Revisiting the Valentine's Day and Halloween Birth Timing Phenomenon

Julia Grace Miller

Pomona College
Department of Economics

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Professor Gary Smith

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Abstract

A 2011 study by the Yale School of Public Health observed an increase of 5% in all births on Valentine's Day and a decrease of 11.3% in all births on Halloween. These results held over three different delivery methods– spontaneous, cesarean section, and medical inducement. The study hypothesized that the change in birthrates on these particular dates was related to the positive and negative symoblism associated with Valentine's Day and Halloween, respectively. To test this hypothesis, we analyzed Valentine's Day and Halloween birthrates for the years 1969 through 1988. Our initial findings exhibited a significant 3.48% increase in all Valentine's Day births and a significant 2.07% decrease in all Halloween births. A delivery method estimation model was then implemented to test the consistency of these results among the three different delivery methods. Finally, we proposed the use of the dates Friday the 13th and July 7th to further assess the impact of symbolic dates on birthrates. We found that births decreased by 3.24% on Friday the 13th and increased by 2.46% on July 7th.

1 Introduction

Social and cultural superstitions have long surrounded the phenomenon of childbirth. Before the advent of modern science, mythos such as old wives' tales, Zodiac signs, and lunar cycles were used to predict birth outcomes and the future health and prosperity of the child. While some of these superstitions persist today, the impact of such beliefs on childbirth has never been extensively studied.

One study conducted by Levy, Chung, and Slade at the Yale School of Public Health investigated the possible effects of positive and negative symbolism on birthrates in the United States between the years 1996 and 2006 [1]. The study investigated whether or not the positive symbolism associated with Valentine's Day and the negative symbolism associated with Halloween corresponded to increases and decreases in birthrates on those days, respectively. The results indicated that on Valentine's Day spontaneous[1] births significantly increased by 3.6%,cesarean births significantly increased by 12.1%, and induced births significantly increased by 3.4%. On Halloween, spontaneous births significantly decreased by 5.3%, cesarean births significantly decreased by 16.9%, and induced births significantly decreased by 18.7%. A number of studies corroborate the fact that the timing of cesarean sections and induced births are influenced by particular dates [2][3][4][5]. The Levy et al. study also went on to suggest that the signifcant changes in spontaneous birthrates may evidence that women possess some degree of autonomy with respect to natural birth timing. They proposed that the woman's perception of a date may play a role in her willingness to give birth at that time, which in turn may affect the hormonal mechanisms that influence birth timing.

Several studies have found that pregnant women exhibit heighetend levels of emotional sensitivity and psychological vulnerability during late pregnancy[6][7]. This may increase maternal susceptibility to belief in superstition or symbolism, such as the positive and negative connotations of certain dates. Psychological stress and pregnancy-related anxiety have also been shown to be associated with spontaneous preterm[2] birth[8][9][10]. However, the effects of stress on the ability to naturally induce or delay labor by a matter of days, as opposed to several weeks, is not well documented. There is also little evidence that the psychological effects of superstitious beliefs are profound enough to affect birth timing. More extensive research is necessary to support the theory that the symbolic connotations of Valentine's Day and Halloween are influential enough to generate significant changes in birthrates on these days.

The Levy et al. paper neglects to provide an empirical basis for the selection of Valentine's Day and Halloween as auspicious and inauspicious days, respectively. They only cite the positive symbolism associated with Valentine's Day, such as flowers and love, and the negative symbolism associated with Halloween, such as witches and death, as potential influences of attitudes and behavior surrounding these dates. Both days are strongly based in symbolism, but the actual magnitude and influence of this symbolism in American culure has not been well documented. In fact, a 2012 poll found that Halloween actually ranked as the third favorite holiday among American adults, while Valentine's Day tied with Hannukah for tenth favorite[11]. The use of dates with significant, documented impacts upon the collective American psyche may provide more compelling evidence for whether

[1] Spontaneous birth is defined as going into labor without the use of drugs or techniques to induce labor, and delivering the baby without the use of forceps, vacuum extraction, or a cesarean section.

[2] Preterm birth is defined as the birth of a baby of less than 37 weeks gestational age, where the average length of gestation is measured as 40 weeks.

or not particulate dates influence birth timing.

