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Abstract

This study revisits a methodological question pursued in 1980 – whether simple information on current pregnancy status can be used to estimate fertility rates reliably. If so, there would be a substantial gain in simplicity, convenience, and contemporaneity. The conclusion in 1980, based on a study of 15 countries in the World Fertility Survey, was negative. The present analysis using data from 148 Demographic and Health Surveys in 65 countries and adding a longitudinal perspective in 41 of these countries with repeat surveys, reaches a positive conclusion. An adjusted pregnancy rate was developed, based on reported pregnancy durations of 3-8 months, which corresponds very closely with national birthrates 1-2 years later. Additional analyses of subnational or regional data are much less reliable except for the states of India with much larger samples.

1. Introduction

This paper revisits the question of whether simple information on current pregnancy status could serve as a reliable indicator of the fertility rate. If a strong predictive association could be demonstrated, the advantages of simplicity, convenience, and contemporaneity over the more complex birth history approach would be considerable. This question was addressed in 1980 with data on 15 countries from the World Fertility Survey (Goldman and Westoff 1980). The conclusion then was that the current pregnancy estimates, even when adjusted, fell too far short of the fertility rates (by an average of 13 percent) to serve as a reliable substitute.

The same question is addressed here with a much richer data set of 148 surveys from 65 countries in The Demographic and Health Surveys (DHS) Program, and a more positive judgment is reached. The analysis reported here is richer not only in the number of observations but also with the inclusion of some subnational data at the state or province level and with a longitudinal perspective focused on the prediction of fertility over time for 41 of the 65 countries, in addition to a cross-sectional analysis of all 65 countries.

2. Measurement Issues

The pregnancy data used here are based on the responses of women age 15-49 to a direct survey question of whether they are currently pregnant and, if so, how many months they think they have been pregnant. Table 1, in the first column, shows the simple percentage of women who reply "yes" to the question, with a mean unadjusted pregnancy rate of 7.3%, for the most recent surveys in the 65 countries. The second column shows an adjusted pregnancy rate, with a mean of 11.9%, derived from the number of women 3-8 months pregnant (a 6-month period). This rate is then doubled in order to set the rate on a 12-month scale for comparison with annual fertility rates. The 1980 study used a different adjustment based on a 3-month period (women 5-7 months pregnant), and then multiplied by 4 to annualize.

Table 1. Estimates of the mean birthrate from the adjusted current pregnancy rate

Country	Survey Year	Unadjusted Pregnancy Rate[1]	Adjusted Pregnancy Rate[2]	Birthrate	Difference
Albania	2008-09	.020	.029	.038	.008
Armenia	2010	.030	.048	.052	.004
Azerbaijan	2006	.035	.054	.057	.003
Bangladesh[3]	2014	.060	.096	.092	-.004
Benin	2011-12	.094	.156	.156	.000
Bolivia	2008	.055	.091	.104	.013
Burkina Faso	2010	.101	.173	.179	.006
Burundi	2010	.104	.183	.174	-.009
Cambodia	2014	.053	.080	.084	.004
Cameroon	2011	.098	.151	.156	.005
Chad	2014-15	.135	.214	.200	-.014
Colombia	2010	.033	.055	.058	.004
Comoros	2012	.066	.103	.126	.023
Congo, B	2011-12	.095	.139	.159	.020
Congo, DR	2013-14	.117	.180	.199	.020
Cote d'Ivoire	2011-12	.102	.164	.154	-.010
Dominican Republic	2013	.055	.085	.076	-.009
Egypt*	2014	.100	.156	.150	-.006
Ethiopia	2011	.073	.123	.137	.015
Gabon	2012	.097	.152	.128	-.024
Gambia	2013	.081	.126	.163	.037
Ghana	2014	.070	.114	.124	.011
Guinea	2012	.107	.169	.154	-.015
Guyana	2009	.043	.062	.080	.018
Haiti	2012	.058	.090	.101	.010
Honduras	2011-12	.053	.089	.092	.003
India	2005-06	.052	.081	.089	.008
Indonesia*	2012	.043	.065	.075	.010
Jordan	2012	.095	.153	.169	.016
Kazakhstan	1999	.029	.045	.057	.012
Kenya	2014	.071	.110	.124	.015
Kyrgyz Republic	2012	.067	.106	.106	.000
Lesotho	2014	.043	.072	.101	.029
Liberia	2013	.083	.133	.143	.009
Madagascar	2008-09	.083	.143	.145	.001
Malawi	2015	.076	.123	.140	-.017
Maldives	2009	.073	.111	.111	.000
Mali	2012-13	.115	.188	.193	.005
Moldova	2005	.024	.040	.045	.005
Morocco	2003-4	.040	.062	.069	.007
Mozambique	2011	.110	.184	.176	-.007
Namibia	2013	.060	.101	.109	.008
Nepal	2011	.049	.075	.084	.008
Nicaragua	2001	.049	.083	.100	.017
Niger	2012	.142	.244	.239	-.005
Nigeria	2013	.121	.202	.163	-.039
Pakistan*	2012-13	.108	.171	.173	.002
Peru	2012	.035	.060	.073	.014
Philippines	2013	.042	.072	.085	.013
Rwanda	2014-15	.073	.121	.122	.002
Sao Tome & Principe	2008-09	.084	.140	.143	.003
Senegal	2014	.080	.130	.147	.017

