

# Education and Fertility in Two Chinese Provinces : 1967-1970 to 1979-1982

*China's family planning programme has been able  
to transcend the barriers of illiteracy  
and low educational levels*

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The rapid decline of fertility in China during the 1970s coincided with a rapid rise in the educational attainment of Chinese women. This coincidence raises questions about the role and importance of educational change in China's fertility decline, which this article attempts to answer.

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Utilizing data from the large-scale One-per-Thousand Population Fertility Sampling Survey of 1982, which collected individual histories on reproductive behaviour and ascertained the educational attainment of each respondent,<sup>1/</sup> fertility decline is analysed in two contrasting provinces, Kaoning and Sichuan, in the period 1967-1970 to 1979-1981.

In fertility studies, education is generally recognized to be the best single indicator of individual modernity. At the aggregate level, moreover, the educational level is usually highly correlated with other major social and economic indicators of development. Thus, these data may provide evidence on the relative importance of developmental change and administrative interventions in the fertility decline, a question of special interest given the ambitious goals of China's fertility control policy.

One major theme of this article is that very large fertility declines at every educational level in the two provinces studied suggest that China's powerful family planning programme has been able to transcend the barriers of illiteracy and low educational levels. A second is that education, nevertheless, is related to reproductive levels in the rural sector both before and after the major programme effects. There are very large differences in both education and fertility between the urban and the rural sectors, so an essential third theme is related to the manner in which the urban environment affects the interrelationship of fertility and education. The article indicates that urban-rural differences in China are far larger and urban fertility levels far lower than can be accounted for by education alone.

The data come from the aforementioned One-per-Thousand Survey, carried out under the auspices of the State Family Planning Commission of the People's Republic of China.<sup>2/</sup> The sample covered 252,000 women 15-49 years old for China as a whole.

Sichuan and Liaoning differ considerably in their social and economic development. Liaoning is among the most economically advanced provinces of China, surpassing by a wide margin the levels of Sichuan using virtually any developmental indicator. Liaoning's population was 42 per cent urban in 1982 compared with 14 per cent for Sichuan, but urban composition alone does not explain the gap between the two provinces. Rural incomes per capita in Liaoning in 1982 exceeded those of Sichuan by 60 per cent (439 yuan compared with 273); adult female illiteracy and semi-literacy in rural Liaoning was 27 per cent compared with 47 per cent in rural Sichuan.

Fertility rates are computed for three-year periods in order to increase the size of the populations at risk. The analysis begins with the period 1967-1970 and ends with the last period of observation, 1979-1982. A sustained fertility decline began in the urban areas of both provinces in 1964. Sustained

rural declines began in Liaoning in 1969 and in Sichuan in 1972. Although Liaoning's rural decline began during the 1967-1970 period, its fertility was still quite high, with a total fertility rate by age (TAFR)<sup>3/</sup> of 5880.,

### Rise in educational levels

Survey respondents were asked questions concerning their educational level at the time of the Survey. In the Survey, if a respondent had any elementary school experience or reported that she could read, she was placed in the elementary category. This amounts to a liberal definition of literacy. For this article, it is assumed throughout that a woman's educational level was attained in childhood<sup>4/</sup>

In 1967-1970 in rural Sichuan (**table 1**), 70 per cent of the women of child-bearing ages (15-49 years old) were illiterate; however, progress is evident. Although 97 per cent of women 45-49 years of age were illiterate, the percentage illiterate decreased systematically the younger were the women who were sampled; for example, among those 15-19 years of age, the proportion illiterate was 50 per cent. In the prime child-bearing years, 20-29, over half were still illiterate in 1967-1970 and almost all of the literate had only elementary schooling; among young rural women 15-24 years of age, only 6-7 per cent had more than an elementary education. By 1967-1970, when Sichuan's fertility decline began, rural women still were predominantly illiterate, and those who were literate were surrounded by role models and relatives who were illiterate.

At the starting point, 1967-1970, the women of Sichuan's urban sector were much better educated than the rural women and as well educated as the women of urban Liaoning. Only 25 per cent of urban Sichuan women 15-49 years of age were illiterate. Even among the oldest (45-49), a significant number had achieved literacy before the People's Republic of China was established<sup>5/</sup> Among women under 30, there was relatively little illiteracy and a large proportion already had post-primary education.

Between 1967-1970 and 1979-1982, in both rural and urban Sichuan, educational levels rose substantially. In the rural area, this improvement still left large proportions illiterate and most of the rest with no more than an elementary education. However, in the urban sector, illiteracy had almost disappeared among women under 30, and most women under 30 had post-elementary education.

Educational levels were substantially higher in rural Liaoning than in rural Sichuan even as early as 1967-1970 (**table 2**). This was especially true for those under 30 years of age. For the older women, there was little difference

Table 1: Percentage educational distribution of Sichuan women\*  
of child-bearing age, by age, total, rural and urban, 1967-1970 and 1979-1982

	Total				Rural				Urban			
	Illiterate	Elem-entary	Jr. high plus	Total	Illiterate	Elem-entary	Jr. high plus	Total	Illiterate	Elem-entary	Jr. high plus	Total
15-19	43	42	15	100	50	43	7	100	3	31	66	100
1967-1970	12	36	52	100	13	41	46	100	1	6	93	100
1979-1982	47	41	12	100	52	42	6	100	3	38	59	100
20-24	30	34	36	100	37	39	24	100	1	12	87	100
1967-1970	61	29	10	100	69	27	4	100	10	41	49	100
1979-1982	41	41	18	100	46	44	10	100	2	25	73	100
30-34	72	21	7	100	83	16	1	100	26	43	31	100
1967-1970	44	43	13	100	50	44	6	100	3	36	61	100
1979-1982	81	14	5	100	91	8	1	100	37	37	26	100
35-39	54	34	12	100	61	33	6	100	7	37	56	100
1967-1970	87	9	4	100	94	5	1	100	55	29	16	100
1979-1982	68	24	8	100	78	20	2	100	18	44	38	100
40-44	91	6	3	100	97	3	0	100	60	26	14	100
1967-1970	77	17	6	100	88	11	1	100	32	41	27	100
1979-1982	64	27	9	100	70	26	4	100	25	35	40	100
Total 15-49	42	34	24	100	47	36	17	100	8	26	66	100
1967-1970	42	34	24	100	47	36	17	100	8	26	66	100
1979-1982	42	34	24	100	47	36	17	100	8	26	66	100

\* Note: These are distributions of woman-years in these age groups during the specified periods. Similar data are available for years of marital exposure.

