THE RELATION OF CHILD MORTALITY TO FERTILITY IN TAIWAN*

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I. Introduction

It has been postulated by several social scientists that high levels of infant and child mortality and the fear of infant and child mortality induce couples in less developed countries to have more children than they might otherwise prefer.[1, 2] In fact it has been implied that child mortality not only induces replacement fertility but also additional fertility as a form of insurance.[3] There are two ways in which child mortality may influence fertility: a) that resulting from community experience of child mortality and b) that resulting from personal experience with child mortality. Community experience may have a bearing on fertility behavior in two ways: first, through the effect on the couple's fear of child mortality, which in turn may influence its decision as to the number of births necessary to obtain an ideal number of children; and second, through its effect on community norms about the ideal number of children.[4] Personal experience with child mortality should raise fertility directly through the desire to replace the lost child and indirectly through increasing the fear of child mortality.

The data used to investigate the relation between child mortality and fertility consists of two surveys conducted by the Taiwan Provincial Institute of Family Planning. Taiwan is particularly suited to the study of demographic problems as it is in the midst of an economic and demographic transition. During the last two decades national income per capita has risen at an average annual rate of 4.6 percent in constant Taiwanese dollars. The growth of real per capita national income accelerated during the last eight years, when it rose at a rate of 6.26 percent per year to a level of US$258.[5] The general fertility rate has fallen from 211 per thousand in 1951[6] to 124 per thousand in 1969[7] and the infant mortality rate from 125.2 per thousand in 1942[8] to 38.7 per thousand in 1968.[9]

The first survey interviewed a cross-section of currently married women aged 20 to 44 during the period October 1967 to February 1968. They were asked about their demographic status, attitudes, and social status. Approximately twenty months later, the husbands of these women were interviewed, and information was obtained as to the current economic status, the husband's attitudes, and changes in demographic status. Overall 18.9 percent of the 2,277 couples included had experienced at least one child death.

The data are analyzed by the method of multiple classification analysis (MCA), which is a form of dummy variable multiple regression. The advantage of MCA is that the independent variables need not be continuous but may consist of sets of subclasses which represent only nominally scored variables (e.g., occupation). MCA makes no assumption as to the form of the relationship between the dependent and the independent variables and hence allows it to be determined by the data. Two sets of coefficients are produced: (1) unadjusted means for each subclass of the independent variables and (2) adjusted means controlled for the effects of the other independent variables.[10]

II. Characteristics of Couples Experiencing Child Mortality

Some correlates of child mortality are shown in Tables 1 and 2. In general Table 1 shows that couples who had experienced child mortality were older and had been married much longer than couples who had not experienced child mortality. There are two explanations for the differences we find: couples who have been married longer have more and older children and on that account have been more exposed to the possibility of experiencing child mortality; they were also married at a time when child mortality rates were substantially higher than they were at the time of the interviews.

Table 2 reveals a strong relation between child mortality and socio-economic status. Child mortality declines with increasing education, while husband's occupation shows similar strong differences in child mortality experience. Couples classified by husband's ancestry and farm background also show substantial differences in child mortality experience. Some other characteristics are presented in column two of Table 3. Total family income per adult shows a strong inverse relationship to experience with child mortality. Quality of housing may have an independent effect on child mortality since poor construction (e.g., mud brick walls, dirt floors, absence of indoor plumbing, etc.) could lead to a higher incidence of disease. An index of quality of housing was therefore constructed which takes material used for walls and the floor as symptomatic of housing quality. This index is highly correlated with income and in fact may be a better indication of permanent income available to the couple than the current income measure. The index shows that couples with housing in the lowest category had two and a half times the incidence of child mortality of couples in the highest category.

