AIDS and Children

: Prospects for the year 2000

- Wathinee Boonchalaksi
- Philip Guest

Institute for Population and Social Research

Mahidol University, Thailand

IPSR Publication No.168 July, 1993

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IPSR Publication No.168
ISBN 974-587-615-1
July, 1993

Published with support from the William and
Flora Hewlett Foundation

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Reprinted, 1994
1,000 copies

Published by: Institute for Population and Social Research
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Preface

AIDS is only now beginning to have an impact upon mortality levels in Thailand. However, enough evidence has now accumulated for the potential impacts of the epidemic on adult mortality be relatively well charted. What is less well known are the effects of the epidemic on the lives of children. Many children will die as a result of contracting AIDS from their mothers. But the effects extend beyond the deaths of children from AIDS. Thousands of children will be orphaned as a result of their parents dying from AIDS. The social, economic and psychological costs involved have not even begun to be estimated as such research awaits some indication of the numbers that will be affected. The research presented in this publication attempts to provide an estimate of the extent of the problem that will be faced in Thailand during the current decade.

The results confirm the seriousness of the AIDS epidemic on the lives of children. Several policy options are suggested as ways of reducing the numbers of children who may be affected by the AIDS epidemic. These policies deserve full consideration so that the impacts are reduced to the full extent possible. The Institute for Population and Social Research is committed to continuing research into the effects of AIDS on children. This volume continues the Institute's tradition of pursuing research aimed at benefiting the Thai people.

Prof. Dr. Pradit Charoenthaitawee
President
Mahidol University

Foreword

The Institute for Population and Social Research (IPSR) has been at the forefront of AIDS research in Thailand. Several projects have been initiated with the aim of understanding the social and cultural context of high risk behaviour. The results from these projects are contributing to ongoing efforts by the Thai government, international organizations and non-governmental organizations to stem the spread of the AIDS epidemic.

The research reported upon in this publication differs from these other projects in that it focuses on estimating the potential impacts of the epidemic rather than trying to understand the behaviour that gives rise to the problem. Children are truly the victims of the AIDS epidemic. No change in behaviour on their part can reduce the likelihood that they will be infected by the HIV virus or that their parents die from AIDS. It is the behaviour of parents that must change if children are to be spared the consequences of the AIDS epidemic. Perhaps the potential enormity of the problem reported upon here may help change behaviour or increase attempts to establish programmes designed to change behaviour.

The main aim of the research described here is to provide a preliminary estimate of the potential impact of HIV/AIDS upon the lives of Thai children during the decade of the 1990s. Two outcomes are examined: (1) the extent to which AIDS affects levels of mortality among infants and children, and how this impacts upon the mortality reduction goals set forth by UNICEF, and (2) the number of children aged 12 years and under who are orphaned through AIDS.

Results of the projections indicate that the numbers of children affected by the AIDS epidemic will grow rapidly over the decade. The effects

on mortality rates will be substantial, undoing much of the progress made in reducing infant and child mortality that has been achieved over the last several years. By the end of the decade most people can be expected to have had some experience of the effects of AIDS on the lives of children, be it through the death of a child or through the death of a child's parents. Many people who do not have AIDS, or who have ever engaged in high risk behaviour, will be affected by AIDS through the need for them to care for AIDS orphans.

It is the hope of IPSR to continue to devote research effort and resources to understanding behaviour leading to AIDS and the social impact of AIDS. In the area of children we now hope to focus on the types of policies which need to be implemented to cushion the effects that will be faced in the coming years. Hopefully those effects will not be as severe as projected in the present publication.

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Acknowledgements

This project was funded by the United Nations Children's Fund (UNICEF). We would like to express our gratitude to UNICEF for their support of the project. Special thanks are due to the two members of the UNICEF staff, Dr. Nobert Engel and Dr. Somsak Boonyawiroj, who provided valuable comments during the writing of the report. Dr. Aphichat Chamratrithirong, the Director of the Institute for Population and Social Research, provided insightful comments during the course of the research and has continued his support of the project through to publication. Research assistance was professionally and cheerfully provided by Aree Uden whose contribution to the project exceeded those normally provided by a research assistant. Finally we would like to thank all those persons who took the time to discuss the research with us.

Wathinee Boonchalaksi
Philip Guest

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Executive Summary

The research results described in this paper provide estimates of the potential impact of HIV/AIDS upon the lives of Thai children during the decade of the 1990s. The results are obtained through standard cohort component methods of demographic projection. Several computer packages that allow for the projection of paediatric AIDS were investigated but were found not sufficiently flexible to deal with the rapid changes in the demographic profile of AIDS in Thailand. The projections for children undertaken in this research are based on published projections of new adult HIV infections. In addition, standard parameters for paediatric HIV transmission, transition from HIV to AIDS and from AIDS to death, are employed. While the tenuous nature of much of the data and behavioral assumptions used in the projections caution against confidence in specific numbers the overall trends of the projections are very clear. They can be summarized as follows:

1. If there is no change in sexual behavior related to HIV infection and fertility the number of child and infant deaths will increase from several hundred in 1990 to over twenty thousand in the year 2000.

