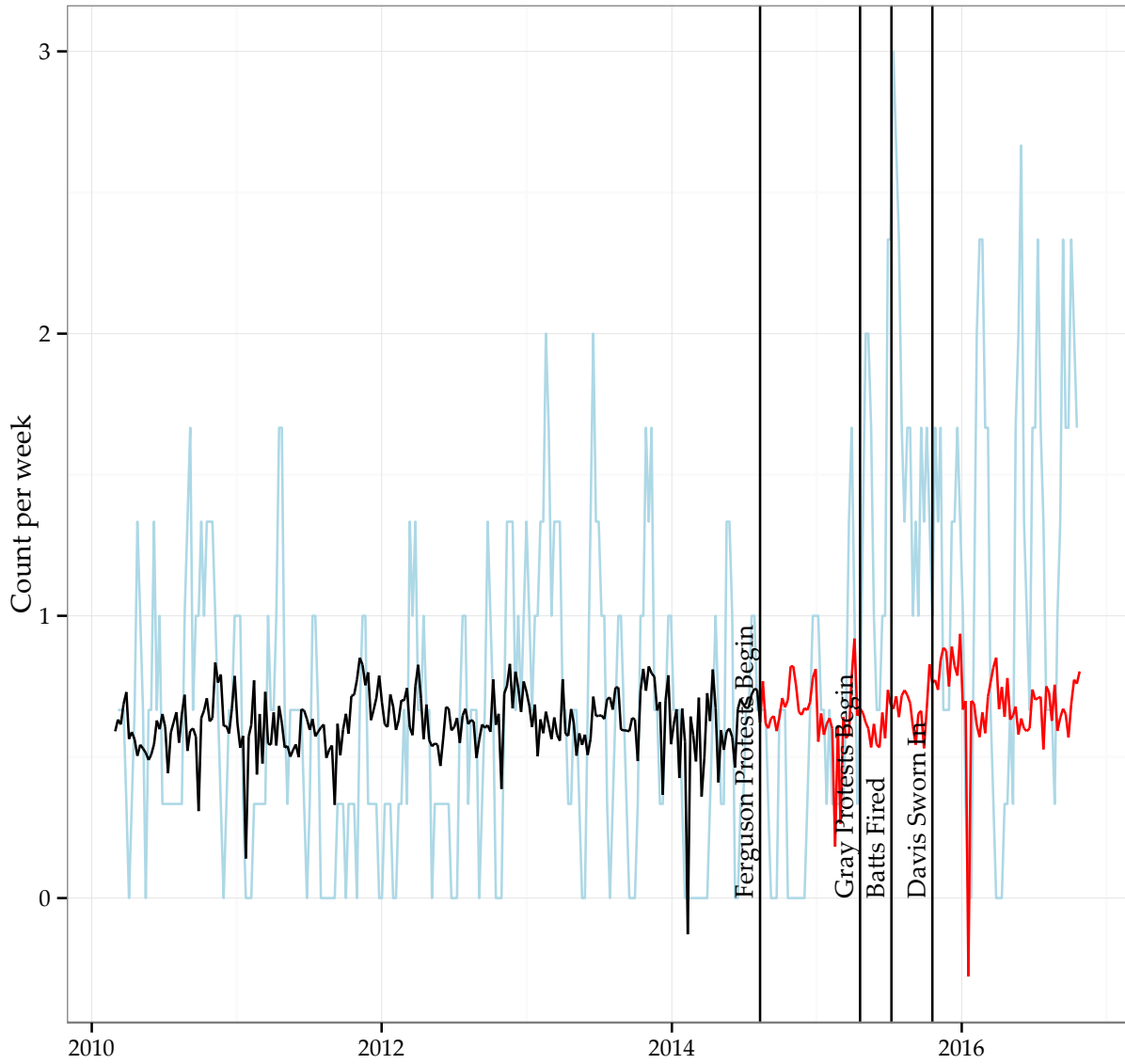


Figure 14. Total Weekly Homicides in the Western District (three-week moving average, blue line) with Predicted Values from the Model Before the Ferguson Protests Began (black line) and Extrapolated Counterfactual Values After the Ferguson Protests Began (red line)