While Tables 1 and 2 and column two of Table 3 are of some descriptive interest, they do not isolate the effect that economic status has on child mortality. Since child mortality is in part due to the joint effects of longer exposure and low socio-economic status, MCA was used to determine the separate effects of exposure and status on a family's experience with child mortality. The dependent variable in this analysis was the deviation from the expected probability of having had at least one child death, based on the number of children a couple has had and their birthdates. The formula used to calculate the deviation for each couple is

$$\delta = \nabla - \left(1 - \prod_{i=1}^{i=N} \sigma_i\right)$$

where δ is the deviation from the expected probability of having had at least one child death; ∇ is equal to one if one or more child deaths occurred and zero if none occurred; N is the number of births the couple has had; and σ_i is the probability of survival to the date of interview for

Table 1--Means of Characteristics Related to Exposure to Child Mortality in Taiwan

Item	At least one child died	No child died
Husband's age, yrs.	39	36
Wife's age	35	32
Wife's age at marriage	19.4	20.3
Marriage duration, mos.	159	114
Number of births	5.2	3.6
Number of cases	430	1847

Source: The source for all tables are two sample surveys conducted in Taiwan in 1967-68 and 1969.

child i. The probabilities of survival were derived internally from the sample data. First the probability of a child dying during a given age interval[11] was determined by dividing the number of deaths occurring during that age interval by the number of people at risk at the beginning of the interval, and then subtracting from one to get the probability of survival to the beginning of the next interval. The product of these probabilities, period by period up to a child's potential current age (interview date), yields σ_i.[12]

Table 3 presents the results of an MCA, using these deviations as the dependent variable. The third column shows the results after removing the effects of exposure by use of the deviations calculated as described in the previous paragraph. This procedure was performed directly on the dependent variable. To remove the effects of other variables, MCA was used, and the combined results are shown in column 4. Exposure accounts for about 19 percent of the variance, and the other variables account for an additional two percent.

Housing quality, adjusted for exposure to child mortality, shows a pronounced relation to experience with child mortality. Adjusting in addition for the date of the first birth, income per adult, and wife's education somewhat weakens this relation (the progression becomesless regular). After exposure to child mortality, the housing index provides the largest increment to the proportion of variance explained.

The date of the first birth, which represents the point in time when the couple's exposure to child mortality began, also shows a strong relationship to child mortality. The means in column 2 show the effects of two sets of factors: 1) a greater amount of exposure through higher numbers of children and the longer time exposure and 2) the general decline in child mortality over the thirty-year period that is represented. Removing the effects of exposure directly eliminates the first factor and thus reduces the difference between the earliest and latest cohort to a ratio of only 1.5 to 1 (column 3). Holding constant socio-economic factors does not produce much further change in the relationship. One reason that the percent of couples with child mortality rises for the latest cohort after adjusting for exposure may be that they do not suffer from as much recall error as other couples in the sample.

Controlling for exposure and holding constant, in addition, the other socio-economic variables, both total income/adult and wife's education show somewhat weakened relationships to

Table 2--Socio-Economic Status of Couples with Child Mortality Experience

Item	Relative frequency of experience	No. of cases
ALL	18.9	2277
HIGHEST EDUCATIONAL LEVEL ATTAINED HUSBAND:		
None	27.1	240
Primary	20.3	1376
Junior h.s.	16.0	269
Senior h.s. grad.	10.6	254
College or univ. grad.	7.2	83
WIFE		
None	25.1	817
Primary attended	19.5	210
Primary completed	16.6	940
Junior h.s.	6.7	164
Senior h.s. grad.	6.4	109
HUSBAND'S OCCUPATION		
Prof., tech., manager	7.2	181
Clerk, office worker	14.2	155
Protective services	12.1	91
Small prop., sales w.	16.1	360
Skilled worker	16.3	276
Personal services	20.0	145
Unskilled worker	23.5	255
Farming, fishing, etc.	23.3	772
EVER LIVED ON FARM		
Never	12.0	357
Wife only	12.6	183
Husband only	14.8	81
Both	21.1	1627
HUSBAND'S ANCESTRY		
Hakka	22.6	297
Fukienese	18.8	1668
Mainlander	12.2	237
Other	25.0	48

differences in child mortality experience. For both adjusted variables, the lowest category has 1.5 times the experience with child mortality of the highest.

Next we may look at the antecedants of fear of child mortality. We would expect to find that people concerned about child mortality have low income, are poorly educated and badly informed, live in areas with high child mortality rates and in poor housing, and perhaps have experienced the death of one of their children.