This paper will analyze United States birth records from the years 1969 to 1988 to determine whether or not these Valentine's Day and Halloween birthrate trends are consistent among earlier years. Additionally, we will attempt to identify dates that have more signficiant cultural influence and examine birthrates on these days. We believe the analyses of these dates will provide greater insight into how certain dates may or may not affect birth timing.

2 Data

Birth records were obtained from the National Vital Statistics system, which is maintained by the National Center for Health Statistics[12]. Levy et al. used the same source of data in their previous study of Valentine's Day and Halloween births, although their data spanned the years 1996 to 2006. This analysis will include data from the years 1969 to 1988. The natality files of the NVSS contain birth certificate samples from all fifty states. Prior to 1972, the data were composed of a 50% sample of birth certificates from each state as well as the District of Columbia. By 1985, every state had converted to a 100% level of reporting. This change in sample size should have no effect on the observed distribution of birthdates, as each state reported a representative sample.

Prior to 1989, the National Vital Statistics System did not record method of delivery for each birth. This is a major limitation of the data set, as we were unable to differentiate between spontaneous and non-spontaneous births, such as those brought about via cesarean section or medical inducement. We endeavored to address this issue by developing a delivery method model to estimate the rate of spontaneous, cesarean, and induced births for the years 1969 through 1988. The exact specifications of the delivery method model can be found in Section 7.1 of the Data Appendix. Estimates derived from this model were then used to designate a delivery method value to each birth in the data set, where values of zero, one, and two represented spontaneous, cesarean, and induced births, respectively. The simulation of delivery method conditions subsequently allowed us to analyze Valentine's Day and Halloween birthrates by type of delivery method.

3 Methods

The Levy et al. study did not explicity enumerate the form of their model or its constituent variables. This being the case, we developed our own regression model that is similar in form to the birth model implemented by Gans and Leigh in their study, "Born on the first of July: an (un)natural experiment in birth timing"[2]. In order to analyze the symbolic effects of Valentine's Day and Halloween on birthrates, we regressed the natural log of the daily birth count on an indicator variable for the holiday. The simplified regression equation is as follows:

$$\begin{aligned} ln\_Births_i = \alpha + \beta_1 \times Holiday + \beta_2 \times Federal\ Holiday \\ + I_i^{Year} + I_i^{Month} + I_i^{Day\ of\ the\ Week} \end{aligned} \tag{1}$$

The date that corresponded to the holiday in question was assigned a value of one for

the indicator variable Holiday, and all other dates in the sample were assigned a value of zero. To remain consistent with the original study on Valentine's Day and Halloween birth timing, the analysis will include the holiday itself and dates that fell within the one week window on either side of the holiday. This will allow us to determine whether or not there is a significant change in birthrates on the date of the holiday. The regression model includes controls for the year and day of the week, as birthrates vary across years and have been shown to fluctuate over different days of the week[13][14]. Studies largely attribute this fluctuation to obsteric intervention, as opposed to any sort of influence on the mother's part. Controls for months were included where appropriate. All dates within the Valentine's Day sample occured in February, so no month control was necessary for that analysis. The one-week window on either side of Halloween included dates in both October and November; accordingly, an indicator variable was included for month and received a value of one if the date fell in November. A control for Federal holidays was also included, as some hospitals observe Federal holidays and may have fewer medical staff on these dates. Although it cannot be assumed that the availability of medical staff affects the timing of spontaneous births, the availablity of doctors has been shown to influence the timing of planned births via cesarean section or medical inducement[3]. Table 8 in the Data Appendix lists the dates of all observed Federal holidays for the years 1969 through 1988.

4 Results

4.1 Valentine's Day and Halloween

The results of the initial analysis of all births are generally consistent with the findings of the 2011 study by Levy et al. The likelihood of giving birth on Valentine's Day showed a statisically significant increase of 3.48% (Table 1).The previous study observed a larger 5% increase in all births on Valentine's Day. To test the consistency of their results, Levy et al. repeated the analysis among racial and ethnic subsamples of African-American and Mexican-American women and found an overall increase of 9.1% in Valentine's Day births. For our own analysis, we tested subsamples of white, African-American, and Mexican-American women. Only the white subsample yielded significant results with a 3.81% increase in Valentine's Day births. The African-American and Mexican-American subsamples yielded no significant results.