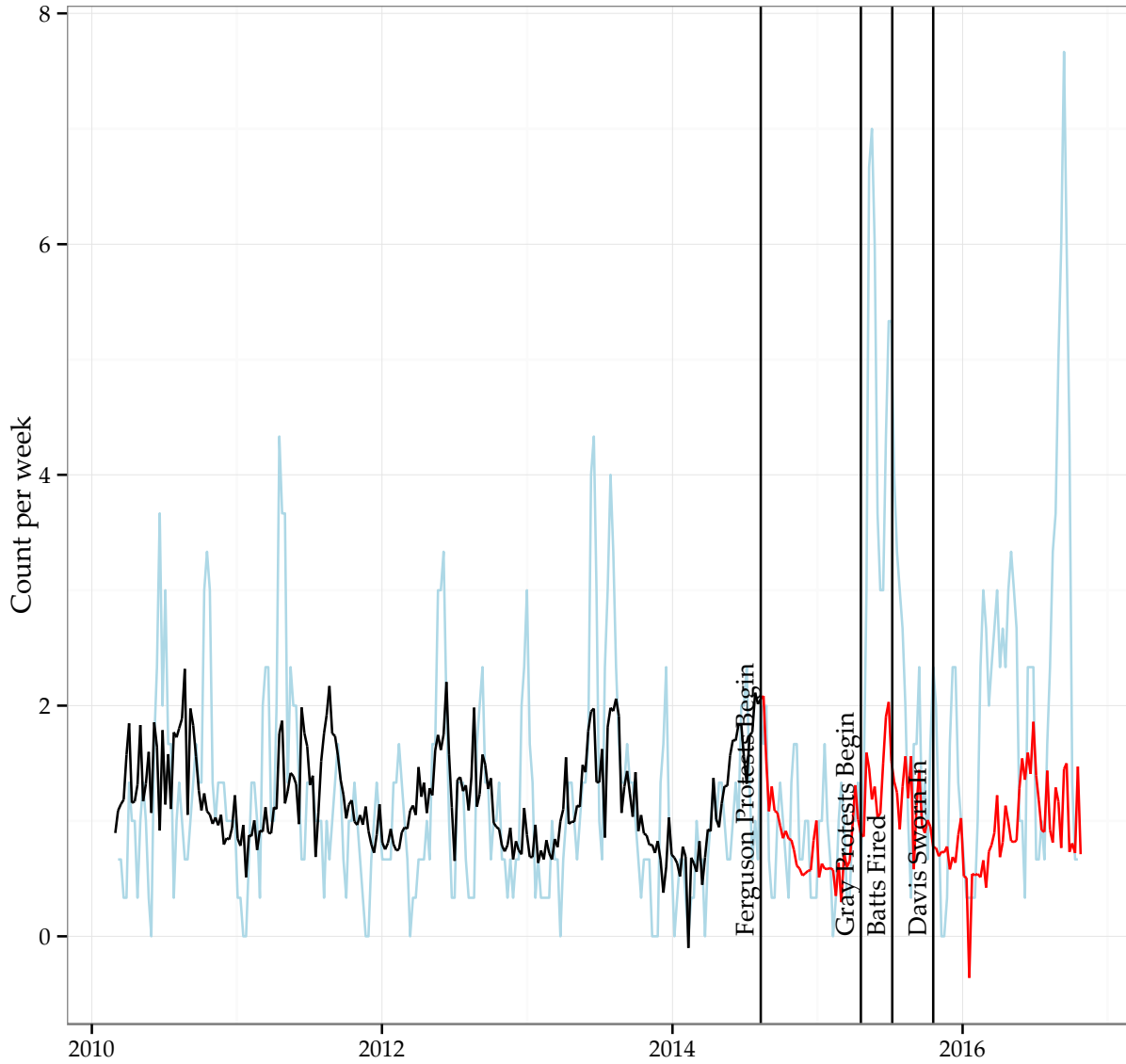


Figure 15. Total Weekly Shootings in the Eastern District (three-week moving average, blue line) with Predicted Values from the Model Before the Ferguson Protests Began (black line) and Extrapolated Counterfactual Values After the Ferguson Protests Began (red line)

