

DISCUSSION PAPER SERIES

IZA DP No. 11444

**Ambulance Utilization in New York City
after the Implementation of the
Affordable Care Act**

Charles Courtemanche
Andrew I. Friedson
Daniel I. Rees

MARCH 2018

DISCUSSION PAPER SERIES

IZA DP No. 11444

Ambulance Utilization in New York City after the Implementation of the Affordable Care Act

Charles Courtemanche

Georgia State University, NBER and IZA

Andrew I. Friedson

University of Colorado Denver

Daniel I. Rees

University of Colorado Denver and IZA

MARCH 2018

Any opinions expressed in this paper are those of the author(s) and not those of IZA. Research published in this series may include views on policy, but IZA takes no institutional policy positions. The IZA research network is committed to the IZA Guiding Principles of Research Integrity.

The IZA Institute of Labor Economics is an independent economic research institute that conducts research in labor economics and offers evidence-based policy advice on labor market issues. Supported by the Deutsche Post Foundation, IZA runs the world's largest network of economists, whose research aims to provide answers to the global labor market challenges of our time. Our key objective is to build bridges between academic research, policymakers and society.

IZA Discussion Papers often represent preliminary work and are circulated to encourage discussion. Citation of such a paper should account for its provisional character. A revised version may be available directly from the author.

ABSTRACT

Ambulance Utilization in New York City after the Implementation of the Affordable Care Act*

Expanding insurance coverage could, by insulating patients from having to pay full cost, encourage the utilization of arguably unnecessary medical services. It could also eliminate (or at least diminish) the need for emergency services through increasing access to preventive care. Using publicly available data from New York City for the period 2013-2016, we explore the effect of the Affordable Care Act (ACA) on the volume and composition of ambulance dispatches. Consistent with the argument that expanding insurance coverage encourages the utilization of unnecessary medical services, we find that, as compared to dispatches for more severe injuries, dispatches for minor injuries rose sharply after the implementation of the ACA. By contrast, dispatches for pre-labor pregnancy complications decreased as compared to dispatches for women in labor.

JEL Classification: I11, I13, I18

Keywords: Affordable Care Act, ambulance, emergency medical service, health insurance, moral hazard

Corresponding author:

Charles Courtemanche
Department of Economics
Andrew Young School of Policy Studies
Georgia State University
Atlanta
GA 30302-3992
USA

E-mail: ccourtemanche@gsu.edu

* We thank seminar participants at San Diego State University for their valuable feedback, and the NYC Open Data Help Desk for their excellent technical support.

1. Introduction

There is strong evidence dating back to the RAND Health Insurance Experiment that expanding health insurance coverage leads to increased health care utilization (Manning et al. 1987). For instance, shortly after qualifying for Medicare, individuals are more likely to be admitted to the hospital and more likely to have elective procedures (Card et al. 2008). Researchers have also documented increased health care utilization after state Medicaid expansions (Finkelstein et al. 2012), the 2006 Massachusetts universal coverage initiative (Miller 2012a), the 2010 dependent coverage expansion under the Affordable Care Act (Antwi et al. 2015), and the 2014 expansions of private and public coverage under the Affordable Care Act (Sommers et al. 2015; Wherry and Miller 2016).

These findings are of obvious importance to policymakers and healthcare experts, but there is also a great deal of interest in estimating the effect of insurance coverage on the use of avoidable and/or unnecessary medical services. This effect could, in theory, be either positive or negative. On the one hand, by insulating patients from having to pay full cost, expanding insurance coverage could encourage the utilization of these services (Arrow 1963). On the other hand, expanding coverage could increase access to preventative care, eliminating, or at least diminishing, the need for subsequent spending.

One potentially fruitful approach to testing whether insurance expansions encourage or discourage the use of avoidable/unnecessary medical care is to focus on emergency services. An increase in the use of emergency services following an insurance coverage expansion likely reflects *ex-post* moral hazard, while a reduction would be consistent with the hypothesis that newly insured individuals are receiving better preventive and/or curative care in office-based settings.

The current study examines changes in emergency medical service (EMS) dispatches in New York City after the implementation of the 2014 provisions of the Affordable Care Act (ACA). These provisions dramatically increased insurance coverage through a combination of insurance market reforms, mandates, subsidies, and Medicaid expansions that took effect in 2014 (Sommers et al. 2015; Courtemanche, Marton, et al. 2017; Frean et al. 2017, Courtemanche et al. 2018).¹ Previous studies provide evidence that emergency department utilization increased due to the randomized Oregon Medicaid expansion (Taubman et al. 2014), but fell after the 2006 Massachusetts reform, specifically among visit types that are preventable by primary care (Kolstad and Kowalski 2012; Miller 2012b). However, this is the first study to investigate whether the 2014 provisions of the ACA affected the use of emergency services, and the only study to examine the association between insurance expansions and the composition of EMS dispatches.

Detailed data on New York City EMS dispatches allow us to stratify by specific call codes used in the ambulance dispatches. These codes indicate the dispatcher's best assessment of the patient's diagnosis based on the information available at the time of ambulance dispatch and can be used to explore whether the ACA led to changes in the composition of EMS dispatches.

¹ The insurance market reforms included prohibitions on denying coverage or pricing based on health, aside from limited adjustments for age and smoking status. The mandates involved tax penalties for individuals without insurance coverage and large employers who do not provide it. The law expanded Medicaid to 138 percent of the Federal Poverty Line and subsidized private coverage via Marketplaces out to 400 percent, with the Medicaid expansion becoming optional for states after a Supreme Court decision. These provisions took effect in 2014 with the exception of partial early Medicaid expansions in some states. One potential concern with using data from New York City is that the New York state Medicaid program was already relatively generous prior to 2014. Nonetheless, health insurance coverage in New York state rose by two percentage points between 2013 and 2014, with half of this increase coming from Medicaid (Courtemanche et al. 2016), which is comparable to estimates of the increase in health insurance coverage for the country as a whole and suggestive of a "woodwork effect". In other words, it suggests that New Yorkers who were already eligible for Medicaid did not enroll in the program until the ACA took effect, perhaps because of outreach efforts or because of publicity surrounding the new law (Frean et al. 2017).

We begin our analysis by evaluating whether, relative to EMS dispatches for more severe injuries, EMS dispatches for minor injuries increased after the implementation of the ACA. Because EMS dispatches for minor injuries are difficult to justify on medical grounds, any such increase can be ascribed to *ex-post* moral hazard.² Graphical evidence and difference-in-differences regression results suggest that dispatches for minor injuries increased substantially after the implementation of the ACA, while dispatches for more severe injuries did not significantly deviate from their pre-treatment trend.

