

Title V 5-Year Needs Assessment Indicators

DATABOOK 2000 to 2011

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TITLE V 5-YEAR NEEDS ASSESSMENT INDICATORS DATABOOK 2013

The 2013 version of the set of Title V Indicator DataBooks has changed in a few important ways. The purpose of this document is to provide an overview of the DataBooks and to introduce implications for using the DataBooks to inform local monitoring and planning activities.

DATABOOK LAYOUT

The DataBook contains a minimum of three types of tabs: Data, Rates, and Graphs. A few DataBooks also have a Definition tab.

Data Tabs. As previously, the Data Tabs are a 2-tab set of local jurisdiction and state data summarizing required and optional indicators. Each Data Tab presents the numerators with the appropriate denominators to calculate rates. Data presented here are the source for calculating a Rates and Graphs tab for each indicator. Most indicators have 12 years of data, 2000-2011. Beginning this year, we are introducing indicators with fewer years, for example 2005-2011.

Some indicators typically have few cases. Births to females age 10 to 14 is an example. For some indicators with few cases, we include the numerator and denominator data on the Data Tab, but we do not calculate rates or make graphs. This is another change introduced this year.

Definition Tab. A few DataBooks have a Definitions Tab to provide more specific information as to how they were calculated. These are mainly indicators using a population subset, e.g., births to mothers age 15 to 44, or singleton births. In these instances, the total cases reported will be less than the total for the source data, e.g., all births vs. singleton births. Other indicators require adding cases from multiple data sources, e.g., births and fetal deaths. For these indicators the total number typically reported will be greater than either file independently.

The Rate Tab incorporates information previously available in FHOP data templates. This table is preset to print in three pages.

Page 1 defines the indicator and its risk factors. Below this is the rate table for total cases. It may have as many as 12 or as few as no data rows, depending on the number of cases available each year. Rules for determining the number of rows are in the next section of this document. Below the rate table for all cases on page 1, we identify the data sources and additional analyses you might wish to undertake to understand your jurisdiction's performance on the indicator.

Page 2 of the rate table summarizes rates for White Non-Hispanic and Hispanic All-Race, and Page 3 summarizes results for Non-Hispanic African-American and Asian/Pacific Island populations. We use the same rules to calculate these tables as we use for the Total table.

The Graph Tab summarizes results of trend tests for data on the Rate Tab. As with the Rate Tab, page 1 summarizes trend results for all data (Total). Under the Total Statistics table, we are introducing a table comparing the change in rates for State and Local by race/ethnicity at the 3-year start and the 3-year end of the trend period. Page 2 shows trend results for White Non-Hispanic and Hispanic All-Race, and page 3 for Non-Hispanic African American and Asian/Pacific Island populations. See Appendix A for the description of methods to calculate rate and trend statistics.

CALCULATING RATES

MINIMUM NUMBER OF EVENTS

If the minimum number of events over all years was greater than or equal to 10 in each year, the years of indicator data was left as given [1]. If the minimum number of events in any period was less than 10, we aggregate the data into 2-year periods. If the minimum still was less than ten, we aggregate into 3-year periods. If any 3-year period still did not meet the minimum of 10, we declare the number of cases not big enough and do not calculate a rate for that period. If all periods had fewer than 10 cases, the table on the Rates tab has the phrase "Rates not calculated." Otherwise, the Rates Tab tables show the period, numerator, rate, and rate confidence interval for every interval with 10 or more cases.

This is a change from earlier DataBooks, where we would suppress all rate information if any period had too few cases. Now we report any period with 10 or more cases.

Given the final level of aggregation for the local data, we do the same aggregation on the corresponding California data. Then we merge the local and state data for side-by-side presentation in the Rate Tab.

DENOMINATORS

We use two different types of denominators: Annual county-level population estimates from the California Department of Finance (DOF) [2], and counts based on the birth, death, and/or or fetal death certificates.

DOF one-year age groups are summarized as needed for indicators that use state population for their denominators. Some indicators use only certain ages in the female population for denominators, others use all population or all population in given age categories.