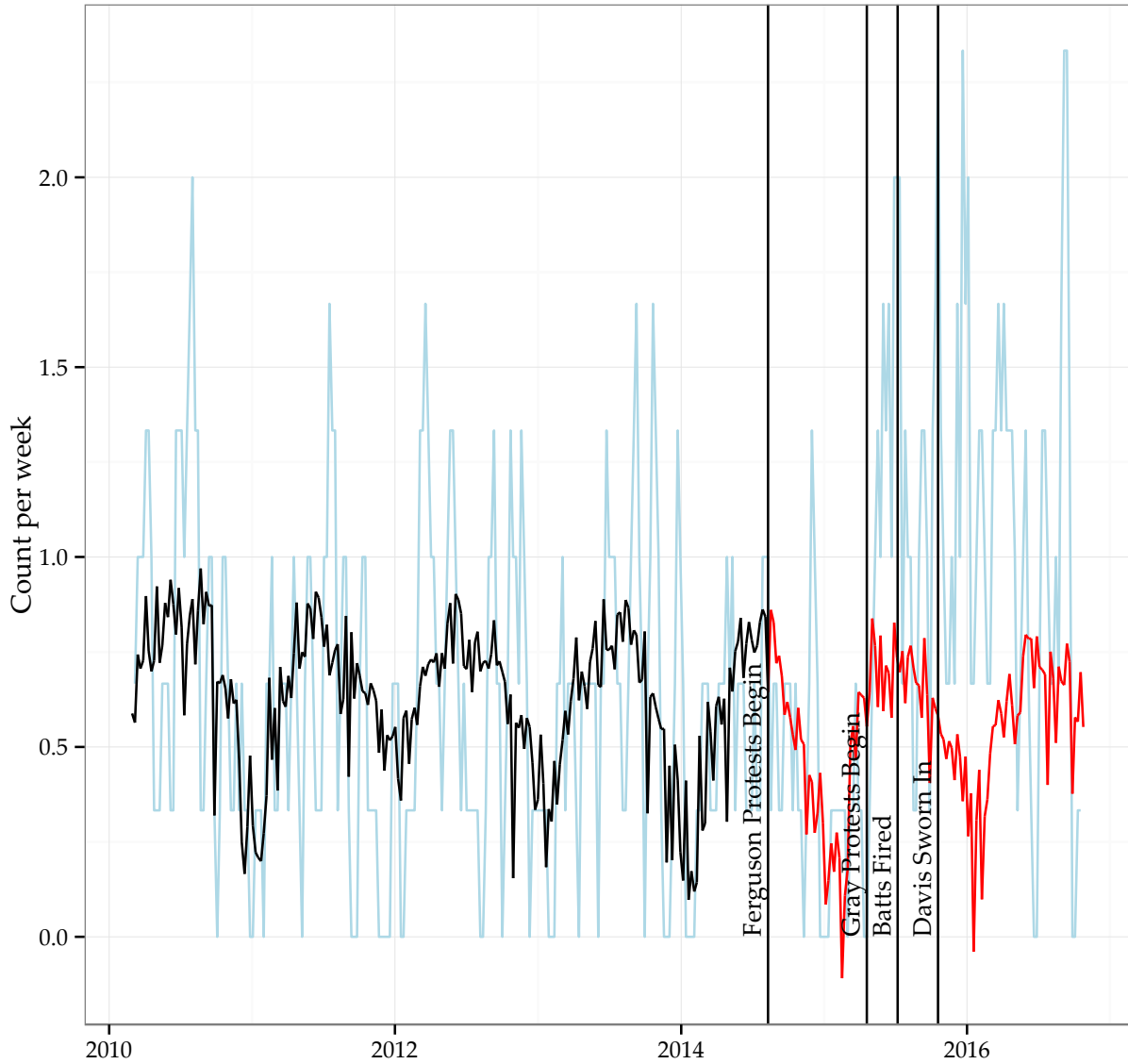


Figure 16. Total Weekly Homicides in the Eastern District (three-week moving average, blue line) with Predicted Values from the Model Before the Ferguson Protests Began (black line) and Extrapolated Counterfactual Values After the Ferguson Protests Began (red line)

Table 5. Coefficients from Three Models for Total Weekly Recorded Arrests

	1/1/2013 – 8/10/2014 Model	Preferred Model	Alternative Model
Time Counter (in weeks)	-0.28		-1.16
After Ferguson Protests Begin (week of 8/11/14 onward)		-150.56	-95.49
After Gray Protests Begin (week of 4/20/15 onward)		-247.70	-231.39
Unrest and National Guard (during week of 4/27/15)		182.92	188.71
After Batts Fired (week of 7/13/15 onward)		166.96	162.92
After Davis Sworn In (week of 10/19/15 onward)		-29.74	9.37
Average Maximum Temperature to 50 Degrees	-0.59		-0.49
Plus Degrees in the 50s	-2.36		2.96
Plus Degrees in the 60s	-0.48		-5.16
Plus Degrees in the 70s	8.45		5.86
Plus Degrees Greater Than 80	-11.15		-6.95
Snowfall (inches)	-75.09		-23.66
Precipitation (inches)	-158.65		-89.11
Darkness Before Midnight (hours)	-38.30		-26.68
School Days (proportion of week)	71.14		38.30
Observations (weeks)	83	199	199
Proportion of variance explained (R-squared)	0.51	0.77	0.85

Notes: The outcome variable for the first and third columns is the same – the total weekly recorded arrest count – but the R-squared values cannot be compared across the two columns because the weeks for the model differ. Relatedly, the outcome for the second column is a residualized total weekly arrest count, and as such the R-squared value of 0.77 cannot be meaningfully compared to either 0.51 or 0.85 in the first and third columns, even though the models in the second and third columns are estimated for the same weeks.