2. The effects on mortality rates will be significant. In the absence of AIDS, infant mortality is projected to decline by almost 30 per cent over the decade. However, if the AIDS epidemic proceeds as projected there will be a reversal of the decline in infant and under 5 mortality sometime around the middle of the decade and an increase in rates thereafter. For infant mortality, rates in 2000 will be at 1991 levels, while under 5 mortality rates in the year 2000 will be higher than 1990 levels.

3. Changes in behavior can have large effects on the number of children dying from AIDS. If HIV infection of women ceased at the end of 1994 the number of children projected to die from AIDS from 1990 to the year 2000 would be less than half the number who would die if infection continued unabated. Lower levels of fertility for women infected by the HIV virus would also have an obvious reducing effect on the numbers of children who would die from AIDS.

4. By the year 2000 there will be approximately 86,000 children age 12 years and under and 30,000 children aged under 5 whose mothers have died from AIDS. At the death of their mother most children will be aged between 5 and 12.

5. The number of children exposed to the risk of being orphaned will grow rapidly over the decade of the 1990s. In the year 2000 there will be over 350,000 living children born to mothers who are infected with the HIV virus, compared to only 5000 in 1990. Most of these children will be aged less than 5.

6. By the year 2000 almost 7 per cent of children aged under 5 will be directly affected by the AIDS epidemic. A portion (0.6 per cent) will have already been orphaned through the death of their mother and an additional 6 per cent will be orphaned or themselves die as a result of AIDS sometime soon after the turn of the new century. This reflects an increase from less than one-tenth of one per cent of children under 5 similarly affected in 1990.

7. Rapid and fundamental changes in behavior (ie. a cessation of HIV infection at the end of 1994) would reduce the number of children age under 5 whose mother had died from AIDS by approximately 40 per cent. However,

even under this unlikely scenario the number of AIDS orphans would continue to increase throughout the decade and in the year 2000 would total over 53,000 children aged 12 years and under.

I. Introduction

Thailand is in the early stages of an AIDS epidemic. The number of AIDS cases diagnosed and the number of deaths attributed to AIDS are still low. This might help explain continued high risk behavior among segments of the Thai population. However, it now recognized that unless sexual behavior changes very rapidly the epidemic will have major impacts upon the mortality of the population by the end of the decade. The most noted and researched aspects of the future course of the epidemic are the effects of AIDS on the adult population (Viravaidya et al. 1991).

What is not often fully recognized is the implications that the spread of AIDS in the adult population will have for the children of Thailand. The most obvious effect will come in terms of higher levels of infant and child mortality of children who have contracted the HIV virus from their mothers. Weniger et al. (1991) argue that children will comprise one of the new high risk AIDS groups in Thailand because of the infection of women by their husbands and the subsequent infection of children during pregnancy. They report that in 1991 the proportion of pregnant women infected by their husbands exceeded the proportions who were infected through their activities as sex workers or through intravenous drug use.

Recently there have been efforts by health officials to raise public awareness to the potential extent of problem. A Ministry of Public Health official has been reported as stating that approximately 10,000 pregnant women are infected and in approximately one-third of cases this will result in their children also being infected (Bangkok Post, 6/1/1993). This is a much more realistic number than the official number of 142 children up to the end of January 1993 recorded as having been infected by their mothers.

A larger, but as yet largely unreported outcome, is the large numbers of children who will experience the effects of AIDS through the death or disability of their parents. A significant number of children can be expected to be living in families in which one or both of their parents are affected by the HIV virus and an increasing number will have one or both of their parents die before they (the child) are capable of independent living. A recent publication on the situation of children with respect to AIDS in several African countries reports that the numbers of children who had lost one or both parents to AIDS is already high and is rapidly rising (UNICEF, 1991). The numbers of AIDS orphans in America is currently estimated to be about 18,500 and is projected to increase to 80,000 by the end of the decade (see report of research in Bangkok Post, 24/12/1992).

The extent to which children will be affected by the AIDS epidemic will be determined by the spread of the disease among the adult population. Viravaidya et al. (1991) report projections which indicate that: 1) by the end of this decade there will be between two and four million Thais infected with the HIV virus, 2) more women than men will be infected and, 3) the majority of those infected will be at young adult ages (see a more detailed description of these projections in Sittitrai et al. 1991). If the projections accurately reflect the future course of the disease, and there are several reasons to believe that they may understate the impact of the epidemic, large numbers of children will be potentially affected. The concentration of the disease among women in the major reproductive ages is most worrying in terms of the transmission of the disease to their children, but also of concern are the large numbers of young children who will lose a parent.