Some indicators have as their denominator the total number of records in a given category and file, for example from the birth certificates file, the number of women age 15 to 44 delivering a live born infant. Others need refinement: women age 15 to 44 delivering a singleton infant. Before deciding if a record meets the minimum qualifying condition(s), we exclude invalid or unlikely cases (e.g., age missing, 92 year old mother, 27-month gestational age, 5 gram birth weight). We exclude cases outside allowable ranges set by the CDC/NCHS [3] and report their frequency in the Quality DataBook.

RACE/ETHNICITY

DataBook rates are based on race and ethnicity as originally reported in the source files. In preparing national statistics, the National Center for Health Statistics (NCHS) randomly reassigns undefined groups ("multi-race" and "other" (which includes "unknown")) to defined single-race groups (white, black, Asian/Pacific Island (API), and American Indian/Alaska Native (AIAN)) based on the local underlying population distribution [4]. Hispanic all-race counts are not changed. As a result, race-specific rates in DataBooks may not match NCHS published rates.

For some DataBooks, FHOP calculates rates using California Department of Finance (DOF) population estimates. DOF estimates race-specific population from various data sources, some of which include undefined groups. DOF uses the NCHS method to reassign "other" but not "multi-race" [5,6].

The accuracy of race/ethnic-specific rates depends on the completeness of race and ethnicity reporting, which varies by geography, reporting year, and reporting source. Incomplete reporting reduces the number of events in the defined groups, and affects the accuracy and stability of rates. It reduces the number of events in the numerator (and sometimes the denominator) for rate calculations, and may underestimate incidence or prevalence. Before interpreting results of statistical tests on rates and trends tabs, FHOP recommends reviewing local tab rows for undefined groups. Consider the extent to which numbers for undefined groups may increase uncertainty about defined group rates.

CALCULATING RATES AND CONFIDENCE INTERVALS

Rates are calculated overall and for each race/ethnic group by dividing the numerator (number of events) by its appropriate denominator (population, births, deaths, etc), and multiplying the result times the appropriate factor (e.g. rate per 1000 births, etc.). The confidence interval for the rate is calculated using the Wilson score without continuity correction [7].

EXAMPLE RATE TAB

Table 1 on the next page is an example of the Rate Tab for one indicator, in this case the number of live births per 1,000 females age 15 to 17. The top section includes definitions of the indicator, numerator, denominator, the Healthy People (HP) 2020 Objective, and risk factors associated with this indicator.

The Rate Table shows data for the total population in California and the local jurisdiction, over the most recent 12-year period for which data are available, in this case 2000 through 2011. For both California and the jurisdiction, columns indicate the number of events, the rate, and lower and upper confidence limits for that rate.

Below the rate table, we present information on the sources for the definitions of the indicator, the numerator, and the denominator. Recommended tables that can be made using EpiBC (if a birth-certificate indicator) are shown. Finally, we present any notes that we think are important to understand the data presented. On pages 2 and 3 of a given Rate Tab, we show the same rate-based data for the other race/ethnic groups, as described earlier.

Comparing the state and local rates and confidence intervals on Table 1, from start to end of period, we see that the local rate and its upper confidence intervals are always below the state rate. This allows us to conclude that the local rate was significantly lower than the state rate throughout the period. In both cases, we also see that the rates appear to be dropping. This leads us to wonder if the drop in rates is statistically significant. Is the rate of change the same for the jurisdiction and state? That is, do we have a trend, and if so, is it linear or curvilinear? How does the jurisdiction compare with the state?