**Table 2: Percentage educational distribution of Liaoning women\* of child-bearing age, by age, total, rural and urban, 1967-1970 and 1979-1982**

	Total						Rural			Urban		
	Illiterate	Elementary	Jr. high plus	Total	Illiterate	Elementary	Jr. high plus	Total	Illiterate	Elementary	Jr. high plus	Total
15-19	12	45	43	100	19	62	19	100	0	15	85	100
1967-1970	2	24	74	100	3	35	62	100	1	3	96	100
1979-1982	12	57	31	100	17	66	17	100	1	38	61	100
20-24	6	26	68	100	11	43	46	100	0	4	96	100
1967-1970	24	53	23	100	34	54	12	100	6	53	41	100
1979-1982	11	37	52	100	18	56	26	100	0	9	91	100
25-29	48	42	10	100	66	31	3	100	28	54	18	100
1967-1970	12	56	32	100	17	68	15	100	1	30	69	100
1979-1982	71	25	4	100	90	10	0	100	49	43	8	100
30-34	18	53	29	100	26	57	17	100	2	46	52	100
1967-1970	80	18	2	100	91	8	1	100	65	32	3	100
1979-1982	36	50	14	100	51	44	5	100	17	57	26	100
35-39	88	11	1	100	93	6	1	100	80	18	2	100
1967-1970	64	30	6	100	84	15	1	100	42	47	11	100
1979-1982	39	40	21	100	48	42	10	100	27	35	38	100
40-44	15	36	49	100	21	47	32	100	6	20	74	100
1967-1970	88	11	1	100	93	6	1	100	80	18	2	100
1979-1982	64	30	6	100	84	15	1	100	42	47	11	100
45-49	39	40	21	100	48	42	10	100	27	35	38	100
1967-1970	15	36	49	100	21	47	32	100	6	20	74	100
1979-1982												
Total 15-49												

\* Note: These are distributions of woman-years in these age groups during the specified periods. Similar data are available for years of marital exposure.

between Sichuan and Liaoning. This indicates very high illiteracy in both provinces before the present regime and a faster course of improvement in Liaoning in the 1960s and 1970s when most of the women 15-24 years of age were educated. Those 25-29 years of age in 1967-1970 were educated just before or just after the founding of the People's Republic of China.

So, at the starting point, 1967-1970, the rural women of Liaoning were already substantially better educated than those of Sichuan. Although rural educational levels improved in both provinces by 1979-1982, Liaoning's women were much better educated. However, in neither province was rural education at the high levels usually associated with very low fertility.

### **Education and fertility in Sichuan, 1967-1970**

As early as 1967-1970, when Sichuan's TAFR was as high as 6470, a fairly strong negative relationship between education and fertility had already appeared (**table 3**). This is evident both for all women, as indicated by the TAFR, and for married women, as measured by the sum of their fertility rates at specific durations of marriage – the total marital-duration-specific fertility rate (TDFR). During this early period, the negative relationship between education and fertility had not fully emerged in Sichuan's rural sector (80 per cent of the total). Only those with more than an elementary education had lower than average fertility.

Also during the 1967-1970 period, urban fertility rates were already lower than rural rates by a very wide margin at every educational level. In fact, the rates for even illiterate urban women were lower than those for rural women with the highest education.

Urban China had already experienced a substantial fertility decline by 1967 - 1970, apparently induced, at least in part, by government-sponsored family planning efforts that began in 1963. This may explain why urban-rural educational differentials alone did not account for the very large urban-rural fertility differentials. Within education categories, the urban TAFRs were 32 to 46 per cent lower than those in the rural areas. Weighting the rural TAFRs by urban educational distributions results in essentially no change in the high TAFR for the total rural population.

Education affected fertility in Sichuan partly through its influence on marriage. By 1967-1970, more education already meant a lesser probability of being married at age 20-24, a prime child-bearing age at that time. Beginning in 1970, delay of marriage became an object of the national family planning programme, sometimes known by the slogan "later (marriage), longer (spacing), fewer (children)." Proportions married at age 20-24 declined rapid-

**Table 3: Total fertility rates (TAFR) and total marital-duration-specific fertility rates (TDFR) for Sichuan, by total, rural and urban, 1967-1970 to 1979-1982**

	Total		Rural		Urban	
	TAFR	TDFR	TAFR	TDFR	TAFR	TDFR
1967-1970						
Illiterate	6909	7279	7061	7451	4794 <sup>a/</sup>	5056 <sup>b/</sup>
Elementary	5794	6131	7224	7631	3913	4355
Jr. high plus	3875	4158	5331 <sup>a/</sup>	3732 <sup>b/</sup>	3556	3766
Total	6470	6980	6980	7483	3970	4541
1973-1976						
Illiterate	5393	5941	5480	6041	3118 <sup>a/</sup>	3543 <sup>b/</sup>
Elementary	4390	4996	5010	5684	2295	2672
Jr. high plus	2268	3044	3515	4718	1657	2321
Total	4719	5452	5195	5918	1914	2581
1979-1982						
Illiterate	2556	2834	2570	2849	915 <sup>a/</sup>	1602 <sup>b/</sup>
Elementary	2139	2283	2225	2364	1192	1477
Jr. high plus	1740	1918	2140	2342	1271	1461
Total	2135	2505	2320	2649	1187	1464

Notes: <sup>a/</sup> = Fewer than 100 women-years in denominator for at least one of age groups 20-24, 25-29, or 30-34; <sup>b/</sup> = fewer than 100 cases in denominator for at least one marital duration group 0-4, 5-9, or 10-14 years.

ly after 1967 - 1970 at every educational level, but the decline was faster in the higher educational groups, suggesting that education facilitated delay of marriage to some extent. However, the major educational difference in total fertility rates was still a result of differential marital fertility, because marriage was still virtually universal for those aged 25-29 and older. These statements apply both to the rural and urban sectors<sup>6/</sup>

Lower fertility for better educated women in third world countries usually results from the use of birth control at that stage of married life when couples have as many children as they want. This generally means that educational differentials in fertility should be greater the later the period of marriage

considered. This is exactly what was found in Sichuan in 1967 - 1970. After the first five years of marriage the negative relationship of education and fertility grows stronger with the duration of marriage. For example, the ratio between the fertility of illiterate women to that for women with post-elementary education is as follows for Sichuan in 1967 - 1970 at different marriage durations:

<b>Marriage duration</b>	<b>Ratio of fertility rate: illiterate/junior high school or more</b>	
	Rural	Urban
0-4 years	0.88	0.65
5 -9	1.10	1.57
10-14	1.39	2.71
15-19	1.47	3.02
20-24	5.03	9.14

Note that the gradient of the decline is much steeper for the urban than for the rural population, as would be expected.

