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Changes in the Teen Birth Rate from 1991 to 2005 and 2005 to 2006: Assessing the Role of Changes in the Teen Population



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Changes in the Teen Birth Rate from 1991 to 2005 and 2005 to 2006: Assessing the Role of Changes in the Teen Population

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***Overall Findings:** Based on final data from the National Center for Health Statistics and additional analyses from the National Campaign to Prevent Teen and Unplanned Pregnancy described below, three quarters of the increase in the overall teen birth rate between 2005 and 2006 can be attributed to the fact that teen birth rates went up for nearly all racial/ethnic groups, while only one quarter of the increase can be attributed to a shift in the racial/ethnic composition of the teen population. Additionally, the results suggest that roughly three quarters of the increase in the teen birth rate can be attributed to older teens and just one quarter to younger teens. Because the overall increase in the teen birth rate between 2005 and 2006 was only three percent, the amount of this increase attributable to any one factor is very small. For example, shifts in the racial/ethnic composition of the teen population led to an increase in the overall teen birth rate of less than one percent (that is, one quarter of three percent).*

The teen birth rate fell continuously between 1991 and 2005, from 61.8 to 40.5 births per 1,000 girls age 15 to 19—a total decline of 34 percent. However, from 2005 to 2006 the rate rose to 41.9, an increase of three percent. Teen birth rates vary for particular subgroups of teens—for example they are higher for older teens than younger teens and higher for Hispanic and non-Hispanic black teens than for non-Hispanic white teens—however the increase between 2005 and 2006 held true for nearly every teen subgroup.

Naturally, there has been great speculation as to what factors contributed to the initial steep decline in the teen birth rate and, subsequently, what factors contributed to the most recent increase. There are a number of ways to frame this question. With respect to the recent increase, one could ask whether a greater share of teens are getting pregnant or a greater share of teen pregnancies are resulting in a birth (rather than an abortion or a miscarriage). To the extent that a greater share of teens are getting pregnant, one could ask whether this is due to an increase in the level of sexual activity among teens or a decrease in the use of contraception among sexually active teens. To the extent that we see changes in either sexual activity or the use of contraception, we can ponder the role of factors that may be driving those changes in teen decision making—factors such as the media, social norms, the economy, public policy and family dynamics.

However, there is an additional question that must also be asked—that is, how much of the increase in the teen birth rate is simply due to the fact that the make-up of the teen population may be changing? For example, if subgroups within the teen population who are more likely to have a teen birth become a larger (or smaller) share of the overall teen population, this would lead to an increase (or decrease) in the overall teen birth rate even if the birth rates for teens within each subgroup remained relatively unchanged.

This memo addresses this last question—the share of change in the teen birth rate that is due to shifts in the makeup of the teen population across subgroups versus the share that is due to increases in teen birth rates within those subgroups. Unlike pondering the factors underlying changes in teen decision making—which will always involve a certain degree of speculation—parsing out changes in the birth rate by demographic shifts is relatively concrete because the birthrate is a mathematical formula that can be

decomposed into its contributing factors. The teen birth rate (TBR) is defined as the number of births per 1,000 girls age 15 to 19, or:

$$\frac{\text{Birth to girls 15-19}}{\text{Population of girls 15-19}} \times 1,000 = \text{TBR}$$

This overall teen birth rate can be restated as a weighted average of teen birth rates across subgroups. That is, taking the teen birthrate for each subgroup times the teen population share for each subgroup and then adding these weighted rates across subgroups.

Subgroups can be defined in terms of race/ethnicity, or in terms of age, or other factors such as nativity. Using the letters *i* through *j* to represent the subgroups one is summing over, the overall teen birthrate can be written as follows:

$$\left[\text{TBR}_i \times \frac{\text{Female Population 15-19}_i}{\text{Female Population 15-19}} \right] + \dots + \left[\text{TBR}_j \times \frac{\text{Female Population 15-19}_j}{\text{Female Population 15-19}} \right]$$

In this example, *i* through *j* could represent the aggregation of white non-Hispanic, black non-Hispanic, Hispanic, and other teens, or of older teens and younger teens, or of native born and foreign born teens. TBR_i through TBR_j represents the teen birth rate for each subgroup. The female population age 15-19 for each subgroup divided by the total female population age 15-19 represents the subgroup weight attached to each birth rate (hereafter referred to as WT_i through WT_j for brevity).