As an indication of attitudes toward child mortality, the Child Mortality Fear Index (CMFI) was constructed from the following three survey questions asked of the husband: a) "Generally speaking, in the past children often died, and therefore it was a great advantage to have at least three or four sons. Do you think this is equally true today?", b) "Most people feel that a couple with 5 or more children have a large family. In your view, what are the main advantages of having such a large family?", and c) "Are there any important disadvantages to having only 2 children?". If the husband answered "equally true" to a), he scored a one; if he answered "less true," he scored a zero. He also scored one on b) and c) if he mentioned child mortality spontaneously. The scores from the three questions were summed to

Table 3--Results of MCA on Deviations from Probability of Child Mortality Experience Expressed as Percent of Couples with Experience, by Date of First Birth(B), Total Family Income/Adult(I), Wife's Education(E), and Housing Quality Index(H)

Mean Percent with Experience: 18.9					
	No. cases	Un-adj. mean	Mean adj. for exposure to child mortality[a] only	and-- I,E	I,E,H
BIRTH DATE					
1940-50	215	37.7	25.6	24.7	24.9
1951-55	501	28.9	22.7	22.4	22.4
1956-60	626	20.4	18.8	18.5	18.3
1961-65	635	9.4	14.5	14.9	14.9
1966-69	277	5.8	17.1	18.2	18.4
INCOME				B,E	
<NT$6,000	798	22.6	21.1	19.6	
6-9,000	425	22.9	20.0	19.2	
9-12,000	317	20.3	21.0	21.4	
12-16,000	286	15.1	16.7	18.4	
16-20,000	170	13.5	15.6	16.9	
>20,000	207	6.8	10.5	13.5	
WIFE'S EDUC.				B,I	
None	820	25.5	23.1	22.1	
<Primary	212	20.2	19.7	19.7	
Primary	940	17.0	16.8	17.0	
>Primary	274	7.0	12.5	15.0	
HOUSING INDEX					B,I,E
Lowest	328	26.7	25.3		24.4
	348	25.3	24.9		24.1
	500	17.8	17.1		17.7
	676	17.1	16.7		17.8
	234	13.2	15.5		17.8
Highest	168	10.7	12.8		15.4

a-Adj. for exposure to child mortality directly upon dpendent variable, adj. for other variables by MCA.

arrive at the husband's score on the index. In all, 66.3 percent of the respondents scored zero on the index (i.e., they expressed no fear of child mortality at all), 26.2 scored one, 2.0 scored two, and 5.5 percent were excluded for uncertainity. The mean score was .32.

For the most part, the unadjusted means in Table 4 bear out our expectations. Column 2 shows us that the fear of child mortality rises substantially with the number of child deaths and declines with increases in income per adult, wife's education, exposure to media, and housing quality. The local area post-neo-natal mortality rate, averaged over the years 1965, 1966, and 1967, serves as the measure of the prevalence of child mortality in that local area.[13]

Exposure to mass media displays a strong relationship to fear of child mortality even when number of child deaths, date of first birth, income per adult, and wife's education are controlled. It had the strongest relationship to fear of child mortality of all the variables. This finding indicates that information is able to dispel fear of child mortality by either changing perceptions about the general child mortality conditions in Taiwan or indicating greater accessibility to health services that allay such fear. Total family income per adult and wife's education, adjusted for number of child deaths and date of first birth, still show inverse relations to CMFI. Additionally controlling for mass media exposure, and wife's education for income per

Table 4--Results of MCA on Child Mortality Fear Index(CMFI), by No. of Child Deaths(D), Date of First Birth(B), Total Family Income/Adult(I), Wife's Education(E), Mass Media Exposure Index(M), Housing Quality Index(H), and Area Post-Neo-Natal Mortality Rate(P)