Continued…

Table 1. —*Continued*

Sierra Leone	2013	.086	.139	.146	.006
Swaziland	2006-07	.056	.099	.117	.018
Tajikistan	2012	.076	.126	.116	-.010
Tanzania	2010	.095	.156	.163	.007
Timor-Leste	2009-10	.068	.110	.149	.039
Togo	2013-14	.085	.137	.145	.007
Turkey	2003	.058	.093	.099	.006
Uganda	2011	.116	.189	.188	-.001
Ukraine	2007	.028	.051	.033	-.018
Vietnam	2002	.047	.077	.077	.001
Yemen	2013	.084	.130	.195	.065
Zambia	2013-14	.087	.138	.160	.022
Zimbabwe	2010-11	.083	.134	.132	-.002
All Countries		.073	.119	.125	.006

[1] Mean number of births in the past 3 years, divided by 3
[2] Two times the proportion of women currently pregnant with duration 3-8 months
[3] Based on ever-married women

The objective of adjustment is to take into account the early months when pregnancy is less certain and when both spontaneous and induced abortions typically occur, and the 9th month, which is influenced by previous births. As Table 2 shows, the average proportion of pregnant women reporting the pregnancy in the 9th month is only 5% compared with 15% in the 8th month. A variety of such adjustments have been tested here, and the correlations between them and the 3-8 months measure are all well over .90. The 3-8 month interval also has the advantage of reducing the sampling error associated with shorter intervals.

Table 2. Mean reported duration of current pregnancy in 65 countries.

Month	Mean Proportion	Standard Deviation
1	.042	.018
2	.101	.024
3	.128	.016
4	.129	.015
5	.132	.016
6	.131	.020
7	.134	.021
8	.152	.031
9	.050	.023

The estimation of fertility rates also has measurement issues associated with underreporting due to omission and dating problems (Schoumaker 2014). Different measures are evaluated here. The third column of Table 1 lists the fertility rate reported in the past 3 years (divided by 3 to annualize the rate for comparison with the pregnancy rates) for each country. Although this birthrate seems to be a more reliable estimate than births in the past 12 months, it loses some of the time sensitivity with current pregnancy rates.

The basic logic of the central question here is whether near-future birthrates can be predicted accurately from the adjusted current pregnancy rates. Such an analysis requires at least two surveys for a country. This paper begins with a cross-sectional view of all 65 countries, including those with only one survey as well as those with multiple surveys. This cross-sectional picture is followed by the longitudinal perspective, which is based on the 41 countries with at least two DHS surveys.