The change in the teen birth rate can be similarly disaggregated into subgroups. Generally speaking, we know mathematically that:

$$\text{if } C = A + B, \text{ then } \Delta C = \Delta A + \Delta B \quad (\text{where } \Delta \text{ means change})$$

That is, if *C* equals the sum of a set of factors, then the change in *C* equals the sum of changes in each of the underlying factors. Applying this to the change in the teen birth rate, we can state the change as follows:

$$\Delta \text{TBR} = \Delta [\text{TBR}_i \times \text{WT}_i] + \dots + \Delta [\text{TBR}_j \times \text{WT}_j]$$

This identifies how much of the change in the teen birth rate is attributable to each subgroup *i* through *j*. For example, how much of the change in the birth rate is accounted for by younger teens versus older teens. One could also apportion the total change into how much is attributable to native born teens versus foreign born, or into how much can be attributable to white non-Hispanic, black non-Hispanic, Hispanic, or other teens.

Focusing, for example, on younger versus older teens, we can rewrite the change in the overall teen birth rate as follows:

$$\Delta TBR = \underbrace{\Delta [TBR_y \times WT_y]}_{\text{Change attributable to younger teens}} + \underbrace{\Delta [TBR_o \times WT_o]}_{\text{Change attributable to older teens}}$$

Looking specifically at the change between 2005 and 2006, or $TBR_{06} - TBR_{05}$, this expression becomes:

$$TBR_{06} - TBR_{05} = \{ [TBR_{y2006} \times WT_{y2006}] - [TBR_{y2005} \times WT_{y2005}] \} \quad (\text{due to younger teens}) \\ + \{ [TBR_{o2006} \times WT_{o2006}] - [TBR_{o2005} \times WT_{o2005}] \} \quad (\text{due to older teens})$$

The next step is to identify how much of the change in the overall teen birth rate that is attributable to younger versus older teens is due to changes in the birth rate for younger and older teens (TBR_y and TBR_o) as opposed to changes in the population weights for younger and older teens (WT_y and WT_o). This is less straightforward because the rates and the weights do not operate independently of each other. Mathematically, this is reflected in the fact that the equation above cannot be factored in such a way that would completely isolate the changes in the birth rates from the changes in the population weights. Conceptually, we see this reflected in the fact that the importance of a change in the birth rate for a particular subgroup depends on how large or small that subgroup is within the population. Thus, the overall change in the teen birth rate is due in part to changes in the underlying teen birth rates for subgroups, in part to changes in the weight or population share of each subgroup, and in part to an interaction of the two.

Intuitively, it would seem plausible to identify the independent contribution of these two factors (that is, rate changes versus population shifts) by simply holding one factor constant while changing the other. For example, holding the subpopulation weights at their 2005 values while changing the subpopulation teen birth rates from 2005 to 2006 levels to assess the change in the overall teen birth rate that is attributable to changes in subpopulation teen birth rates. Similarly, holding the subpopulation teen birth rates fixed at 2005 values while changing the subpopulation weights from 2005 to 2006 levels to assess the change in the overall teen birth rate that is attributable to population shifts. While seemingly sensible, this approach has two problems. First, these two components do not necessarily sum to the total change in the overall rate. Second, using 2005 as the base year (factors that are held constant take on their 2005 values) will yield different results than using 2006 as the base year (factors that are held constant take on their 2006 values). This is because such an approach does not take account of the interaction term described above. Ideally, a decomposition analysis should produce results that account for the exact amount of the total change and that produce the same results regardless of

whether looking forward or looking backward (that is, regardless of which year is chosen as the base year).¹

One method put forward by the Census Bureau to make this problem more tractable and to produce a consistent decomposition of factors underlying a change in rates is that of standardized rates (Das Gupta, 1993). As proposed by Das Gupta, the change in any rate can be standardized and decomposed as follows:

For any rate R that is a product of two factors, A and B , that rate can be expressed as follows where R_1 is the rate in period 1 and R_2 is the rate in period 2:

$$R_1 = A_1 \times B_1 \qquad R_2 = A_2 \times B_2$$

The rates for period 1 and for period 2 can be standardized with respect to factor B as follows:

$$R_1 = A_1 \times (B_1 + B_2)/2 \qquad R_2 = A_2 \times (B_1 + B_2)/2$$

Similarly, the rates for period 1 and for period 2 can be standardized with respect to factor A as follows:

$$R_1 = (A_1 + A_2)/2 \times B_1 \qquad R_2 = (A_1 + A_2)/2 \times B_2$$

The change in rate from period 1 to period 2 that can be attributed to factors A and B is estimated as follows:

$$\begin{aligned} \text{A effect} &= (B_1 + B_2)/2 \times (A_2 - A_1) \\ \text{B effect} &= (A_1 + A_2)/2 \times (B_2 - B_1) \end{aligned}$$

This estimation will fully account for the total change in the rate being decomposed, and will yield the same result regardless of whether the base period is period 1 or period 2. Below, Das Gupta's standardization and decomposition method is applied to the question posed here—that is, how much of the change in the teen birth rate is due to changes in the

¹ As an example of why it is important to get the same results looking forward or looking backward, consider a slightly different example where instead of analyzing the difference between the birth rate in year 1 and year 2, we were analyzing the difference in the birth rate between State A and State B. In this example there is no “starting point” that is more intuitively defensible than the other, and so one would hope to get the same answer regardless of which state you used as the base.

teen birth rates within subpopulations versus population shifts across subpopulations, using a division by younger teens and older teens as an example.

Recall that the change in the overall teen birth rate can be written as:

$$\Delta \text{TBR} = \Delta [\text{TBR}_y \times \text{WT}_y] + \Delta [\text{TBR}_o \times \text{WT}_o]$$

←-----→
←-----→

Change attributable to younger teens
Change attributable to older teens

The change attributable to younger teens, can be further broken down as follows:

$$\begin{aligned} \text{TBR}_y \text{ effect} &= (\text{WT}_{y2006} + \text{WT}_{y2005})/2 \times (\text{TBR}_{y2006} - \text{TBR}_{y2005}) \\ \text{WT}_y \text{ effect} &= (\text{TBR}_{y2006} + \text{TBR}_{y2005})/2 \times (\text{WT}_{y2006} - \text{WT}_{y2005}) \end{aligned}$$

Similarly, the change attributable to older teens, can be further broken down as follows:

$$\begin{aligned} \text{TBR}_o \text{ effect} &= (\text{WT}_{o2006} + \text{WT}_{o2005})/2 \times (\text{TBR}_{o2006} - \text{TBR}_{o2005}) \\ \text{WT}_o \text{ effect} &= (\text{TBR}_{o2006} + \text{TBR}_{o2005})/2 \times (\text{WT}_{o2006} - \text{WT}_{o2005}) \end{aligned}$$

Then, collecting terms across younger and older teens, the total effect attributable to changes in the birth rates for these subpopulations versus shifts in the population between these subpopulations can be stated as follows:

$$\begin{aligned} \text{TBR effect} &= \{(\text{WT}_{y2006} + \text{WT}_{y2005})/2 \times (\text{TBR}_{y2006} - \text{TBR}_{y2005})\} \\ &+ \{(\text{WT}_{o2006} + \text{WT}_{o2005})/2 \times (\text{TBR}_{o2006} - \text{TBR}_{o2005})\} \end{aligned}$$

$$\begin{aligned} \text{WT effect} &= \{(\text{TBR}_{y2006} + \text{TBR}_{y2005})/2 \times (\text{WT}_{y2006} - \text{WT}_{y2005})\} \\ &+ \{(\text{TBR}_{o2006} + \text{TBR}_{o2005})/2 \times (\text{WT}_{o2006} - \text{WT}_{o2005})\} \end{aligned}$$

The same methodology can be applied whether defining population subgroups by race/ethnicity, by age, by nativity, or by any other factors for which one has birth rates and teen population counts. Findings for race/ethnicity, age, nativity, and marital status are displayed in Tables 1 through 3.

Table 1 shows the birth rate for various subgroups of teens for the years 1991, 2005 and 2006. As shown, birth rates declined for all subgroups of teens between 1991 and 2005. For example, the rate fell from 38.6 to 21.4 births per 1,000 teens age 15 to 17 and from 94.0 to 69.9 births per 1,000 teens age 18 to 19. In contrast, the overall birth rates

between 2005 and 2006 rose from 40.5 to 41.9 births per 1,000 teens age 15 to 19, and rose for all subgroups shown here except for married teens.