In the urban sector, there was a monotonic negative relationship between education and fertility at all marriage durations after the first five years of marriage.<sup>77</sup> In the rural sector, it was the highest education group that was always differentiated as having lower fertility than the other two less educated groups after the first five years of marriage, but those with primary education also usually had higher fertility than the illiterate women.

What explains the positive relationship between education and fertility during the first five years of marriage, both in the rural sector and in the total population?

This beginning stage of marriage is minimally affected by the effects of post-partum amenorrhea and breast-feeding. It is unlikely that any significant number of rural women were using contraception in the early years of marriage, especially in the illiterate stratum. One plausible interpretation is that better health and nutrition of the better educated means higher fecundability. A quite different interpretation is that the better educated have a shorter first birth interval resulting from closer conjugal ties and more frequent intercourse, more prevalent among better educated couples. Perhaps this positive relationship early in marriage should not be stressed too much, since it is evident in the Sichuan rural data only for the periods 1967 - 1970 and 1970-1973. It is not found in the urban sector data for any of the periods considered, although it perhaps appeared in the urban sector earlier, when urban fertility was higher. In any case, from 1973 -1976 onward to 1979 - 1982 there is



no consistent relationship between fertility and education in the first five years of marriage.

The negative relationship between fertility and education after the first five years of marriage, 1967-1970, means that the higher the educational status, the greater the concentration of births relatively early in the marriage:

**Percentage of total marital-duration-specific fertility rate attributable to fertility at durations of marriage (in years)**

	0-4 years	5-9	10-34
Illiterate	23	25	52
Elementary	29	28	43
Junior high school	48	31	21
Total	25	25	50

The relative concentration of fertility early in marriage was much more marked at this early point in urban than in rural areas (table 4). As will be seen, the pattern of the rural sector was to follow that of the urban sector somewhat later, as fertility declined.

**Table 4: Percentage of the total marital fertility rate attributable to specific marital duration fertility rates in Sichuan, by education and specific periods, total, rural and urban, 1967 - 1970 and 1979 - 1982**

Education	Marital duration (in years)			Total
	0-4 years	5-9	10+	
<i>Total</i>				
Illiterate				
1967-1970	23	25	52	100
1979-1982	59	24	17	100
Elementary				
1967-1970	29	28	43	100
1979-1982	69	21	10	100
Jr. high plus				
1967-1970	48	31	21	100
1979-1982	84	13	3	100
Total				
1967-1970	25	25	50	100
1979-1982	65	21	14	100

**Table 4: (continued)**

Education	Marital duration (in years)			Total
	0-4 years	5-9	10+	
<i>Rural</i>				
Illiterate				
1967-1970	23	24	53	100
1979-1982	59	24	17	100
Elementary				
1967-1970	23	23	54	100
1979-1982	67	22	11	100
Jr. high plus				
1967-1970	33	29	38	100
1979-1982	77	18	5	100
Total				
1967-1970	23	24	53	100
1979-1982	63	22	15	100
<i>Urban</i>				
Illiterate				
1967-1970	27	31	42	100
1979-1982	95	5	0	100
Elementary				
1967-1970	49	28	23	100
1979-1982	94	5	1	100
Jr. high plus				
1967-1970	55	27	18	100
1979-1982	93	6	1	100
Total				
1967-1970	46	25	29	100
1979-1982	93	6	1	100

### **The major decline in Sichuan's fertility**

Sichuan's fertility declined precipitously from 1967 - 1970 to 1979 - 1982 at every educational level and in both the rural and urban sectors (**table 5**). While educational differentials will be considered shortly, the most striking fact is the large declines in all educational strata. The percentage declines in

**Table 5: Percentage change in total fertility rates and total maritalduration-specific fertility rates for Sichuan and Liaoning, by total, rural and urban, 1967-1970 to 1979-1982**

	Sichuan			Liaoning		
	Total	Rural	Urban	Total	Rural	Urban
<i>Changes in total fertility rates</i>						
Illiterate	- 63	-64	-81	-50	-53	-80 *
Elementary	- 63	-69	-70	-50	-62	-52
Jr. high plus	-55	-60	-64	-48	-53	-49
Total	- 67	-67	-70	-60	-62	-53
<i>Changes in total marital duration-specific fertility rates</i>						
Illiterate	- 67	-62	-68	-55	-59	-70
Elementary	- 63	-69	66	-56	-63	-69
Jr. high plus	-54	-59	-61	-54	-58	-59
Total	- 64	-65	-68	-61	-63	-63

\* Note: Fewer than 40 woman-years in denominators of age-specific fertility rates for at least one of age groups 20-24, 25-29, or 30-34, in at least one period.

TAFR for the three educational strata were between 55 and 63 per cent for the total population, 60 to 69 per cent for the rural population and 64 to 81 per cent for the urban population.

Education played a role, but the magnitude of the declines in all educational strata and the fact that the declines were so great even among illiterate women suggest that the exceptionally powerful family planning programme in Sichuan during this period was able to transcend the barriers of low educational levels. It should be kept in mind that the profound transformation in reproductive behaviour in Sichuan occurred despite the fact that educational levels, while rising, were still low. In Sichuan during 1979 - 1982, 42 per cent of all women of reproductive age and 47 per cent of those in rural areas were still illiterate.

Much of the very large decline in fertility occurred in a short part of the period under review. Fifty-four per cent of the total fertility decline of 4335 points, from 1967-1970 to 1979-1982, occurred between 1973-1976 and 1976-1979 and 29 per cent occurred between 1970-1973 and 1973-1976. So, 83 per cent of the decline occurred in half of the 12-year period being

considered. No social or economic changes – other than the intensification of the family planning programme – are known which could account for those major declines.

