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Community and Program Determinants of Fertility, Child
Mortality, and Population Growth in Malaysia

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II. PUBLICATIONS PREPARED UNDER THIS GRANT

(These publications are available as a special appendix to this Final Report.)

William P. Butz, "The Changing Role of Breastfeeding in Economic Development: A Theoretical Exposition," in I. Sirageldin (ed), Research in Human Capital and Development, Vol. 2, JAI Press, Greenwich, Conn., 1981.

Julie DaVanzo and William P. Butz, Birthspacing: Variations in the Duration of the Fertile Portion of the Pregnancy Interval, The Rand Corporation, WD-1653-AID, September 1982. (Partially funded by the Rockefeller Foundation.)

William P. Butz, Julie DaVanzo, and Jean-Pierre Habicht, Biological and Behavioral Influences on the Mortality of Malaysian Infants, The Rand Corporation, N-1638-AID, April 1982.

Julie DaVanzo, The Role of Breastfeeding in Population Growth: A Conceptual Model, Brief Review of Evidence, and Suggestions for Future Research, The Rand Corporation, WD-584-AID, April 1980.

Julie DaVanzo, William P. Butz, Tan Boon Ann, and Ramli Othman, Determinants of Contraceptive Use and Choice of Method in Peninsular Malaysia, The Rand Corporation, WD-1656-AID, September 1982. (Partially supported by the Hewlett Foundation and by AID Grant No. AID/OTR-G-1822.)

Julie DaVanzo, William P. Butz, and Jean-Pierre Habicht, How Biological and Behavioral Influences on Mortality in Malaysia Vary During the First Year of Life, The Rand Corporation, WD-1730-AID, December 1982. Forthcoming in Population Studies, July 1983.

Julie DaVanzo and Sidney Goldstein, Migration and Fertility: Some Illustrative Tabulations Based on the Malaysian Family Life Survey, The Rand Corporation, N-1310-AID, November 1979.

Julie DaVanzo and John Haaga, Anatomy of a Fertility Decline: Ethnic Differences in the Experience of Malaysian Women, 1950-1976, The Rand Corporation, N-1639-AID, August 1981.

Julie DaVanzo and John Haaga, "Anatomy of a Fertility Decline: Peninsular Malaysia, 1950-1976," in Population Studies, November 1982.

Julie DaVanzo, Jean-Pierre Hawicht, and William P. Butz, Assessing Socioeconomic Correlates of Birthweight in Peninsular Malaysia: Ethnic Differences and Changes Over Time, The Rand Corporation, WD-1652-AID, September 1982. submitted to Social Science and Medicine, December 1981. Revising.

Dennis De Tray, Children's Economic Contributions in Peninsular Malaysia, The Rand Corporation, WD-1471-1-AID, September 1982. (Partially supported by AIL Grant No. AID-OTR-G-1822.)

Terry Fain, Three Methods for Processing Life-History Data, The Rand Corporation, N-1544-AID, July 1980.

John Haaga, Validity and Reliability of Retrospective Life History Data From the Malaysian Family Life Survey, The Rand Corporation, WD-993-AID, March 1981.

I. INTRODUCTION AND SUMMARY

BACKGROUND AND CONTENTS

The activities reported herein were funded by grant no. AID/otr-1744 from the Agency for International Development to the Rand Corporation. The grant began on June 8, 1979 and ended on June 8, 1981. The purpose of this grant was to analyze data from the Malaysian Family Life Survey (MFLS) and report scientific findings and program and policy implications regarding fertility and infant mortality.

The MFLS, itself, was funded by AID through an earlier contract, no. AID/PHA-1057 to Rand. The survey was designed and conducted by Rand personnel in collaboration with survey experts at the Department of Statistics in The Government of Malaysia and at Survey Research Malaysia, Sdn.Bhd., a private survey firm. Our analyses under this subsequent grant have been conducted by a multidisciplinary team of economists, demographers, epidemiologists, and policy analysts. The results have been reported in written and oral form to a variety of program, policy, and scientific audiences.

The main contents of this Final Report are thirteen publications that resulted from this grant. In this introductory section, we briefly summarize our principal scientific findings and their program and policy implications; present abstracts of the publications; list our presentations of this material at program and policy forums, academic seminars, and professional meetings; and identify other researchers using the Malaysian Family Life Survey.

PRINCIPAL PROGRAM AND POLICY IMPLICATIONS

The research reported in the sixteen publications included in this Final Report implies the following program and policy initiatives:

- o Water and sanitation improvements will have their greatest impact on public health if focused on areas where mothers breastfeed little or not at all, or where the mothers appear, on the basis of research there or elsewhere, to be at risk of reducing their breastfeeding in the near future.

- o Policy and program initiatives of whatever type to increase breastfeeding will have their greatest effect in reducing infant mortality if applied selectively to populations whose water and sanitation systems are poor. Policy initiatives that apply generally to the whole population, such as the 1981 W.H.O. infant feeding code, may not be the most cost-effective way to reduce infant mortality.

- o The advantages and disadvantages of integrating family planning and maternal and child health services in the Third World have been much debated. Our research suggests one benefit of integration that has not entered into the debate: availability of integrated clinics appears to be associated with increased initiation of breastfeeding, even while it is also associated with use of modern contraceptives.

