

# **Online Appendix**

## **Unequal Responsiveness in City Service Delivery: Evidence from 42 Million 311 Calls**

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Figure A1: Clustering of Closing Dates by Hour and City

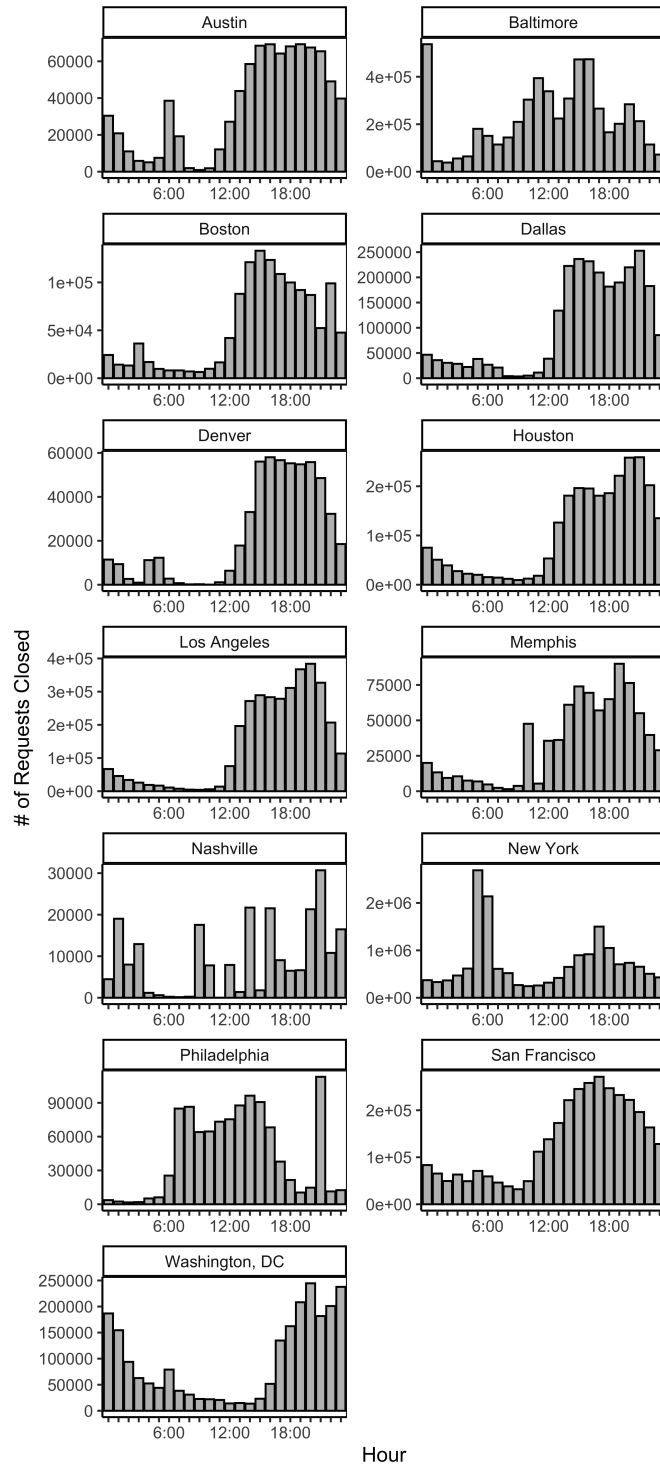


Figure A2: Clustering of Closing Dates by Day of Week and City

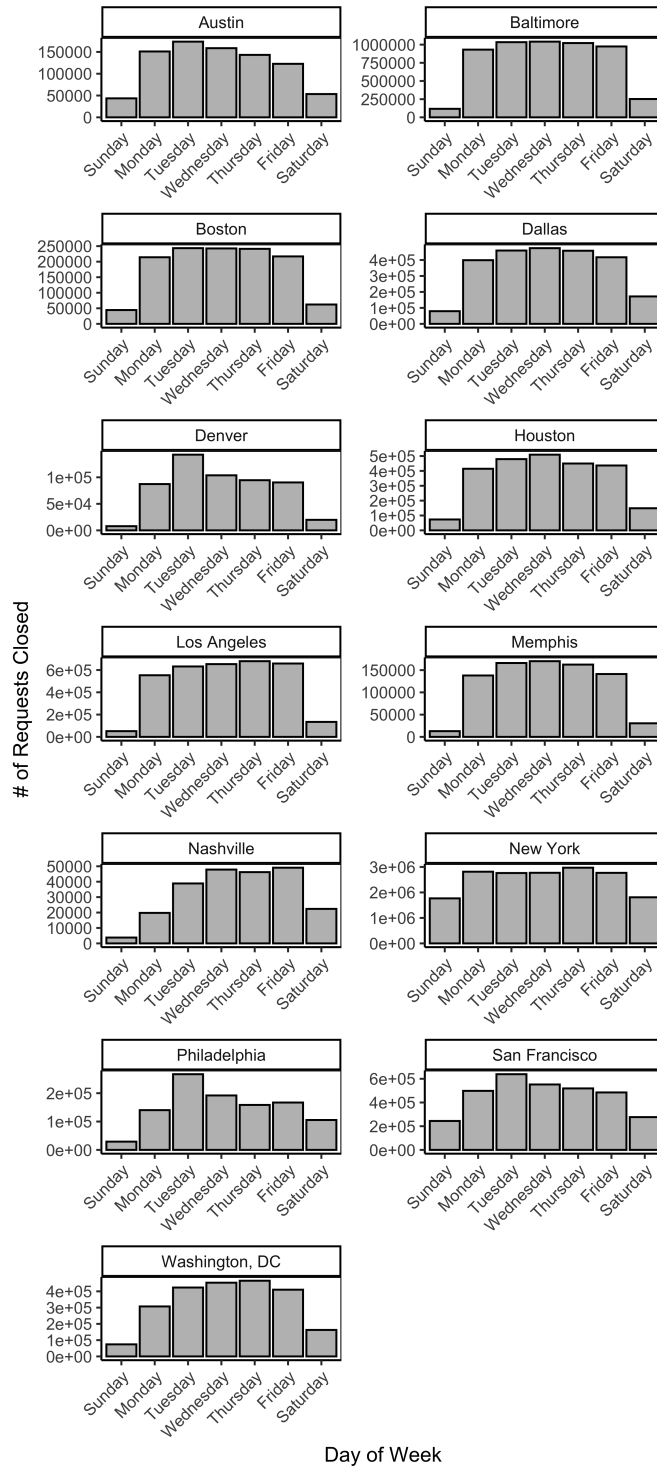


Figure A3: Clustering of Closing Dates by Day of Month and City