The fertility declines (table 6) occurred mainly among those 15 - 19 years of age and above 30 years of age, with the result that fertility was increasingly concentrated among those between the ages of 20 and 29. For the specific five-year age groups 15 - 19 and 30-34 or older, the fertility declines ranged from 83 to 94 per cent for all women, 84 to 95 per cent for rural women and 88 to 100 per cent for urban women. Truly remarkable! For rural and total Sichuan, the declines among women aged 25-29 and older were due to declining age-specific marital fertility, while declines in the 15-19 and 20-24 age groups were mainly due to declines in the proportions married.

**Table 6: Percentage change in age-specific and total fertility rates for Sichuan, by total, rural and urban, 1967-1970 to 1979-1982**

Education	Age							TAFR
	15-19	20-24	25-29	30-34	35-39	40-44	45-49	
<i>Total</i>								
Illiterate	-66	-24	-54	-81	-90	-90	-95	-63
Elementary	-79	-27	-53	-86	-95	-97	-86-	63
Jr. high plus	-70	-53	-29	-80	-97	-100	0*	-55
Total	-83	-38	-51	-84	-92	-93	-94	-67
<i>Rural</i>								
Illiterate	-64	-24	-54	-81	-90	-91	-95	-64
Elementary	-79	-25	-55	-88	-97	-98	-78	-69
Jr. high plus	-73	-38	-22	-86*	-99*	-100*	0*	-60
Total	-84	-31	-52	-85	-93	-92	-95	-67
<i>Urban</i>								
Illiterate	-100*	-100*	-39*	-100*	-100*	-100	-100	-81
Elementary	-72	-67	-49	-98	-100	-100	-100	-70
Jr. high plus	-100	-80	-37	-79	-96	-100	0*	-64
Total	-93	-80	-39	-88	-99	-100	-100	-70

\* Note: Fewer than 40 woman-years in denominators of age-specific fertility rates for at least one of ages 20-24, 25-29, or 30-34, in at least one period.

However, in urban Sichuan the declines in marital fertility as well as in the proportions married account for the very large declines in fertility of all women at ages 15 -19 and 20-24. At ages 25-29 the marital fertility decline was considerably less in the urban than in the rural areas, because in the urban sector marital fertility was increasingly concentrated in that age group. Between 1967-1970 and 1979-1982 the proportion of the urban TAFR attributable to the age group 25-29 increased in urban Sichuan from 36 to 72 per cent.

Because of the large changes in nuptiality in the young age groups, the total marital fertility rate (TMFR) is inferior to TDFR as a summary measure of changes in marital fertility. Since TMFR assumes essentially that all women



*The decline in fertility among Sichuan women 20-24 years old during the last decade was due to a decline in the proportion*

are married throughout their child-bearing years, it gives undue weight to the small fertility declines at ages 15-19 and 20-24. TDFR indicates larger marital fertility declines than TMFR for the period of observation. As will be shown, a decomposition of the factors producing the TAFR declines gives major importance to the marital fertility decline and a minor, if significant, effect for declining nuptiality .

Although the large fertility declines at all educational levels are the most notable feature of the entire period, differentials by education did emerge in the rural sector during the period. By 1973 -1976, there was a negative fertility-to-education relationship for all women and all rural women in every age group. By then, rural elementary fertility rates were intermediate between those for illiterates and for post-elementary education in every age group but one. Marital fertility also was negatively related to education from ages 30-34 onward. The differential in marital fertility does not appear at younger ages because the better educated women in these young ages were more concentrated than others in the earliest, high-fertility marriage duration (0-4) (**table 7**). By 1979 - 1982, for those married more than five years, the monotonic relationship of education and fertility appears at all durations.

Also by 1979 - 1982, urban fertility is almost entirely concentrated in the first five years of marriage and rural fertility in the first 10 years. The extreme (93 per cent) concentration of the urban TDFR in the first five years of marriage compares with 71 per cent in Hong Kong in 1985, a level of concentration which might in itself be considered to be extraordinary.

Rural marital fertility at the crucial ages 15 - 19, 20-24 and 25 -29 was positively, rather than negatively, related to education by 1979- 1982. This positive relationship of marital fertility to education at ages 15 -29 is mainly a result of the fact that, in those age groups many women, and especially the better educated ones, were likely to be in the very early years of marriage, which are characterized by high fertility in China and Sichuan. This means, as will be seen, that high educational levels at those ages have little influence on fertility.

It was still true that, in the rural sector during 1979-1982, education and fertility were strongly negatively correlated after the first five years of marriage. However, in the urban sector, one could not speak of educational differentials by 1979 - 1982, because fertility was uniformly at very low levels in the two educational categories of consequence. There were almost no illiterate women in the prime child-bearing years in urban Sichuan by 1979 -1982.

The very large declines in fertility in all educational strata were particularly marked for women less than 20 or more than 30 years of age and for

**Table 7: Percentage distribution of marital exposure years for 1979-1982 by duration of marriage as of 1 July 1982, for education categories and selected age groups in Sichuan, by total, rural and urban**

Marriage duration (years)	Age 20-24			Age 25-29			Age 30-34		
	Illit-erate	Elem-entary	Jr. high plus	Illit-erate	Elem-entary	Jr. high plus	Illit-erate	Elem-entary	Jr. high plus
<i>Total</i>									
0-4	66	76	92	17	25	55	1	1	7
5-9	32	23	8	46	47	38	8	10	33
10-14	2	1	0	36	28	7	55	59	50
15+	0	0	0	1	0	0	36	30	10
Total	100	100	100	100	100	100	100	100	100
Number	1 993	1 867	982	5 316	5 338	2074	4 241	4 125	1 229
<i>Rural</i>									
0-4	66	76	91	16	24	49	1	1	4
5-9	32	23	9	47	48	41	8	10	24
10-14	2	1	0	36	28	10	55	57	54
15+	0	0	0	1	0	0	36	32	18
Total	100	100	100	100	100	100	100	100	100
Number	1 991	1 800	737	5 281	4 960	1 116	4 208	3 663	454
<i>Urban</i>									
0-4	100	72	94	21	35	61	6	1	9
5-9	0	28	4	36	44	34	16	15	39
10-14	0	0	2	43	21	5	62	69	47
15+0	0	0	0	0	0	0	16	15	5
Total	100	100	100	100	100	100	100	100	100
Number	2	67	245	35	378	958	33	462	775

women married more than 10 years. For women under 20 and over 30, fertility rates declined by 83 to 94 per cent. For women married more than 10 years, the declines in marital fertility were 89 to 100 per cent in specific education-duration groups. Even for women married only five to nine years, marital fertility declined by 70 per cent. Even considering specific education-duration-of-marriage subgroups, the range of declines was 82 to 100 per cent with only two exceptions. Even these exceptions (for illiterate women and those with elementary school education married five to nine years) involved declines of 47 to 68 per cent.