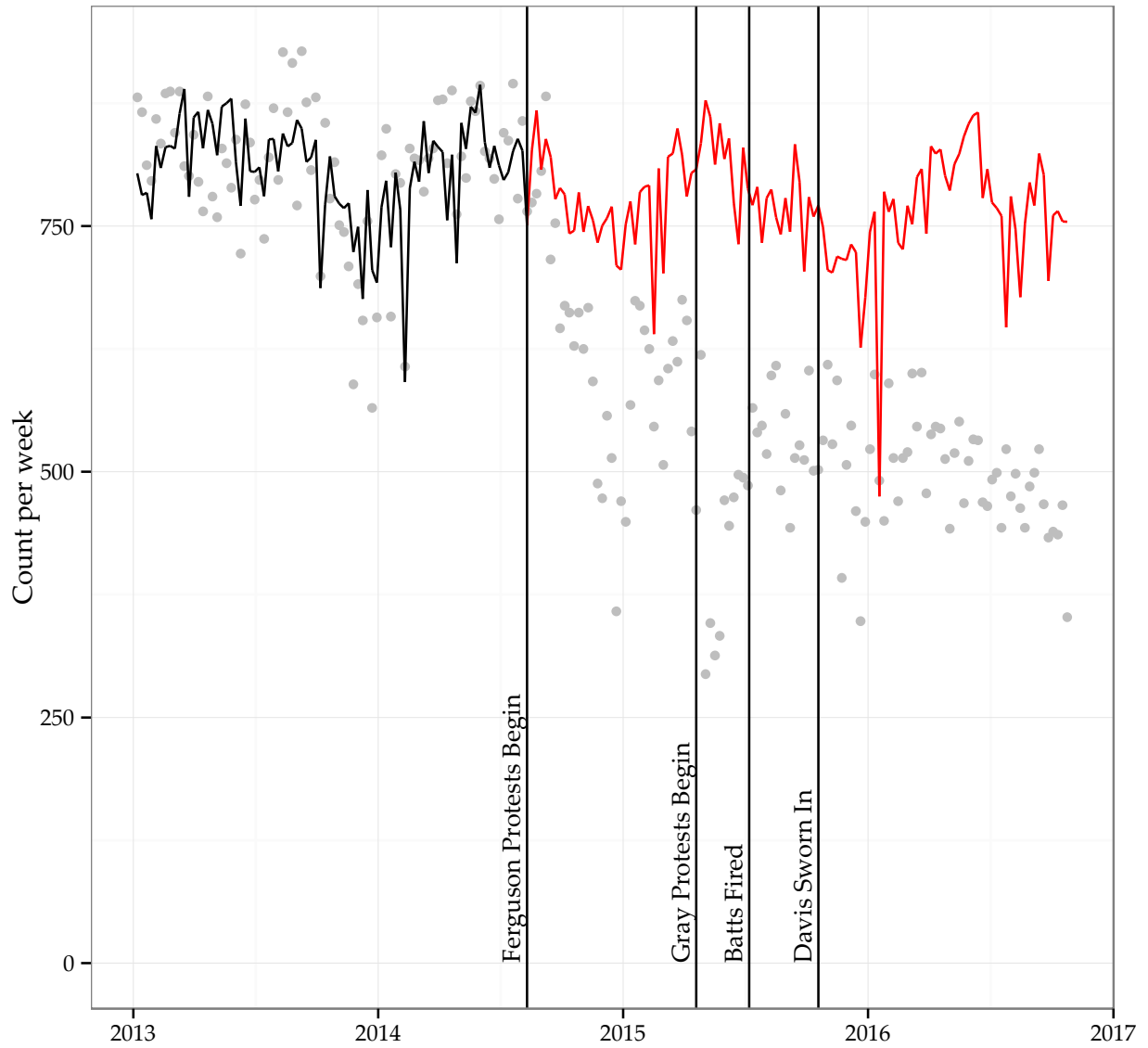


Figure 17. Total Weekly Arrests (gray dots) with Predicted Values from the Model Before the Ferguson Protests Began (black line) and Extrapolated Counterfactual Values After the Ferguson Protests Began (red line)