- o Proximity to private maternity clinics is associated with reduced breastfeeding in Malaysia. Field investigations should move quickly to identify the practices of these clinics that may be discouraging breastfeeding. Something may be learned in that process that can improve procedures in other institutions as well.

- o Family planning evaluation activities should be modified to include consideration of the traditional methods women have used to space and limit their births. Evaluations should try to measure the net changes in fertility due to the program.

- o Rather than "preaching to the converted," the payoff to family planning activities, in terms of net changes in fertility and health, may be higher if these services were targeted on women who are unlikely to practice contraception otherwise, especially those who breastfeed little or not at all. A focus on women already interested in practicing contraception is a reasonable way to begin a program, so that organizational and operational procedures can be set up efficiently while focusing on a relatively easy target. However, at a more mature stage, it is productive to focus, as Malaysia's program now does, on more difficult groups. This should increase the public health impact of the family planning program.

- o Family planning services should focus on very young and older women to reduce infant mortality, as well as to reduce fertility.

- o Malaysia is a multiethnic society of Malays, Chinese, and Indians. Since 1969, the government has instituted many policies and programs to assist the Malays. Many Chinese are sufficiently well-to-do to help themselves. The Indians seem to be caught in the middle and, on a number of indicators, their relative position is deteriorating. Beyond Malaysia, the implication is that minority populations should be carefully monitored to avoid their being neglected in the process of socioeconomic development.

MAJOR SCIENTIFIC FINDINGS SUPPORTING THESE IMPLICATIONS

The enclosed publications report many findings relevant to different scientific and practical questions. Those findings most relevant to program and policy concerns are highlighted here.

Findings Pertinent to Family Planning

o Women are more likely to practice contraception and to do so with effective methods when they want no more children. A significant proportion of women who want more children practice some form of contraception, primarily the pill; nonetheless, reaching the family-size goal is associated with increased use of sterilization, pill, condom, safe time (rhythm), and abstinence. One out of eight couples who want no more children have insured through tubal ligation or vasectomy that this will be the case. Hence, when women want no more children they change from relatively ineffective methods (e.g., folk methods), or use of no method at all, to more effective ways of preventing births, mainly the pill and sterilization. In Malaysia and many developing countries contraception is practiced primarily for limiting the number of births rather than spacing them. Nonetheless, it is noteworthy that in Malaysia many couples also practice contraception for spacing births.

o There are six different types of family planning clinics in Malaysia. Some types of family planning clinics, such as those run by the National Family Planning Board (NFPB), tend to be located in areas where women are already motivated to practice contraception, that is where income and education are high, and desired additional fertility is low. Even when proximity to family planning clinics is controlled,

income and education are positively related to the use of effective contraceptive methods, such as the pill, condom, and sterilization. Furthermore, NFPB clinics tend to be located in areas where contraceptives are already commercially available, perhaps in response to families' motivation to practice contraception. Other types of Malaysian family planning clinics, e.g., traditional midwife clinics, are located primarily in the opposite kind of areas--where incomes are low and desired family size is high. This nonrandom placement of family planning clinics has important implications for evaluating their impact: If clinics are located in areas where women would practice contraception even if the clinics weren't there, or where fertility rates would have fallen anyway, evaluations may overstate the changes in contraceptive use or in fertility due to the clinic, unless other factors that affect fertility and contraceptive use are appropriately controlled.

- o Proximity to most types of family planning clinics is associated with higher rates of contraceptive use, even when other influences on contraceptive use are controlled. However, the estimated association with proximity to NFPB, Family Planning Association, and estate clinics is smaller when these other factors are controlled. The estimated associations with proximity to clinics integrated with maternal/child health services clinics and to traditional midwife clinics are larger when other influences on contraceptive use are controlled.

- o Certain types of clinics appear to be especially associated with use of particular methods. For example, couples who live near Family Planning Association clinics are particularly likely to use condoms or to be surgically sterilized. Couples near NFPB clinics are also likely to resort to sterilization, and many use the pill.

o Although modern methods are most effective in extending the length of the susceptible interval, some traditional methods are associated with significantly longer susceptible intervals, other things the same. Even though pill, condom, and other modern methods are associated with the longest susceptible intervals, intervals in which safe time and abstinence are practiced are two-to-three times longer than intervals in which no contraception is reported. Even folk methods are associated with intervals 24 percent longer than those in which no contraception is reported. The rather large effect of safe time is probably due to the fact that in Malaysia this method is used by very highly educated women. Hence, the relatively high effectiveness of safe time in Malaysia may not generalize to other countries.

o In addition, our analysis of variations in postpartum amenorrhea (the infertile period following a birth) shows that unsupplemented breastfeeding is a more effective contraceptive than previously thought. The lower effectiveness estimates from other research are due to methodological problems. Our results indicate that full breastfeeding, with no supplementary food, is a very effective contraceptive, at least for the first 12 months.

o Furthermore, in Malaysia many women treat breastfeeding and use of other contraceptives as substitutes. Malays breastfeed more and practice contraception less than Chinese and Indians; within each ethnic group breastfeeding declines occurred simultaneously with increases in the practice of other forms of contraception. Furthermore, within each woman's experience, the longer her postpartum amenorrhea (due to longer breastfeeding), the less likely she is to practice contraception.

o The effectiveness of some traditional contraceptive methods, including unsupplemented breastfeeding, and the fact that women treat breastfeeding and use of other contraceptives as substitutes, has important implications for targeting of family planning efforts and for evaluating their impact. Because of the high contraceptive effectiveness of unsupplemented breastfeeding, a good time to target family planning services is when the mother first begins giving her child supplementary food.