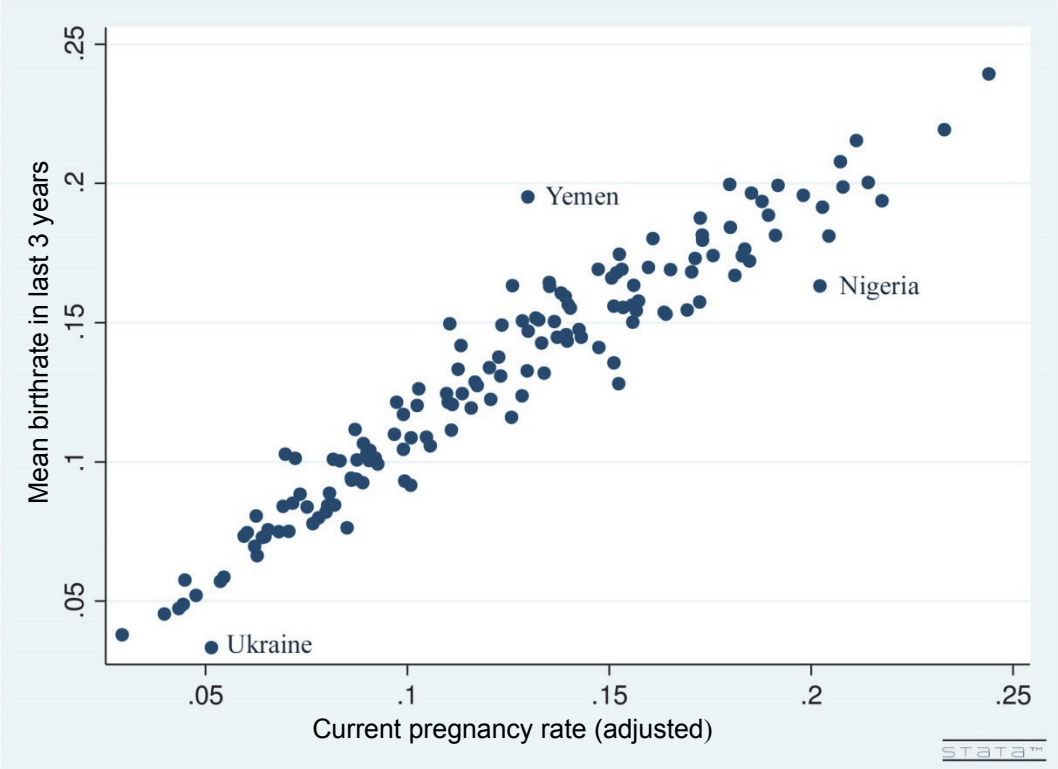
3. Results

3.1 Cross-Sectional Comparisons

As Figure 1 shows, there is a strong cross-sectional association between the adjusted pregnancy rate and the birthrate for the most recent surveys in the 65 countries. The correlation is .948. Two outliers are Yemen, where the pregnancy rate appears under-reported, and Nigeria, where fertility may be underestimated. In the earlier Nigeria 2008 DHS survey, the two measures are similar, with a difference of only .004. The mean difference between the two measures across the 65 countries is .006 (see Table 1), with an average birthrate of .125 and an estimated pregnancy rate of .119. Most of the differences show birthrates higher than the pregnancy rates.

Although the statistical association is strong, relative differences cannot be ignored. A leading example is Ukraine (another outlier in Figure 1), with a pregnancy rate of .051 and a birthrate of .033. If this birthrate is accurate, the pregnancy rate would imply a serious over-estimate. Gambia, Guyana, Lesotho, and Timor-Leste have the opposite problem, where the pregnancy rate estimates are below the birthrate.