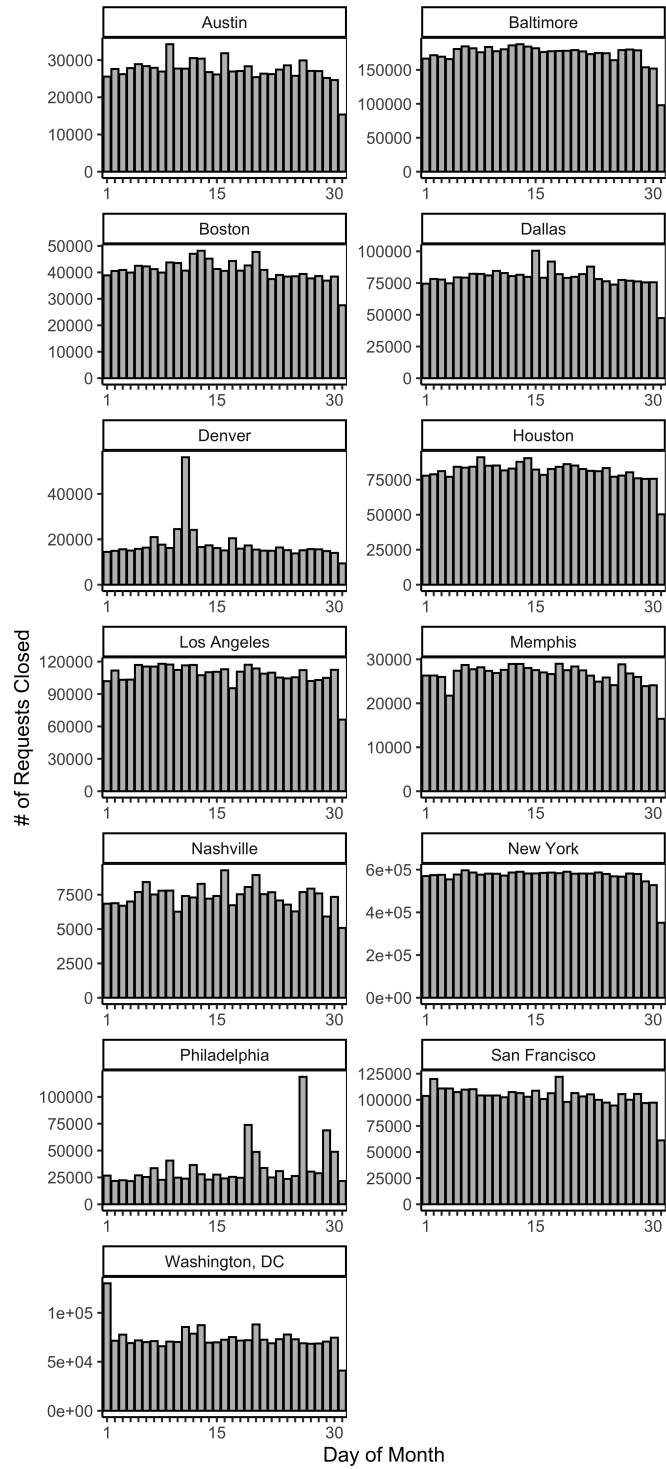


Figure A4: Clustering of Closing Dates by Hour and Neighborhood Race

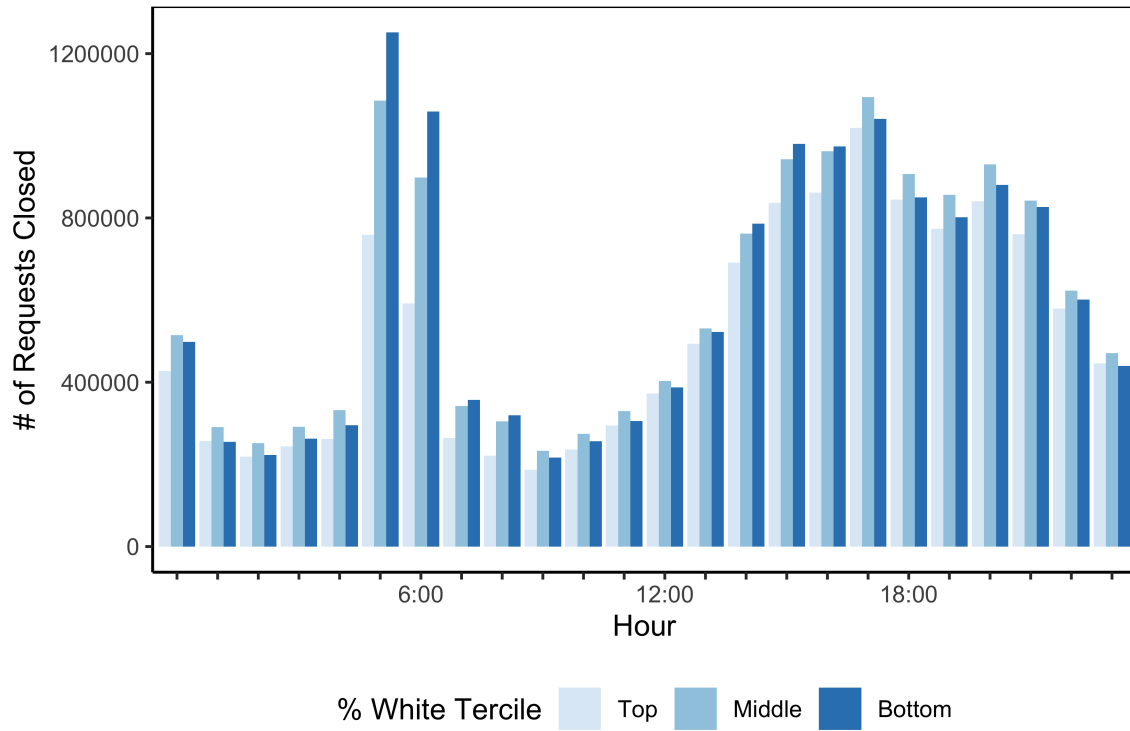


Figure A5: Clustering of Closing Dates by Hour and Neighborhood Income

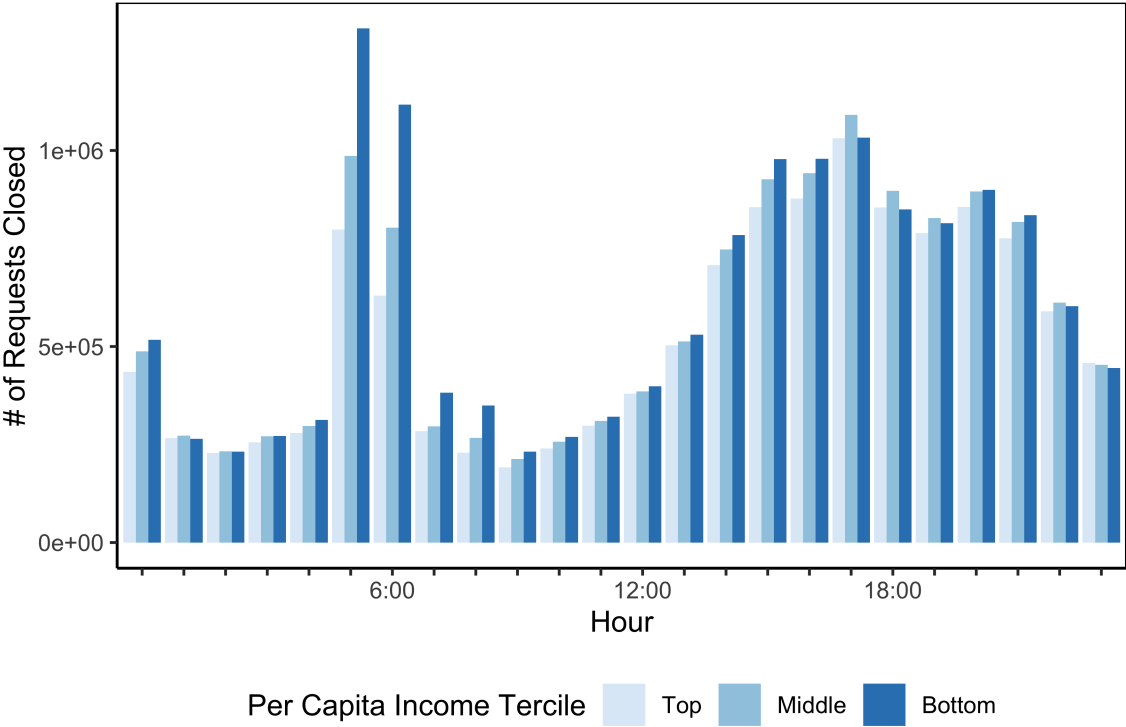


Figure A6: Clustering of Closing Dates by Day of Week and Neighborhood Race

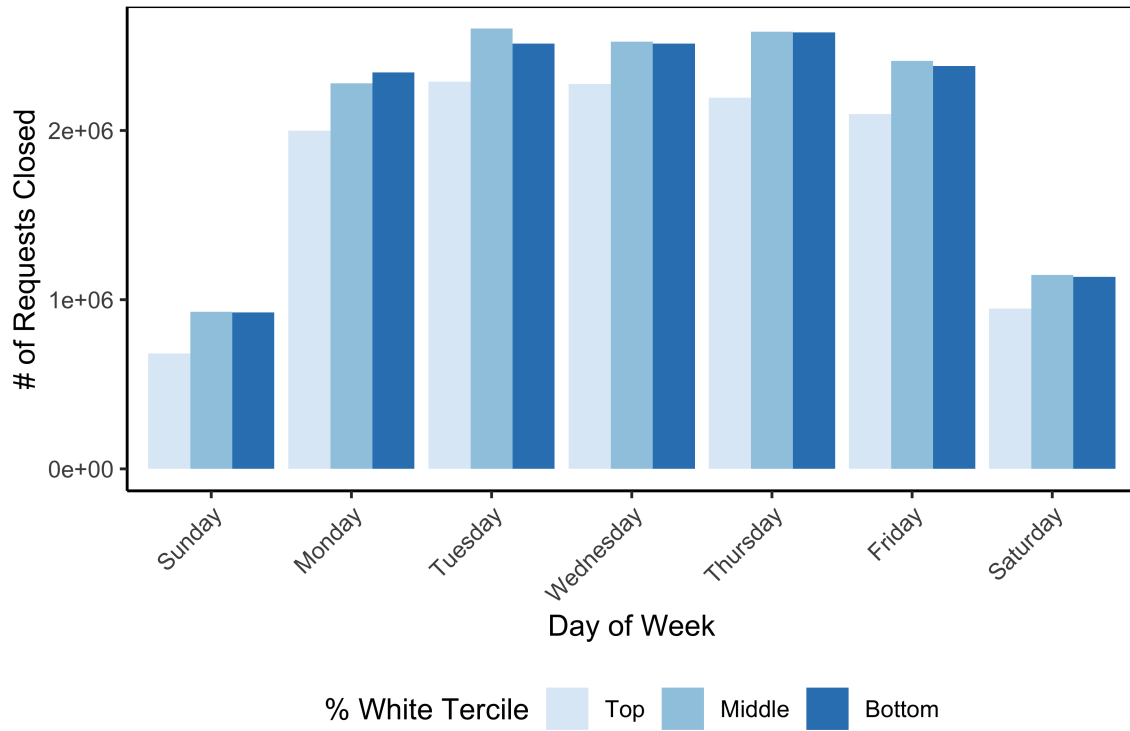