Table 1: Fertility Rate per 1,000 Female Population Age 15 to 17 by Race/Ethnicity

DEFINITION: The number of live births per 1,000 females age 15-17
NUMERATOR: Number of live births to females age 15-17, by place of residence in a calendar year
DENOMINATOR: Population of females age 15-17, by place of residence in a calendar year
HP 2020 OBJECTIVE **FP 8.1:** Reduce the pregnancy rate among adolescent females aged 15 to 17 years to 36.2 pregnancies per 1,000 (Baseline: 40.2 per 1,000 in 2005)
RISK FACTORS: Poverty, education, access to family planning, substance use

TOTAL POPULATION									
Year	California				Local				
	Births	Rate	Confidence Limit		Births	Rate	Confidence Limit		
			Lower	Upper			Lower	Upper	
2000	18,887	26.5	26.1	26.9	577	21.6	20.0	23.5	
2001	17,307	23.8	23.5	24.2	514	18.6	17.1	20.3	
2002	16,660	22.6	22.2	22.9	414	14.7	13.3	16.1	
2003	16,193	21.6	21.3	21.9	426	14.8	13.5	16.3	
2004	16,263	21.3	21.0	21.7	397	13.6	12.3	15.0	
2005	16,740	21.6	21.3	21.9	453	15.2	13.9	16.6	
2006	17,208	21.7	21.4	22.0	422	13.8	12.6	15.2	
2007	17,582	21.8	21.4	22.1	425	13.6	12.4	14.9	
2008	17,007	20.8	20.5	21.1	396	12.7	11.5	14.0	
2009	15,418	19.2	18.9	19.5	407	14.4	13.1	15.9	
2010	13,308	16.4	16.2	16.7	289	10.4	9.3	11.7	
2011	11,839	14.8	14.5	15.0	264	9.5	8.4	10.7	

Sources: Definition: The National Association for Public Health Statistics and Information Systems (NAPHSIS). Age-Specific Birth Rate. Last access 05-Dec-2013 at: http://www.naphsis.org/about/Documents/ASBR_Final_Scott.pdf
Numerator: California Center for Health Statistics, Vital Statistics, Birth Statistical Master File. To order see: <http://www.cdph.ca.gov/data/dataresources/requests/Pages/BirhandFetalDeathFiles.aspx>. Last access 05-Dec-2013
Numerator: California Center for Health Statistics, Vital Statistics, Birth Statistical Master File. To order see: <http://www.cdph.ca.gov/data/dataresources/requests/Pages/BirhandFetalDeathFiles.aspx>. Last access 05-Dec-2013
 State of California, Department of Finance, Report P-3: State and County Population Projections by Race/Ethnicity, Detailed Age, and Gender, 2010-2060. Sacramento, California, January 2013. Last access 04-Dec-2013 at: <http://www.dof.ca.gov/research/demographic/reports/projections/P-3/>

Recommended Tables: *Can be analyzed using EpiBC*
 Births by mother's race/ethnicity -- Review Crude Birth Rate Tables
 Births by mother's age, parity, geographic area (ZIP code, if available)
 Map of distribution of births by geographic area (ZIP code)

Notes: **Race/Ethnicity.** DataBook rates are based on race and ethnicity as originally reported in the source files. In preparing national statistics, the National Center for Health Statistics (NCHS) randomly reassigns undefined groups ("multi-race" and "other" (which includes "unknown")) to defined single-race groups (white, black, API, and AIAN) based on the local underlying population distribution [1]. Hispanic all-race counts are not changed. As a result, race-specific rates in DataBooks may not match NCHS published rates.

For some DataBooks, FHOP calculates rates using California Department of Finance (DOF) population estimates. DOF estimates race-specific population from various data sources, some of which include undefined groups. DOF uses the NCHS method to reassign "other" but not "multi-race" [2,3].

The accuracy of race/ethnic-specific rates depends on the completeness of race and ethnicity reporting, which varies by geography, reporting year, and reporting source. Incomplete reporting reduces the number of events in the defined groups, and affects the accuracy and stability of rates. It reduces the number of events in the numerator (and sometimes the denominator) for rate calculations, and may underestimate incidence or prevalence. Before interpreting results of statistical tests on rates and trends tabs, FHOP recommends reviewing local tab rows for undefined groups. Consider the extent to which numbers for undefined groups may increase uncertainty about defined group rates.