Mean Index Score for CMFI: .32				
	No. cases	Unadj. score	Mean score adjusted for	R^2 at entry
NO. OF DEATHS			B	B,I,E,M .006*
0	1750	.30	.31	.31
1	320	.36	.34	.33
2	59	.44	.41	.36
3+	26	.54	.50	.47
BIRTH DATE			D	D,I,E,M .008
1940-50	206	.41	.39	.39
1951-55	481	.37	.36	.35
1956-60	583	.32	.31	.31
1961-65	601	.27	.27	.28
1966-69	284	.27	.28	.30
INCOME			B,D	B,D,E,M .016
<NT$6,000	754	.35	.35	.30
6-9,000	412	.36	.35	.34
9-12,000	304	.31	.31	.33
12-16,000	270	.32	.33	.37
16-20,000	167	.29	.29	.35
>20,000	203	.15	.17	.24
WIFE'S EDUC.			B,D,I	B,D,I,M .023
None	768	.40	.38	.35
<Primary	206	.30	.29	.29
Primary	910	.29	.29	.30
>Primary	264	.19	.24	.28
MEDIA INDEX			B,D,I,E	.032
Lowest	382	.45	.43	
	313	.35	.34	
	312	.38	.36	
	261	.30	.29	
	500	.25	.25	
Highest	284	.21	.24	
HOUSING INDEX			B,D,I,E,M	.031
Lowest	306	.38	.34	
	338	.33	.30	
	465	.35	.34	
	660	.30	.30	
	222	.26	.31	
Highest	164	.23	.31	
AREA PNN MR			B,D,I,E	.039
4.0-7.9(/000)	197	.34	.35	
8.0-10.9	486	.30	.32	
11.0-13.9	936	.29	.29	
14.0-16.9	135	.47	.43	
17.0-19.9	277	.27	.25	
20.0+	124	.45	.44	

*ETA-squared

adult, weakens the relationships so that only the highest categories differ from the rest. After considering the other variables, housing quality appears to have even less impact. A priori, the post-neo-natal mortality rate might be expected to display a strong association with the CMFI, but no clear relationship is shown for either unadjusted or adjusted mean scores. It is possible that in as small a country as Taiwan information about national conditions, as communicated by the mass media, is more relevant for attitude formation than perceptions about local conditions. Or it is possible that we have not looked at the most appropriate local mortality rate since the recency of the rate may not sufficiently allow for the

Table 5--Unadjusted Parity Progression Ratios by Experience with Child Mortality

Mortality	Parity level reached							
experience	0	1	2	3	4	5	6	7
NO EXP.								
Number:								
Eligible	2277	2105	1742	1329	884	446	210	79
Prog.	2258	2036	1574	1064	573	241	110	33
Ratio	99.2	96.7	90.4	80.1	64.8	54.0	52.4	41.8
SOME EXP.								
Number:								
Eligible	0	91	200	264	279	240	167	88
Prog.	0	90	198	249	224	175	89	36
Ratio	--	98.9	99.0	94.3	80.3	72.9	53.3	40.9
ALL								
Number:								
Eligible	2277	2196	1942	1593	1163	686	377	167
Prog.	2258	2126	1772	1313	797	416	199	69
Ratio	99.2	96.8	91.2	82.4	68.5	60.6	52.8	41.3

gestational period necessary in formation of attitudes toward child mortality. These questions will be examined in later work. The proportion of variance explained by all the variables jointly is quite low although some of the relationships reveal a regular and meaningful progression of the means. We must keep in mind that our CMFI may be a weak measure of the actual fear of the death of a child. This is a first attempt at measuring this attitude, and the survey questions used may not be optimal in fully eliciting the fear that may exist. Conceivably, couples who act on a fear of child mortality may not want to acknowledge this fear even to themselves.

III. Fertility and Child Mortality

We are now ready to examine the major question with which this paper is concerned: What are the effects of child mortality and fear of child mortality on fertility? To take a first look at this, we use parity progression ratios to control for the high correlation between number of children and exposure to child mortality. For our measure of mortality we take the number of child deaths occurring more than nine months prior to the date of the next birth or the total number of deaths that had occurred by the date of the first interview if the next birth did not occur. Table 5 shows the rates of progression to the next parity by the couple's experience with child mortality as just described. All couples who had arrived at a given parity level prior to the first interview were eligible to progress to the next level. They were considered to have progressed if they reached or exceeded the next parity level by the second interview. Table 5 shows that couples without mortality experience have lower progression ratios than couples with a child death at each parity level until the sixth level is reached. However, we learned earlier that couples without child mortality experience are of higher economic status than others. Conceivably, this difference could account for their lower progression ratios. Therefore we need to use MCA to see what happens to the parity progression ratios in Table 5 when they are adjusted for the normal likelihood of couples having another birth for reasons other than experiencing a child death.[14]