Figure A7: Clustering of Closing Dates by Day of Week and Neighborhood Income

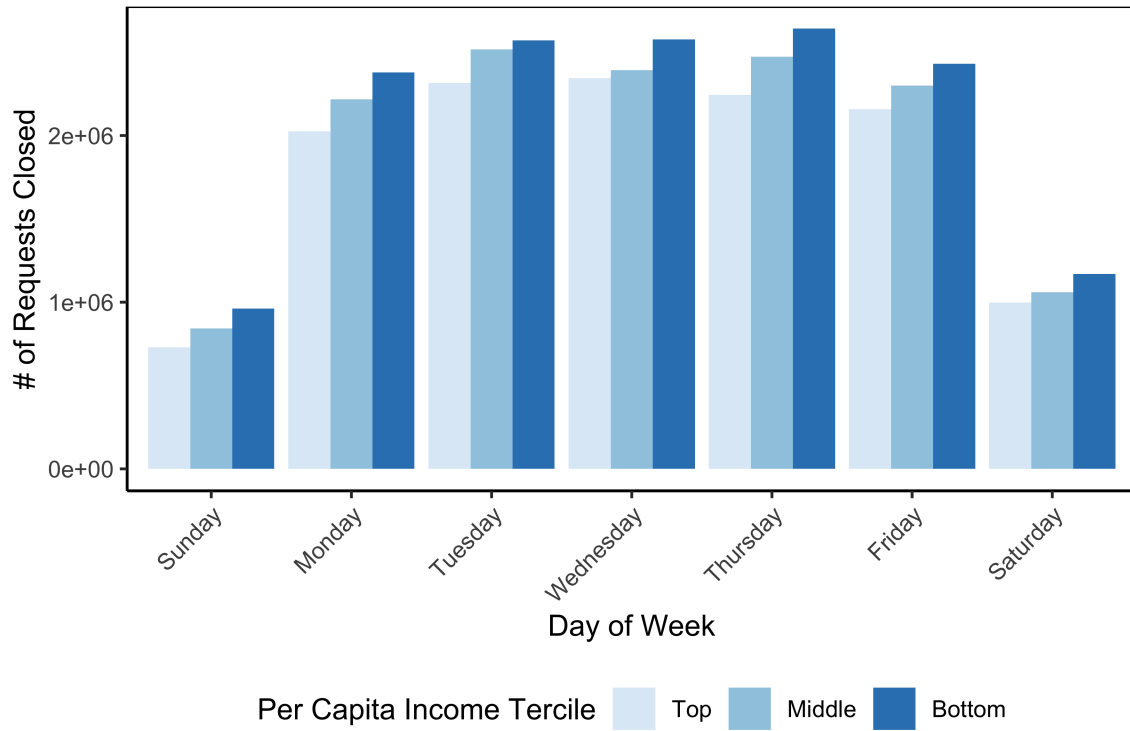


Figure A8: Clustering of Closing Dates by Day of Month and Neighborhood Race

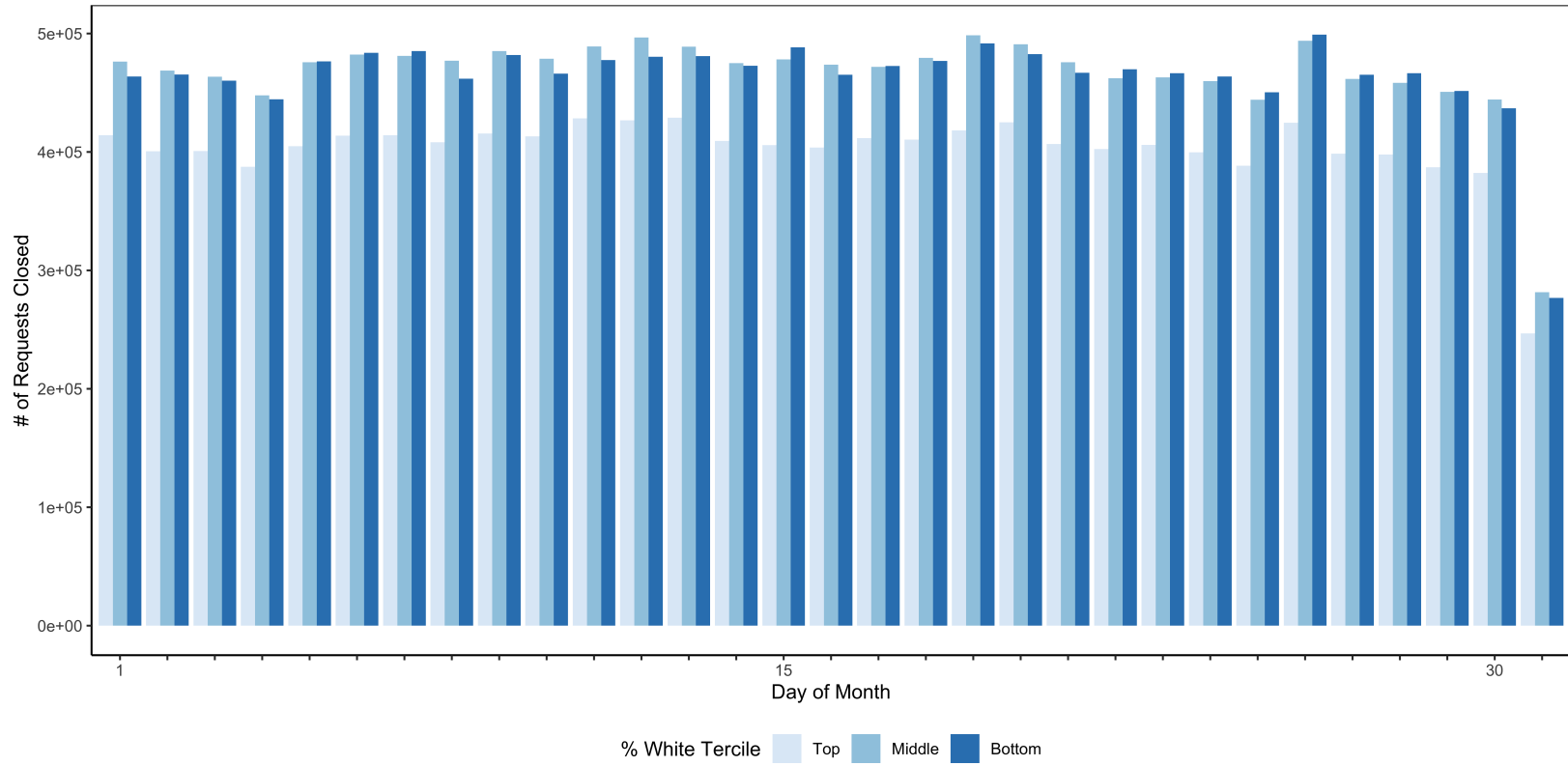


Figure A9: Clustering of Closing Dates by Day of Month and Neighborhood Income

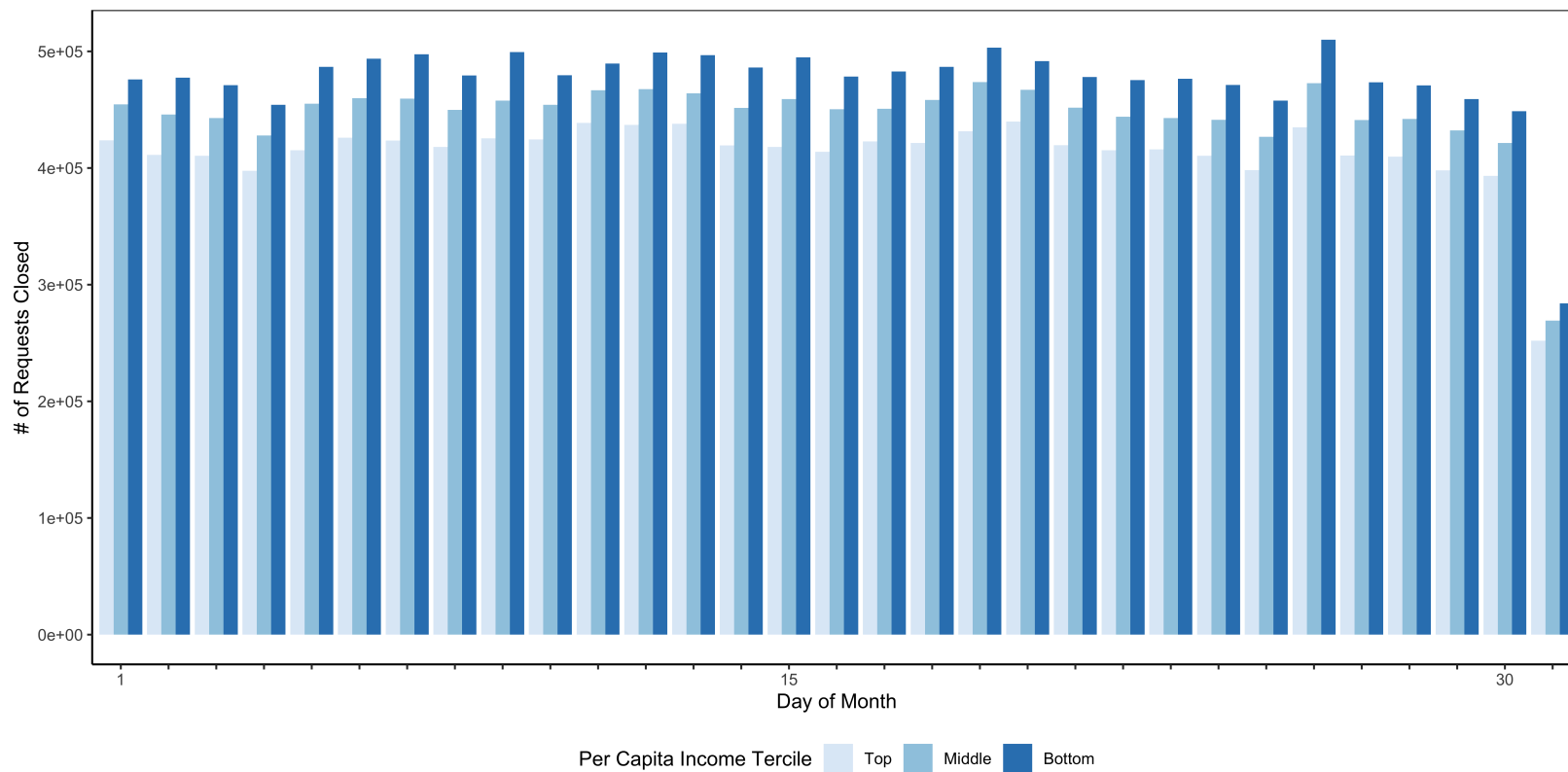


Table A1: **Effects of Neighborhood Race and Income on Wait Times: Controlling for Unmeasured Need**