We then implemented the delivery method model to analyze Valentine's Day birthrates by delivery method. The regression results indicated that spontaneous births significantly increased by 1.90%, cesarean births significantly increased by 12.0%, and induced births significantly increased by 3.6% (Table 2). Our observed increase in spontaneous Valentine's Day births is notably smaller than the significant 3.6% increase observed by Levy et al. However, their study also reported a 12.1% increase in cesarean sections and a 3.4% increase in induced births, which are quite similar to our own results.

The second part of our analysis focused on Halloween birthrates. We found that the likelihood of giving birth on Halloween decreased by 2.07% for all births (Table 3). The Levy et al. study observed a much larger 11.3% decrease in births on Halloween. Their results were also consistent among African-American and Mexican-American women, who demonstrated an overall decrease of 7.1% in births. Once again, our results were only consistent among the white subsample, which exhibited a significant decrease of 2.39% in Halloween births. The African-American and Mexican-American subsamples yielded no

signifcant results.

Analyzing Halloween births by delivery method produced some unexpected outcomes. Most interestingly, we observed a significant *increase* of 1.36% in spontaneous births (Table 4). This positive coefficient is contradictory to the results of our initial analysis of all births as well as the findings of the Levy et al. paper, which cited a significant decrease of 5.3% in spontaneous births on Halloween. Contrastingly, we observed large and significant increases of 18.2% and 18.4% in cesarean and induced births on Halloween, respectively. These findings are similar to those of the Levy et al. study, which reported a 16.9% decrease among cesarean births and a 18.7% decrease among induced births.

4.2 Analysis of Other Dates

4.2.1 Selection of Dates

To further expand our analysis, we considered a number of dates that possess some degree of significance in American culture. This significance must be widespread and pervasive enough that it influences the collective American subconscious and potentially impacts behavior. Superstitious beliefs provide a reasonable basis for selecting particular dates. Supersititon is the belief in supernatural causality– that certain events will bring good or bad luck, without any natural or logical process linking the event and outcome. Superstitious individuals perceive a causal relationship between their thoughts or actions and unrelated events in the world around them.

Numerous studies have documented both the physical and mental effects brought about by superstitious stimulus. Individuals may avoid certain behaviors they believe to be unlucky or unsafe, such as walking under a ladder or spilling salt. One study found that fewer individuals drive on Friday the 13th, possibly because they think the date is ill-boding and dangerous[15]. Likewise, superstitious individuals may also be more inclined to perform ritualistic behaviors that they believe will turn fortune in their favor, such as knocking on wood or carrying a good luck charm. Empirical evidence demonstrates that the activation of good luck superstitions actually serves to increase individuals' perceptions of self-efficacy, which leads to improved performance of tasks[16]. Research has also found that trait anxiety, which is the tendency to develop anxiety in anticipation of impending events, is correlated with superstitious thinking[17]. Individuals that exhibit obsessive thoughts and behavioral patterns are also more susceptible to believing in supernatural ideologies. Consequently, it is possible that expectant mothers with elevated levels of stress and anxiety may be more prone to placing irrational significance on certain birthdates.

In American culture, Friday the 13th and July 7th are perhaps the most superstition laden dates of the calendar year. Friday the 13th is considered to be particularly unlucky and wrought with misfortune. This may be attributed to the fact that both Friday and the number thirteen are independently regarded as bad omens. The exact origins of these beliefs are unclear yet many theories find root in early Christianity. Chrisitian theology asserts that Jesus was crucified on a Friday; other notable biblical events that are said to have occurred on a Friday include the casting out of Adam and Eve from the Garden of Eden, the destruction of the Temple of Solomon, and the beginning of the Great Flood[18][19]. Fear of the number thirteen often relates back to the unlucky nature of thirteen guests at the dinner table. Jesus was betrayed by the apostle Judas Iscariot, the thirteenth person to arrive to the Last Supper. In Norse myhology, evil and turmoil were introduced to the

world by the god Loki, who was the thirteenth god to attend a dinner party in Valhalla[20]. Despite the uncertainty surrounding the ancient origins of this superstition, its effects are very much present in modern American culture. According to the North Carolina Stress Management Center and Phobia Institute, an estimated 17 to 21 million Americans suffer from friggatriskaidekaphobia– fear of Friday the 13th.