The move to an extreme concentration of fertility early in marriage for all educational strata is indicated by the data in **table 4**. In 1967 - 1970, the degree of concentration of fertility early in marriage was directly related to education in the urban sector, but was substantial only for the best-educated women in the rural sector. By 1979-1982 the positive relationship between concentration of fertility early in marriage and education was evident in the rural sector also among women at every level of education. By that time, almost all fertility in the urban sector was concentrated in the first five years of marriage for all educational strata. This is surely a unique phenomenon in a third world country, even for an urban sector, and notable even in comparison with developed societies. The concentration is consistent with the fact that, by 1979 - 1982, 91 per cent of all births in urban Sichuan were first births, an indication of the strength of the one-child campaign in Sichuan.

The unusual character of the Sichuan fertility decline during the 12-year period under review is indicated by comparison with Singapore and Hong Kong during the 12 -year period following 1961, when their levels and pace of economic and social development were considerably greater than that of Sichuan. At the outset of the period, both of these other Chinese populations also had high fertility. The 67 per cent decline for Sichuan over 12 years compares with declines of 50 and 38 per cent for Singapore and Hong Kong, respectively.

The period 1979 - 1982 in all of our analyses necessarily averages years of contrasting trends in nuptiality and fertility. In both the rural and urban sectors of Sichuan and Liaoning, the TAFR was at an all-time low in 1979 and 1980 and then rebounded in 1981 and 1982 as a result of a "marriage boom" with a decline in age at marriage<sup>8/</sup>

#### **Decomposition of change in TAFR for Sichuan, 1967-1970 to 1979-1982**

The overall decline in TAFRs has been decomposed for the whole period as a way of summarizing the contributions of several components to the overall decline.

Changes in marital fertility rates for specific age-education groups of married women account for most of the decline in Sichuan's TAFR between 1967 -1970 and 1979-1982. Much smaller parts of the decline are attributable to the decline in the percentage married among young women within the various age groups and to upward shifts in educational distributions. These conclusions are drawn from the following decomposition of the 1967 - 1970 to 1979 - 1982 decline in TAFR:



**Proportion of fertility decline, 1967 - 1970  
to 1979 - 1982 attributable to changes in:**

	(per cent)	
	Total	Rural
Age-marital-specific fertility rates within education categories	85	88
Percentage married in specific age- education categories	12	10
Changes in educational distributions	7	-1
Interaction	- 4	3
<b>Total</b>	<b>100</b>	<b>100</b>

The modest proportions of the declines due to rising educational levels for all of Sichuan were due entirely to the urban sector. When the rural decline is decomposed, essentially no effect of the rising educational levels is found. The explanation is that at ages 15-19, 20-24 and 25-29, which accounted for 84 per cent of the total fertility rate in 1979-1982, marital fertility was positively, rather than negatively, related to education. Therefore, the upward shift in education at those early reproductive ages acted to increase, rather than to decrease, fertility. This phenomenon almost exactly compensated for the effect of more education in decreasing fertility at older ages. While marital fertility was negatively related to education at ages 30 and over, the rates at those ages were already so low, regardless of education, that the total effect on fertility was small.

The very small role of the improving educational levels on the total fertility decline in Sichuan resulted from the unusually high concentration of fertility within a very narrow age band and within the very early durations of marriage, especially for the better educated. In another Chinese population, for example, in which education levels were rising very rapidly and to much higher levels than in Sichuan, 14 per cent of the total fertility rate decline between 1966 and 1980 was a result of changes in the educational distribution (Liu, 1983). Another measure of the extent to which TAFR has been reduced by changes in nuptiality is the degree to which TAFR falls short of TDFR. The following data are for Sichuan:

**Percentage by which TAFR was less than TDFR**

Period	Total	Rural	Urban
1967-1970	7	7	13
1973-1976	13	12	26
1979-1982	15	12	19

These data indicate that rising age at marriage had begun to affect TAFR by 1967-1970. It had an accelerated effect by 1973-1976. The relatively high figure for 1979 - 1982 averages out what must have been a large effect for 1979-1980, since age at marriage fell in 1981.1982.<sup>9/</sup> Our sample was not large enough to sustain year-by-year analysis.

Sichuan's fertility decline was not at all a result of the changes in age distribution for the period. In reaching this conclusion, it was estimated what the general fertility rate (GFR) would have been if the age distribution would have remained as in 1967-1970 but age-specific fertility changed as it did by 1979-1982. Then this rate was compared with the actual GFR for 1979-1982.

For the rural sector, the result was no net age effect. In the urban sector, the change in the age distribution produced a GFR 25 per cent higher than it would have been if the age distribution had remained as in 1967 - 1970. This was due to increases over the period in the proportions of women 20-24 and 25 -29 years of age, precisely the high-fertility age groups whose rates accounted for 92 per cent of urban TAFR in 1979 - 1982. Change in the urban age distribution thus acted to retard the fertility decline.

The net effect of the change in the age distribution for all of Sichuan was to make the 1979 - 1982 GFR 9 per cent higher than it would have been if the age distributions had remained unchanged.

### **Education and fertility in Liaoning, 1967 - 1970**

In 1967-1970, Liaoning's TAFR was still quite high (5880) in its rural sector, but it was already low enough in the urban sector (3075) that the TAFR for all of Liaoning was 4740 (**table 8**). In every educational group in both the rural and urban sectors, TAFR was lower for Liaoning than for Sichuan (compare tables 3 and 8).

For all of Liaoning and for the rural sector, there was a marked negative relationship of education to TAFR (**table 8**). There was no consistent pattern in the urban sector, but these urban patterns probably are affected by the small numbers of respondents in the young illiterate and in the older post-elementary categories.