	<i>DV: ln(Wait Time)</i>			
	<i>% White</i>		<i>Per Capita Income</i>	
	(1) Across	(2) Within	(3) Across	(4) Within
Middle	-0.025 <sup>+</sup> (0.014)	0.002 (0.004)	0.002 (0.013)	0.008* (0.004)
Bottom	0.052*** (0.013)	0.004 (0.003)	0.025 <sup>+</sup> (0.013)	-0.001 (0.003)
ln(City Center Distance)	0.021* (0.008)	0.009*** (0.002)	0.023** (0.008)	0.009*** (0.002)
ln(Pop. Dens.)	0.021** (0.007)	-0.016*** (0.002)	0.021** (0.007)	-0.015*** (0.002)
Walkability Index	-0.016*** (0.003)	0.002** (0.0006)	-0.017*** (0.003)	0.002** (0.0006)
City-Time FEs	✓		✓	
City-Service-Time FEs		✓		✓
Observations	41,107,325	41,107,040	41,106,792	41,106,507
R <sup>2</sup>	0.114	0.650	0.114	0.650

Notes: Time refers to month-year. Standard errors clustered by block group. <sup>+</sup>p<0.10; \*p<0.05; \*\*p<0.01; \*\*\*p<0.001

**Table A2: Effects of Neighborhood Race and Income on Expected Wait Times: Controlling for Unmeasured Need**

	<i>DV: ln(Expected Wait Time)</i>			
	<i>% White</i>		<i>Per Capita Income</i>	
	(1) Across	(2) Within	(3) Across	(4) Within
Middle	0.104*** (0.018)	-0.0007 (0.0010)	0.132*** (0.017)	0.002+ (0.0009)
Bottom	0.211*** (0.017)	-0.002* (0.0009)	0.210*** (0.018)	-0.0003 (0.0009)
ln(City Center Distance)	-0.031** (0.011)	$6.85 \times 10^{-5}$ (0.0006)	-0.035** (0.011)	0.0001 (0.0006)
ln(Pop. Dens.)	-0.0008 (0.013)	0.004*** (0.0006)	-0.007 (0.013)	0.004*** (0.0006)
Walkability Index	-0.004 (0.004)	$2.94 \times 10^{-5}$ (0.0002)	-0.006 (0.004)	0.0001 (0.0001)
City-Time FEs	✓		✓	
City-Service-Time FEs		✓		✓
Observations	14,437,586	14,437,585	14,437,054	14,437,053
R <sup>2</sup>	0.111	0.916	0.111	0.916

*Notes:* Time refers to month-year. Standard errors clustered by block group. +p<0.10; \*p<0.05; \*\*p<0.01; \*\*\*p<0.001

Table A3: Effects of Neighborhood Race and Income on Wait Times: Deciles

Decile	<i>DV: ln(Wait Time)</i>			
	<i>% White</i>		<i>Per Capita Income</i>	
	(1) Across	(2) Within	(3) Across	(4) Within
9th	0.016 (0.018)	0.003 (0.005)	0.047 (0.037)	0.020*** (0.005)
8th	0.041 (0.037)	0.009 <sup>+</sup> (0.005)	-0.019 (0.018)	0.034*** (0.006)
7th	-0.020 (0.018)	0.021*** (0.006)	0.025 (0.017)	0.036*** (0.006)
6th	-0.005 (0.019)	0.006 (0.007)	0.004 (0.018)	0.031*** (0.008)
5th	0.011 (0.018)	-0.002 (0.006)	0.041* (0.017)	0.029*** (0.005)
4th	0.038 <sup>+</sup> (0.019)	0.003 (0.005)	0.034 <sup>+</sup> (0.019)	0.014* (0.006)
3rd	0.065*** (0.019)	0.007 (0.005)	0.100*** (0.018)	0.018** (0.006)
2nd	0.066*** (0.019)	0.011* (0.005)	0.051** (0.020)	0.012* (0.006)
1st	0.164*** (0.020)	-0.004 (0.005)	0.021 (0.024)	0.009 (0.006)
City-Time FEs	✓		✓	
City-Service-Time FEs		✓		✓
Observations	41,111,241	41,110,956	41,110,708	41,110,423
R <sup>2</sup>	0.114	0.650	0.114	0.650

Notes: Time refers to month-year. Standard errors clustered by block group. <sup>+</sup>p<0.10; \*p<0.05; \*\*p<0.01; \*\*\*p<0.001

Table A4: Effects of Neighborhood Race and Income on Expected Wait Times: Deciles

Decile	<i>DV: ln(Expected Wait Time)</i>			
	<i>% White</i>		<i>Per Capita Income</i>	
	(1) Across	(2) Within	(3) Across	(4) Within
9th	0.029 (0.021)	-0.004* (0.002)	0.125* (0.056)	0.0002 (0.002)
8th	0.088 (0.057)	-0.003+ (0.002)	0.075*** (0.021)	-0.0009 (0.002)
7th	0.068*** (0.020)	-0.004** (0.002)	0.161*** (0.018)	-0.0007 (0.002)
6th	0.143*** (0.020)	-0.003 (0.002)	0.206*** (0.019)	0.003 (0.002)
5th	0.197*** (0.017)	-0.002 (0.002)	0.220*** (0.019)	0.0007 (0.002)
4th	0.212*** (0.020)	-0.002 (0.002)	0.241*** (0.018)	0.003 (0.002)
3rd	0.215*** (0.018)	-0.003+ (0.002)	0.291*** (0.018)	0.0004 (0.002)
2nd	0.265*** (0.018)	-0.005** (0.001)	0.290*** (0.019)	$8.29 \times 10^{-5}$ (0.002)
1st	0.323*** (0.018)	-0.004** (0.001)	0.304*** (0.024)	-0.003 (0.002)
City-Time FEs	✓		✓	
City-Service-Time FEs		✓		✓
Observations	14,437,586	14,437,585	14,437,054	14,437,053
R <sup>2</sup>	0.112	0.916	0.111	0.916

Notes: Time refers to month-year. Standard errors clustered by block group. +p<0.10; \*p<0.05; \*\*p<0.01; \*\*\*p<0.001

Table A5: **Effects of Neighborhood Race and Income on Wait Times: Top 10 City-Service Areas**

	<i>DV: ln(Wait Time)</i>			
	<i>% White</i>		<i>Per Capita Income</i>	
	(1) Across	(2) Within	(3) Across	(4) Within
Middle	0.052*** (0.013)	0.004 (0.005)	0.076*** (0.012)	0.007 (0.005)
Bottom	0.163*** (0.013)	0.005 (0.005)	0.112*** (0.014)	-0.009+ (0.005)
City-Time FEs	✓		✓	
City-Service-Time FEs		✓		✓
Observations	23,532,391	23,532,391	23,532,096	23,532,096
R <sup>2</sup>	0.163	0.624	0.162	0.624

Notes: Time refers to month-year. Standard errors clustered by block group. +p<0.10; \*\*\*p<0.001

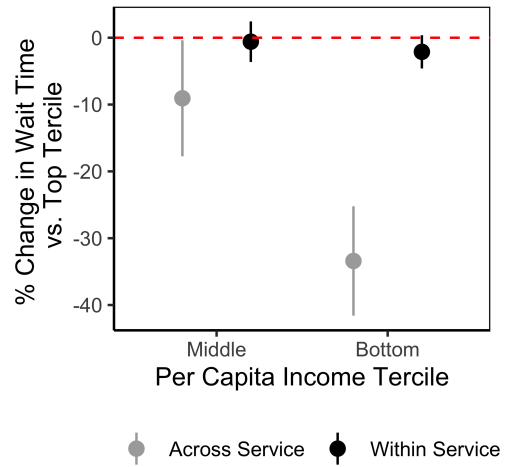
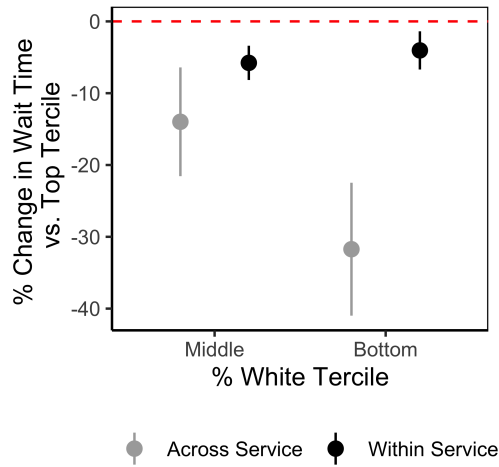