o Evaluations of family planning programs often measure the impact of a program merely by the number of women who use the program (modern) contraceptives. Such an approach is likely to overstate the anticipated effect of the program on fertility for several reasons: (1) the evaluation would overlook the fact that some, perhaps many, of these women previously used other traditional methods to space or prevent births. The expected effect on fertility of their adopting modern methods will be smaller than if these women had previously used no contraception or only ineffective methods. (2) These women's demands for contraception may be adequately handled by commercial suppliers. The program may induce women to shift from private to public sources, but may not increase the total amount of contraception practiced. An alternative approach is for the public program to target on women who are not already practicing some form of contraception, modern or traditional. Since such women are likely to be less motivated to practice contraception, it may be necessary to devote more program resources to activities to reduce desired family sizes and to motivate couples to practice contraception. However, the payoff in terms of net

reductions in fertility of focusing on these more "difficult" groups may exceed that for the "easier" targets.

o Furthermore, proximity to family planning clinics is not only associated with the use of modern methods of contraception, but also with breastfeeding. Women near certain types of family planning clinics without maternal/child health activities, especially clinics on rubber estates, are less likely to breastfeed. This may be due to the hormonal interference between estrogen contraceptive pills and breastfeeding. Or it may be due to the fact that women treat breastfeeding and other contraceptives as substitutes and, when modern contraceptives are more readily available, they breastfeed less. However, women who live near family planning clinics that are integrated with maternal/child health activities are more likely to breastfeed. This is especially true for Chinese, the ethnic group which breastfeeds least. Proximity to integrated clinics, including some NFPB clinics, is associated with higher rates of both contraceptive use (especially the pill) and initiation of breastfeeding. Focused field investigations should attempt to determine why proximity to these particular clinics is associated with increased breastfeeding while others are not.

o In Malaysia both postpartum amenorrhea and susceptible intervals are shorter after a child dies. Hence when a child dies soon after birth, interpregnancy intervals are shorter for both biological and behavioral reasons. The death curtails breastfeeding and reduces the length of postpartum amenorrhea. Furthermore, following a child's death women are less likely to practice contraception, in an attempt to "replace" the child who has died. These findings are replicated in other studies. In addition, we find that a child's death is especially

likely to discourage use of sterilization, the pill, and abstinence, but has relatively little effect on the practice of safe time. These results are useful reminders that both biological and behavioral factors affect fertility, and that infant mortality not only affects population growth directly but also indirectly through its effects on fertility. The dramatic reductions in infant mortality that have taken place in Malaysia have in themselves helped reduce the incidence of short birth intervals, which can detrimentally affect mothers' and children's health.

Findings Pertinent to Health and Nutrition

- o Inadequate nutrition of teenage girls, reflected in late age of menarche (age of the girls' first menstruation), is associated with low birthweights of these girls' babies. This result emerges both in the raw data and when controlling for other influences on birthweight, such as the mother's age and parity, family income, and the child's sex. This finding is new. Low birthweight is important because it is associated with slow development and increased mortality in infancy, especially under the public health conditions typical in less developed countries. If it is corroborated in other studies, this finding means that nutrition programs should be reaching girls before menarche, at least five-to-seven years before existing maternal child health programs typically find them. By the time these programs now reach women, low-birthweight babies may be preordained. In the meantime, prenatal care intervention should screen for and focus on women who experienced delayed menarche.

- o Babies born to very young mothers (less than 19 years old) are much more likely to die in infancy. This fact is known from other

studies. What is new here is the additional finding that this increased mortality is concentrated in the first month of life. We infer from this pattern of very early mortality, as well as from other evidence, that this association between mothers' young age and babies' deaths is due to biological causes, rather than behavioral ones.

- o Babies born to mothers older than 39 are also more likely to die, but their deaths are concentrated in the second six months of infancy. No known biological mechanism would produce this pattern of late infant mortality. But there are a number of behavioral factors associated with older motherhood that could cause it. These two infant mortality patterns imply that family planning programs should target on very young and very old mothers for reasons of babies' health, apart from the usual reasons of reducing fertility and improving mothers' health and well-being.

- o The presence of relatives in the household (apart from members of the nuclear family) is associated with a higher tendency to begin breastfeeding. The association is strongest for births since 1970 and is nonexistent for births before 1960. This overall pattern is consistent with the hypothesized importance of a "doula", another woman who gives advice and support concerning breastfeeding. Two decades ago, when breastfeeding was nearly universal in Malaysia, it is reasonable that the presence of other women who could help wouldn't matter. More recently, however, when the pressures against breastfeeding have risen and fewer women do it, it appears that this factor has become important. Interestingly, women who do begin breastfeeding tend to wean their children earlier when other relatives live in the household. It may be that although these relatives help the mother begin breastfeeding, later

on they help to feed the baby, freeing the mother to stop breastfeeding earlier to do other things with her time.

o The place where a woman gives birth is associated with initiation of breastfeeding. Even when many other influences on breastfeeding are controlled, women who give birth in private maternity clinics are significantly less likely to begin breastfeeding than women who give birth at home. While place of birth is significantly associated with whether a woman begins to breastfeed, once she begins there is no association with how long she continues. We conclude therefore that the influence of birthplace is not due to attitudinal factors associated with birthplace, but with actual differences among birthplaces in perinatal and nursery practices. It may be that these clinics use heavier anaesthesia at birth, that they separate the baby and mother for a longer time, or that they distribute free bottles and infant formula. These possible reasons merit investigation in data more focused on this question.

o There is something about hospitals such that, even when many socioeconomic characteristics are held constant, women are more likely to practice contraception after giving birth there.