1. Martin JA, Hamilton BE, Ventura SJ, et al (2013). Births: Final data for 2011. National vital statistics reports; Vol 62, No 1. Hyattsville, MD: National Center for Health Statistics. Last access 03-Dec-2013 at:
 2. California and its Counties Population by Age, Race/Hispanics, and Gender: 2000–2010. Base population. Last access 03-Dec-2013 at: <http://www.dof.ca.gov/research/demographic/data/race-ethnic/2000-2010/index.php>
 3. U.S. Census Populations with Bridged Race Categories. Last access 03-Dec-2013 at: http://www.cdc.gov/nchs/nvss/bridged_race.htm
 Confidence Limit = the boundary of the 95% confidence interval.

DISPLAYING AND TESTING TRENDS

If rates are on the Rates Tab, as for our example, we display local and state rates over the period on the Graph Tab and show results of statistical tests for trends and rate differences

THE TREND GRAPH

Figure 1 shows the graph made using the rates from Page 1 of the Graph Tab for our example indicator. Depending on the number of events, the data allow us to calculate, a given graph might have no points, 1 to 4 points, or 6 or 12 points. Note that the graphs do not include confidence intervals, which would be inappropriate for a trend test. Here, we focus on the rate of change over time rather than the rate within a given period such as a year.

Figure 1: Fertility Rate Trend per 1,000 Female Population Age 15 to 17

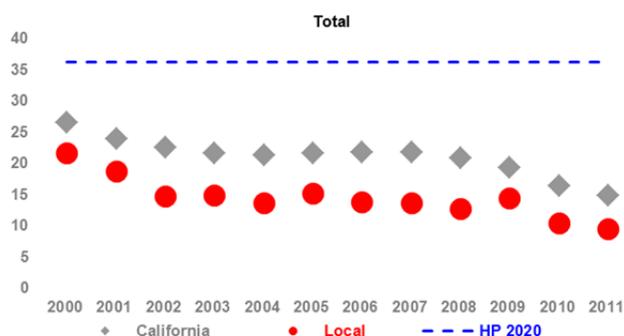


Figure 1 has 12 points, because the number of events was 10 or more in all years. If the indicator had too few cases in a period, the local year space would be blank. Red dots (●) show the local rate and grey diamonds (◆) the state rate. When an indicator has a Healthy People (HP) 2020 objective, it shows with a dashed blue line. For this indicator, the HP objective is 36.2 births per 1,000 female population age 15 to 17.

STATISTICAL TESTS

In the trend analysis, we first examine the state and local rates for linear or non-linear trends. If the data permits 12 years of rates, as they do here, or six 2-year rate periods, we test for non-linear trends. With 12 rates, we allow the non-linear trend to have up to 3 separate time intervals, while with 6 rates we allow up to 2 time intervals.

We evaluate the indicator data on the rate tab three ways. First, we test it to see if the trend(s) were statistically significant, that is, significantly increasing or decreasing over each time interval or over the complete period, comparing each slope to zero. Second, in the special case where both the local and state trends are described by a single linear trend over the complete period, we perform a statistical comparison of the two slopes, asking in essence if the local jurisdiction is changing at a rate similar to or different from the state and in what direction. Third, we test if the local jurisdiction rate is significantly different from the state at the start and end of our period. The emphasis here is whether local jurisdiction results are lower than, higher than, or the same as the state. Table 3 reports the results of these three types of statistical tests for our example trend test and difference test.

Trend Test. Sometimes the "eyeball" test may make you think that significant linear trends are present when in fact the data are not linear or the trend is not significant. For example, the linear trend test may be non-significant because the data has some other shape like \cap or \cup . When the data has another shape, it would be inaccurate to describe a trend as linear.

We use JoinPoint software to test for trends. When JoinPoint finds that one or more segments of a period have slopes that are significantly different from the slope of the previous period or finds significant shifts in the intercept, it breaks the trend into segments. This means that JoinPoint found a bend, or change in the angle of the trend line that is significantly different from the previous segment at $P = 0.05$ or less. If it finds bends, JoinPoint defines the time-based segment and describes the slope and intercept during each period. Each time the segment slope changes, its intercept also changes.