At the time (1967-1970) a monotonic negative relationship of education and fertility for total and rural Liaoning was found in almost every age group both for all women and for married women, with a few minor deviations. In the rural sector, the strong negative relationship of fertility to education among those 20-24 years of age was largely a result of the negative rela-

**Table 8: Total fertility rates (TMR) and total marital-duration-specific fertility rates (TDFR) for Liaoning, by total, rural and urban, 1967-1970 to 1979-1982**

	Total		Rural		Urban	
	TAFR	TDFR	TAFR	TDFR	TAFR	TDFR
1967-1970						
Illiterate	5738	6135	6318	6847	2734 <sup>a/</sup>	3972 <sup>b/</sup>
Elementary	4528	5089	6112	6565	3271	3995
Jr. high plus	3280	4028	4510 <sup>a/</sup>	5700 <sup>b/</sup>	2958	3667
Total	4740	5644	5880	6782	3075	3999
1973-1976						
Illiterate	3272	3946	3430	4150	1598 <sup>a/</sup>	2223 <sup>b/</sup>
Elementary	2698	3501	3055	3997	1665	2241
Jr. high plus	1839	2784	2965	3654	1399	2283
Total	2473	3519	3150	4133	1355	2280
1979-1982						
Illiterate	2880	2780	2955	2809	544 <sup>a/</sup>	1177 <sup>b/</sup>
Elementary	2260	2258	2350	2417	1565 <sup>a/</sup>	1241
Jr. high plus	1720	1839	2135	2421	1503	1500
Total	1915	2186	2245	2527	1456	1490

Notes: **a/** = Fewer than 100 women-years in denominator for at least one of age groups 20-24, 25-29, or 30-34; **b/** = fewer than 100 cases in denominator for at least one marital duration group 0-4, 5-9, or 10-14.

relationship between the percentage married and education. Therefore, marital fertility differentials at 20-24 were much smaller than those for all women 20-24 years of age. The strong monotonic relationship of fertility and education at ages 15 - 19 was of little consequence for TAFR comparisons, since even in 1967 - 1970 only 10 per cent of rural women and 1 per cent of urban women were married at those young ages.

Differentials were not much different for married women and all women at ages above 20-24, because of the very high proportions married. There was a small negative marriage differential at ages 25 -29, but even at those ages, 98 per cent of rural and 91 per cent of urban Liaoning women were married. At older ages, marriage was virtually universal.

**Table 9: Percentage of the total marital fertility rate attributable to specific marital duration fertility rate for Liaoning, by education and specific periods, total, rural and urban, 1967-1970 and 1979-1982**

Education	Marital duration (in years)			Total
	0-4 years	5-9	10+	
<i>Total</i>				
Illiterate				
1967-1970	31	26	43	100
1979-1982	61	31	8	100
Elementary				
1967-1970	37	29	34	100
1979-1982	71	21	8	100
Jr. high plus				
1967-1970	46	30	24	100
1979-1982	84	12	4	100
Total				
1967-1970	33	26	41	100
1979-1982	73	20	7	100
<i>Rural</i>				
Illiterate				
1967-1970	28	24	48	100
1979-1982	62	30	8	100
Elementary				
1967-1970	29	24	47	100
1979-1982	69	22	9	100
Jr. high plus				
1967-1970	32	29	39	100
1979-1982	76	17	7	100
Total				
1967-1970	28	24	48	100
1979-1980	68	23	9	100

Table 9 : (continued)

Education	Marital duration (in years)			Total
	0-4 years	5-9	10+	
<i>Urban</i>				
Illiterate				
1967-1970	49	20	31	100
1979-1982	100	0	0	100
Elementary				
1967-1970	42	32	26	100
1979-1982	85	13	2	100
Jr. high plus				
1967-1970	49	26	25	100
1979-1982	93	6	1	100
Total				
1967-1970	44	28	28	100
1979-1982	92	7	1	100

Liaoning's TDFR also was negatively correlated to education in 1967 - 1970 both for the rural and the total population (table 8). The steepness of the fertility differential with education increased with longer marriage duration after 10 years.<sup>10/</sup> In both the rural and urban sectors, the proportion of fertility occurring in the first five years of marriage increased monotonically with education (table 9).

Urban-rural differentials were already very large in every educational stratum in 1967-1970, whether TAFR or TDFR is considered (table 8). The highest education-specific TAFR or TDFR for the urban sector was lower than the lowest value for any rural educational stratum. There was no overlap of rates in the two sectors. It also is true that the proportion married at ages 15-19, 20-24 and 25 -29 was less in the urban than in the rural stratum in each educational group in 26 of 27 comparisons.

### The decline in fertility for Liaoning

In Liaoning, as in Sichuan, fertility fell very sharply between 1967-1970 and 1979-1982 at every educational level, whether the fertility measure is TAFR or TDFR (table 5). As for Sichuan, what is striking is the large size of the declines at every educational level rather than the differentials. For all the educational strata, the percentage decline of TAFR was between 48 and

50 per cent for all women, 53 and 62 per cent for rural women, and 49 and 80 per cent for urban women

For Liaoning's total population, most of the decline in TAFR resulted from declines in marital fertility in specific age-education categories for married women. Much smaller proportions of the declines resulted from changes in nuptialty and in educational distributions, as the following decomposition indicates:

**Proportion of decline in TAFR, 1967 - 1970  
to 1979-1982, attributable to changes in:**

	(per cent)	
	Total	Rural
Age-marital-specific fertility rates for specific age-education groups	75	82
Percentage married in specific age- education groups	14	12
Education distributions within specific age groups	11	0
Interaction	0	6
Total	100	100

The effects of increasing education in reducing fertility found in the total population is entirely a result of effects in the urban sector. As in Sichuan, they do not appear in the rural sector decomposition. Most of the total, rural and urban TAFRs for 1979 - 1982 in Liaoning were accounted for by the rates at ages 20 -24 and 25 -29 (86-87 per cent). At those ages there had been a large upward shift during this period in the proportion of the better educated (high school or higher level). But, it is also true that, at those ages, marital fertility was higher for the best educated than for others. As for Sichuan, the effect of rising education in *increasing* fertility at ages 20-29 was almost exactly compensated by its effect in *decreasing* fertility at older ages.

This same result can be seen from another point of view by considering duration-specific rates and the percentage distribution of marital exposure time by duration of marriage. In 1979-1982, as in 1967 -1970, the higher the educational level of married women, the greater was the proportion who were in the earliest duration of marriage (0 -4 years). Marital fertility was much higher at duration 0-4 than at any later duration, and at that duration it was highest for the best educated women. The high fertility of the better educated women at ages 20-24 and 25 -29 is a result of the fact that they were disproportionately recently married (**table 10**) and experiencing the high fertility of that time in their lives.