In the second half of our analysis, we focus on EMS dispatches for pre-labor pregnancy as compared to EMS dispatches for women in active labor. Unlike minor injuries, pregnancy complications are clearly linked to manageable health conditions such as depression, diabetes, high blood pressure, HIV and obesity (NIH 2010; ACOG 2012, 2015). Moreover, there is strong evidence that pregnant women who are covered by health insurance are more likely to seek prenatal care as compared to their counterparts who are not covered (Currie and Gruber 1996).³ Consistent with the preventive/curative care hypothesis, graphical evidence and difference-in-differences regression results suggest that dispatches for pre-labor pregnancy complications decreased immediately after the implementation of the ACA. By contrast, EMS dispatches for women in labor continued uninterrupted on their pre-treatment trend. This pattern of results

² Theoretically, EMS dispatches for minor injuries could go down because access to insurance also lowers the price of office-based care. However, the reduction in absolute price is much larger for ambulance services, which commonly cost up to \$2000 out-of-pocket (<https://www.howmuchisit.org/ambulance-ride-cost/>). For evidence that EMS dispatches for minor injuries are medically unnecessary, see, for instance, Smith et al. (2001). These authors showed that diverting nonurgent 911 calls to a telephone consulting nurse did not affect patient outcomes. See also Cooke et al. (2004), who reviewed the research on diverting patients away from emergency departments. Further, work by Moskatel and Slusky (2017) shows substitution from ambulances when ride sharing services enter a market, suggesting that the advanced care capabilities of ambulances are not needed for many ambulance dispatches.

³ Prior to the implementation of the ACA, fully 22 percent of women of childbearing age (i.e., ages 15-44) in the United States were uninsured (March of Dimes 2009). While women were more likely to qualify for Medicaid after becoming pregnant, there is strong evidence that the ACA increased coverage for pregnant women (Palmer 2018).

suggests that the effect of expanding insurance coverage on EMS dispatches can differ dramatically depending upon the type of medical emergency.

2. Data

EMS Incident Dispatch Data (EIDD) are a census of all ambulance dispatches in New York City collected by the New York City Fire Department and were obtained through the New York City Open Data portal.⁴ Under Local Law 11, passed in 2012, all public data collected by New York City must be made available through a single web portal.

Other municipalities and the federal government have taken steps to make the data they collect available to researchers and the public. For instance, under an executive order issued by the Obama administration on May 9, 2013, “the default state of new and modernized Government information resources shall be open and machine readable.”⁵ However, because current federal policy is based on an executive order, it could easily be amended or rescinded by the current or subsequent administrations, while the New York City data availability rules are written into law and cannot easily be changed from one administration to the next.

Ambulances in New York City use a computer system to track ambulance dispatches (as opposed to paper run-sheets), and EIDD contains detailed information about each incident, including dispatch time and locational information (aggregated to the zip code level before being made public so as to comply with HIPAA protections). EIDD are currently available for the period January 1, 2013 through July 30, 2016, allowing us to explore the short-term effects of the 2014 ACA provisions.

⁴ The New York City Open Data portal can be found at <https://opendata.cityofnewyork.us/>.

⁵ The Presidential Executive Order was issued on May 9, 2013, “Making Open and Machine Readable the New Default for Government Information”

In addition to time and location, the EIDD includes the initial “call code” for each dispatch. When someone calls 9-1-1 and reaches an EMS dispatcher in New York City, the dispatcher asks a series of questions to triage the call based on type and severity. The answers to these questions are fed into a computer algorithm (effectively a decision tree), which assigns a call type and associated severity.⁶ Although this designation is not an official diagnosis and does not necessarily reflect the actual condition of the patient, it can be thought of as a reasonably accurate assessment based on the information provided immediately prior to ambulance dispatch.⁷ Each call type has an associated severity code that ranges from 1 to 9, with 1 being the most severe and 9 being the least severe.

The EIDD contain 114 unique call codes, but the 10 most common call codes account for 76 percent of all dispatches, and the 25 most common codes account for 95 percent of all dispatches. Our interest is in whether and how the composition of call codes changed following the implementation of the ACA in January of 2014.

3. Graphical Evidence

Figure 1 plots percent changes in the volume of all EMS dispatches in New York City between January 1, 2013 and July 30, 2016 relative to the final quarter of 2013 (baseline), when New York City dispatched 308,000 ambulances. The vertical black line denotes the last quarter before the implementation of the ACA, which increased insurance coverage (due to the opening of the ACA exchanges and Medicaid expansion) and mandated that emergency services

⁶ All dispatchers in New York City are also trained Emergency Medical Technicians, and have the ability to override the algorithm’s triage designation based on their best medical judgement

⁷ This information comes from direct conversation with the OpenData Help Desk

(including ambulance rides) be covered by all health plans as an “essential health benefit.”⁸ The volume of ambulance dispatches grew steadily after the implementation of the ACA, with some seasonal variation. The volume of EMS dispatches reached a high of 357,856 in the 3rd quarter of 2015, or an increase of 15 percent relative to baseline.

Although interesting, it is difficult to ascertain how much (if any) of this increase in total EMS dispatches was due to the ACA and how much was due to other factors such as population growth and economic activity. We begin our exploration of this question in Figure 2, which compares EMS dispatches for minor injuries (which are clearly subject to *ex-post* moral hazard), to dispatches for other types of injuries (which are presumably less subject to *ex-post* moral hazard). By making this comparison, we are, in effect, removing any underlying trends common to both types of injuries. Again, percent changes in dispatch volumes relative to the final quarter of 2013 (i.e., baseline) are shown.⁹

Utilization of ambulances for minor injuries followed the same general trend as other injuries prior to the implementation of the ACA. Then, in the 1st quarter of 2014, the two trends diverged, with minor injuries becoming relatively more frequent. By the 2nd quarter of 2015, there was a 150 percent increase in dispatches for minor injuries relative to baseline. Although we cannot discern which of these dispatches were medically unnecessary, it is reasonable to speculate that much of this increase was the result of *ex-post* moral hazard given that more severe injuries exhibited no upward trend whatsoever.

⁸These benefits are defined in Section 103(b) of the Affordable Care Act.

⁹ Minor injuries are coded as a 7 on the EIDD severity scale, major injuries are coded as a 3 on this scale, and injuries that are neither minor nor major (simply designated as “injuries” by the EIDD) are coded as a 5. Together, these three types of EMS dispatches comprised 16.7 percent of total EMS dispatches in New York City during the period under study.