Table A6: **Effects of Neighborhood Race and Income on Expected Wait Times: Top 10 City-Service Areas**

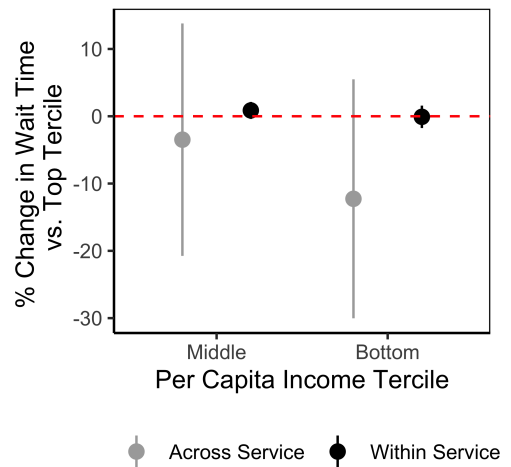
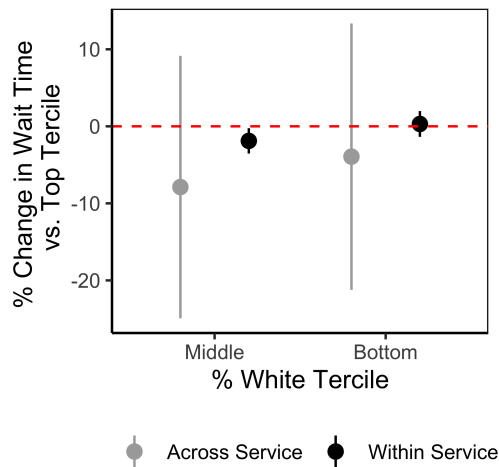
	<i>DV: ln(Expected Wait Time)</i>			
	<i>% White</i>		<i>Per Capita Income</i>	
	(1) Across	(2) Within	(3) Across	(4) Within
Middle	0.160*** (0.015)	-0.001 (0.002)	0.212*** (0.014)	0.003+ (0.001)
Bottom	0.327*** (0.015)	-0.003* (0.001)	0.323*** (0.015)	0.0008 (0.001)
City-Time FEs	✓		✓	
City-Service-Time FEs		✓		✓
Observations	7,873,783	7,873,783	7,873,488	7,873,488
R <sup>2</sup>	0.16415	0.88705	0.16428	0.88705

Notes: Time refers to month-year. Standard errors clustered by block group. +p<0.10; \*p<0.05; \*\*\*p<0.001

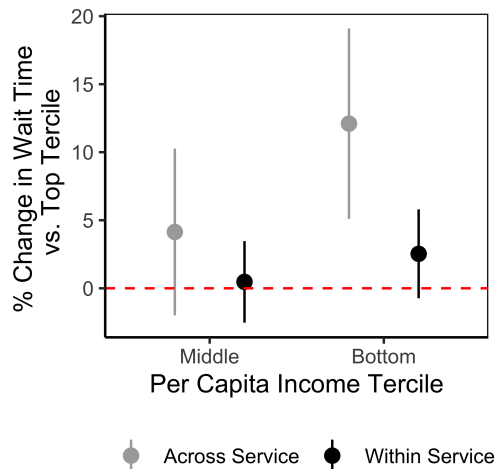
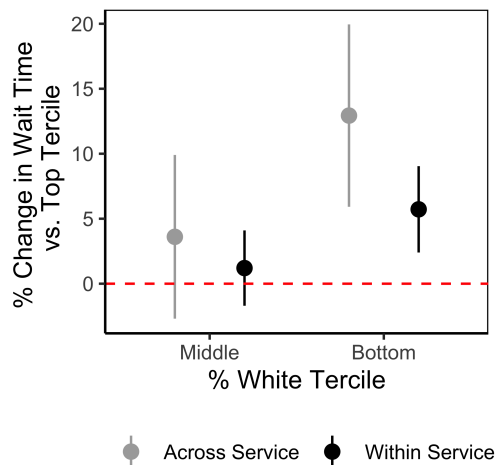
Figure A10: Effects of Neighborhood Race and Income on Wait Times: City-by-City



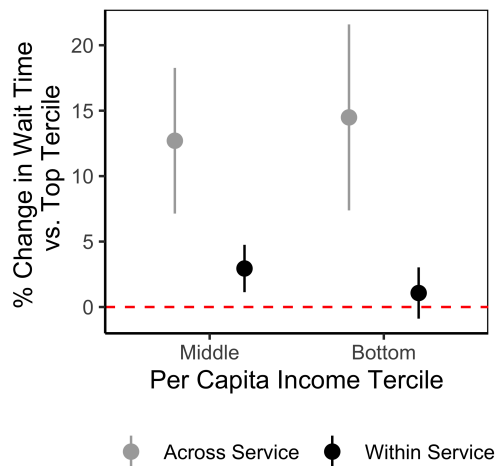
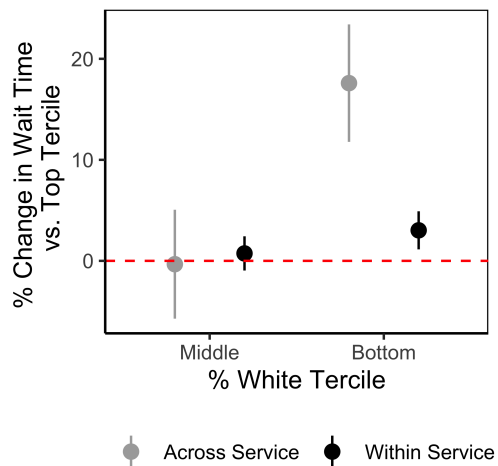
(a) Austin



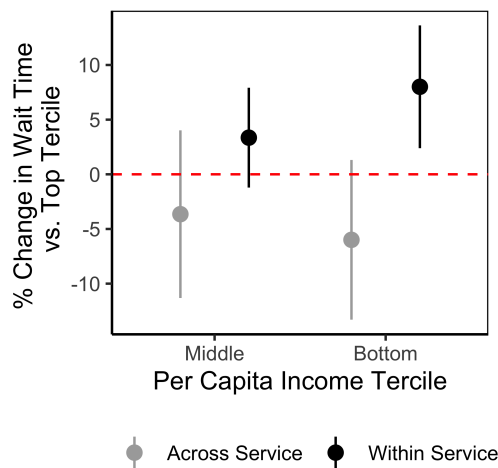
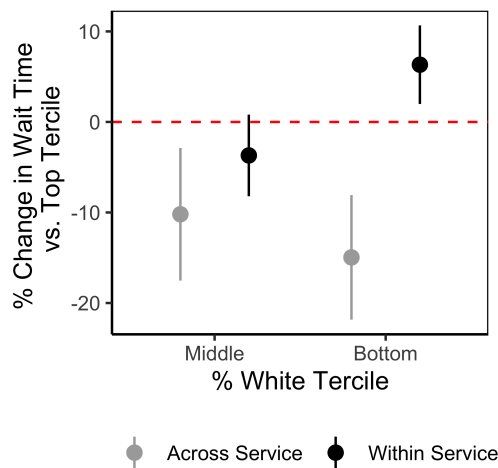
(b) Baltimore



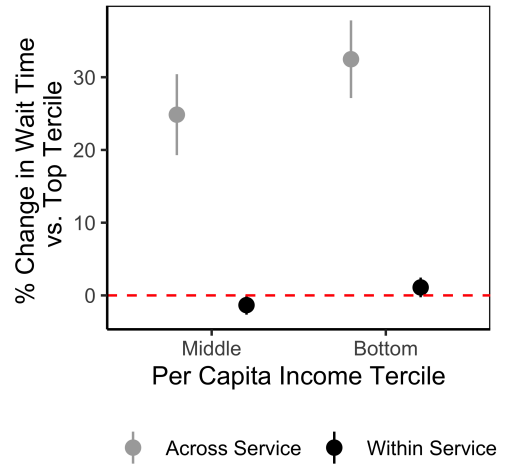
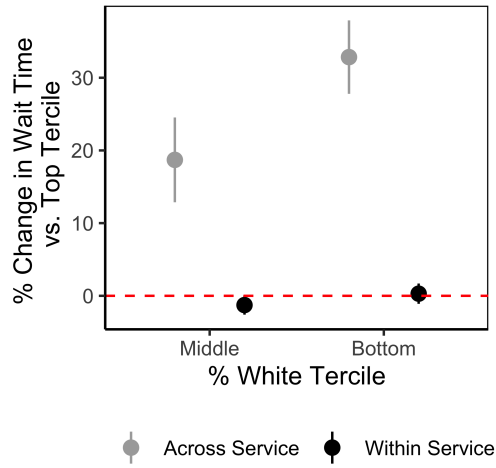
(c) Boston