**Table 10: Percentage distribution of marital exposure years for 1979-1982 by duration of marriage as of 1 July 1982, for education categories and selected age groups in Liaoning, by total and rural**

Marriage duration (years)	Age 20-24			Age 25-29			Age 30-34		
	Illit-erate	Elem-entary	Jr. high plus	Illit-erate	Elem-entary	Jr. high plus	Illit-erate	Elem-entary	Jr. high plus
<i>Total</i>									
0-4	61	80	94	24	33	68	2	3	13
5-9	37	19	6	49	45	28	16	16	40
10-14	2	1	0	27	22	4	50	56	40
15+	0	0	0	0	0	0	32	25	7
Total	100	100	100	100	100	100	100	100	100
Number	269	875	804	629	2 078	2 462	1 884	2 133	1 206
<i>Rural</i>									
0-4	60	80	91	24	32	36	3	2	4
5-9	37	19	9	49	46	44	16	16	27
10-14	3	1	0	27	22	20	49	54	55
15+	0	0	0	0	0	0	32	28	14
Total	100	100	100	100	100	100	100	100	100
Number	269	844	469	623	1 887	799	683	1 763	388

For specific age cohorts, the peculiar situation of rising education not contributing to lower overall fertility was probably temporary. For any specific age cohort, as time goes on, the fertility of its better educated women will plunge as more of them are married longer. At duration 5-9 years in 1979-1982, there was a strong negative correlation between education and fertility for total and rural Liaoning.

Fertility decreases rapidly with duration of marriage for all education groups. By 1979-1982, fertility was highly concentrated in the first five years of marriage in the urban sector and in the first 10 years in the rural sector. However, it is also true that large new cohorts successively are entering the child-bearing years; their flooding into the early marriage stage should have the effect of countering the negative effect on fertility of the next older cohort as it enters the later low-fertility marriage-duration categories. The effects of educational change in successive periods depend on the relative sizes of the successive cohorts as well as the degree of concentration of the better educated in younger ages and early marriage durations.

The comparison of the TAFR and TDFR for Liaoning, as for Sichuan, indicates that the effect of rising age at marriage was already evident in 1967-

1970, increased substantially by 1973-1976 and was reduced in 1979-1982, presumably as a result of the marriage boom, with a decrease in age at marriage in 1980 and 1981:

Percentage by which TAFR was less than TDFR			
	Total	Rural	Urban
1967-1970	14	12	22
1973-1976	28	22	39
1979-1982	11	9	0

In comparison with Sichuan, the nuptiality effects were much greater by 1967-1970 and 1973-1976, but somewhat less in the period 1979-1982. The extreme oscillation of the urban sector may be, at least in substantial part, due to sampling variability, since the components of the urban rates are necessarily based on small subgroup frequencies.

Liaoning's fertility decline was not a result of changes in the age distribution during the period. On the contrary, the changing age distributions had the effect of making the GFRs 12 per cent higher in the rural sector, 46 per cent higher in the urban sector and 16 per cent higher for the total population than they would have been if age distributions had remained at their 1967-1970 levels.<sup>11/</sup>

In the urban sector, large increases in the proportions 20-24 and 25-29 years of age had a strong pro-natal effect, since those were the age groups with the highest fertility, accounting for 88 per cent of TAFR in the urban sector. The smaller pro-natal effect in the rural sector occurred mainly because only the proportions at 25-29 and 30-34 years of age increased; rates for those 30-34 were lower than for those 20-24 years of age and, in general, fertility was not so strongly concentrated in the age groups where the proportions of women increased.

### **Convergence of fertility rates for Sichuan and Liaoning**

Between 1967 - 1970 and 1979 - 1982, the fertility rates of Liaoning and Sichuan converged despite the fact that educational, social and economic development remained higher in Liaoning throughout the period.

In 1967-1970, both TAFR and TDFR were substantially lower in Liaoning than in Sichuan. For the total population, Liaoning's rates were 27 per cent lower for TAFR and 19 per cent lower for TDFR. In part, the size of these inter-provincial differentials resulted from the fact that women in Liaoning were more urban and better educated. However, the 1967-1970 differentials, while



smaller, persist without exception when the comparisons are made for each of the three education groups within the rural or the urban strata. In 1967 - 1970, the lower fertility levels for Liaoning were particularly marked in the urban sector.

Between 1967 -1970 and 1979 -1982, fertility (as measured by TAFR) fell more rapidly in Sichuan than in Liaoning in both the rural and urban sectors for each educational stratum, as well as for the total population of child-bearing age. For TDFR, fertility declines were greater in Sichuan than in Liaoning at every educational level as well as for the total for all women and for rural women. In the urban sector, the picture is mixed for specific education groups. However, for all urban women, the decline was larger for Sichuan than for Liaoning.

The more rapid decline of fertility in Sichuan as compared with Liaoning is especially striking for the six years between 1973-1976 and 1979-1982, when the TAFR in Sichuan fell by 55 per cent compared with 23 per cent in Liaoning.

These major changes in fertility levels occurred despite the fact that educational differentials in fertility existed throughout the period.

The net result was that by 1979 - 1982 Sichuan's fertility levels were similar to those of Liaoning (or even lower) within the rural and urban sectors (compare **tables 3 and 8**).

The very large declines in both Sichuan and Liaoning in all educational strata and in both the rural and urban sectors have already been noted to be remarkable for such a short period, especially in such populations. The fact that Sichuan's declines were as large as or larger than those in Liaoning in specific urban and rural education groups is particularly notable in view of the fact that the general level of education and social and economic development was substantially higher in Liaoning than in Sichuan throughout the period.

It is plausible that the Government's family planning programme played a significant role in such precipitous declines across educational strata and in provinces so different with regard to variables usually associated with fertility levels. That the declines were especially large in Sichuan is consistent with the reports of family planning officials that the programme was especially well organized and intensive in Sichuan. Based on statistics compiled by family planning workers, Sichuan in 1980 ranked substantially higher than China as a whole on the proportions using contraception, the proportion of births which were of first or second parity, and the percentage of couples of first parity with a one-child certificate.<sup>12/</sup> The figures for China and Sichuan probably exaggerate the level of programme accomplishment, but it is likely that the higher levels for Sichuan would persist even after downward adjustment.

The proportion of contraception comprising sterilization as of 1 July 1982 was 49 per cent for Sichuan and 29 per cent for Liaoning. The abortion ratio for the period 1979 - 1982 was 43 in Sichuan and 28 in Liaoning. (Sterilization and abortion may be considered as indicators of the strength of the programme.)