Findings Pertinent to Water and Sanitation Programs

o Babies in households with piped water are less likely to die in infancy. The cost-effectiveness of large investments in the availability of potable water is now a subject of intense debate. One of the persistent surprises has been the failure of focused field trials, by now a large number of them, to show significant survival gains from the introduction of potable water, this despite laboratory evidence that these gains should be occurring. In Malaysia, however,

the availability of piped water is related to lower infant mortality, with or without controls for other family and environmental factors. The association is quantitatively small, but it is statistically significant.

- o Babies in houses without modern toilet sanitation also tend to have higher mortality. This association is considerably stronger than with piped water.

- o Most important, both these associations are much stronger for babies who breastfeed little or not at all. The infant mortality rate for babies who do not breastfeed at all is 34 deaths per thousand lower in homes with piped water than in homes without piped water. This is a large and statistically significant reduction. The corresponding reduction is 30 per thousand babies who breastfeed with supplementation, also a significant difference. However, the presence of piped water makes no difference at all for the mortality of babies who fully breastfeed through their first six months of life.

- o The same distinction exists for toilet sanitation. Here the presence of modern facilities has a much larger effect, and the relative difference between breastfed babies and non-breastfed babies is even greater. In both cases, modern facilities are associated with a significant difference in infant mortality only for babies who have foods other than breastmilk in their first six months.

These differences presumably arise because babies who do not breastfeed usually have other foods mixed with water. If the water is bad--a more likely occurrence with traditional water sources and sanitation methods--then the babies are more likely to die. These findings have important implications for the negative results from field

trials with potable water: Such investigations should focus on communities where breastfeeding is low or decreasing, hence where good water and sanitation are most likely to matter.

Findings Pertinent to Socioeconomic Policy

- o Breastfeeding reduces infant mortality less than previous estimates indicate. The effect is nonetheless substantial and important, at least where water and sanitation are poor, but it is everywhere less than implied by other studies. Most of these studies attributed many infant deaths to short breastfeeding, when other causes were most likely responsible. Prevalent diseases, for example, frequently weaken the child so that he stops nursing, and then the disease kills him. The halt in breastfeeding is not responsible for the subsequent death though most studies have treated it as such. Policies concerned with infant health and mortality should take account of this finding. Previous estimates of the breastfeeding-mortality link may have incorrectly given principal priority to policies to increase breastfeeding. Our findings suggest that policies to reduce mortality by other means are also worth pursuing. The fostering of breastfeeding is important, at least under some conditions, but should be accompanied by other measures to reduce infant mortality.

- o The higher mortality of babies born to very young mothers has implications broader than those discussed above for family planning programs. This finding implies that policies which have the effect of raising women's marriage age will reduce infant mortality. Such policies are usually argued only on the grounds of reducing fertility.

- o Mothers who can earn high wages breastfeed less. For such women the opportunity cost of nursing a baby is higher than for other women

whose activities are more compatible with infant care. When other differences are controlled, almost nine out of ten mothers capable of earning only 25 cents an hour in paid employment breastfeed their infants. For mothers capable of earning one dollar an hour, on the other hand, only 67 percent breastfeed their infants. Interestingly, a recent history of agricultural work is associated with more breastfeeding, even compared with women who were not employed at all. Beyond the Malaysian setting, these findings indicate that the availability and characteristics of jobs influence whether women breastfeed. Some jobs, for example, agricultural jobs near home, are compatible with child care and breastfeeding; others are not. Public policies can influence these job characteristics through taxes, subsidies, and regulation.

o The average birthweight of Indian babies in our sample has been declining since the mid-1960s, while their infant mortality has been steady or rising. Birthweight has an important biological influence on infant mortality. In these data, low birthweight babies are much more likely to die, controlling for many other factors including whether the baby is Indian. Hence, Indians' declining birthweight is partially responsible for the failure of Indians' infant mortality to fall. In addition to their babies' low birthweight, many Indian women in our sample have not sufficiently increased their use of contraceptives to compensate for their reduction in breastfeeding. A result is shorter birthspacing which, by itself, reduces birthweight and increases infant mortality. Indians' incomes also appear to be rising less rapidly than the incomes of Malays and Chinese. This may also contribute to the different birthweight and mortality trends. A higher proportion of

Indians in the Malaysian Family Life Survey is rural than for Indians in the entire Malaysian population. At the least, our findings suggest that rural Indians are suffering, relative to Malays and Chinese. Worse, these differences might characterize the Indian population as a whole.

o A hypothesis frequently advanced to explain declines in breastfeeding is the commercial merchandising of infant formula. Although the MFLS is not ideally suited to investigate this possibility, we find no relationship between a woman's breastfeeding and the availability and price of infant formula in the community where she lives. It is possible that the relationship exists, and that our data and statistical methods cannot uncover it. But in any case, our research offers no support for the hypothesis. Rather, it shows that in Malaysia breastfeeding declines began before the beginning of wide-scale commercial merchandising of infant formula. These declines appear to be due to improved nonagricultural work opportunities for women and to other socioeconomic changes.

o Socioeconomic changes associated with economic development-- increasing education, income, and urbanization--increase contraceptive use but reduce breastfeeding. The declines in breastfeeding put upward pressure on fertility, which is often, but not always, offset by increases in contraceptive use. An example is young Indian mothers in Malaysia, who have not sufficiently compensated for their reduced breastfeeding by increasing their use of contraceptives. These mothers have experienced dramatic breastfeeding declines, especially since 1969, but their use of modern contraceptives has not increased. A result has been an increase in the proportion of interpregnancy intervals less than

15 months long. These increases in short intervals are associated with reductions in Indian birthweights and increases in their infant mortality.