If Friday the 13th is considered the most unlucky date of the year, July 7th– the seventh day of the seventh month of the year– may be considered the luckiest. In Western culture, seven is often regarded as a lucky number. Like Friday the 13th, the origin of this superstition stems from early religious tradition, namely Judaism and Christianity. In Hebrew, the word for luck, *gad*, is associated with the number seven[21]. Seven recurs frequently throughout the Bible and is considered to be highly symbolic. It took God seven days to create the world, and many believe that the number seven represents divinity, completeness, and unity. Even today, many Americans believe that the number seven will bring good fortune. Over 38,000 couples tied the knot on July 7, 2007, which was more than triple the average number of weddings for a Saturday in July. At that point in time, it was the single most concentrated wedding date in American history.

4.2.2 Results

When analyzing birthrates on Friday the 13th, we observed a significant decrease of 3.24% among all births (Table 5). These results held across all racial and ethnic subsamples, with whites, African-Americans, and Mexican-Americans demonstrating significant decreases of 3.60%, 1.59%, and 11.3%, respectively. It is important to note that, unlike our Valentine's Day and Halloween analyses, the African-American and Mexican-American subsamples produced significant results. This may lend credibility to our assertion that Friday the 13th is a more influential date than Halloween with regards to negative symbolism.

Our analysis of July 7th birthrates exhibited a significant increase of 2.46% among all births (Table 6). The white, African-American, and Mexican-American subsamples demonstrated significant increases of 2.48%, 2.36%, and 22.7%, respectively. The increase in July 7th births among Mexican-Americans is surprisingly large; nevertheless, these subsample results are far more consistent with our initial findings than those of the Valentine's Day analysis. This further supports the selection of July 7th as a more superstitiously significant date than Valentine's Day.

5 Discussion

In the first stage of our analysis, we sought to determine whether or not the Valentine's Day and Halloween birthrate trends observed by Levy et al. for the years 1996 through 2006 were also present in data from earlier years, specifically 1969 through 1988. We observed a significant 3.48% increase in births on Valentine's Day and a significant decrease of 2.07% on Halloween. The direction of our coefficients were consistent with the results of the Levy et al. study; however, our coefficients were substantially smaller in magnitude. It is also important to note that our results were only consistent within the white subsample and became insignificant when examining birthrates among African-Americans and Mexican-Americans. Dissimilarly, the results of the Levy et al. study held up across racial and ethnic subsamples.

Our implementation of the birth method model to investigate birthrates by delivery method yielded some mixed results. We observed a significant increase of 1.90% among spontaneous births on Valentine's Day, which is smaller than the spontaneous birth coefficient cited by Levy et al. but still positive. Our Halloween analysis, however, also indicated a significant increase of 1.36%. The direction of this sign was inconsistent with the decrease of 5.3% in spontaneous births observed by the earlier study. With regards to cesarean and induced birthrates, our results were quite similar to those of Levy et al. Ultimately, the interpretation of our own results are somewhat limited by the fact that we did not have access to actual delivery method data. Consequently, we were forced to rely on an estimated model of delivery method frequencies. That being said, our observed increase in spontaneous births on Halloween casts a shadow of doubt upon whether or not symbolic dates influence spontaneous birth timing, or at least in the way we predict they will.

Our analyses of Friday the 13th and July 7th yielded results that were both significant and similar in magnitude to the results of our Valentine's Day and Halloween analyses. The significant decreases and increases in births on these dates reaffirm our selection of Friday the 13th and July 7th as symbolically influential dates in American culture. However, unlike our Valentine's Day and Halloween analyses, we observed consistent and significant results across all of our subsamples. This consistency may imply that the symbolic connotations of these dates are more widespread throughout American culture and consequently impact a larger variety of people.

6 Conclusion

After analyzing the Valentine's Day and Halloween birthrates for 1969 through 1988, we find that our results are largely consistent with those of the Levy et al. study. However, our analyses were limited by the lack of delivery method data. The next step in investigating the potential impact of symbolic dates on birthrates, and more specifically spontaneous birthrates, would be to analyze Friday the 13th and July 7th birthrates using more recent data that contains delivery method data. The further identification of other culturally significant dates would also allow for a more rigorous testing of this theory.