If JoinPoint reports a multiple-segment model, we report each segment separately. Otherwise, we report the simple linear model.

Table 2. Trend Regression Results
Births per 1,000 Female Population Age 15 to 17

Level	Date Range	Intercept		Slope			Sig?
		Est.	Std. Err	Est.	Std. Err	P-Value	
State	2000-2002	26.29	0.34	-2.13	0.46	0.010	Yes
	2002-2008	22.33	0.48	-0.14	0.09	0.191	No
	2008-2011	38.67	1.81	-2.19	0.18	0.000	Yes
Local	2000-2002	21.83	0.93	-3.52	1.25	0.048	Yes
	2002-2009	15.25	0.98	-0.22	0.17	0.248	No
	2009-2011	31.62	9.15	-2.04	0.87	0.078	No
State Avg	2000-2002	24.28	0.10				
Local Avg	vs State	18.24	0.47			0.000	Yes
State Avg	2009-2011	16.81	0.08				
Local Avg	vs State	11.45	0.37			0.000	Yes

State Trend. The first data row in the Level column contains the word "State". The "Date Range" column shows one or more time intervals. If a simple linear model is justified, one line of State results shows, and the Date Range column shows the 12-year range. In our example, JoinPoint found three segments, so three rows show with three ranges.

For each trend segment, the next column sets show the intercept and its standard error, the slope and its standard error, and the P-value associated with the slope. In the last column, we identify by "Yes" or "No" if the slope in the time segment is significantly different from zero at $P = 0.05$ or less.

JoinPoint found that a 3-segment model offered the "best" description of the state data. By best, we mean that this model explained more significantly variance than the simple linear model. From 2000-2002, the state declined at a rate of -2.13 births per 1000 per year, a rate which is a significant decline as shown by the P-value of 0.010. From 2002-2008, the rate was essentially flat (slope -0.14, P-value 0.191). Then during the period 2008-2011, the state rate returned to its significant decline (slope -2.19, P-value 0.000).

Local Trend. The first column contains the word "Local". In all other respects reporting the local trend is like the state trend discussed above. For our example, JoinPoint found the local trend declined significantly for the period 2000-2002 (slope -3.52, P-value 0.048), was flat between 2002-2009 (slope -0.22, P-value = 0.248), and declined in 2009-2011 (slope -2.04, P-value - .078). For an overall sense of how the jurisdiction did, look at the slope estimate section of the table. The last column summarizes the "big picture": "Yes" means the local trend is significant at $P = 0.05$ or less through 2002 and non-significant thereafter. Note that in the 2009-2011 period both the local and state rates declined but because the local sample is much smaller than the state, the local decline was not statistically significant ($p=.078$ is greater than .05).

If the local jurisdiction has too few cases to calculate trends, we show the text "Too few cases", and the rest of the table is blank.

Difference of Slopes Test. If JoinPoint accepts a linear model for both the State and jurisdiction, we test to see if their slopes are significantly different from each other. This test

uses the estimates and standard errors of the state and local slopes, assuming the data are independent and normally distributed.

Since JoinPoint found both state and models were nonlinear for our first example, we do not show a difference of slopes test for it. When one area has a linear trend and another area has a curvilinear trend, or as in this case when both are curvilinear, we cannot test if the slopes for these trends are different. But we can show the difference of slopes test for the fertility rate results for African-American females age 15-17 in this same jurisdiction, as on Table 3.

Table 3. Trend Regression Results per 1,000 African-American Females Age 15-17

Level	Date Range	Intercept		Slope			Sig?
		Est.	Std. Err	Est.	Std. Err	P-Value	
State	2000-2011	27.37	0.88	-0.92	0.13	0.000	Yes
Local	2000-2011	30.43	2.68	-1.23	0.39	0.011	Yes
	Different?					0.462	No
State Avg	2000-2002	27.28	0.41				
Local Avg	vs State	33.16	1.55			0.000	Yes
State Avg	2009-2011	18.31	0.34				
Local Avg	vs State	20.80	1.30			0.050	Yes

Table 3 shows that both the state and local jurisdictions had significant linear trends. When both trends are linear, line 3 of the "Level" column is blank and the "Date Range" column contains the word "Different?". The P-value is from the test that the local slope equals the state slope over the trend period.