The first factor to be adjusted for in Table 6 is the length of time following a given birth in which a couple could have had another birth. We use the date of the birth from which they are progressing to control for this exposure to subsequent fertility. Further, we may control for their fear of child mortality by holding constant the CMFI. The effects of socio-economic status are adjusted for by using income per adult, wife's education, and husband's occupation. Table 6 indicates that after adjusting for these characteristics, parity progression ratios for couples with mortality experience are still higher than those for other couples at each parity level but that the differences have been substantially reduced. We can see that the largest reduction in the progression differentials between couples with and without mortality occurs when exposure to subsequent fertility is taken into account. Controlling for the socio-economic variables makes for some small further reduction, white controlling for fear of child mortality affects the differentials very little.

Table 6--Results of MCA on Parity Progression Ratios by Number of Child Deaths Experienced, Adjusted for Date of Birth from which Couple is Eligible to Progress(T), CMFI Score(F), Total Family Income/Adult(I), Wife's Education(E), and Husband's Occupation(O).

Parity	No.	Unadj.	Mean adjusted for		
Progression	cases	mean	T	T,F	T,F,I,E,O
2ND TO 3RD					
No. Deaths					
0	1741	90.4	90.9	90.9	91.0
1	183	98.9	94.2	94.4	93.8
2	17	*	*	*	*
Adj. R^2		.009[a]	.135	.136	.160
3RD TO 4TH					
No. Deaths					
0	1329	80.1	80.9	80.9	81.3
1	236	94.1	89.5	89.3	87.8
2	28	96.4	94.2	94.7	90.7
Adj. R^2		.019[a]	.125	.130	.195
4TH TO 5TH					
No. Deaths					
0	884	64.8	66.1	66.0	66.4
1	232	78.0	73.7	74.0	73.1
2	44	93.2	89.7	89.8	87.0
Adj. R^2		.024[a]	.119	.124	.154
5TH TO 6TH					
No. Deaths					
0	446	54.0	55.7	55.7	56.0
1	181	72.9	69.3	69.5	69.6
2	47	70.2	68.5	68.2	66.4
Adj. R^2		.035[a]	.174	.176	.216

*Base less than 25. a-ETA-squared.

Table 7 enables us to examine the impact of fear of child mortality on fertility. The unadjusted ratios show substantial differences in parity progression for different levels of the fear index except the last. Controlling for the number of child deaths experienced and the length of time exposed to subsequent fertility mainly reduces the parity progression ratios for couples with a score of two on the CMFI. Taking account of socio-economic status reduces the differences between the ratios by a small additional amount.

We can see in both Tables 6 and 7 that the differentials in the ratios rise with parity level.

Table 7--Results of MCA on Parity Progression Ratios by Fear of Child Mortality, Adjusted for Number of Chil Deaths(D) Date of Birth from which Couple is Eligible to Progress(T), Total Family Income/Adult(I), Wife's Education(E), and Husband's Occupation(O)

Parity progression	No. cases	Unadj. mean	Mean adjusted for D,T	D,T,I,E,O
2ND TO 3RD				
CMFI				
0	1281	90.1	90.7	90.9
1	511	93.5	92.6	92.0
2	42	97.6	93.7	93.1
Adj. R^2		.004[a]	.135	.160
3RD TO 4TH				
CMFI				
0	1028	80.4	80.9	81.9
1	435	87.4	86.3	84.3
2	39	89.7	86.7	84.3
Adj. R^2		.008[a]	.125	.195
4TH TO 5TH				
CMFI				
0	726	66.5	66.7	67.2
1	345	72.8	72.5	71.5
2	31	80.6	76.4	75.4
Adj. R^2		.006[a]	.119	.154
5TH TO 6TH				
CMFI				
0	409	60.1	60.3	61.3
1	221	60.2	60.2	58.9
2	23	*	*	*
Adj. R^2		.005[a]	.174	.216