7 Data Appendix

7.1 Delivery Method Model

In the absence of individual delivery method data for the years 1969 through 1988, we used a combination of historical annual data and results from the Levy et al. study to estimate the fraction of spontaneous, cesarean, and induced births within our data set. Estimates for delivery method frequencies were needed for both Valentine's Day and non-Valentine's Day births. The delivery method model was based on the following identity:

$$\frac{V^T}{N^T} = \frac{V_S + V_C + V_I}{N_S + N_C + N_I} \tag{2}$$

$$\frac{V^T}{N^T} = \frac{V_S}{N_S} \times \frac{N_S}{N_T} + \frac{V_C}{N_C} \times \frac{N_C}{N_T} + \frac{V_I}{N_I} \times \frac{N_I}{N_T} \tag{3}$$

V_T = total number of Valentine's Day births
V_S = number of spontaneous Valentine's Day births
V_C = number of cesarean section Valentine's Day births
V_I = number of induced Valentine's Day births
N_T = total number of non-Valentine's Day births
N_S = number of sponataneous non-Valentine's Day births
N_C = number of cesarean section non-Valentine's Day births
N_I = number of induced non-Valentine's Day births

Historical data were used to estimate values for $\frac{N_S}{N_T}$,$\frac{N_C}{N_T}$,and $\frac{N_I}{N_T}$. Annual cesarean rates were available from the National Center for Health Statistics for the years 1965, 1970,1975,1981, and 1983 through 1988[22][23]. Using these rates, a linear estimation was used to calculate the missing values for the years between each known value. These cesarean rates correspond to the value of $\frac{N_C}{N_T}$ for each year.

The National Center for Health Statistics did not begin collecting data on the rate of induced births until 1985[24]. Using data from the years 1989 through 1997, we generated the following estimated exponential growth equation ($R^2 = 0.9888$):

$$y = 10^{-83} e^{0.0948x} \tag{4}$$

This equation was then used to forecast backwards twenty years to obtain estimates for the rate of induced births from 1969 through 1988. Figure 1 shows the induction rates for the years 1989 through 1997 and the backwards-forecasting trendline. The forecasted values for 1969 through 1988 represent the $\frac{N_I}{N_T}$ value for each year.
We were then able to estimate the $\frac{N_S}{N_T}$ value for each year using the following identity:

$$1 - \frac{N_C}{N_T} + \frac{N_I}{N_T} = \frac{N_S}{N_T} \tag{5}$$

The results of the Levy et al. study indicated that cesarean births significantly increased by 12.1% on Valentine's Day, in comparison to the rate of cesarean births on other days within the two-week window. Induced births demonstrated a significant increase of 3.4%. Using these results, we estimate the following values:

$$\frac{V_C}{N_C} = 1.121, \frac{V_I}{N_I} = 1.034$$

We had now estimated values for $\frac{N_S}{N_T}$, $\frac{N_C}{N_T}$, $\frac{N_I}{N_T}$, $\frac{V_C}{N_C}$,and $\frac{V_I}{N_I}$. From our own data, we were able to calculate $\frac{V_T}{N_T}$ using the results of the initial regression. The regression results estimated a 3.48% increase in births on Valentine's Day as compared to all other dates in its two-week window; thurs, $\frac{V_T}{N_T} = 1.0348$. Using Equation 2, we solved for the value of $\frac{V_S}{N_S}$ for

each year.

We then estimated the yearly values for $\frac{V_S}{V_T}, \frac{V_C}{V_T}, \frac{V_I}{V_T}$ using the following identities:

$$\frac{V_T}{N_T} \times \frac{V_S/V_T}{N_S/N_T} = \frac{V_S}{N_S} \tag{6}$$

$$\frac{V_T}{N_T} \times \frac{V_C/V_T}{N_C/N_T} = \frac{V_C}{N_C} \tag{7}$$

$$\frac{V_T}{N_T} \times \frac{V_I/V_T}{N_I/N_T} = \frac{V_I}{N_I} \tag{8}$$

These estimates were applied to the data to simulate known delivery method conditions. All non-Valentine's Day births were randomized and assigned a delivery method value of 0,1, or 2 to designate spontaneous, cesarean, or induced births, respectively. These values were assigned on a year-by-year basis in accordance with each year's corresponding estimates for $\frac{N_S}{N_T}, \frac{N_C}{N_T}$, and $\frac{N_I}{N_T}$ (e.g. in 1969, $\frac{N_S}{N_T} = 0.9353$ so 93.53% of non-Valentine's Day were randomly assigned a value of 0 for that year.) Similarly, Valentine's Day births were randomized and delivery method was assigned with respect to the yearly values for $\frac{V_S}{V_T}, \frac{V_C}{V_T}$, and $\frac{V_I}{V_T}$. This same process was repeated to analyze Halloween births by delivery method, using relevant values for the Halloween sample to calculate the estimated frequencies of spontaneous, cesarean, and induced births.