Again, a "Yes" or "No" indicates whether the P-value is statistically significant. In this case, both trends are significant, but the local rate of change is not statistically different from the state rate of change. In any circumstance where the difference of slopes test is not statistically significant, report the state rate, since the local rate is not different from that, and the state rate has more power. Only when the two trends are significantly different should the local trend be reported in favor of the state trend.

Difference of Rates Tests. The lower part of Tables 2 and 3 answers a question of central importance to most jurisdictions: Overall, did they do better, the same as, or worse than the state? To approach this question, we do difference of rates tests, comparing the local jurisdiction to the state for the first three and last three years of the trend period. The statistical test is a Chi-square on a 2-by-2 table of events or non-events for state versus local. The approximate standard error is the semi-width of the Wilson score 95% confidence interval for the rates divided by 1.96.

State Average in First 3 Years. The first column shows "State Avg", and the Date Range column identifies the first 3 years in the period. The three-year average state rate and its standard error are displayed in the Intercept Estimate and Standard Error columns. In the first three years of the example period for Table 2, the average state rate was 24.28 births per 1,000 females age 15 to 17. In the first three years of the example period for Table 3, the average state rate was 27.28 per 1,000 African-American females age 15-17. In both cases, notice that the jurisdiction standard error is wider than the state, since the jurisdiction is smaller.

Local Average in First 3 Years and Comparison to State. This is located on the line after the State Average. The first column contains "Local Avg" and the Years column contains the words "vs State". The three-year average local rate and its standard error are displayed in the Intercept Estimate and Standard Error columns. In the first three years of the trend period for Table 2, the local jurisdiction rate was 18.24 births per 1,000 females age 15 to 19. In the first three years of the trend period for Table 3, the local jurisdiction rate was 33.16 per 1,000 African-American females age 15-17.

The "P-value" column shows the P-value for the Chi-square test that the state and local 3-year rates are the same. "Yes" indicates that the P-value is less than 0.05 and the state and local rates are significantly different. "No" indicates they are not significantly different. The example local jurisdiction had a statistically lower rate than the state during the last 3-year period for births to females age 15-17 and a higher rate for African-American females age 15-17.

State Average in Last 3 Years. In the last three years, the State as a whole had a rate of 16.81 births per 1,000 females age 15 to 17 and a rate of 18.31 births per 1,000 African-American females age 15-17.

Local Average in Last 3 Years and Comparison to State. This is like the first three years described above, with the local jurisdiction having a rate of 11.45 births per 1,000 females age 15 to 17 and a rate of 20.80 per 1,000 African-American females age 15-17. During the last three years in the trend period, the "Yes" in the last column, and the P = 0.050 indicates that the local jurisdiction had statistically lower rates than the state for births to females age 15-17 but the local rate was higher than the state for births to African-American females age 15-17.

RACE/ETHNIC DISPARITIES

Immediately below the analysis of Total trend regression results, a new table labeled "Change of rates within race/ethnicity" shows State and Local rates and confidence intervals for the four primary race/ethnic groups for the 3-year start- (2000-2002) and end-of-period (2009-2011). The column labeled "Change" shows the rate of change over the interval, if results for a given race/ethnic group were statistically significant, and if so, the direction of change. The column labeled "Change" shows the percent change over the interval. If the rate rose, the number will be positive. If the rate dropped, the number will be negative. The word "No" will indicate no important change for that race/ethnic group over the interval.

The statistical test of change from start of period to end of period is a Chi-square test on a 2-by-2 table of start or end versus events or non-events, The "CI" confidence intervals on these lines are the semi-width of the Wilson score 95% confidence intervals for the rates.