The social and economic consequences of the impact of AIDS on children are wide ranging, both for the families of affected children and for communities. Thai families, compared to families in other Asian societies, have high levels of co-residence of children with their grandparents (Mason et

al. 1987), often as part of extended families (Richter et al. 1992). Increased mortality from AIDS will force a greater reliance on grandparents for childcare. Where childcare within families is not available the community may have to take on the role of providing for the upbringing of children.

The research described here provides projections of the numbers of children who may be affected by the AIDS epidemic up to the year 2000. The analysis examines both the direct and indirect effects of AIDS. It is hoped that these projections will bring the potential seriousness of the problem to the attention of policy makers and planners. The results also highlight the need for more direct behavioral research concentrated on the outcomes for children living in HIV and AIDS affected families.

II. Research Objectives

The research has the following objectives:

1) to project the numbers of children who will be infected with the HIV virus and who will die from AIDS,

2) to estimate the effects that these numbers will have on decline in infant and child mortality rates over the course of this decade,

3) to project the numbers of children aged 12 and below living in families where the mother has been infected by the HIV virus,

4) to project the numbers of living children aged 12 and under whose mother has died from AIDS.

III. Research Methods

Many of the basic parameters required for modelling and projecting the effects of AIDS on children are not known. While there has already been

substantial work undertaken on ways in which projections of the spread of AIDS can be undertaken (see United Nations, 1991; Chin and Lwanga,1991), most require detailed behavioral information. At a minimum the projection models that have been proposed typically require detailed data on the structure of the population, the composition of the population in terms of risk status, and the levels of infection at the initial period of infection. Assumptions concerning interaction between risk groups and the general population, the latency period for AIDS, and levels of high risk behavior may also be required.

Once the course of infection in adults is projected the analysis of the direct impact of AIDS on children is simplified to some extent because of the limited range of transmission routes. Barring a few situations where blood transfusions have been a major source of transmission, most children contract HIV from their mothers. Therefore, to project the numbers of children who will be infected by HIV the basic information required is the number of infected women who give birth during a specified time period. The main issue at this step of the projections is deciding upon expected levels of fertility of HIV infected women.

Projections of the numbers of children aged 12 and under who will be affected by HIV/AIDS through the infection or death of their mother is more difficult than estimating the numbers of children who will die from AIDS. The main complication arises from the duration dependence that must be incorporated into the projections. Duration dependence requires that the joint distribution of the stage of infection of the mother and her children be incorporated into the projections. Additional complications arise if the analysis also includes the probabilities of the father being infected and dying from HIV/AIDS. In the projections reported upon below orphans are defined as children whose mother has died of AIDS (see discussion in Appendix A regarding the probabilities of both parents dying from AIDS).

Details of the projection methods are provided in Appendix A. The estimates presented in this report are directly dependent upon the parameters selected for the model and the quality of the data. In both these areas there remains a great deal of uncertainty (for example, see debate between Muecke, 1990;1991 and Sittitrai and Brown, 1991). This is partly a result of a lack of basic behavioral research, but also reflects the rapidly changing nature of the AIDS epidemic in Thailand. While the absolute numbers provided in this paper should be treated with caution the trends provide clear evidence of the underlying processes operating.

IV. Results

In Table 1 the projected numbers of paediatric HIV infections and paediatric AIDS deaths are displayed. These estimates are based on the numbers of HIV infected women (also shown in Table 1). The number of women of reproductive age who have been infected by the HIV virus is expected to grow from around 25 thousand in 1990 to almost 1.5 million in the year 2000. By the year 2000 it is projected that over 100,000 of women infected will have contracted AIDS.

Women of reproductive age make up the vast majority of women who contract HIV and who will die from AIDS. This is simply a reflection of the main mode of transmission of HIV in Thailand (heterosexual sexual contact) and the probabilities of the persons primarily responsible for transmission (the husbands of infected women) becoming infected. The interaction of these two factors result in the majority of women in Thailand who are, and will become, HIV infected being in their late teens or early 20s (see projections by Sittitrai et al. 1991). Hence most women who become infected are entering those ages where fertility levels are highest. Also, as it can be expected that a majority of women will have no knowledge of their infection during the initial

Table 1

Projected Current and Cumulative Numbers of: Paediatric HIV Infections, Deaths Resulting from Paediatric AIDS, Percentage of Deaths Resulting from Paediatric AIDS, Women in Reproductive Ages with HIV and Contracting AIDS - Thailand, 1990-2000