IMPLICATIONS FOR RESEARCH

Although we have focused on the policy implications of our research, the findings also have some methodological implications for future research that could further inform policy:

- o Retrospective life-history surveys can be much more useful than commonly thought. They should be considered for documenting more than just past births and deaths, to which they have been nearly always restricted. They should also be used to establish baseline data on trends at the start of interventions and experiments, and to monitor changes in control variables and in the public health outcomes and the demographic and economic variables that are the target indicators for these interventions. To their low cost and quick availability, compared with prospective panel data, must now be added their quality. While decidedly less reliable than good panel data, retrospective life-history data may be good enough for many important purposes.

- o Outcomes that result from interplays of behavioral, biomedical, and institutional factors are most reliably and productively studied in data that document all three aspects and by researchers whose expertise spans these areas. In our case, at least, biomedical and behavioral scientists have produced more together than they could have separately. Our experience may be an exception, but then real interdisciplinary collaboration may not have been tried enough yet to establish a rule.

- o Very disaggregated analysis appears to have payoffs, even at the expense of working with small subsamples. For example, examining

experiences of individual infants and following them through succeeding phases of infancy have produced new findings. So have our separate analyses of the initiation and the lengths of supplemented and total breastfeeding.

ABSTRACTS OF PUBLICATIONS

The sixteen research publications prepared under this grant, which are abstracted in this subsection, are contained in Section II of this Final Report. Seven are in final form. The others have been or are currently being scientifically reviewed and are being editorially prepared for final Rand publication. The final versions will be sent to AID as soon as they are available. Most of these publications have been submitted to scientific or policy journals. Several of these publications have been partitioned into several journal articles in order to target particular findings to interested audiences. As these journal publications appear, we will forward reprints to A.I.D. for inclusion in this Report.

William P. Butz, "The Changing Role of Breastfeeding in Economic Development: A Theoretical Exposition," in I. Sirageldin (ed), Research in Human Capital and Development, Vol. 2, JAI Press, Greenwich, Conn., 1981.

This paper develops a model that predicts the choices that mothers make about breastfeeding. The model assumes that mothers respond to changes in the cost of this activity, and to changes in the cost, availability, and effectiveness of other means of feeding babies and of spacing births. The model predicts that mothers will breastfeed less when their time spent in other ways is more valuable and when substitutes for breastfeeding are more readily available. Breastfeeding declines appear to be an integral part of the process of economic development. This does not mean that the declines are good, but it does mean that they are endemic and will be difficult to arrest. The model points to a number of specific factors that might be changed by public policy in order to encourage breastfeeding.

Julie DaVanzo and William P. Butz, Birthspacing: Variations in the Duration of the Fertile Portion of the Pregnancy Interval, The Rand Corporation, WD-1653-AID, September 1982. (Partially funded by the Rockefeller Foundation.)

This paper uses data from the MFLS to examine factors that explain variation in the length of the fertile portion of the pregnancy interval--the length of time between the resumption of postpartum ovulation (which we measure by the resumption of menstruation) and the next conception. In Malaysia, these intervals have increased in length since 1950 and these increases have occurred for each of the three ethnic groups. A hazard model is estimated to examine the effectiveness of different types of contraceptive methods in extending the length of this interval, (the "menstruating interval"), and to assess the effects of other possible influences. (The hazard model enables consideration of both open and closed intervals.) Although modern methods (e.g., pill) are most effective in extending menstruating intervals, some traditional methods (e.g., safe time and abstinence) are associated with longer menstruating intervals. Much of the increase in menstruating intervals in Malaysia appears to be due to increased rate of contraceptive use and to relative increases in the use of the most effective methods.

William P. Butz, Julie DaVanzo, and Jean-Pierre Habicht, Behavioral and Biological Influences on the Mortality of Malaysian Infants, The Rand Corporation, N-1638-AID, April 1982.

This study uses MFLS data to examine the determinants of infant mortality variations in Peninsular Malaysia. It considers proximate biological correlates of mortality as well as family characteristics and behavior, and inspects the degree to which some of these latter factors have their effects indirectly through more proximate factors.

It assesses how these influences and interactions change in importance through successive subperiods of the first year of an infant's life. Included are most of the influences commonly cited as affecting infant mortality: maternal education, socioeconomic class, age, birthspacing, and prior reproductive loss; and infant's sex, breastfeeding and type of weaning food, birthweight, and birth order. In addition, the analyses include proxies for exposure to respiratory and gastrointestinal diseases, measures of the mother's availability for child care and of household composition, child's year of birth, ethnicity, and a measure of rurality. These data, despite being mothers' reports of events many years earlier, produce many statistical associations with mortality that are consistent with the clinical and epidemiological literature. Examples are the elevated mortality risk associated with very young maternal age, low birthweight, short previous birth interval, and male sex of the child. These corroborations with clinical data suggest that retrospective data can yield valid conclusions about influences on infant mortality. This paper moves beyond these findings to investigate other less well-known interrelationships with infant mortality. These new findings have specific implications for risk screening programs and for direct interventions to reduce infant mortality, which are discussed.