Figure 1. Association between the adjusted current pregnancy rate and the mean birthrate in the past 3 years



The perspective has focused thus far on a cross-sectional analysis in which fertility was measured by an average of births in the 3 years before the survey and the current pregnancy rate was measured at the time of the survey. In the following longitudinal analysis, a different measure of fertility is used that follows the pregnancy measure in time, rather than preceding it.

3.2 Longitudinal Analysis

The longitudinal analysis is based on data from 41 countries that have conducted more than one DHS survey, typically at 5-year intervals. Table 3 shows the statistical association between the adjusted current pregnancy rate and the birthrate 1-2 years later, on average. The two measures are derived from different surveys linked across time. The early survey is used to estimate the pregnancy rate using the same adjusted current status measure from the earlier analysis. The later survey is used to estimate the birthrate 1-2 years after the preceding survey, calculated as the difference between the mean number of births in the past 5 years minus the mean number in the past 3 years, divided by 2. This measure reflects the birthrate 4-5 years before the later survey and thus 1-2 years after the previous one, helping to line up the pregnancy rates and birthrates.

Table 3. Current pregnancy rate (adjusted) and birth rates 1-2 years later.

Country and Survey Year	Pregnancy Rate Adjusted	Birth Rate 1-2 Years Later	Birth Rate Minus Pregnancy Rate
Armenia			
2000	.043	.041	-.002
2005	.044	.045	.001
2010	.040		
Bangladesh*			
1999	.113	.126	.013
2004	.102	.112	.010
2007	.107	.108	.001
2011	.099	.090	-.009
2014	.091		
Benin			
2001	.185	.177	-.008
2006	.173	.167	-.006
2012	.156		
Bolivia			
1998	.094	.126	.032
2003	.088	.101	.013
2008	.090		
Burkina Faso			
1999	.160	.183	.023
2003	.170	.181	.011
2010	.173		
Cambodia			
2000	.103	.114	.011
2005	.087	.086	-.001
2010	.073	.080	.007
2014	.084		
Cameroon			
1998	.140	.150	.010
2004	.163	.147	-.016
2011	.151		
Colombia			
2000	.081	.068	-.013
2005	.066	.060	-.006
2010	.061		
Congo, B.			
2005	.132	.138	.006
2011	.150		
Congo, D.R.			
2007	.180	.189	.009
2013	.180		

Continued…

Table 3.—*Continued*

Country and Survey Year	Pregnancy Rate Adjusted	Birth Rate 1-2 Years Later	Birth Rate Minus Pregnancy Rate
Dominican Republic			
1999	.082	.091	.009
2002	.086	.081	-.005
2007	.077	.079	.002
2013	.085		
Egypt*			
2003	.147	.117	-.030
2008	.151	.135	-.016
2014	.135		
Ethiopia			
2000	.154	.164	.010
2005	.140	.153	.013
2011	.123		
Ghana			
1998	.138	.136	-.002
2003	.122	.119	-.003
2008	.117	.116	-.001
2014	.116		
Guinea			
1999	.148	.152	.004
2005	.152	.153	.001
2012	.168		
Haiti			
2000	.108	.131	.023
2006	.101	.095	-.006
2012	.094		
Honduras			
2006	.094	.092	-.002
2012	.094		
India*			
1993	.129	.129	.000
1999	.113	.118	.005
2005	.110		
Indonesia*			
2002	.098	.099	.001
2007	.097	.093	-.004
2012	.090		
Jordan			
2002	.185	.182	-.003
2007	.204	.180	-.024
2012	.153		
Kenya			
1998	.133	.146	.013
2003	.128	.134	.006
2008	.119	.128	.009
2014	.110		