In Figure 3, we compare percent changes relative to baseline in the volume of EMS dispatches for two pregnancy-related emergencies: active labor and pre-labor obstetric complication.¹⁰ During the period under study, dispatches for these two types of emergencies comprised 0.9 percent of total EMS dispatches in New York City. Although the EIDD does not disclose what specific medical conditions are included in the obstetric complication category, a recent analysis of pregnancy-related EMS transports suggests that these cases are most likely vaginal bleeding, ruptured membranes, ectopic pregnancy, and pregnancy-related hypertension (McLelland et al. 2016), which can often be treated by a woman’s primary care provider or avoided through proper case management (American College of Obstetricians and Gynecologists 2013, 2014), eliminating, or at least reducing, the need for EMS transport.

The volume of dispatches for women in labor held relatively stable over the observed period, with a slight downward trend beginning roughly a year after the ACA came into effect. By contrast, dispatches for pregnancy complications followed a very different pattern: specifically, there was a decrease in dispatches for pregnancy complications beginning the quarter before implementation, which became more pronounced after implementation. This “pre-treatment” decrease in dispatches for pregnancy complications is consistent with evidence that health insurance coverage also began to rise in the 4th quarter of 2013, at least in Medicaid expansion states (Long et al. 2014).¹¹ Within three months after implementation, dispatches for pregnancy complications had fallen by over 40 percent, and within 6 months they had fallen by

¹⁰ Active labor is coded as a 5 on the EIDD severity scale and denotes a woman in active labor requesting medical transport. Obstetrical complications do not include miscarriages and are coded as a 2 on the EIDD severity scale.

¹¹ Specifically, Long et al. (2014) found that, in Medicaid expansion states, the uninsured rate dropped from 16% in the 3rd quarter of 2013 to 15% in the 4th quarter of 2013 (and to 12% in the 1st quarter of 2014). This decrease in the uninsured rates did not occur in states that did not to expand their Medicaid programs, and could have been due to pre-implementation outreach efforts and individuals realizing that they were already eligible for Medicaid and did not have to wait until January 1, 2014 to sign up.

over 60 percent. After 6 months, the volume of dispatches for pregnancy complications held steady (at a little under 500 per quarter), with perhaps a slight downward trend. The fact that much of the reduction in EMS dispatches for pregnancy complications occurred so rapidly after the ACA came into effect suggests that it was driven by already pregnant women receiving better prenatal care and better treatment for preexisting chronic health conditions such as diabetes, high blood pressure, and HIV.

4. Difference-in-Differences Regression Strategy

In this section, we turn our attention to producing more rigorous estimates of the effects of the ACA on the composition of EMS dispatches. Specifically, using a difference-in-differences regression design, we compare the volume of dispatches for minor as compared to more severe injuries before and after the implementation of the ACA. Because the dependent variable is a count, we estimate baseline Poisson regression models of the form:

$$\ln \lambda_{czmy} = \beta_0 + \beta_1(Minor_c * Post_y) + \beta_2 Minor_c + \beta_3 Post_y, \quad (1)$$

where λ_{czmy} represents the expected number of dispatches for call type c , in dispatch zone z , month m , and year y .¹² $Minor_c$ is an indicator that distinguishes between dispatches for minor

¹² When a 9-1-1 call is received, it is first handled by a Police Communications Technician, who determines the nature of the call, and then hands it off to an appropriate dispatcher: police, fire or EMS. The city is divided into separate EMS dispatch zones, each with its own ambulance fleet (See NYC's "Anatomy of a 9-1-1 call for more detail: <http://www.nyc.gov/html/911reporting/html/anatomy/call.shtml>). Given that there are 2 possible call types, 31 dispatch zones in New York City and 42 months of data, each regression has 2,604 observations (2 x 31 x 42 = 2,604). As noted by Card and Dahl (2011), an advantage of the Poisson regression model is that including fixed effects does not lead to an incidental parameters problem. Table A1 provides descriptive statistics for the variables used in the analysis.

injury and dispatches for more severe injuries. $Minor_c * Post_y$ is the interaction of $Minor_c$ and an indicator for calls made in 2014, 2015 or 2016. Our coefficient of interest, β_1 , is the difference-in-differences estimator. It represents the pre- vs. post-ACA change in expected dispatches for minor injuries as compared to more severe injuries.

We also report Poisson estimates of the following regression model:

$$\ln \lambda_{czmy} = \alpha_0 + \alpha_1(Complication_c * Post_y) + \alpha_2 Complication_c + \alpha_3 Post_y, \quad (2)$$

where λ_{czmy} again represents the expected number of dispatches for call type c , in dispatch zone z , month m , and year y . In this model, however, call type is either pre-labor pregnancy complication or woman in active labor.¹³ $Complication_c$ is an indicator that distinguishes between these two types of dispatches, and $Complication_c * Post_y$ is the interaction of $Complication_c$ and an indicator for calls made in 2014, 2015 or 2016. Our coefficient of interest, α_1 , represents the pre- vs. post-ACA change in expected dispatches for pregnancy complications as compared to women in active labor. Because both types of dispatches involve a pregnant woman, the difference-in-differences estimator accounts for the influence of unobserved shocks to the local pregnancy rate. Moreover, to the extent that *ex-post* moral hazard manifests in both EMS dispatches for pre-labor pregnancy complications and EMS dispatches for women in labor, it isolates the effect of better prenatal care and treatment for preexisting chronic health conditions.

¹³ Again, given that there are 2 possible call types, 31 dispatch zones in New York City and 42 months of data, each regression has 2,604 observations ($2 \times 31 \times 42 = 2,604$).

4.1. Difference-in-Differences Regression Results

Poisson estimates of equations (1) and (2) are reported in Table 1. Standard errors are in parentheses and are adjusted for clustering at the call type-zone level. In general, the Poisson estimates reported in Table 1 are consistent with the graphical evidence described in the preceding section.

In the first column of Table 1, we report baseline estimates of equation (1). The estimate of β_1 , is 0.46, which suggests that, as compared to dispatches for more severe injuries, dispatches for minor injuries increased by 58 percent ($e^{.46} - 1 = .584$) after the implementation of the ACA. By contrast, the estimate of β_3 , is .01, which suggests that the volume of dispatches for more severe injuries did not appreciably change after the implementation of the ACA.

In column (2) of Table 1, we augment the baseline model by controlling for pre-treatment dispatch trends by call type.¹⁴ The estimates of β_1 are remarkably robust to this modification, lending support to the argument that they reflect *ex-post* moral hazard. Specifically, even controlling for pre-treatment trends in dispatch counts by call type we find that, relative to dispatches for other types of injuries, dispatches for minor injuries increased by 60 percent after the implementation of the ACA.