In any case, no other factors are known that could account for the sharp declines or for the convergence of the rates in two very different provinces.

### Summary

This article has examined the role of education in the sharp decline of fertility between 1967-1970 and 1979-1982 in both Sichuan, a relatively backward province of China, and Liaoning, a relatively advanced province. Initially, Liaoning had lower fertility than Sichuan at every educational level in both the rural and urban sectors. This was plausibly a result of the fact that Liaoning had higher educational levels and was considerably more advanced in economic development and in transportation and communications facilities.

The decline of fertility between 1967 -1970 and 1979 -1982 occurred in both provinces in each of the subgroups defined by the three educational levels and in the rural and urban sectors. However, in each of the six subgroups the rate of decline was greater in Sichuan than in Liaoning. The more rapid fertility decline in Sichuan compared with Liaoning is especially striking for the six years between 1973-1976 and 1979-1982, when TAFR fell by 55 per cent in Sichuan and 23 per cent in Liaoning. These major changes across educational levels occurred despite the fact that educational differentials existed throughout the period.

As a result of these rapid changes, by 1979-1982 the TAFR and TDFR in Sichuan were lower than or equal to those of Liaoning in each rural educational subgroup. The overall urban TAFR and TDFR were both lower for Sichuan than for Liaoning in 1979 - 1982 <sup>13/</sup>

The magnitude of the fertility declines in both provinces across educational strata in both the rural and urban sectors probably was in large part a result of the unusually powerful family planning programme during the period under review. Rising educational levels, lower mortality and other social changes no doubt contributed to the decline. However, it is not credible that these changes could have produced such rapid declines in such a short time-period without the influence of the family planning programme. Further, the rapid convergence of the Sichuan and the Liaoning rates between 1973-1976 and 1979-1982 suggests the validity of reports that the Sichuan programme was especially powerful and effective.

Over the entire period, 1967-1970 to 1979-1982, changes in the percentage married at young ages could account for most of the fertility decline at ages 15-19 and 20-24 with the educational differential playing a small role. But, at ages 25-29 and older, universally high nuptiality meant that marital fertility declines accounted for almost all of the fertility declines at these ages. Changes in age structure contributed nothing to the fertility decline, and in urban areas of both provinces, significantly retarded the decline.

Educational levels were rising rapidly in both Liaoning and Sichuan over the 12-year period, but ironically the effects on fertility were modest. This is due to the fact that, at the same time fertility was increasingly concentrated in younger age groups and early marriage durations, the rapid rise in female educational levels tended also to concentrate the best educated women in those same groups.

### Footnotes

1. With the exception of education, the Survey contains very little data on social or economic status. A question on occupation only distinguished the rural sector from the urban; data on nationality (ethnicity) are useful for analysis of minority regions.
2. For the official report on the Survey, see China Population Information Center (1984). The fertility data from this Survey were found to be of very high quality by Ansley Coale (1984). For a detailed presentation of age-specific and duration-specific fertility rates for all of China and for all provinces except Tibet and Taiwan, see Coale and Chen (1987).
3. Total fertility rate by age, conventionally known as TFR (per thousand women). The terminology utilized here is employed by Coale and Chen (1987).
4. Thus, explicitly discounted are the effects of adult literacy programmes.
5. A significant proportion of urban Sichuan women who were of school age during the war years apparently achieved literacy during the period. Sichuan was the seat of the wartime government of the Republic of China from 1939 to 1946. The literacy rates of women educated before and during that period may reflect the relative peace of the region as well as government educational programmes. This situation may be contrasted with that of Liaoning, which was under Japanese occupation from 1931 to 1945. Even in the four county towns in the Sichuan sample, early cohort educational levels exceed those of urban Liaoning. Liaoning's urban educational rates only surpass Sichuan's, beginning with cohorts born in 1940 and after.
6. Data, by education, on the percentage married at each child-bearing age for Sichuan and Liaoning, total, rural and urban for 1967-1970, 1973-1976 and 1979-1982, are available in unpublished tables.
7. Data, by education, on fertility rates for specific durations of marriage (0-4 to 30-34) for Sichuan and Liaoning, total, rural and urban for 1967-1970 and 1979-1982, are available in unpublished tables.
8. The sample size is too small for year-by-year analysis, especially when subdivided by education. For year-by-year TAFR and TDFR for Sichuan and Liaoning, see Coale and Chen, 1987.

9. Coale and Chen (1987, p. 4) write about China as a whole:

In China the degree to which TAFR falls short of TDFR (or, more precisely, falls short of 0.98 TDFR) is a measure of the extent to which TAFR has been lowered by changes in nuptiality. In the 1960s, TAFR was 5 to 7 per cent lower than it would have been had age at marriage been constant; but in the 1970s, TAFR was as much as 22 per cent lower than it would have been with the same marital fertility by duration of marriage and a history of constant instead of rising age at marriage. By 1981 the contribution of nuptiality change to lower fertility had been reduced by one-half of its contribution during 1977-79 as a result of the marriage boom in 1980 and 1981.

10. For the total population the negative differential begins at duration 0-4 years, but it is found neither in the rural nor urban sector at that time. It was a result of the relative concentration of low-fertility urban women in higher education levels and of high fertility rural women at lower education levels in the initial duration group.
11. The major reason for the changing age distribution in the reproductive ages in the period is change in fertility rates from the late 1940s to the early 1950s (the birth cohorts of women in their twenties in the periods 1967- 1970 and 1979- 1982, respectively). Fertility was higher in the 1950s than in the 1940s, and although fertility in urban areas was lower than that of rural areas, the increase in urban areas was far greater. The contrast for urban Liaoning was greater than for urban Sichuan, explaining the greater positive influence of age structure on fertility in Liaoning. For historical time series of fertility rates, see Coale and Chen 1987.
12. These data were made available to Ronald Freedman from unpublished records during a visit as a consultant to the State Family Planning Commission of China in 1981. They were based on reports from local areas up through the administrative hierarchy to provincial family planning headquarters and then to the national level. We know from the Census of 1982 and the One-per-Thousand Survey of 1982 that these reports exaggerated programme accomplishments and understated fertility. For examples of such discrepancies, see Freedman *et al.* (forthcoming).
13. The rates in specific educational groups were unstable because of small sample size.

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