Continued…

Table 3.—*Continued*

Country and Survey Year	Pregnancy Rate Adjusted	Birth Rate 1-2 Years Later	Birth Rate Minus Pregnancy Rate
Lesotho			
2004	.101	.091	-.010
2009	.073	.083	.010
2014	.070		
Liberia			
2007	.168	.163	-.005
2012	.145		
Madagascar			
1997	.164	.159	-.005
2004	.139	.148	.009
2009	.144		
Malawi			
2000	.197	.176	-.021
2004	.208	.166	-.042
2010	.159	.144	-.015
2015	.123		
Mali			
2001	.209	.194	-.015
2006	.201	.207	.006
2013	NA		
Mozambique			
1997	.179	.167	-.012
2003	.161	.152	-.009
2011	.169		
Namibia			
2000	.099	.095	-.004
2008	.098	.099	.001
2013	.099		
Nepal			
2001	.134	.106	-.028
2006	.089	.087	-.002
2011	.074		
Niger			
1998	.209	.211	.002
2006	.209	.239	.030
2012	.227		
Nigeria			
2003	.177	.167	-.010
2008	.168	.164	-.004
2013	.193		
Pakistan*			
2007	.200	.182	-.018
2012	.175		
Peru			
2000	.073	.072	-.001
2005	.067	.075	.008
2010	.070		