Julie DaVanzo, The Role of Breastfeeding in Population Growth: A Conceptual Model, Brief Review of Evidence, and Suggestions for Future Research, The Rand Corporation, WD-584-AID, April 1980.

This paper was prepared for the National Academy of Science Panel on Determinants of Fertility Change. It presents a conceptual model of the determinants and consequences of breastfeeding; briefly reviews what is known about the behavioral determinants of breastfeeding and about its effects on postpartum amenorrhea and infant mortality; and provides a list of questions for future research.

Julie DaVanzo, William P. Butz, Tan Boon Ann, and Ramli Othman, Determinants of Contraceptive Use and Choice of Method in Peninsular Malaysia, The Rand Corporation, WD-1656-AID, September 1982.
(Partially supported by the Hewlett Foundation and by AID Grant No. AID/OTR- G-1822.)

Increases in the use of contraceptives, especially effective modern methods, has been a major factor contributing to the dramatic fertility decline in Malaysia since World War II. This paper uses dichotomous and polytomous logit estimation techniques to explain variations in contraceptive practice and choice of contraceptive method following pregnancies in this time period. Main findings include:

- Women who do not want more children are much more likely to practice contraception, and to do so with effective methods, compared with women who have not yet reached their family size goal.
- Education increases the likelihood of contraception and is strongly associated with the likelihood that safe time (rhythm) is used.

- Higher income is associated with greater use of sterilization, pill, and condom.
- Longer postpartum amenorrhea or a recent child death discourage contraceptive use.

Hence, socioeconomic development in Malaysia--increases in education and income and reductions in mortality--have led to increases in contraceptive use rates. These influences have been reinforced by the decreases in desired family size and declines in breastfeeding that typically accompany socioeconomic development, and by the activities of an active family planning program.

Julie DaVanzo, William P. Butz, and Jean-Pierre Habicht, How Biological and Behavioral Influences on Mortality in Malaysia Vary During the First Year of Life, The Rand Corporation, WD-1730-AID, December 1982; forthcoming in Population Studies.

This article, derived from N-1638-AID, considers proximate biological correlates of mortality as well as family characteristics and behavior, and inspects the degree to which some of these latter factors have their effects indirectly through more proximate factors. It assesses how these influences and interactions change in importance through successive subperiods of the first year of an infant's life.

Main findings include:

- o Biological factors such as low birthweight are more important early in the first year of life, while such behavioral and environmental factors as mother's education or types of water and sanitation system are more important later.

- o When proximate mortality determinants are not controlled, Indians' infant mortality is not significantly different from Malays'. When the more proximate correlates are controlled, Indian infant mortality is significantly lower than Malays'. This is because Indians have lower birthweights and shorter intervals preceding their births.
- o When no other variables or only the biological attributes at birth are controlled, rural babies are significantly more likely to die in the first week and last six months of infancy. But when other biological and family influences are controlled, no rural/urban differentials emerge. Hence, it is not rurality per se, but postnatal biological influences (e.g., type of water) and indirect family influences (e.g., mother's education) correlated with rurality, that increase the mortality risk of babies born in rural areas

Julie DaVanzo, and Sidney Goldstein, Migration and Fertility: Some Illustrative Tabulations Based on the Malaysian Family Life Survey, The Rand Corporation, N-1310-AID, November 1979.

This note presents several cross-tabulations based on MFLS data to explore whether migration data collected as part of a survey concerned mainly with fertility can be used to yield insights into the relationship between migration and fertility. In a subsample of married women aged 20-29 in 1971, migration and fertility are inversely related. 1971-74 migration rates are inversely related to 1971 parity. Migrants had lower fertility than nonmigrants both at the beginning of and during the 1971-74 migration interval. However, migrants are less likely to

practice contraception than normigrants, though they are more likely to be using modern methods. Only further research can tell whether their greater usage of modern methods of contraception, migration-related marital separations, or some other factor is responsible for the migrants' lower fertility.

Julie DaVanzo and John Haaga, Anatomy of a Fertility Decline: Ethnic Differences in the Experience of Malaysian Women, 1950-1976, The Rand Corporation, N-1639-AID, August 1981. A condensed version is published under the title "Anatomy of a Fertility Decline: Peninsular Malaysia, 1950-1976," in Population Studies, November 1982.

Between 1950 and 1975, fertility rates fell for each of the three major ethnic groups (Malays, Chinese, and Indians) in Peninsular Malaysia. This note uses the MFLS retrospective pregnancy-history data to investigate the proximate causes of these fertility declines. For each of the ethnic groups the study investigates time trends in age at marriage, marital fertility rates, and interpregnancy intervals. It decomposes the interpregnancy intervals into their two main component parts--postpartum amenorrhea and menstruating intervals--and examines how these components have changed over time and with parity. These changes reflect trends in the major determinants of these components--breastfeeding and contraceptive use--which are also examined. Though breastfeeding has declined for each of the ethnic groups, in most cases increases in contraceptive use have more than compensated, resulting in longer birth intervals and lower fertility.