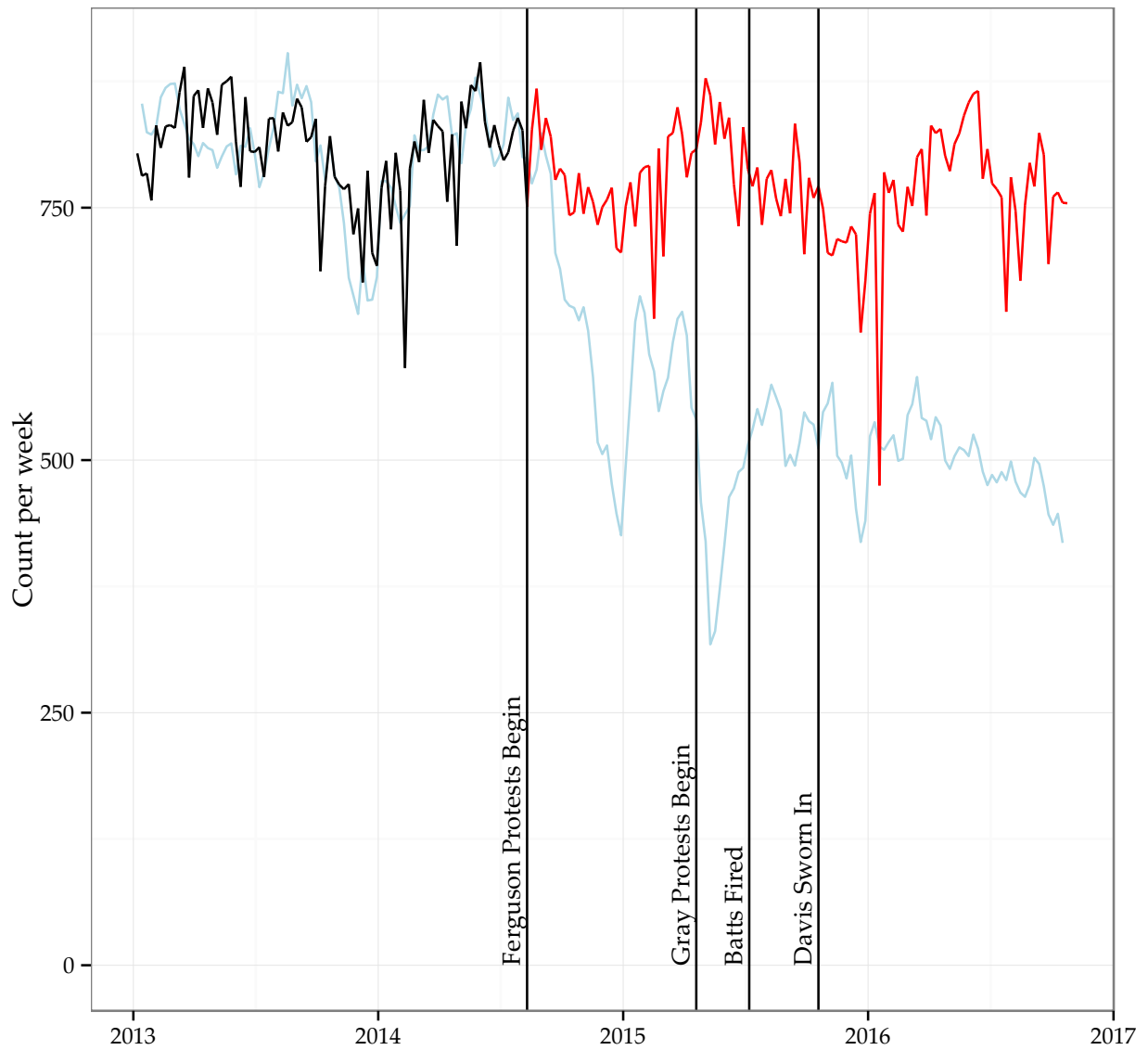


Figure 18. Total Weekly Arrests (three-week moving average, blue line) with Predicted Values from the Model Before the Ferguson Protests Began (black line) and Extrapolated Counterfactual Values After the Ferguson Protests Began (red line)

Table 6. Baseline and Percentage Change in the Weekly Count of Arrests

	Baseline Count Per Week	Ferguson Period (percent change)	Gray Period (percent change)	Unrest Period (percent change)	Transition Period (percent change)	Davis Period (percent change)
Total	797.0	-18.9	-31.1	23.0	20.9	-3.7

Table 7. Baseline Weekly Count of Arrests and Estimated Cumulative Percentage of the Baseline Weekly Count in Subsequent Periods

	Baseline Count Per Week	Ferguson Period (percent)	Gray Period (percent)	Unrest Period (percent)	Transition Period (percent)	Davis Period (percent)
Total	797.0	81.1	50.0	--	71.0	67.2

Notes: See Table 5. In addition, the unrest period is modeled with a “spike” specification, and this modeling choice removes it from the calculation of cumulative change. The Gray period is therefore an artificial period with the week of unrest removed, and subsequent periods do not incorporate the week of unrest in the calculation of cumulative change. The four negative values are implausible and should be interpreted as zero (because the true cumulative change is bounded by zero, even though the model does not have this constraint); note that these values are only present for the categories that we have placed in gray.