Continued…

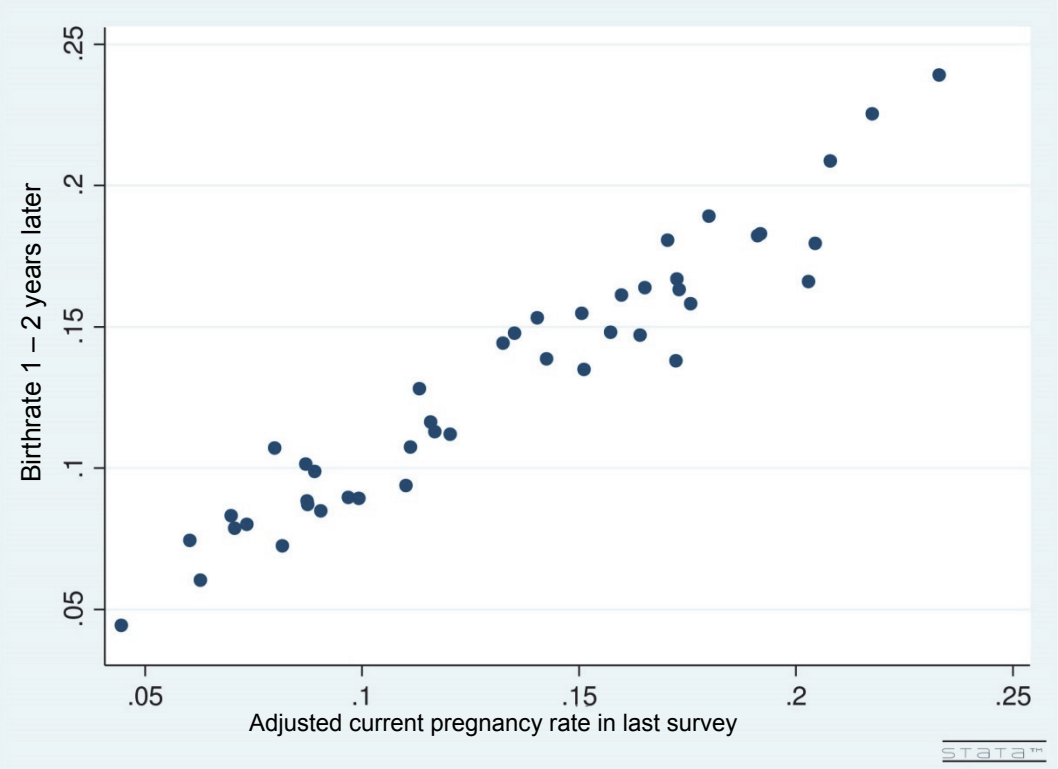
Table 3.—*Continued*

Country and Survey Year	Pregnancy Rate Adjusted	Birth Rate 1-2 Years Later	Birth Rate Minus Pregnancy Rate
Philippines			
1998	.101	.103	.002
2003	.096	.093	-.003
2008	.087	.088	.001
2013	.076		
Rwanda			
2000	.152	.140	-.012
2005	.136	.141	.005
2010	.114	.113	-.001
2015	.113		
Senegal			
2005	.142	.143	.001
2010	.133	.143	.010
2014	.142		
Sierra Leone			
2008	.129	.147	.018
2013	.139		
Tanzania			
1998	.154	.161	.007
2004	.173	.158	-.015
2010	.152	.143	-.009
2015	.143		
Uganda			
2001	.195	.195	.000
2006	.187	.183	-.004
2011	.180		
Zambia			
2002	.165	.169	.004
2007	.174	.167	-.007
2014	.137		
Zimbabwe			
1999	.129	.113	-.016
2006	.107	.107	.000
2014	.123		
All country surveys	.133**	.132	-.001

* Based on ever-married women
** Excludes most recent survey

The results summarized in Table 3 show the two measures for a total of 86 comparisons across the 41 countries. Overall, as Figure 2 shows, there is a close association between the two measures, with a strong correlation of .964 for the 41 countries based on their most recent surveys. If all 86 surveys are included, the correlation is almost identical, at .961.

Figure 2. Association between the adjusted current pregnancy rate and the mean birthrate 1 – 2 years later



A close examination of Table 3 focusing on the differences between the two rates shows this close pattern, with many of the differences around zero. The number of surveys in which the current pregnancy estimates exceed the birthrate is the same as the number with the reverse association. There are numerous possible explanations for these differences, including sampling error as well as measurement error. The sampling error depends mainly on the size of the sample and design effects. To take the Rwanda 2014-15 DHS as an example, the estimated sampling error for the total sample of 13,497 women for the proportion currently pregnant (.073) yields a 95% confidence range between .068 and .078. In addition, there are uncertainties about under-reporting especially in the early months of pregnancy, which led to the need for adjustment. There is also sampling error associated with the estimation of the birthrates calculated for the comparison, as well as other types of measurement problems involving the omission of births and the recall of dates. Also, the birthrates are the average of 2 years rather than a single-year estimate.

Overall, both the pregnancy rate and the birthrate have the same average value for the 86 comparisons and a net difference of .001. Despite the strong association, there are several countries with relatively large differences. These include Egypt in the 2003 survey, Jordan in 2007, Malawi in both earlier surveys, Nepal in 2001, and Niger in 2006. In five of these six instances the estimated pregnancy rate exceeds the birthrate. The exception is Niger, where the calculated birthrate is higher than the pregnancy rate.

3.3 Subnational Level

In the interest of further evaluating this general method of estimating recent fertility from current pregnancy data, regional or other subnational data have been used in several countries with large samples of women surveyed.

Nigeria

Nigeria has had several recent DHS surveys, in 2013, 2008, and 2003, with large samples in each of 37 states. Two analyses were conducted. The adjusted current pregnancy rate was estimated for each state in 2008 and compared with the birthrate 1-2 years later calculated from the 2013 survey. Although the correspondence is high across the 37 states, in several states the difference is unacceptably large. In this comparison, 12 states show "errors" mostly where the pregnancy estimate is more than 20 percent higher than the calculated birthrate. A similar pattern appears in the 2003 pregnancy estimates of the later birthrates.

Rwanda

Rwanda has 30 districts in both its 2010 and 2015 surveys, ranging in sample size from 400 to 650 women. The estimated current pregnancy rates in 2010 for each district and the corresponding birthrates 1-2 years later show a very poor relationship. Half of the districts have pregnancy rates and birthrates with differences greater than 20%, equally divided between those under-estimating and those over-estimating the subsequent birthrate. Only a third of the districts fall below a 10% difference range.

Ghana

There are 10 regions of Ghana and three surveys in 2003, 2008, and 2014 with samples of women ranging from 350 to 1,040. A comparison of the adjusted pregnancy rate in each region in 2008 with the birthrate 1-2 years later shows a fairly close fit, with an average difference of .015 and only one region with a large difference (.037), the Upper West, the region with the smallest number of women surveyed. Comparing the pregnancy rate in 2003 with the later birthrate shows a similar picture, with an average difference of .016.