In the remaining columns of Table 2, we turn our attention to pregnancy-related dispatches. The estimate of α_1 in column (3) is -.97, which suggests that, as compared to active labor dispatches, EMS dispatches for pre-labor complications fell by 62 percent ($e^{-.97} - 1 = -.621$)

¹⁴ With the pre-treatment trends in dispatch counts by call type, the estimating equation becomes:

$$\ln \lambda_{czymy} = \beta_0 + \beta_1(\text{Minor}_c * \text{Post}_y) + \beta_2 \text{Minor}_c + \beta_3 \text{Post}_y + \hat{Z}_{czymy}$$

where \hat{Z}_{zymy} comes from Poisson models in which monthly dispatches by call type are regressed on dispatch zone indicators and a linear trend using only pre-ACA data. \hat{Z}_{zymy} is the predicted count of dispatches for each call type-zone-month. In other words, these predictions are from the pre-treatment dispatch trend projected into the post-treatment period. See Repetto (2018) for further description of this approach.

after the implementation of the ACA. The estimate of α_3 is -0.13, which suggests that dispatches for women in active labor decreased after the implementation of the ACA by 12 percent ($e^{-.13} - 1 = -.122$). This decrease in EMS dispatches for active labor, although much smaller than the decrease we observe for pregnancy complications, is statistically significant at conventional levels and suggests that the ACA may have slightly reduced the demand for emergency services among women in active labor. When equation (2) is augmented with pre-treatment time trends, we find that EMS dispatches for pre-labor complications fell by 71 percent ($e^{-1.24} - 1 = -.711$) relative to active labor dispatches after the implementation of the ACA in 2014.¹⁵

4.2. Event-Study Analyses

As a final robustness check, we conduct an event-time analysis, which allows us to explore pre-treatment trends by call type and whether the effect of the ACA gained strength over time. Specifically, we replace the interaction of *Minor* and *Post* in equation (1) with a series of its leads and lags, tracing out the evolution of minor vs. more severe injury dispatches during the period under study and allowing us to test the parallel trends assumption.

Figure 4 plots the event-time coefficients for each quarter as well as a 95 percent confidence interval around each coefficient. It provides some evidence, albeit tentative, that minor injuries were falling relative to more severe injuries prior to the implementation of the ACA. However, immediately after implementation, minor injury dispatches began to increase. By the 2nd quarter of 2015, we observe an 84% increase in minor vs. more severe injuries relative

¹⁵ In Appendix Tables 1 and 2, we provide OLS and Negative Binomial estimates of equations (1) and (2). The results are qualitatively similar to those reported in Table 1.

to the 4th quarter of 2013 (baseline), which is consistent with evidence that coverage gains from the ACA grew considerably in 2015 (Courtemanche et al. 2018).

In Figure 5, we plot the event-time coefficients for pregnancy complication vs. active labor dispatches. These two types of dispatches appear to have been on similar trends through the 3rd quarter of 2013. Beginning in the 4th quarter of 2013, there was a pronounced decrease in dispatches for pregnancy complications relative to active labor dispatches, which is consistent with evidence that health insurance coverage in Medicaid expansion states also began to rise in the 4th quarter of 2013 (Long et al. 2014). The decrease in dispatches for pregnancy complications gained momentum after the official implementation of the ACA, and by the 4th quarter of 2014 there was a 71 percent decrease in pregnancy complication calls relative to active labor calls. After the 4th quarter of 2014, dispatches for pregnancy complication calls began to increase relative to active labor calls, albeit modestly.

5. Conclusion

Uniquely detailed data from New York City allow us to examine two valuable case studies of how utilization of EMS services responded to the ACA's large-scale expansion of health insurance coverage. The policy implications are mixed. To the extent that unnecessary care grew relative to similar but more essential types of care (such as minor injury dispatches relative to other injuries documented above), the ACA seems to have had the unintended effect of increasing medical spending on the so-called "flat of the curve," i.e. spending with dubious medical value. This growth in utilization could also have the further unintended effect of creating ambulance system congestion if the increased utilization pushed the ambulance system past its capacity (Courtemanche, Friedson et al. 2017). By contrast, our analysis of pregnancy-

related dispatches illustrates that coverage expansions do not always increase avoidable emergency spending. Moral hazard can be offset by improving access to preventive services and providing better care for chronic conditions.

While previous studies have examined how the use of emergency services responds to coverage expansions, this literature has focused almost entirely on emergency room (ER) visits. We offer a different perspective by using novel data to study ambulance utilization. Our results indicate that the same forces that influence ER use are also at work in the decision to call for an ambulance. Our finding of increased dispatches for minor injuries echoes Taubman et al.'s (2014) result that ER use rose among winners of the Oregon Medicaid lottery, while our finding of reduced dispatches for pregnancy complications are consistent with the declines in ER visits for preventable conditions observed after the Massachusetts reform (Kolstad and Kowalski 2012; Miller 2012b).

For EMS providers, our results suggest that the optimal response to changing utilization patterns will depend on the pre-policy case mix. The nuanced changes in New York City dispatch patterns following the insurance coverage expansion under the ACA highlights the value of providing easy-to-access public data at the municipal level. Such data will make the task of responding to future policies considerably easier, allowing for flexible local responses to each unique case mix and situation.