*Base less than 25 a-ETA-squared

This may be due to the fact that at low parity levels most couples continue to have children irrespective of child mortality or their fear of child mortality, while at higher levels the number of living children has an important bearing on the decision to continue or not to continue. The rise in the differentials is caused by large drops in the ratios for couples with no child deaths and for those scoring zero on the CMFI as parity level increases, while couples with mortality experience and couples with more fear of child mortality remain at high ratios until relatively higher parity levels are reached.

Table 8 enables us to compare couples with equal numbers of living children. According to the adjusted ratios in Tables 6 and 8, while couples with child mortality experience are more likely to have another birth than couples without such experience, as a whole they do not make up for the lost child. The exception is progression from four living children. The data seem to indicate that couples with child mortality experience may end up with smaller numbers of living children than couples without such experience.

To check this indication, we used the parity progression ratios to predict the mean number of additional births occurring to couples with given numbers of living and dead children. This is done in Table 9 for those with zero and one child death. From the unadjusted ratios we might infer that the couples experiencing a child death would slightly more than replace that dead child, up to four living children. However, when we use the adjusted ratios, we see that couples with a child death end up with substantially

Table 8--Unadjusted and Adjusted[a] Parity Progression Ratios by Number of Child Deaths

Number of living children	Number of child deaths 0	1	2
ONE			
Unadjusted	96.7	98.9	96.4
Adjusted	96.8	93.8	90.7
TWO			
Unadjusted	90.4	94.1	93.2
Adjusted	91.0	87.8	87.0
THREE			
Unadjusted	80.1	78.0	70.2
Adjusted	81.3	73.1	66.4
FOUR			
Unadjusted	64.8	72.9	50.0
Adjusted	66.4	69.6	--
FIVE			
Unadjusted	56.0	58.9	*
Adjusted	--	--	--

[a]Adjusted for period of time exposed to subsequent fertility, fear of child mortality, total family income per adult, wife's education, and husband's occupation.
--Not available *Base less than 25

smaller numbers of additional births at every level of achieved family size. This result is consistent with earlier findings that a significant proportion of couples in Taiwan have more children than they consider ideal.[15]

Table 10 shows projections of mean number of additional births at each achieved parity for couples with differing scores on the Child Mortality Fear Index. Projections based on unadjusted and adjusted parity progression ratios show similar patterns. The higher the score on the CMFI, the greater is the number of additional births. Adjustment of the progression ratios for number of child deaths, length of time exposed to subsequent fertility, and socio-economic status substantially decreases the amount of excess fertility attributable to fear of child mortality but does not eliminate it altogether.

IV. Conclusion

To summarize our findings, we have shown that in Taiwan the poorer and less well educated and informed couples are most likely to experience child mortality and have fear of child mortality. Differences in child mortality by socio-economic status persist after differences in demographic exposure have been taken into account.

The hypotheses that high levels of child mortality and fear of child mortality lead to additional births is supported by the foregoing analysis. However, the idea that couples who experience a child death may have more children overall as a form of insurance against additional deaths is not substantiated by the data. In fact they do not even replace the lost child. Fear of child mortality seems to affect only about 30 percent of the couples in present day Taiwan, and these couples have only minimally higher fertility (after adjustments) than couples without such fear. Thus, we conclude that while child mortality has a small negative impact on population growth, fear of child mortality has a small positive impact. Together these two factors do not seem to have more than a negligible effect on the population growth rate in Taiwan today.

Table 9--Number of Additional Births by Number of Living Children for Couples with No and One Child Death, Predicted by Unadjusted and Adjusted[a] Parity Progression Ratios

Number of living children	Unadj. ratios by no. of deaths		Adj. ratio by no. of deaths	
	0	1	0	1
0	4.38	4.57	4.47	4.08
1	3.42	3.62	3.51	3.13
2	2.54	2.66	2.62	2.32
3	1.81	1.83	1.89	1.65
4	1.32	1.34	1.32	1.28
5	.94	.84	.98	.84
6	.74	.58	.74	.58

[a]Ratios were adj. ratios from Table 7 where available. Unadj. births shown for five and six living children since MCA could not be used due to small no. of cases and similarity of ratios.