Table 1. Teen Birth Rates by Subgroup, Various Years

	1991	2005	2006
Total	61.8	40.5	41.9
Subgroup			
Ages 15-17	38.6	21.4	22.0
Ages 18-19	94.0	69.9	73.0
Native born	57.9	36.0	37.4
Foreign born	122.8	95.5	97.0
White non-Hispanic	43.4	25.9	26.6
Black non-Hispanic	118.2	60.9	63.7
Other	40.8	24.9	25.3
Hispanic	104.6	81.7	83.0
Married	410.4	308.7	265.9
Unmarried	44.6	34.5	36.2

Source: Author’s tabulations based on NCHS Vital Statistics Reports, NCHS vital statistics data online, Current Population Survey data accessed online and American Community Survey data accessed online. Note that NCHS does not publish teen birth rates for foreign born and native born teens or for married teens and these rates are imputed here based on a combination of NCHS and Census Bureau data. The category “Other” includes Native Americans or Alaskan Natives as well as Asian or Pacific Islanders, and rates for Other are based on published birth rates, birth numbers and populations for these underlying categories and authors tabulations.

Table 2 shows how the composition of the teen population has changed over time with respect to these same subgroups—that is, what share of the population age 15 to 19 is accounted for by each group. The proportion of the teen population that falls into each subgroup is that subgroup’s weight in the decomposition analysis as described in the methodology above. The population of teens shifted slightly between 1991 and 2005 from older to younger teens; from native born to foreign born; from non-Hispanic white teens to non-Hispanic black, Hispanic, and other teens; and from married to unmarried teens. *It is important to note, however, that these shifts were fairly modest. Not surprisingly, shifts in the population between 2005 and 2006 were even smaller—generally less than a percentage point.*

Table 2. Teen Population Weights by Subgroup, Various Years

	1991	2005	2006
Subgroup			
Ages 15-17	58.1%	60.7%	60.9%
Ages 18-19	41.9%	39.3%	39.1%
Native born	94.0%	92.5%	92.5%
Foreign born	6.0%	7.5%	7.5%
White non-Hispanic	68.6%	62.8%	62.1%
Black non-Hispanic	15.0%	15.6%	15.8%
Native American or Alaskan Native	1.0%	1.1%	1.1%
Asian or Pacific Islander	3.4%	4.2%	4.2%
Other	4.4%	5.3%	5.3%
Hispanic	11.9%	16.4%	16.9%
Married	4.7%	2.2%	2.5%
Unmarried	95.3%	97.8%	97.5%

Source: Author's tabulations based on NCHS Vital Statistics Reports, NCHS vital statistics data online, Current Population Survey data accessed online and American Community Survey data accessed online. Note that NCHS does not publish population breakouts for foreign born and native born teens, nor for married and unmarried teens, and these numbers are imputed here based on a combination of NCHS and Census Bureau data.

Table 3 shows what factors contributed to changes in the overall teen birth rate, both for the decrease between 1991 and 2005 and the increase between 2005 and 2006. For each period, the first column shows how much of the change in the overall teen birth rate is accounted for by each subgroup of the teen population. For example, over the period from 1991 to 2005, 44 percent of the decline in the teen birth rate is accounted for by younger teens and 56 percent is accounted for by older teens. Looking across these two populations, 93 percent is attributable to changes in the underlying birth rates for these groups (rates for both younger and older teens went down substantially as shown in Table 1) and seven percent is attributable to shifts in the population between the two subgroups.