References

- Akosa Antwi, Yaa., Asako Moriya, and Kosali Simon. 2015. "Access to health insurance and the use of inpatient medical care: Evidence from the Affordable Care Act young adult mandate." *Journal of Health Economics*, 39: 171–87.
- American College of Obstetricians and Gynecologists. 2012. "HIV and Pregnancy" (FAQ113). Available at: <http://www.acog.org/~media/For%20Patients/faq113.pdf?dmc=1&ts=20120730T1640322605>
- American College of Obstetricians and Gynecologists. 2013. "Gestational Diabetes" (FAQ117). Available at: <https://www.acog.org/Patients/FAQs/Gestational-Diabetes>
- American College of Obstetricians and Gynecologists. 2014. "Preeclampsia and High Blood Pressure During Pregnancy" (FAQ034). Available at: <https://www.acog.org/~media/For%20Patients/faq034.pdf?dmc=1&ts=20120730T1500377195>
- American College of Obstetricians and Gynecologists. 2015. "Obesity in Pregnancy." *Obstetrics and Gynecology*, 126(6), 112–126.
- Arrow, Kenneth. 1963. "Uncertainty and the Welfare Economics of Medical Care." *American Economic Review*, 53(5): 941-973.
- Card, David and Gordon Dahl. 2011. "Family Violence and Football: The Effect of Unexpected Emotional Cues on Violent Behavior." *Quarterly Journal of Economics*, 126(1): 103-143.
- Card, David, Carlos Dobkin, and Nicole Maestas. 2008. "The Impact of Nearly Universal Insurance Coverage on Health Care Utilization: Evidence from Medicare." *American Economic Review*, 98(5): 2242-2258.
- Cooke, Matthew, Joanne Fisher, Jeremy Dale, Eileen McLeod, Ala Szczepura, Paul Walley, and Sue Wilson. 2004. *Reducing Attendances and Waits in Emergency Departments. A Systematic Review of Present Innovations*. London: National Co-ordinating Centre for NHS Service Delivery and Organisation R & D (NCCSDO).
- Courtemanche, Charles, Andrew Friedson, Andrew Koeller, and Daniel I. Rees. 2017. "The Affordable Care Act and Ambulance Response Times." NBER Working Paper No. 23722.
- Courtemanche, Charles, James Marton, and Aaron Yelowitz. 2016. "Who Gains Insurance Coverage in 2014, the First Year of Full ACA Implementation?" *Health Economics*, 25: 778-784.
- Courtemanche, Charles, James Marton, Benjamin Ukert, Aaron Yelowitz, and Daniela Zapata. 2017. "Early impacts of the Affordable Care Act on Health Insurance Coverage in Medicaid Expansion and Non-Expansion States." *Journal of Policy Analysis and Management*, 36(1): 178–210.

Courtemanche, Charles, James Marton, Benjamin Ukert, Aaron Yelowitz, and Daniela Zapata. 2018. "Early Effects of the Affordable Care Act on Health Care Access, Risky Health Behaviors, and Self-Assessed Health." *Southern Economic Journal*, 84(3): 660-691.

Currie, Janet and Jonathan Gruber. 1996. "Saving Babies: The Efficacy and Cost of Recent Changes in the Medicaid Eligibility of Pregnant Women." *Journal of Political Economy*, 104(6): 1263-1296.

Finkelstein, Amy, Sarah Taubman, Bill Wright, Mira Bernstein, Jonathan Gruber, Joseph P. Newhouse, Heidi Allen, Katherine Baicker, and the Oregon Health Study Group. 2012. "The Oregon Health Insurance Experiment: Evidence from the First Year." *Quarterly Journal of Economics*, 127(3):1057–1106.

Frean, Molly, Jonathan Gruber, and Benjamin Sommers. 2017. "Premium Subsidies, the Mandate, and Medicaid Expansion: Coverage Effects of the Affordable Care Act." *Journal of Health Economics*, 53: 72-86.

Kolstad, Jonathan T. and Amanda E. Kowalski. 2012. "The Impact of Health Care Reform on Hospital and Preventive Care: Evidence from Massachusetts." *Journal of Public Economics*, 96 (11-12): 909-929.

Long, Sharon K., Michael Karpman, Adele Shartzter, Douglas Wissoker, Genevieve M. Kenney, Stephen Zuckerman, Nathaniel Anderson, and Katherine Hempstead. 2014. "Taking Stock: Health Insurance Coverage under the ACA as of September 2014." Urban Institute Health Reform Monitoring Survey, available <http://hrms.urban.org/briefs/Health-Insurance-Coverage-under-the-ACA-as-of-September-2014.html?version=meter+at+null&module=meter-Links&pgtype=article&contentId=&mediaId=&referrer=&priority=true&action=click&contentCollection=meter-links-click>.

Manning, Willard G., Joseph P. Newhouse, Naihua Duan, Emmett B. Keeler, Bernadette Benjamin, Arleen Leibowitz, M. Susan Marquis, and Jack Zwanziger. 1987. "Health Insurance and the Demand for Medical Care: Evidence from a Randomized Experiment." *American Economic Review*, 77(3): 251-77.

March of Dimes. 2009. *Census Data on Uninsured Women and Children*. Available at: https://www.marchofdimes.org/chapterassets/files/Uninsured_Highlights09.pdf

McLelland, Gayle, Lisa McKenna, Ameer Morgans, and Karen Smith. 2016. "Antenatal Emergency Care Provided by Paramedics: A One-Year Clinical Profile." *Prehospital Emergency Care*, 20(4): 531-538.

Moskatel, Leon S., and David J.G. Slusky. 2017. "Did UberX Reduce Ambulance Volume?" Working Paper Series in Theoretical and Applied Economics No. 201708.

Miller, Sarah. 2012a. "The Effect of the Massachusetts Reform on Health Care Utilization." *Inquiry*, 49(4): 317-326.

Miller, Sarah. 2012b. "The Effect of Insurance on Emergency Room Visits: An Analysis of the 2006 Massachusetts Health Reform." *Journal of Public Economics*, 96 (11-12): 893–908.

National Institutes of Health (NIH). 2010. *Risk of Newborn Heart Defects Increases with Maternal Obesity* [news release]. Available at: <http://www.nih.gov/news/health/apr2010/nichd-07.htm>

Palmer, Makayla. 2018. "Effects of Publicly Subsidized Health Insurance on the Birth Rate." Working paper, Georgia State University.

Repetto, Luca (2018). "Balance Sheet Disclosure and the Budget Cycle of Italian Municipalities." *Economic Journal* (forthcoming).

Smith, William, Linda Culley, Michele Plorde, John Murray, Tom Hearne, Paul Goldberg, and Mickey Eisenberg. 2001. "Emergency Medical Services Telephone Referral Program: An Alternative Approach to Nonurgent 911 Calls." *Prehospital Emergency Care*, 5(2). Available <http://www.tandfonline.com/doi/abs/10.1080/10903120190940092>.

Sommers, Benjamin D., Munnira Z. Gunja, Kenneth Finegold, and Thomas Musco. 2015. "Changes in Self-Reported Insurance Coverage, Access to Care, and Health Under the Affordable Care Act." *Journal of the American Medical Association*, 314(4): 366–74.

Taubman, Sarah L., Heidi L. Allen, Bill J. Wright, Katherine Baicker, and Amy N. Finkelstein. 2014. "Medicaid Increases Emergency-Department Use: Evidence from Oregon's Health Insurance Experiment." *Science*, 343(6168): 263-268.

Wherry, Laura R., and Sarah Miller. 2016. "Early Coverage, Access, Utilization, and Health Effects Associated with the Affordable Care Act Medicaid Expansions: A Quasi-Experimental Study." *Annals of Internal Medicine*, 164(12): 795–803.