7.2 Tables and Figures

Table 1: Valentine's Day Births: All Delivery Methods, 1969-1988

VARIABLES	(1) lnBirths (All)	(2) lnBirths (White)	(3) lnBirths (African-American)	(4) lnBirths† (Mexican-American)
Valentine's Day	0.0348***	0.0381***	0.0114	-0.0330
	(0.00535)	(0.00564)	(0.00872)	(0.0708)
Federal Holiday	-0.0244***	-0.0234***	-0.0203*	-0.0514
	(0.00736)	(0.00776)	(0.0120)	(0.0943)
Constant	8.588***	8.395***	6.731***	6.178***
	(0.00682)	(0.00719)	(0.0111)	(0.0710)
Observations	300	300	300	150
R-squared	0.994	0.993	0.985	0.770

† only includes years 1979-1988
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2: Valentine's Day Births by delivery method, 1969-1988

VARIABLES	(1) lnBirths (Spontaneous)	(2) lnBirths (Cesarean)	(3) lnBirths (Induced)
Valentine's Day	0.0190***	0.120***	0.0366**
	(0.00542)	(0.0103)	(0.0179)
Federal Holiday	-0.0243***	-0.0220	-0.0598**
	(0.00727)	(0.0138)	(0.0240)
Constant	8.477***	5.603***	4.063***
	(0.00690)	(0.0131)	(0.0228)
Observations	300	300	300
R-squared	0.988	0.997	0.992

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3: Halloween Births: All Delivery Methods, 1969-1988

VARIABLES	(1) lnBirths (All)	(2) lnBirths (White)	(3) lnBirths (African-American)	(4) lnBirths† (Mexican-American)
Halloween	-0.0207***	-0.0239***	-0.00510	-0.00101
	(0.00559)	(0.00601)	(0.00867)	(0.0162)
Federal Holiday	-0.0198*	-0.0254**	0.00597	-
	(0.0115)	(0.0124)	(0.0179)	-
Constant	8.522***	8.322***	6.687***	5.331***
	(0.00691)	(0.00744)	(0.0107)	(0.0163)
Observations	300	300	300	150
R-squared	0.995	0.993	0.987	0.984

† only includes years 1979-1988
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4: Halloween Births by delivery method, 1969-1988

VARIABLES	(1) lnBirths (Spontaneous)	(2) lnBirths (Cesarean)	(3) lnBirths (Induced)
Halloween	0.0136**	-0.182***	-0.184***
	(0.00563)	(0.00973)	(0.0210)
Federal Holiday	-0.0215*	0.00396	0.0452
	(0.0116)	(0.0201)	(0.0433)
Constant	8.402***	5.772***	4.290***
	(0.00710)	(0.0123)	(0.0264)
Observations	300	300	300
R-squared	0.989	0.998	0.990

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Friday the 13th Births, 1969-1988

VARIABLES	(1) lnBirths (All)	(2) lnBirths (White)	(3) lnBirths (African-American)	(4) lnBirths† (Mexican-American)
Friday the 13th	-0.0324***	-0.0360***	-0.0159**	-0.113**
	(0.00521)	(0.00555)	(0.00800)	(0.0495)
Federal Holiday	-0.0131	-0.0144	0.00260	-0.0581
	(0.00929)	(0.00990)	(0.0143)	(0.0904)
Constant	9.024***	8.789***	7.261***	6.215***
	(0.0126)	(0.0134)	(0.0194)	(0.0516)
Observations	510	510	510	270
R-squared	0.993	0.992	0.986	0.834

† only includes years 1979-1988
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6: July 7th Births, 1969-1988