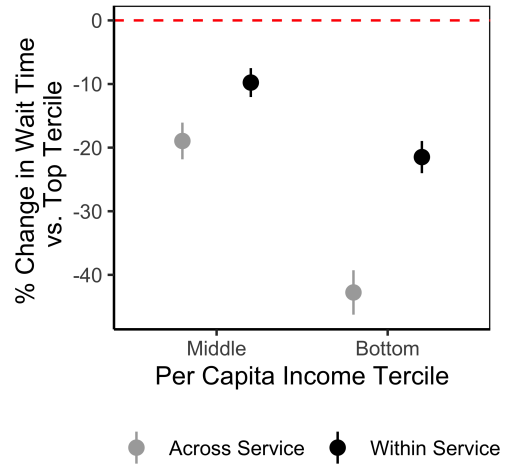
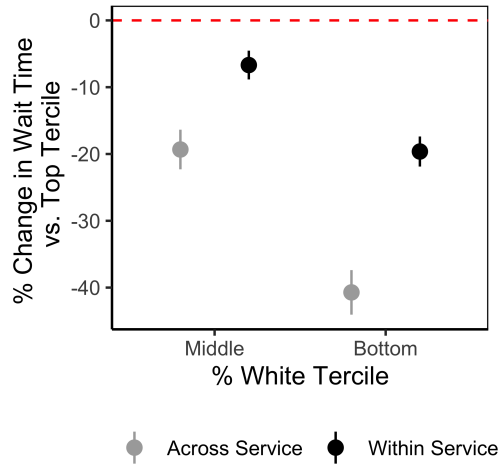
(d) Dallas



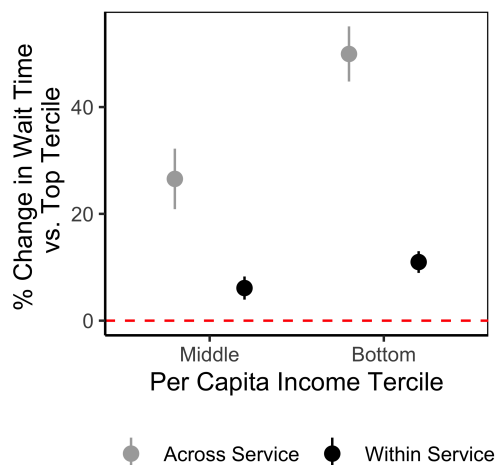
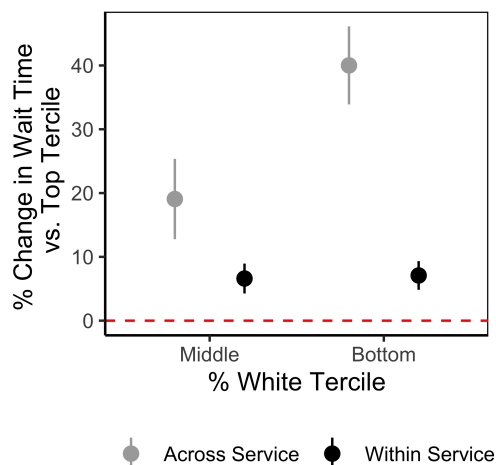
(e) Denver



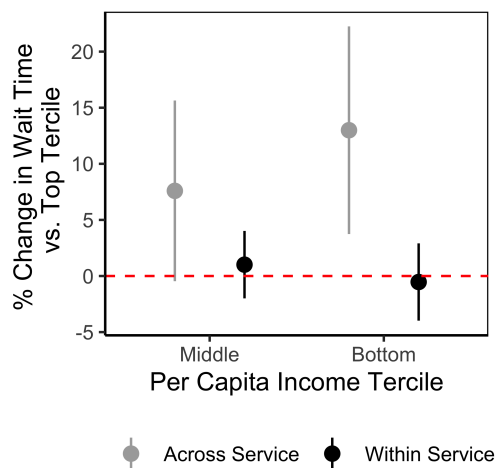
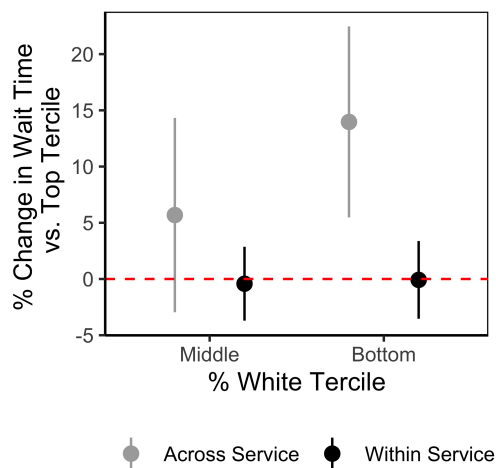
(f) Houston



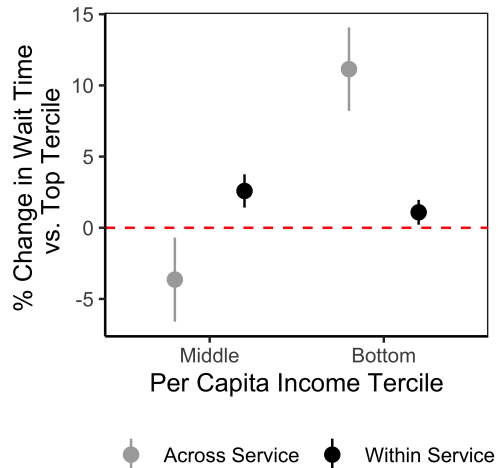
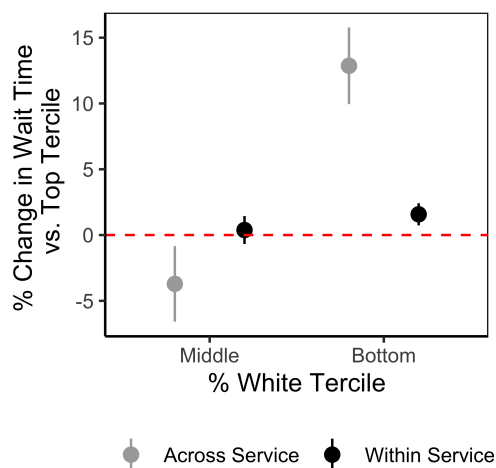
(g) Los Angeles



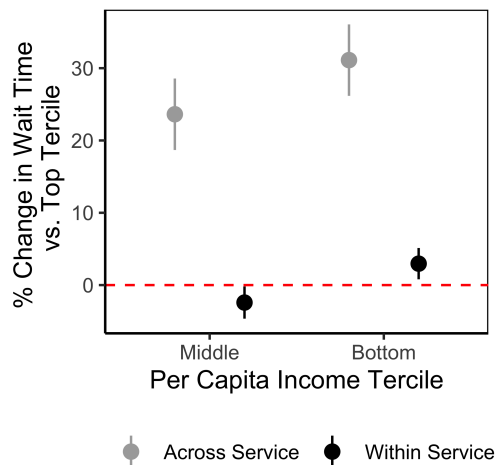
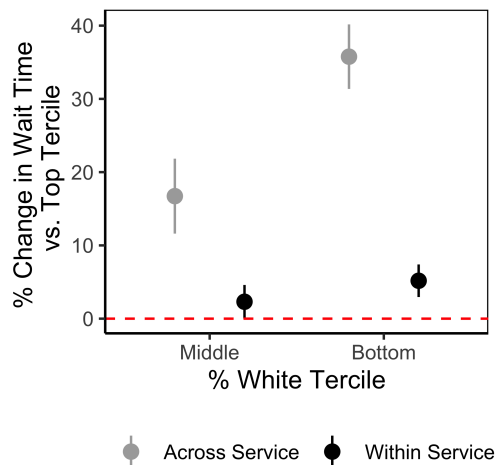
(h) Memphis



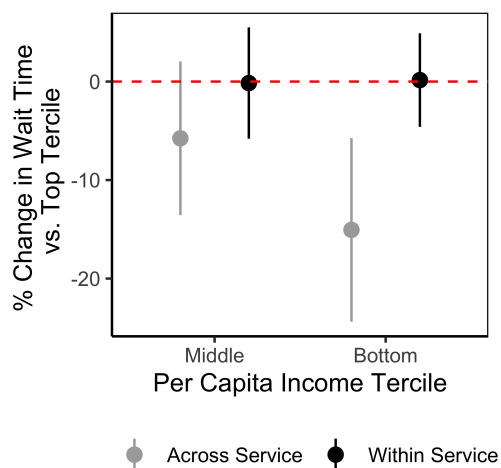
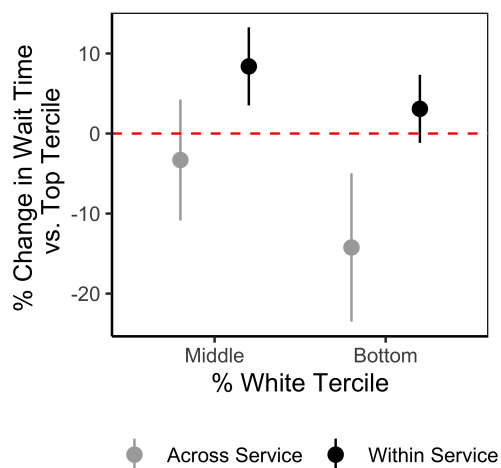
(i) Nashville