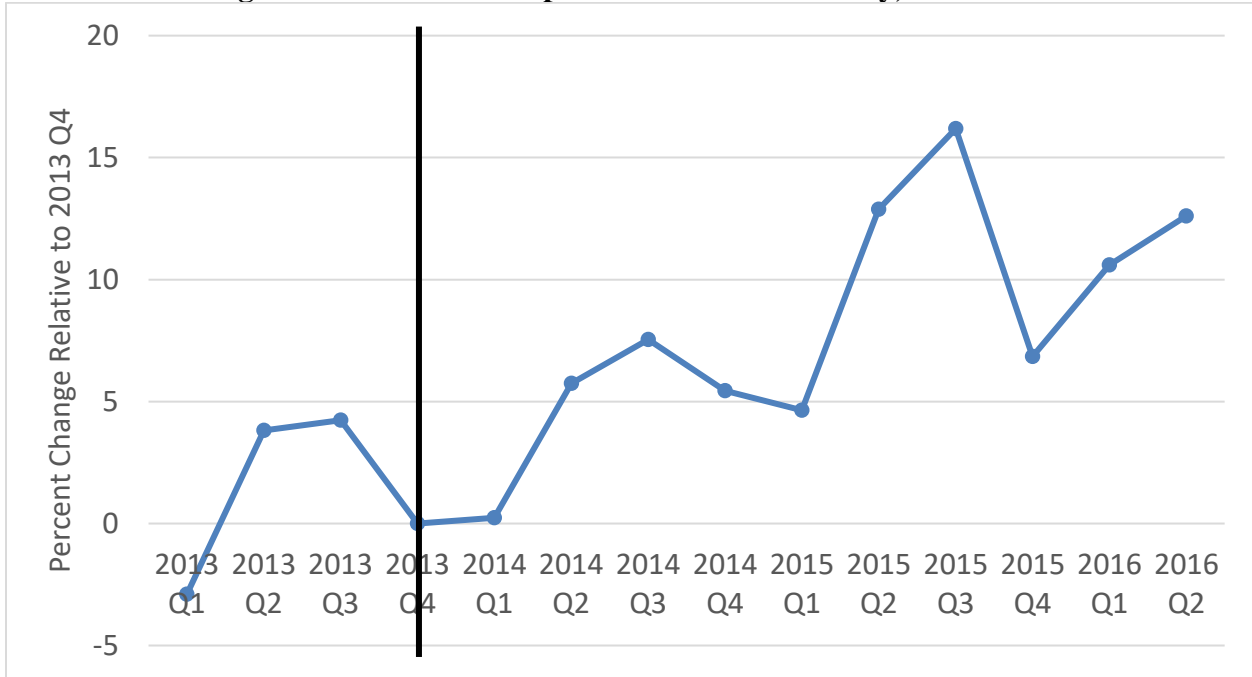
Table 1. Poisson Estimates of the Effect of the ACA on EMS Dispatches in NYC

	Minor vs. Other Injuries		Pregnancy Complication vs. Active Labor	
Treatment * Post	0.46*** (0.012)	0.47*** (0.013)	-0.97*** (0.039)	-1.24*** (0.060)
Treatment	-3.29*** (0.150)	-3.21*** (0.157)	-0.44* (0.243)	-0.70** (0.278)
Post	0.01 (0.012)	-0.001 (0.006)	-0.13*** (0.024)	0.02 (0.035)
Control for pre-treatment trends	no	yes	no	yes
N	2,604	2,604	2,604	2,604

*, **, and *** denote $p < 0.1$, $p < 0.05$, and $p < 0.01$, respectively.

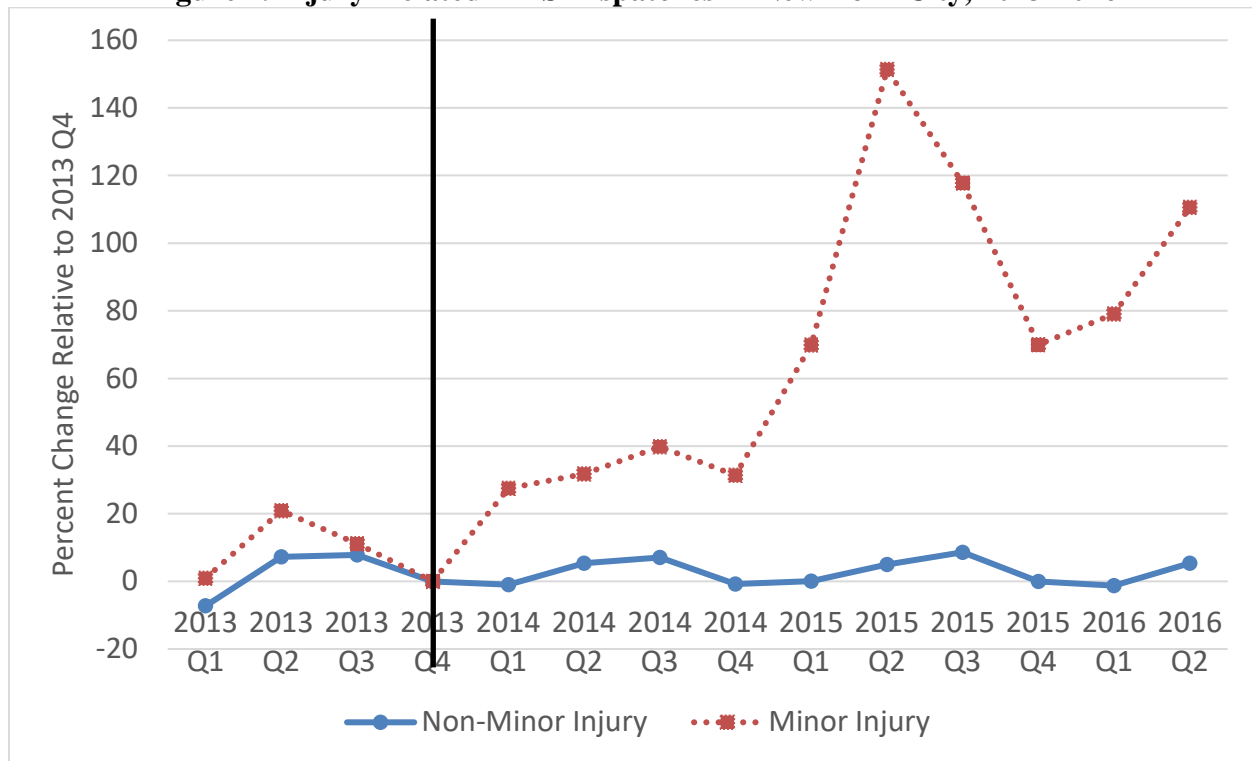
Notes: Observations are at the call type-zone-month level. Standard errors are corrected for clustering at the call type-zone level.