VARIABLES	(1) lnBirths (All)	(2) lnBirths (White)	(3) lnBirths (African-American)	(4) lnBirths† (Mexican-American)
July 7th	0.0246***	0.0248***	0.0236***	0.227**
	(0.00792)	(0.00866)	(0.00890)	(0.0634)
Federal Holiday	-0.139***	-0.152***	-0.0865***	-0.169***
	(0.00736)	(0.00805)	(0.00827)	(0.0643)
Constant	8.586***	8.404***	6.684***	5.235***
	(0.0101)	(0.0111)	(0.0114)	(0.0897)
Observations	300	300	300	150
R-squared	0.989	0.986	0.987	0.805

† only includes years 1979-1988
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 7: Historical Cesarean Rate Estimates, 1969-1988

Year	Cesarean Rate
1965	0.045*
1966	0.047
1967	0.049
1968	0.051
1969	0.053
1970	0.055*
1971	0.0608
1972	0.0666
1973	0.0724
1974	0.0782
1975	0.084*
1976	0.09725
1977	0.1105
1978	0.12375
1979	0.137
1980	0.145
1981	0.132*
1982	0.1675
1983	0.203*
1984	0.211*
1985	0.227*
1986	0.241*
1987	0.244*
1988	0.247*
Average Rate (years 1969-1988)	0.1378