Looking at subgroups defined by race/ethnicity tells a somewhat different story. Over this same period of 1991 to 2005, 63 percent of the decline is attributable to non-Hispanic white teens, while 39 percent of the decline can be attributed to non-Hispanic black teens and two percent to other teens (which include Native Americans or Alaskan Natives and Asian or Pacific Islanders). The influence of Hispanic teens on overall teen birth rates during this period is more complex. While teen birth rates for Hispanic teens fell during this period, their rates remained above the overall average and the Hispanic share of the

teen population grew slightly during this period (from 11.9 percent to 16.4 percent, as shown in Table 2). Thus, outcomes among Hispanic teens actually offset the decline in the overall teen birth rate by four percent—that is, in the absence of the actual birth rate and population changes among Hispanic teens, the overall teen birth rate would have declined four percent more than it actually did. Looking at the total influence of changes in birth rates within subpopulations versus total changes in population composition with respect to race/ethnicity, we see in Table 3 that 113 percent of the decline is accounted for by declines in the underlying teen birth rates for the subgroups, while shifts in the population among racial/ethnic groups contributed an offsetting 13 percent. That is, in absence of these population shifts across all racial/ethnic groups, the decline in the teen birth rate would have been 13 percent greater. Table 3 also shows results for subgroups defined by nativity and marital status.

Looking now to the increase in the teen birth rate from 2005 to 2006, Table 3 shows that roughly three-quarters, or 74 percent, was accounted for by older teens, and 26 percent by younger teens. The increase in the overall teen birth rate is fully accounted for by increases in the underlying birth rates for younger and older teens, while shifts in the population between younger and older teens actually offset the increase by six percent. Again, this means that the increase would have been six percent higher if the population had not shifted more toward younger teens. While the population shift toward younger teens was very small (from 60.7 percent of the teen population to 60.9 percent), it nonetheless makes a measurable contribution given that the overall teen birth rate change we are decomposing is only three percent.

With respect to subgroups defined by race/ethnicity, the results indicate that white non-Hispanic teens contributed 15 percent to the increase, black non-Hispanic teens contributed 37 percent, other teens contributed two percent, and Hispanic teens contributed 45 percent. In terms of the total influence of changes in birth rates versus changes in population composition with respect to race/ethnicity, it appears that 76 percent of the overall increase in the teen birth rate between 2005 and 2006 can be attributed to the fact that teen birth rates increased for nearly every subgroup, while 24 percent can be attributed to a shift in the racial/ethnic makeup of the teen population. ***Again, however, it should be noted that this is 24 percent of a very small increase in the teen birth rate overall—three percent—implying that these population shifts raised the overall teen birth rate by less than one percent.***

Table 3. Sources of Change in the Overall Teen Birth Rate, 1991 to 2005 and 2005 to 2006

Subgroup	Contribution to the <i>Decline</i> of 91-05:			Contribution to the <i>Increase</i> of 05-06:		
	of each subgroup	of rate change across subgroups	of pop shifts across subgroups	of each subgroup	of rate change across subgroups	of pop shifts across subgroups
Ages 15-17	44% of total decline			26% of total increase		
Ages 18-19	56% of total decline			74% of total increase		
	100% of total decline	93% of total decline	7% of total decline	100% of total increase	106% of total increase	6% offsetting decline
Native born	99% of total decline			88% of total increase		
Foreign born	1% of total decline			12% of total increase		
	100% of total decline	104% of total decline	4% offsetting increase	100% of total increase	98% of total increase	2% of total increase
White non-Hispanic	63% of total decline			15% of total increase		
Black non-Hispanic	39% of total decline			37% of total increase		
Other	2% of total decline			2% of total increase		
Hispanic	4% offsetting increase			45% of total increase		
	100% of total decline	113% of total decline	13% offsetting increase	100% of total increase	76% of total increase	24% of total increase
Married	59% of total decline			6% offsetting decline		
Unmarried	41% of total decline			106% of total increase		
	100% of total decline	62% of total decline	38% of total decline	100% of total increase	45% of total increase	55% of total increase

Source: Author's tabulations based on NCHS Vital Statistics Reports, NCHS vital statistics data online, Current Population Survey data accessed online and American Community Survey data accessed online.

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About The National Campaign to Prevent Teen and Unplanned Pregnancy

The National Campaign to Prevent Teen and Unplanned Pregnancy seeks to improve the lives and future prospects of children and families and, in particular, to help ensure that children are born into stable, two-parent families who are committed to and ready for the demanding task of raising the next generation. Our specific strategy is to prevent teen pregnancy and unplanned pregnancy among single, young adults. We support a combination of responsible values and behavior by both men and women and responsible policies in both the public and private sectors.

If we are successful, child and family well-being will improve. There will be less poverty, more opportunities for young men and women to complete their education or achieve other life goals, fewer abortions, and a stronger nation.



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