Haiti

Two sets of comparisons are possible for nine regions of Haiti – between 2006 and 2012 and between 2000 and 2006. Between 2006 and 2012, four of the nine regions have poor fits, as do three different regions of the nine between 2000 and 2006. The average difference between the pregnancy rates and the "predicted" birthrates in the later surveys comes close to 30% of the birthrate.

India

In India the large samples of 124,385 women in the 2005-06 survey and 89,199 women in the 1998-99 survey increase confidence in the reliability of estimates for the 26 individual states in the country. The comparison of the adjusted current pregnancy rate in the 1998-99 survey with the birthrate 1-2 years later (Table 4) shows a close correspondence, with a few exceptions. The overall averages are .116, for both rates. The three main exceptions are Meghalaya, Tamil Nadu, and Uttar Pradesh. In Meghalaya the birthrate is overestimated by 25%, and by 30% in Tamil Nadu, while in Uttar Pradesh the reverse discrepancy appears, with a similar difference. Overall, the number of states with underestimates of the birthrate is the same as the number with overestimates.

Table 4. The association of the estimated current pregnancy rate in India in 1999 with the birth rate 1-2 years later, by state.

States	1999 Current Pregnancy Rate	Birth Rate 1-2 Years Later	Difference
Andhra Pradesh	.084	.085	.001
Arunachal Pradesh	.182	.160	-.022
Assam	.118	.117	-.001
Bihar	.130	.160	.030
Delhi	.099	.100	.001
Goa	.093	.084	-.009
Gujarat	.088	.113	.025
Haryana	.095	.112	.017
Himachal Pradesh	.092	.089	-.003
Jammu & Kashmir	.109	.122	.013
Karnataka	.108	.095	-.013
Kerala	.082	.073	-.009
Madhya Pradesh	.135	.139	.004
Maharashtra	.109	.092	-.017
Manipur	.132	.132	.000
Meghalaya	.220	.175	-.045
Mizoram	.113	.138	.025
Nagaland	.156	.176	.020
Orissa	.108	.108	.000
Punjab	.121	.099	-.022
Rajasthan	.139	.133	-.006
Sikkim	.105	.095	-.010
Tamil Nadu	.099	.076	-.023
Tripura	.098	.085	-.013
Uttar Pradesh	.122	.162	.040
West Bengal	.084	.101	.017
All States	.116	.116	.000

These subnational analyses of the relationship between the current adjusted pregnancy rate and the subsequent birthrate show mixed results. The evidence supporting the use of pregnancy data is fairly strong for India and Ghana but is not encouraging for Nigeria, Rwanda, and Haiti. The reasons reflect both the smaller samples and also the unknown mobility of populations across local borders, which is clearly more of an issue within countries than at the national level.

4. Summary and Conclusion.

The main focus of this research has been to revisit the question of whether information on current pregnancy can be used to estimate fertility reliably. If so, the gains in simplicity and in contemporaneity would be considerable. The earlier evidence in 1980, based on cross-sectional data from 15 countries in the World Fertility Survey program, concluded that the pregnancy data were not useful because they underestimated birthrates. The present analysis, based on 148 DHS surveys, reaches a more positive conclusion, although the evidence does not support the value of pregnancy data at subnational levels. The strong support at the national level is based not only on the cross-sectional evidence for 148 surveys but also on a longitudinal design that examines repeated surveys in 41 countries of the association of current pregnancy rates and birthrates 1-2 years after the survey.

References

Goldman, Noreen, and Charles F. Westoff. 1980. "Can Fertility be Estimated from Current Pregnancy Data?" *Population Studies* 34(3):535-550.

Schoumaker, Bruno. 2014. *Quality and Consistency of DHS Fertility Estimates, 1990 to 2012.* DHS Methodological Reports No. 12. Rockville, MD: ICF.