*Non-estimated historical rate

Figure 1: Rate of Induced Births, United States 1989-1997

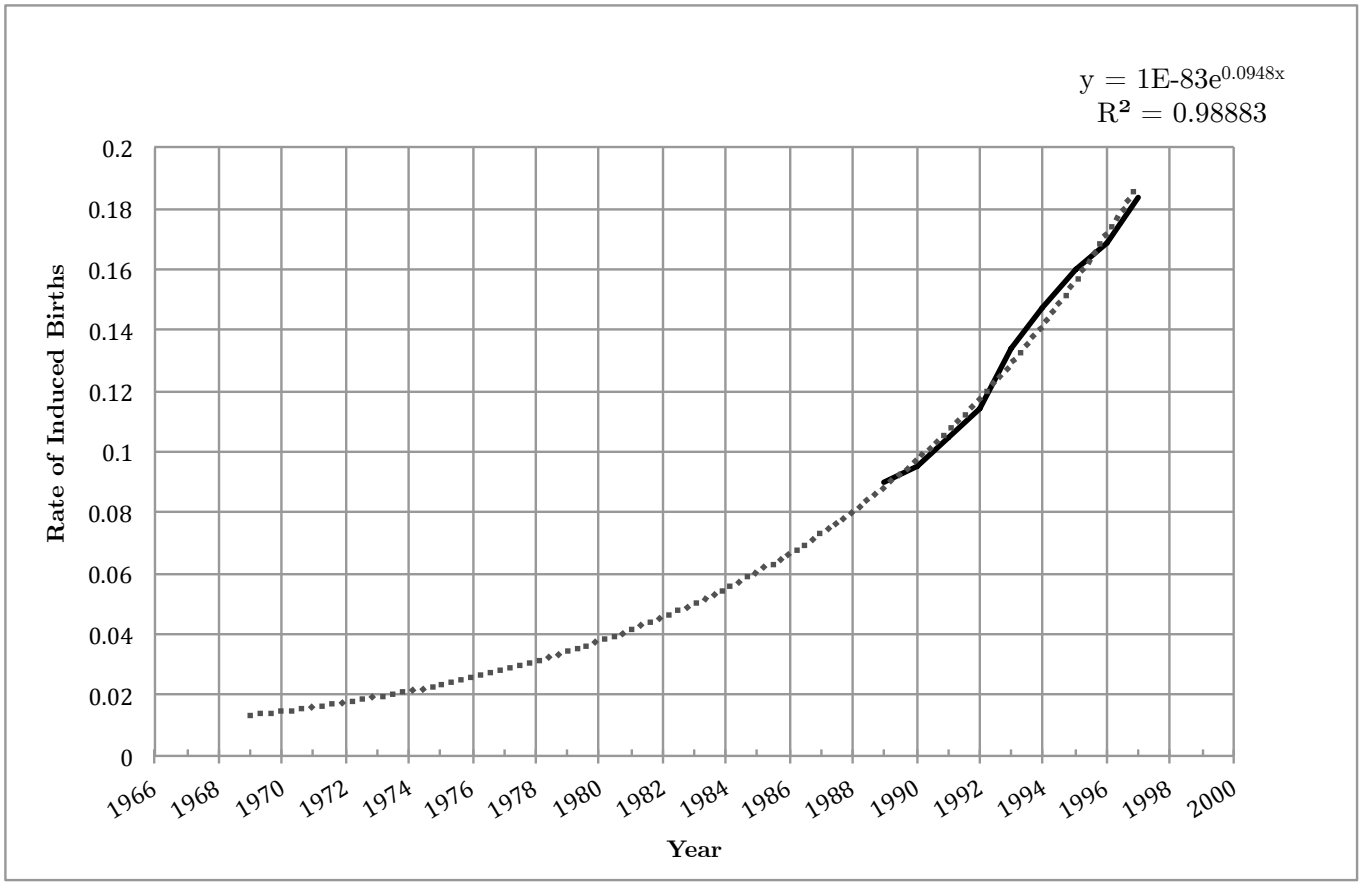

Table 8: US Federal Holidays

Year	New Year's Day	MLK Day	Washington's Birthday	Memorial Day	Independence Day	Labor Day	Columbus Day	Veterans Day	Thanksgiving Day	Christmas Day
1969	1/1/69	-	2/22/69	5/30/69	7/4/69	9/1/69	10/12/69	11/11/69	11/27/69	12/25/69
1970	1/1/70	-	2/22/70	5/30/70	7/4/70	9/7/70	10/12/70	11/11/70	11/26/70	12/25/70
1971	12/31/70*	-	2/15/71	5/31/71	7/5/71*	9/6/71	10/11/71	10/25/71	11/25/71	12/24/71*
1972	1/1/72	-	2/21/72	5/29/72	7/4/72	9/4/72	10/9/72	10/23/72	11/23/72	12/25/72
1973	1/1/73	-	2/19/73	5/28/73	7/4/73	9/3/73	10/8/73	10/22/73	11/22/73	12/25/73
1974	1/1/74	-	2/18/74	5/27/74	7/4/74	9/2/74	10/14/74	10/28/74	11/28/74	12/25/74
1975	1/1/75	-	2/17/75	5/26/75	7/4/75	9/1/75	10/13/75	10/27/75	11/27/75	12/25/75
1976	12/31/75*	-	2/16/76	05/31/76	7/5/76*	9/6/76	10/11/76	10/25/76	11/25/76	12/24/76*
1977	1/1/77	-	2/21/77	5/30/77	7/4/77	9/5/77	10/10/77	10/24/77	11/24/77	12/26/77
1978	1/1/78	-	2/20/78	5/29/78	7/4/78	9/4/78	10/9/78	11/10/78*	11/23/78	12/25/78
1979	1/1/79	-	2/19/79	5/28/79	7/4/79	9/3/79	10/8/79	11/12/79*	11/22/79	12/25/79
1980	1/1/80	-	2/18/80	5/26/80	7/4/80	9/1/80	10/13/80	11/11/80	11/27/80	12/25/80
1981	1/1/81	-	2/16/81	5/25/81	7/3/81*	9/7/81	10/12/81	11/11/81	11/26/81	12/25/81
1982	12/31/82*	-	2/15/82	5/31/82	7/5/82	9/6/82	10/11/82	11/11/82	11/25/82	12/24/82*
1983	1/1/83	-	2/21/83	5/30/83	7/4/83	9/5/83	10/10/83	11/11/83	11/24/83	12/26/83*
1984	1/2/84*	-	2/20/84	5/28/84	7/4/84	9/3/84	10/8/84	11/12/84*	11/22/84	12/25/84
1985	1/1/85	-	2/18/85	5/27/85	7/4/85	9/2/85	10/14/85	11/11/85	11/28/85	12/25/85
1986	1/1/86	1/20/86	2/17/86	5/26/86	7/4/86	9/1/86	10/13/86	11/11/86	11/27/86	12/25/86
1987	1/1/87	1/19/87	2/16/87	5/25/87	7/4/87	9/7/87	10/12/87	11/11/87	11/26/87	12/25/87
1988	1/1/88	1/18/88	2/15/88	5/30/88	7/4/88	9/5/88	10/10/88	11/11/88	11/24/88	12/26/88*

*Date upon which the holiday was observed by the US Federal Government, if the traditional date fell on a weekend day

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