Figure 1. Total EMS Dispatches in New York City, 2013-2016



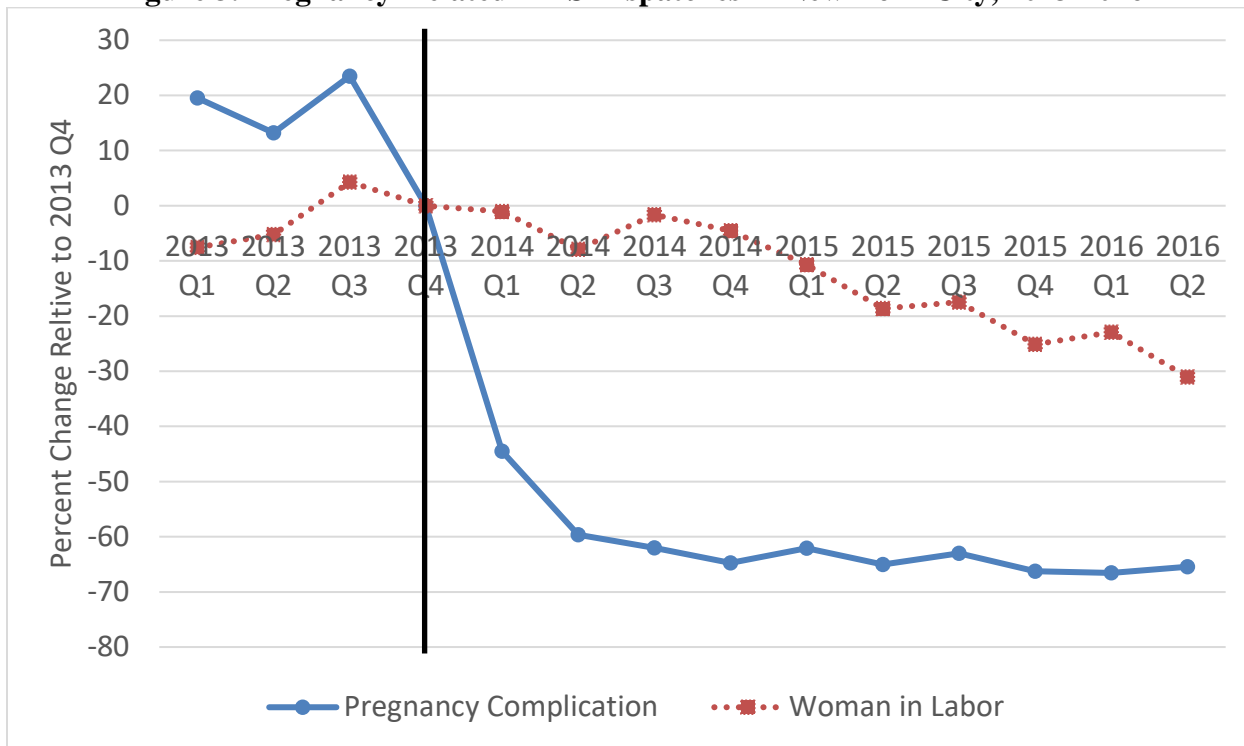
Source: Fire Department of New York City's EMS Incident Dispatch Data via NYC Open Data. Dispatch volume is reported as a percent change relative to Q4, 2013. There were a total of 308,000 dispatches in Q4, 2013.

Figure 2. Injury-Related EMS Dispatches in New York City, 2013-2016



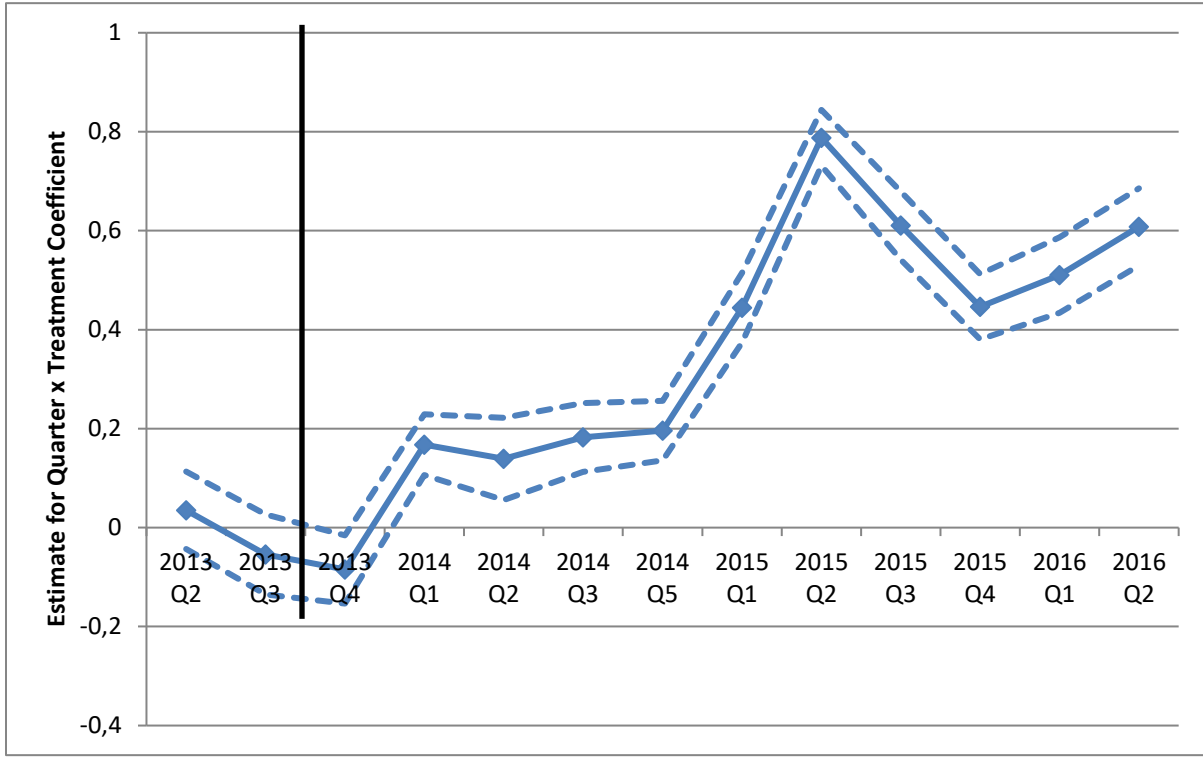
Source: Fire Department of New York City’s EMS Incident Dispatch Data via NYC Open Data. Dispatch volume is reported as a percent change relative to Q4, 2013. In Q4 2013, there were 1,783 minor injury dispatches and 50,684 dispatches for more severe injuries.