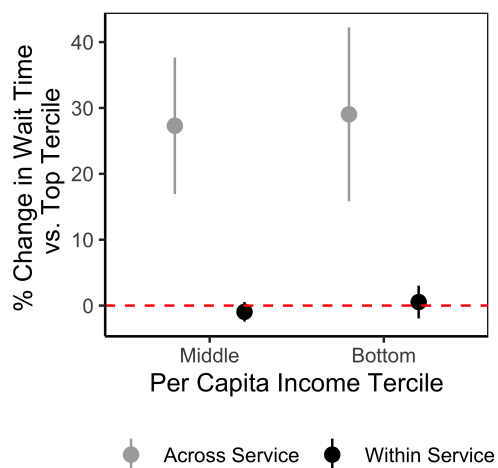
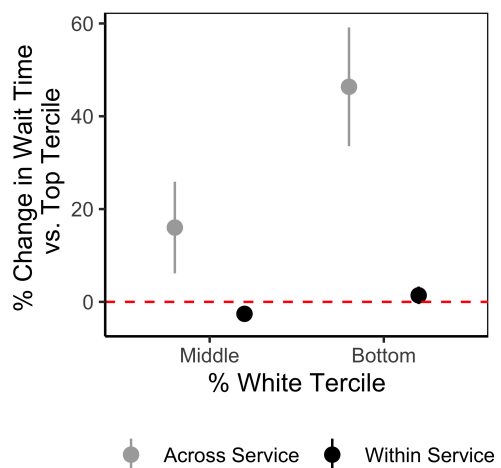
(j) New York



(k) Philadelphia

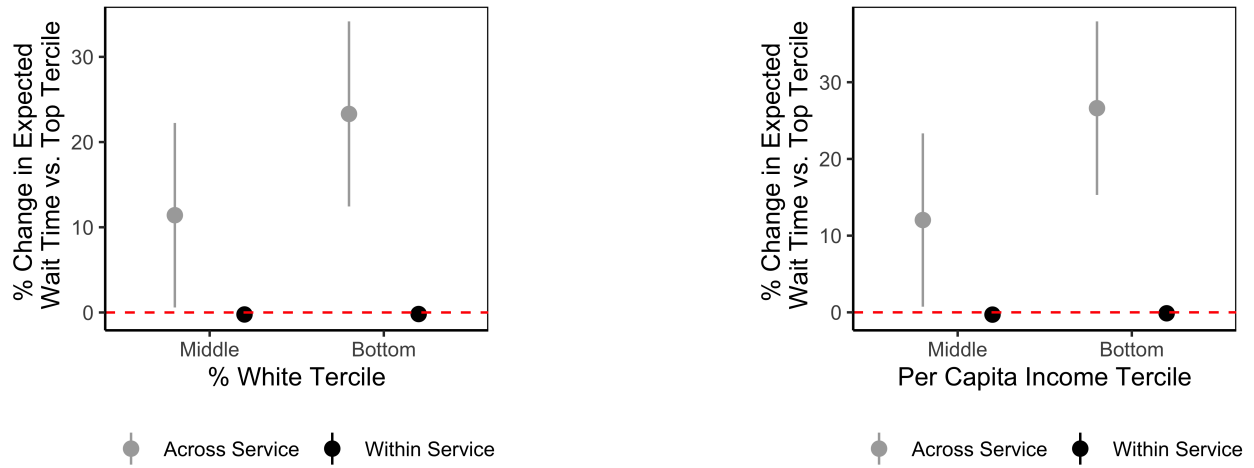


(l) San Francisco

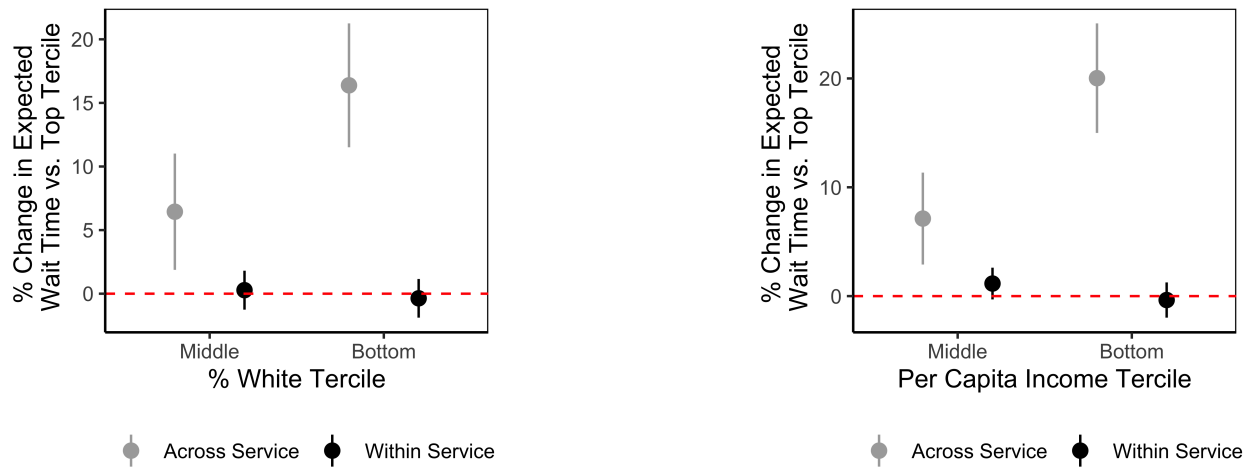


(m) Washington, DC

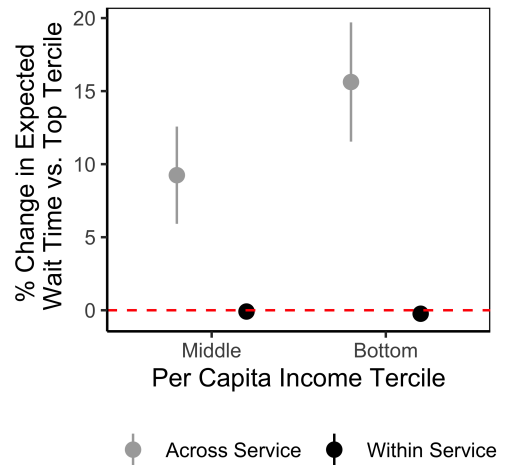
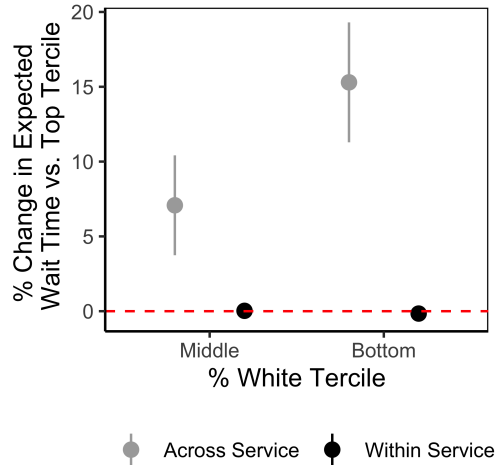
Figure A11: Effects of Neighborhood Race and Income on Expected Wait Times: City-by-City



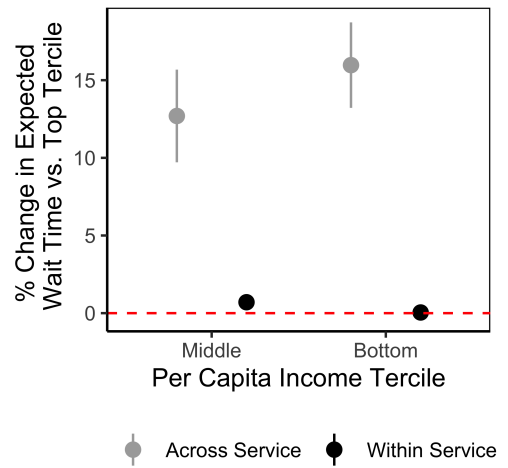
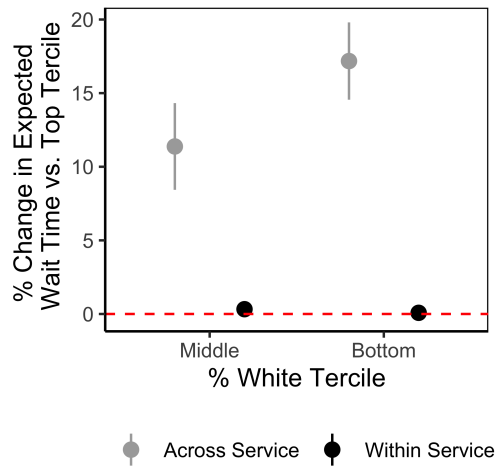
(a) Baltimore