Julie DaVanzo, Jean-Pierre Habicht, and William P. Butz, Assessing Socioeconomic Correlates of Birthweight in Peninsular Malaysia: Ethnic Differences and Changes Over Time, The Rand Corporation, WD-1652-AID, September 1982. Submitted to Social Science and Medicine, December 1981. Revising, November 1982.

The MFLS retrospective data are used to show that mothers' reports of their children's birthweights, including reports of unweighed babies' approximate size at birth, can be used to examine many biological and socioeconomic correlates of birthweight. The study uses a sample of over 5,500 singleton births that occurred between 1945 and 1976 to examine the bivariate and multivariate relationships between birthweight and the following variables: infant mortality; the baby's sex, birth order, and the length of the interval preceding its birth; the mother's age at menarche and age at the baby's birth, and the family's income and access to medical care. These relationships are examined separately for Malays, Chinese, and Indians, and for three time periods. Main findings include: late menarche (a proxy for the mother's nutrition during pregnancy) is associated with low birthweight; a preceding short interval is associated with lower birthweight; Indians' birthweights are lower than those of Malays and Chinese and have not improved over time; these ethnic differences are due to Indians' closer birthspacing, falling incomes and lack of access to medical care.

Dennis De Tray, Children's Economic Contributions in Peninsular Malaysia, The Rand Corporation, WD-1471-1-AID, September 1982.
(Partially supported by AID Grant No. AID-OTR-G-1822.)

This note uses MFLS data to explore productive contributions that children make to family well-being while living with their parents. Separate analyses are reported for labor force activities, work on home products, and housework. Three aspects of time use are explored for each activity: participation; hours worked conditional on participation; and parent demand for child hours. The study's findings suggest that even in a relatively advanced developing country such as Malaysia, considerable transfers flow from child to parent. Further, the analysis contradicts a number of widely held beliefs. For example, this study finds that girls are equally as likely as boys to participate in labor force activities; girls' productive contributions to the household exceed boys' at least while both are living at home; children's contributions to parents are no larger for poor than for rich families.

Terry Fain, Three Methods for Processing Life-History Data, The Rand Corporation, N-1544-AID, July 1980.

This Note discusses three methods of data retrieval used with the Malaysian Family Life Survey and The INCAP-Rand Guatemala data. The three methods are:

- (1) RETRO--a retrieval program written at Rand specifically for these datasets, which can be implemented by researchers and research assistants

- (2) SIR (Scientific Information Retrieval)--a commercially available data handler designed especially for hierarchical and network datasets
- (3) Custom programming by a professional programmer/analyst.

Each method is examined with respect to the scope of the method; the type, amount, and extent of data preparation required; the type of data storage required; the amount and sophistication of the retrieval program; the nature of the execution and output; and the overall costs incurred. Advantages and disadvantages of each method are discussed.

John Haaga, Validity and Reliability of Retrospective Life History Data From the Malaysian Family Life Survey, The Rand Corporation, WD-993-AID, March 1981.

A number of methods are used to assess the quality of the MFLS recall data elicited by MF2, the Female Retrospective Questionnaire. These include checks of overall rates and patterns in the data against vital statistics, census, and other survey data; various tests of the internal consistency of the data; and several analyses of re-test reliability when the same question was asked in different rounds of the survey. In general, there was no evidence of bias due to omissions or misreported timing of births or infant deaths. Fetal deaths appear to have been underreported. Birthweights, respondents' education, housing conditions, and employment all appear to have been accurately reported. Re-test reliability of breastfeeding questions was high, but both the breastfeeding and amenorrhea data exhibit implausible "peaks" at

reported durations that are multiples of six months. A multivariate analysis shows that Chinese women tended to report more reliable answers than Malays, even when factors such as literacy, urban residence, and education are taken into account. Users of the retrospective data need to be aware both of their strengths and limitations for different types of analysis.

ORAL PRESENTATIONS BASED ON RESEARCH SUPPORTED BY THIS GRANT

1981

November, Washington, D.C. "Birthspacing, Fertility and Family Planning: Policy and Program Implications from the Malaysian Family Life Survey," briefing to program officers and technical staff of the Agency for International Development (William P. Butz and Julie DaVanzo).

November, Washington, D.C. "Behavioral and Biological Influences on Fertility, Health, and Nutrition: Policy and Program Implication from Malaysia," briefing to AID Administrator, Assistant Administrators, and Special Advisors (William P. Butz and Julie DaVanzo).

October, Belmont, Maryland. "Problems and Prospects for Retrospective Data," presented to World Bank Conference on Living Standards Measurement (William P. Butz).

August, Mt. Michaels, Maryland. "Behavioral Substitutions and the Measurement of Family Planning Program Effectiveness," presented to workshop on Measurement of Cost-Benefit, Cost-Effectiveness of Family Planning, hosted by Johns Hopkins University (William P. Butz).

June, Washington, D.C. "Program and Policy Initiatives to Improve Infant Health, Nutrition, and Survival," briefing presented before Agency for International Development program officers (William P. Butz and Jean-Pierre Habicht).

June, Washington, D.C. "Infant Feeding: Three Questions and a Caveat," presented to NICHD Workshop on the Determinants of Infant Feeding Patterns (William P. Butz).