Figure 3. Pregnancy-Related EMS Dispatches in New York City, 2013-2016



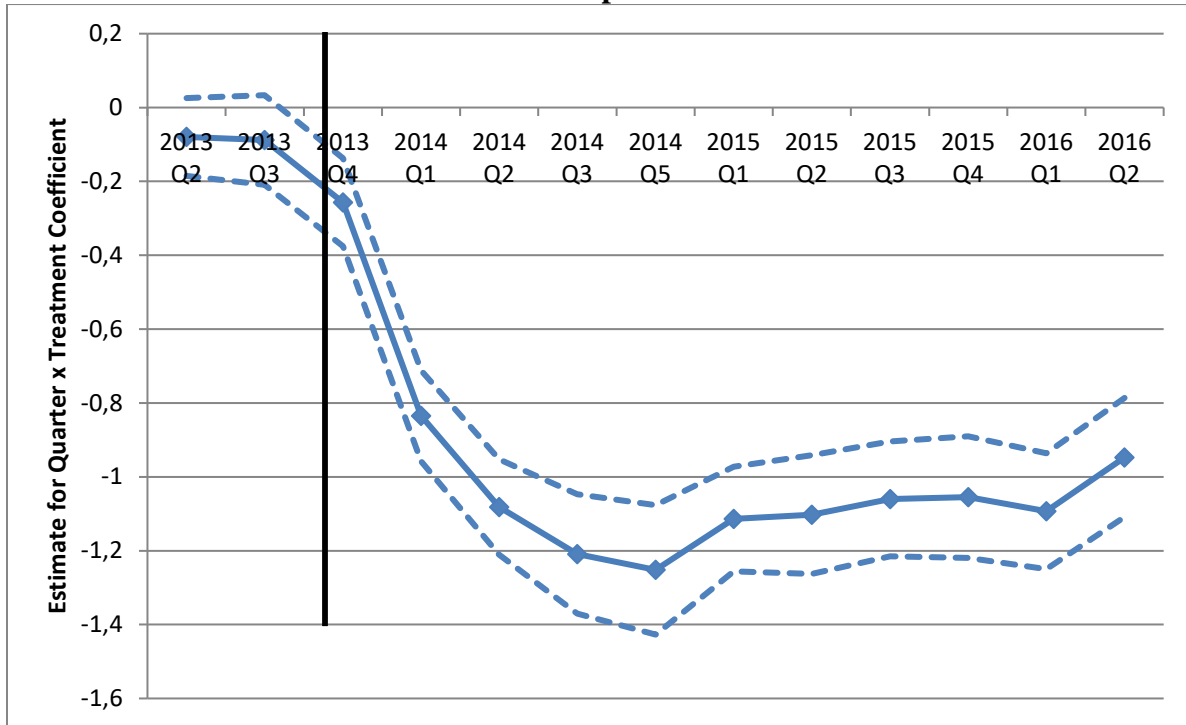
Source: Fire Department of New York City’s EMS Incident Dispatch Data via NYC Open Data. Dispatch volume is reported as a percent change relative to Q4, 2013. In Q4 2013, there were 1,319 dispatches for pregnancy complications and 2,402 dispatches for women in labor.

Figure 4. Event-Time Estimates for Minor-Injury vs. Other-Injury Dispatches



Notes: All standard errors are adjusted for clustering at the dispatch-zone level (31 dispatch-zones). Observations are at the call type-zone-month level. The outcome is the count of dispatches. Dashed lines represent 95 percent confidence interval around the estimates. Model includes dispatch-zone and borough by month by year fixed effects. Omitted quarter is Q1, 2013.

Figure 5. Event-Time Estimates for Pregnancy-Complication vs. Woman-in-Labor Dispatches



Notes: All standard errors are adjusted for clustering at the dispatch-zone level. Observations are at the call type-zone-month level. The outcome is the count of dispatches. Dashed lines represent 95 percent confidence interval around the estimates. Model includes dispatch-zone and borough by month by year fixed effects. Omitted quarter is Q1, 2013.

Appendix Table 1. Summary Statistics for Dispatch Counts in New York City, 2013-0216

Average Monthly Dispatches per Dispatch Zone

Year	Minor Injury	Other Injury	Pregnancy Complication	Woman in Labor
2013	20.37 (0.73)	545.36 (15.73)	15.88 (0.85)	24.82 (1.25)
2014	24.31 (0.89)	534.91 (15.90)	5.73 (0.32)	23.76 (1.24)
2015	37.17 (1.39)	540.33 (16.14)	4.88 (0.27)	20.31 (1.03)
2016	36.18 (1.78)	538.75 (21.99)	4.67 (0.35)	18.27 (1.27)

Appendix Table 2. OLS Estimates of the Effect of the ACA on EMS Dispatches in New York City (in Levels)

	Minor vs. Other Injuries		Pregnancy Complication vs. Active Labor	
Treatment * Post	7.71** (3.29)	13.28*** (3.71)	-7.68*** (2.09)	-12.45*** (2.08)
Treatment	-534.7*** (53.23)	-493.42*** (56.16)	-9.10* (5.11)	-13.43** (6.24)
Post	4.67 (2.98)	-0.72 (3.40)	-3.10*** (0.765)	-0.48 (0.736)
Control for pre-treatment trends	no	yes	no	yes
Mean of the dep. variable	284.28	284.28	15.23	15.23
N	2,604	2,604	2,604	2,604

*, **, and *** denote $p < 0.1$, $p < 0.05$, and $p < 0.01$, respectively.

Notes: Observations are at the call type-zone-month level. Standard errors are corrected for clustering at the call type-zone level

Appendix Table 3. Negative Binomial Estimates of the Effect of the ACA on EMS Dispatches in New York City

	Minor vs. Other Injuries		Pregnancy Complication vs. Active Labor	
Treatment * Post	0.46*** (0.012)	0.46*** (0.013)	-0.97*** (0.039)	-1.05*** (2.08)
Treatment	-3.29*** (0.150)	-3.28*** (0.159)	-0.45* (0.243)	-0.52** (0.265)
Post	0.008 (0.096)	0.008 (0.007)	-0.131*** (0.024)	-0.087** (0.007)
Control for pre-treatment trends	no	yes	no	yes
N	2,604	2,604	2,604	2,604

*, **, and *** denote $p < 0.1$, $p < 0.05$, and $p < 0.01$, respectively.

Notes: Observations are at the call type-zone-month level. Standard errors are corrected for clustering at the call type-zone level.