Table 4. Change of rates within level and ethnicity, Births to Females Age 15-17

Level	Race/ethnic Group	2000-2002		2009-2011		Change	
		Rate	CI	Rate	CI	%	Sig?
State	White	8.64	0.20	4.94	0.16	-43	Yes
	Black	27.28	0.81	18.31	0.66	-33	Yes
	Hispanic	43.52	0.43	26.86	0.29	-38	Yes
	API	7.82	0.34	3.43	0.22	-56	Yes
Local	White	5.02	0.84	3.06	0.75	-39	Yes
	Black	33.16	3.04	20.80	2.55	-37	Yes
	Hispanic	40.59	2.79	21.42	1.79	-47	Yes
	API	5.27	1.05	1.84	0.59	-65	Yes

Table 4 shows births to females age 15-17 in the example jurisdiction. Births plummeted 33 to 56 percent (all significant) statewide. Locally, rates plummeted 37 to 65 percent. The gap between Black and Hispanic females closed locally, although their rates remain 6 to 10 times higher than White and API females.

CONCLUSION

Reality is often complex, and complexity trumps simplicity when reporting statistical results. Thus, when a statistically significant nonlinear trend exists, the interpretation must reflect this *even in the presence of a statistically significant linear trend*. In our example, the jurisdiction trend for teen births is nonlinear for both the state and local jurisdiction. In such a circumstance,

trends cannot be directly compared statistically and each must be summarized separately. Only when the best description for *both* trends is linear can their rates of change be compared.

The local rate of live births per 1,000 females age 15-17 declined linearly at the statistically significant rate of -3.52 during the period 2000-2002 with no significant change thereafter. Similarly, much of the state's decrease occurred in the interval 2000-2002, -2.70 per 1,000 live births, paused from 2002-2008, but resumed a significant decline thereafter. The local rate was significantly below the state rate at the start and end of the period.

On the other hand, the state and local jurisdiction each had a statistically significant linear trend for decreased births to African-American females age 15-17. The local trend was not significantly different from the state trend of -0.92 per 1,000 population.

In this jurisdiction, young women age 15-17 overall were much less likely to have a baby than the state average. On the other hand, African-Americans of this age in this jurisdiction were more likely to have a baby than the state average.

Over the period, both the state and jurisdiction rates fell well below the HP 2020 Objective for births to females age 15-17 (36.2 per 1,000). Rates plummeted for all age groups, and locally, disparities between Black and Hispanic females closed although disparities with White and API females still were 6 to 10 times higher.

Readers with a non-statistical background will find it most helpful to focus on the last column of the trend results table. If it says "Yes," the trend is significant at $P = 0.05$. Those who would like a statistical refresher may wish to review the FHOP monograph, "Do We Have a Linear Trend?" It is available on the FHOP website at: <http://fhop.ucsf.edu/fhop/>.

APPENDIX A: OTHER STATISTICAL ISSUES

The process of creating DataBooks is macro driven using SAS. The process starts by classifying cases as to the presence or absence of a given indicator, then summarizing the indicator data and appropriate denominator data to the geographic level of interest (state, county, super region (e.g., Bay Area) or sub-region (Berkeley, Long Beach, Pasadena, LA County Service Provider Areas). We calculate rates, feed the numerators and denominators into JoinPoint, bring JoinPoint results back into SAS, and output results directly into preformatted Excel template files.

We use JoinPoint to estimate linear trends for the jurisdiction and state and to test whether the resulting slope for each trend is significantly different from zero [8,9]. The Statistical Research and Applications Branch (SRAB) of the National Cancer Institute developed JoinPoint as one among a set of new statistical methods and associated software tools for the analysis and reporting of cancer statistics. This group of powerful shareware statistical packages is appropriate for the analysis of any population-based data [10]. In this set of software, JoinPoint was developed explicitly to estimate linear and curvilinear trends.