March, Washington, D.C. "Validity and Reliability of Retrospective Data from the Malaysian Family Life Survey: Some New Methods and Implications for Survey Design," presented at Population Association of America Annual Meetings (John Haaga).

March, Washington, D.C. "Anatomy of a Fertility Decline: Peninsular Malaysia 1950-1976," presented to the Population Association of America Annual Meetings (Julie DaVanzo).

March, Washington, D.C. "Family, Community and Program Influences on the Mortality of Malaysian Infants," presented at the Population Association of America Annual Meetings (William P. Butz).

March, Washington, D.C. "The Contraceptive Role of Breastfeeding," presented at the Population Association of America Annual Meetings (Jean-Pierre Habicht).

February, Los Angeles. "Validity and Reliability of Retrospective Survey Data," panel on "What Do We Know About Self-Reports," Pacific Chapter of American Association for Public Opinion Research (John Haaga).

February, Berkeley, California. "Determinants of Breastfeeding and Birthweight in Peninsular Malaysia," presented to Graduate Group in Demography, University of California, Berkeley (Julie DaVanzo).

1980

December, Irvine, California. "Sample Design for a Fertility Study in Malaysia," presented to Statistics Course on Sample Design (Julie DaVanzo).

December, Columbus, Ohio. "The Responsibility of Baby Formula Merchandising for Breastfeeding Declines and Infant Mortality: The Case of Malaysia," briefing to David Cox, Board Chairman of Ross Laboratories, and his staff (William P. Butz).

October, Dominquez Hills. "Population, Women, and Development: Women as Producers and Reproducers," presented to California Women's Congress, California State University (Julie DaVanzo).

June, Laxenburg, Austria. "Migration and Fertility," seminar at International Institute for Applied Systems Analysis (Julie DaVanzo).

June, Honolulu. "Three Methods for Processing Life-History Data," Eleventh Summer Seminar in Population, East-West Population Institute (Terry Fain).

March, Washington, D.C. "Breastfeeding and Population Growth," presented to National Academy of Science Panel on Determinants of Fertility Change (Julie DaVanzo).

March, Los Angeles. "Contraceptive Use, Breastfeeding, and Birthspacing in Malaysia," Seminar on Population, School of Public Health, UCLA (Julie DaVanzo).

March, Washington, D.C. "Patterns and Determinants of Malaysian Infant Mortality," Policy Briefing, Agency for International Development (William P. Butz).

February, Stanford, California. "Patterns and Determinants of Malaysian Infant Mortality," Food Research Institute (William P. Butz).

OTHER RESEARCHERS USING THE MALAYSIAN FAMILY LIFE SURVEY

Many researchers other than those at Rand are using the MFLS data in their research. The following is a list of individuals and institutions to whom the data have been sent:

Professor Yoram Ben-Porath
Department of Economics
Hebrew University (Jerusalem)

Dr. Bryan L. Boulier
Office of Population Research
Princeton University

Dr. Mary Jean Bowman
School of Education
University of Chicago

Ruby Bussen
East-West Center
University of Hawaii

Beth Gerfin
Department of Population Dynamics
School of Hygiene and Public Health
Johns Hopkins University

Professor Sidney Goldstein
Population Studies and Training Center
Brown University

Dr. Reuben Gronau
Falk Institute of Economic Research
Tel Aviv University (Israel)

Dr. Christian Grootaert
Development Research Center
World Bank

Professor A. S. Hadi
School of Social Sciences
The Flinders University of South Australia

R. Hauchechrne
Institut National D'Etudes Demographiques (Paris)

Professor Denise Kandell
Department of Psychiatry
Columbia University

Professor Michael Kusnic
Department of Economics and Business
North Carolina State University

Datin Dr. Noor Laily Bte. Dato' Abu Bakar
Director General
National Family Planning Board (Kuala Lumpur)

Lenore Launer
Division of Nutritional Science
Cornell University

Professor Donald L.P. Lee
Faculty of Economics
University of Malaya

Dr. Evelyn Lehrer
Department of Economics
Northwestern University

Karen Leppel
Office of Population Research
Princeton University

Maureen Lewis
AID

Uli Locher
Department of Sociology
McGill University (Montreal)

Mr. Stephen Mayo
World Bank

Mark R. Montgomery
Department of Economics
University of Michigan

Professor Jeffrey B. Nugent
Department of Economics
University of Southern California

Kim Oaks
Graduate Group in Demography
University of California at Berkeley

Professor Anne R. Pebley
Office of Population Research
Princeton University

Scott Radloff
Population Studies and Training Center
Brown University

Professor Ronald Rindfuss
Department of Sociology
University of North Carolina

Dr. Andrei Rogers
International Institute for
Applied Systems Analysis (Laxenburg, Austria)

Rosemary Rothwell
East-West Population Institute
University of Hawaii

Prof. T. Paul Schultz
Economic Growth Center
Yale University

M.Y. Shahabuddin
Department of Economics
Pennsylvania State University

G. Sivalingham
Department of Rural Sociology
Cornell University

Dr. Peter C. Smith
East-West Center
University of Hawaii

Lee-Ying Soon
Philadelphia

Mr. Guy Standing
Employment and Development Department
International Labor Office (Geneva)

Ms. Judy Tom
East-West Center
University of Hawaii

Professor Amy Ong Tsui
Community and Family Study Center
University of Chicago

Professor Pan Yotopoulos
Food Research Institute
Stanford University