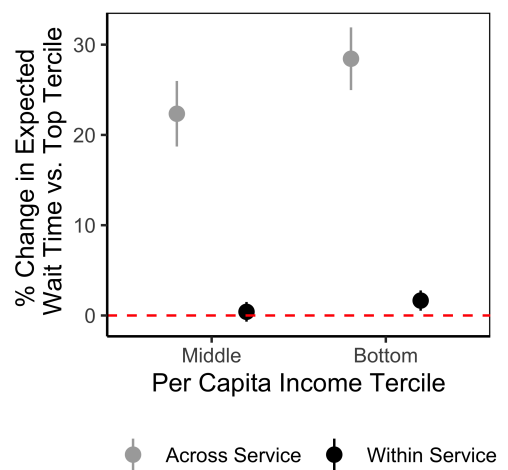
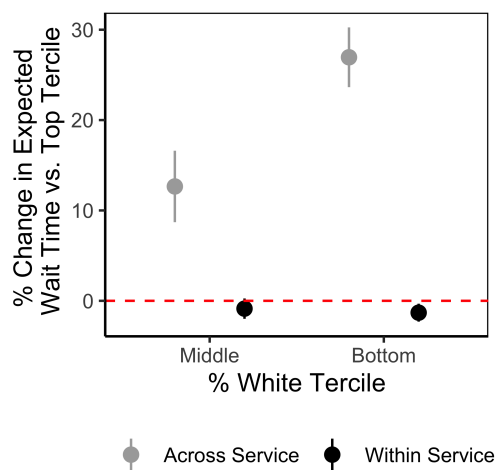
(b) Boston



(c) Dallas

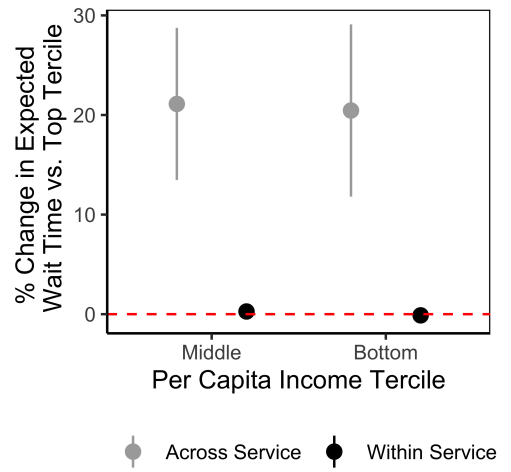
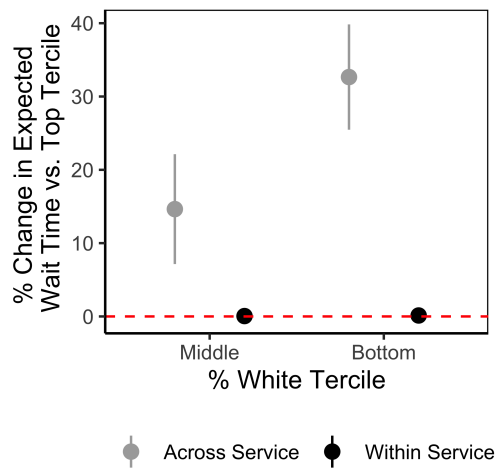


(d) Houston



(e) Philadelphia





(f) Washington, DC

Table A7: Effects of Neighborhood Race and Income on Wait Times: Week Fixed Effects

	<i>DV: ln(Wait Time)</i>			
	<i>% White</i>		<i>Per Capita Income</i>	
	(1) Across	(2) Within	(3) Across	(4) Within
Middle	-0.013 (0.014)	0.0004 (0.004)	0.015 (0.014)	0.007 <sup>+</sup> (0.004)
Bottom	0.075 <sup>***</sup> (0.015)	0.0009 (0.003)	0.048 <sup>**</sup> (0.015)	-0.006 <sup>+</sup> (0.003)
City-Time FEs	✓		✓	
City-Service-Time FEs		✓		✓
Observations	41,111,241	41,110,956	41,110,708	41,110,423
R <sup>2</sup>	0.117	0.661	0.116	0.661

Notes: Time refers to week. Standard errors clustered by block group. <sup>+</sup>p<0.10; <sup>\*\*</sup>p<0.01; <sup>\*\*\*</sup>p<0.001

**Table A8: Effects of Neighborhood Race and Income on Expected Wait Times: Week Fixed Effects**

	<i>DV: ln(Expected Wait Time)</i>			
	<i>% White</i>		<i>Per Capita Income</i>	
	(1) Across	(2) Within	(3) Across	(4) Within
Middle	0.110*** (0.021)	-0.0005 (0.0009)	0.135*** (0.021)	0.002* (0.0009)
Bottom	0.219*** (0.021)	-0.002+ (0.0009)	0.217*** (0.022)	0.0004 (0.0009)
City-Time FEs	✓		✓	
City-Service-Time FEs		✓		✓
Observations	14,437,586	14,437,585	14,437,054	14,437,053
R <sup>2</sup>	0.116	0.919	0.116	0.919

*Notes:* Time refers to week. Standard errors clustered by block group. +p<0.10; \*p<0.05; \*\*\*p<0.001

Table A9: **Effects of Neighborhood Race and Income on Wait Times: Date Fixed Effects**

	<i>DV: ln(Wait Time)</i>			
	<i>% White</i>		<i>Per Capita Income</i>	
	(1) Across	(2) Within	(3) Across	(4) Within
Middle	-0.005 (0.014)	0.004 (0.004)	0.018 (0.014)	0.009* (0.004)
Bottom	0.085*** (0.015)	0.006+ (0.003)	0.055*** (0.015)	-0.002 (0.003)
City-Time FEs	✓		✓	
City-Service-Time FEs		✓		✓
Observations	41,111,241	41,110,956	41,110,708	41,110,423
R <sup>2</sup>	0.133	0.691	0.133	0.691

*Notes:* Time refers to date. Standard errors clustered by block group. +p<0.10; \*p<0.05; \*\*\*p<0.001

Table A10: **Effects of Neighborhood Race and Income on Expected Wait Times: Date Fixed Effects**

	<i>DV: ln(Expected Wait Time)</i>			
	<i>% White</i>		<i>Per Capita Income</i>	
	(1) Across	(2) Within	(3) Across	(4) Within
Middle	0.107*** (0.021)	0.0005 (0.0008)	0.133*** (0.021)	0.002** (0.0008)
Bottom	0.215*** (0.021)	0.001+ (0.0008)	0.212*** (0.022)	0.003** (0.0009)
City-Time FEs	✓		✓	
City-Service-Time FEs		✓		✓
Observations	14,437,586	14,437,585	14,437,054	14,437,053
R <sup>2</sup>	0.128	0.933	0.128	0.933

Notes: Time refers to month-year. Standard errors clustered by block group. +p<0.10; \*p<0.05; \*\*p<0.01; \*\*\*p<0.001

Table A11: Effects of Changes in Lagged Differential Demand on Wait Times

	<i>DV: ln(Mean Wait Time)</i>				<i>DV: ln(Mean Expected Wait Time)</i>			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Non-White - White <sub>t-1</sub>	-0.0007 (0.001)				0.0008 (0.0009)			
Non-White Need <sub>t-1</sub>		0.016 (0.051)				0.029 (0.046)		
Poor - Rich <sub>t-1</sub>			0.0008 (0.001)				0.0006 (0.0009)	
Poor Need <sub>t-1</sub>				0.036 (0.050)				0.055 (0.038)
City-Service FEs	✓	✓	✓	✓	✓	✓	✓	✓
Time FEs	✓	✓	✓	✓	✓	✓	✓	✓
Observations	108,119	108,119	108,119	108,119	67,777	67,777	67,777	67,777
R <sup>2</sup>	0.858	0.858	0.858	0.858	0.764	0.764	0.764	0.764

Notes: Time refers to month-year. Standard errors clustered by city-service. Observations are weighted by the total number of calls.

Table A12: **Effects of Changes in Differential Demand by Year on Wait Times**

	<i>DV: ln(Mean Wait Time)</i>				<i>DV: ln(Mean Expected Wait Time)</i>			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Non-White - White	-0.003 (0.005)				0.005 (0.003)			
Non-White Need		0.072 (0.114)				0.135 (0.112)		
Poor - Rich			0.006 (0.006)				0.003 (0.003)	
Poor Need				0.016 (0.135)				0.022 (0.049)
City-Service FEs	✓	✓	✓	✓	✓	✓	✓	✓
Time FEs	✓	✓	✓	✓	✓	✓	✓	✓
Observations	12,120	12,120	12,120	12,120	7,578	7,578	7,578	7,578
R <sup>2</sup>	0.889	0.889	0.889	0.889	0.767	0.766	0.766	0.766

Notes: Time refers to year. Standard errors clustered by city-service. Observations are weighted by the total number of calls.

Table A13: **Effects of Lagged Differential Demand on Wait Times: Across Cities, Within Common Service**

	<i>DV: ln(Mean Wait Time)</i>				<i>DV: ln(Mean Expected Wait Time)</i>			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Non-White - White <sub>t-1</sub>	0.001 (0.002)				-0.0007 (0.003)			
Non-White Need <sub>t-1</sub>		-0.016 (0.075)				-0.098 (0.135)		
Poor - Rich <sub>t-1</sub>			0.002 (0.002)				-0.002 (0.003)	
Poor Need <sub>t-1</sub>				0.017 (0.088)				-0.129 (0.144)
Common Service-Time FEs	✓	✓	✓	✓	✓	✓	✓	✓
Observations	23,809	23,809	23,809	23,809	14,634	14,634	14,634	14,634
R <sup>2</sup>	0.602	0.601	0.603	0.601	0.648	0.652	0.649	0.654

Notes: Time refers to month-year. Standard errors clustered by city-common service. Observations are weighted by the total number of calls.