JoinPoint takes trend data and fits the simplest trend model that the data allow. The user supplies the minimum and maximum number of joinpoints. The program starts with the minimum number of joinpoints (e.g. 0 joinpoints, which is a straight line, or a standard trend test) and then tests whether more joinpoints are statistically significant and must be added to the model (up to that maximum number). This enables the user to test if an apparent change in trend from one period to another is statistically significant. Tests of significance use a Monte Carlo Permutation method.

Models may incorporate estimated variation for each point (e.g. when the responses are age adjusted rates) or use a Poisson model of variation. In addition, models may be linear on the log of the response (e.g. for calculating annual percentage rate change). The software allows viewing one graph for each joinpoint model, from the model with the minimum number of joinpoints to the model with maximum number of joinpoints.

JoinPoint uses a complex algorithm to decide whether to add a bend (“join point”) to a simple linear model. For each segment or for the entire period, JoinPoint tests whether the slope is equal to zero (i.e. the line is flat). When calculating the standard error of the slope of a segment, it ignores points at the bend. This reduces the effective sample size when calculating the standard errors of the slopes. Consequently, JoinPoint tests comparing the slopes to zero are quite conservative.

We use the following JoinPoint program options to calculate trends: 1) input numerators and denominators, 2) test for bends at whole years, 3) use a minimum of two years between bends and between a bend and either end of the data, 4) test for a maximum of 2 bends, 5) fit a linear (not log-linear) model with uncorrelated errors.

We use the single line model unless one or more line segments have a slope significantly different from zero. If both the local and state data had a simple linear model, we use the estimates and standard errors JoinPoint reports to test equality of the two slopes. The standard error of the difference is the square root of the sum of the squared standard errors.

In calculating state and local three-year rates, we use the total of the numerators and average of the denominators over the three years. Then we divide the resulting rates and confidence limits

by 3. In this calculation, we use the same methodology used to calculate 1-year rates and confidence intervals displayed on the rates table, namely the Wilson approximation method. We convert the 95% confidence interval into an estimated standard error by dividing the width of the confidence interval in half and dividing by 1.96. We test equality of the two rates using the estimated rates and standard errors.

ENDNOTES

- 1 Minimum numbers are smaller than suggested in FHOP's "Small Numbers Guidelines". The focus here is on longitudinal trends rather than one-year comparisons, and statistical tests are based on counts rather than rates.
- 2 See: <http://www.dof.ca.gov/research/demographic/>. Last accessed 24-Sep-2013
- 3 See National Vital Statistics System (NVSS) Computer Edits for Natality Data (Revised States) Data, September 23, 2008 (Updated 2/11/2011). Available upon request.
- 4 Martin JA, Hamilton BE, Ventura SJ, et al (2013). Births: Final data for 2011. National vital statistics reports; Vol 62, No 1. Hyattsville, MD: National Center for Health Statistics. Last accessed 03-Dec-2013 at: http://www.cdc.gov/nchs/data/nvsr/nvsr62/nvsr62_01.pdf
- 5 California and its Counties Population by Age, Race/Hispanics, and Gender: 2000–2010. Base population. Last accessed 03-Dec-2013 at: <http://www.dof.ca.gov/research/demographic/data/race-ethnic/2000-2010/index.php>
- 6 U.S. Census Populations with Bridged Race Categories. Last accessed 03-Dec-2013 at: http://www.cdc.gov/nchs/nvss/bridged_race.htm
- 7 Newcombe RG. Two-sided confidence intervals for the single proportion: Comparison of seven methods. *Statist. Med.* 17, 857-872 (1998). Note that this is a different test than is recommended in FHOP's "Small Numbers Guidelines," which focuses on easy-to-calculate statistics.
- 8 The Joinpoint software program was obtained at: <http://surveillance.cancer.gov/joinpoint/>. Last accessed 18-Oct-2013.
- 9 Kim HJ, Fay MP, Feuer EJ, Midthune DN. Permutation tests for joinpoint regression with applications to cancer rates. *Stat Med* 2000;19:335-51 (correction: 2001;20:655).
- 10 See Methods & Software for Population-Based Cancer Statistics: <http://surveillance.cancer.gov/software/>. Last accessed 18-Oct-2013.