Table 10--Number of Additional Births by Achieved Parity Level for Couples with Various Fears of Child Mortality (CMFI), Predicted by Unadjusted and Adjusted[a] Parity Progression Ratios

Parity level achieved	Unadjusted ratios by CMFI score			Adjusted ratios by CMFI score		
	0	1	2	0	1	2
0	4.46	4.80	5.32	4.53	4.66	4.79
1	3.49	3.84	4.36	3.57	3.70	3.88
2	2.61	2.97	3.51	2.69	2.82	3.02
3	1.90	2.18	2.60	1.96	2.07	2.24
4	1.36	1.49	1.91	1.39	1.45	1.65
5	1.05	1.05	1.37	1.07	1.03	1.19
6	.75	.75	.75	.75	.75	.75

[a]Ratios were adjusted ratios from Table 7.

NOTES

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1. For example see R. Freedman and J. Y. Takeshita, Family Planning in Taiwan, Princeton: Princeton University Press, 1969; H. Frederiksen, "Feedbacks in Economic and Demographic Transition," Science, 166 (1969), 837-847; Taiwan: "An Area Analysis of the Effect of Acceptances on Fertility," Studies in Family Planning, 33 (1968), 7-11; and D. Heer, "Economic Development and Fertility," Demography, 3 (1966), 423-444.

2. Henceforth infant mortality and childhood mortality will be referred to as child mortality.

3. For example see T. Paul Schultz, "A Family Planning Hypothesis: Some Empirical Evidence from Puerto Rico," RAND Corp. Memorandum RM-5405-RC/AID, (1967); ----- and J. DaVanzo, "Analysis of Demographic Change in East Pakistan: A study of Retrospective Survey Data," RAND Corp., R-464-AID, (1970); and A. Harman, "Fertility and Economic Behavior of Families in the Philippines," RAND Corp., RM-6385-AID, (1970).

4. For example see R. Freedman, "Norms for Family Size in Underdeveloped Areas," Proceedings of the Royal Society, B, 159 (1963), 220-245.

5. Industry of Free China, 34 (July 1970), Taipei.

6. Demographic Reference: Taiwan, Republic of China, 2 (1965), Taipei.

7. Taiwan Demographic Fact Book, 1969, Taipei.

8. Statistical Bureau of Taiwan, Administrative Office, (Past) Fifty-One Year Statistical Abstract of Taiwan, (1946), Taipei.

9. J. M. Sullivan, "A Review of Taiwanese Infant and Child Mortality Statistics, 1961-1968," Taiwan Population Studies Working Paper No. 10, Ann Arbor: Population Studies Center, University of Michigan.

10. For a more detailed explanation of MCA, see F. Andrews, J. Morgan, and J. Sonquist, Multiple Classification Analysis, Ann Arbor: Institute for Social Research, University of Michigan, 1969.

11. For ages less than 2 years, one month was used as the age interval to accurately reflect the sharply decreasing mortality rate with age. For ages 2 to 15 years, a one-year interval was used.

12. The use of a single schedule of age-specific survival probabilities biases the deviations for couples with early dates of first birth by underestimating their expectation of mortality experience. The opposite is true for couples with recent dates of first birth. Since the date of the first birth is included in the MCA, it should remove the bias from the other explanatory variables.

13. The surveys covered 56 local administrative units chosen to be representative of the entire Chinese population: 23 rural townships (Hsiang), 16 urbanized townships (Chen), 4 small cities (Shih), and 13 precincts (Chu) of the five major cities. The additional data for these areas come from the Taiwan Demographic Fact Book for the relevant year.

14. MCA is not shown for the first-to-second progression since nearly everyone progressed, and it was not carried out on the sixty-to-seventh and seventh-to-eighth progressions since the numbers of cases involved were small and the unadjusted ratios very similar.

15. R. Freedman and J. Takeshita, op. cit.