Characteristic	Year										
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Paediatric HIV											
New	959	1753	3048	4656	7332	10567	14469	19409	25372	32504	40614
Cumulative	2057	3810	6859	11515	18847	29415	43894	63294	88666	121170	161784
Paediatric AIDS Deaths											
New	325	586	1045	1749	2805	43222	6320	8879	12109	16099	20902
Cumulative	642	1227	2272	4022	6827	11150	17471	26351	38460	54559	75461
Per Cent of Deaths resulting from AIDS											
Infants	0.43	0.79	1.49	2.53	3.97	5.94	8.41	11.46	15.33	19.78	25.23
Under 5	0.48	0.90	1.71	2.99	4.81	5.38	10.75	14.91	20.14	26.05	33.10
Women 15-49 HIV*											
New	10376	22927	39134	49412	86616	103157	134878	179841	222334	268787	319185
Cumulative	25059	47986	87120	136532	219148	322306	457184	637025	859359	1128125	1447330
Women 15-49 AIDS											
New	164	493	988	1742	3156	5438	8737	13468	19886	28170	38903
Cumulative	284	777	1725	3467	6624	12063	20800	34268	54155	82235	121299

* Source: HIV numbers for women inferred from projections reported by Sittitrai et al. (1991)

stages of infection, many will have completed their fertility by the time they are aware of their infection. In Thailand infection with the HIV virus is in most cases an indication of sexual activity and a consequent risk of childbearing. Because of the age distribution of infection many women will conceive, and for those that go on to have a child, a significant proportion will transmit the HIVvirus to their child.

Due to low levels of fertility in Thailand the potential impact of adult HIV infection on the numbers of children with HIV is to some extent reduced. Unpublished results from the 1990 census show that women aged 20-24 had an average of 0.52 children while women age 25-29 had an average of 1.18. However, even with the existing low fertility levels in Thailand the projected number of cases of paediatric HIV is projected to grow from 2,057 in 1990 to 161,784 in the year 2000. By the end of the decade it is projected that the annual number of new cases of paediatric HIV will exceed 40,000.

As expected, the estimated numbers of children with HIV and the numbers of these who have subsequently died from AIDS is much higher than that reported officially. While estimates from the model indicate over 2,000 deaths of children from AIDS in 1992 this number exceeds the numbers of AIDS deaths at all ages reported by the Ministry of Public Health. This indicates that the vast majority of deaths resulting from AIDS are attributed to other causes, but it also suggests that child AIDS deaths are especially likely to be attributed to other causes, perhaps a reflection of the relative rarity of the event at the present time. Another possibility, that can neither be discounted or confirmed, is that the recorded numbers are accurate and reflect very high abortion rates among pregnant women who have tested HIV positive. By the end of the decade, however, a child death resulting from AIDS will no longer be a rare event, and will in fact be the major contributing cause of child deaths, comprising 33 per cent of all deaths that occur under the age of 5 years and 25 per cent of deaths in the first year of

life. In 2000 over 20,000 children are projected to die from AIDS contracted from their mothers. By this time it is projected that 75,000 children will have died from paediatric AIDS.

These numbers translate into significant effects on mortality rates. At the World Summit for Children held in New York in 1990 twenty-seven goals for improving the health and well-being of children and their families by the year 2000 were established. Two of these goals directly relate to child and infant mortality. By the year 2000 the goal is to reduce levels of under five mortality and infant mortality by one-third (UNICEF, 1992). The projected mortality rates shown in Figures 1 and 2 indicate that in the absence of AIDS the Thai government would be well on the way to meeting these targets. Infant mortality is projected to decline by about 28 per cent from a rate of 40 in 1990 to 29 in 2000. Over the same period under 5 mortality is expected to decline from 54 to 38, a reduction of around 30 per cent. Further improvements in the extent of mortality reduction are within reach because of the rapid economic development of the early 1990s. It should be noted that the infant mortality rate is slightly higher than that estimated from other sources (see IPSR, 1993). Both the infant mortality rate and the under 5 mortality rate used in the current projections are much higher than those based on Ministry of Public Health registration data.

The spread of AIDS into the Thai population has now made it almost impossible for Thailand to achieve the goals set for a reduction in infant and child mortality. Instead, major efforts will be needed to maintain existing levels of mortality. If the AIDS epidemic continues as projected the infant mortality rate can be expected to reach a low of 36.9 in 1994. This rate is only marginally above the rate of 35.6 projected in the absence of AIDS. From this rate of 36.9 the level is projected to increase to reach 38.5 in 2000; a level of mortality that existed in 1991. The difference in the year 2000 between infant mortality rates projected in the absence of paediatric AIDS

Figure 1: Infant Mortality Rate in Presence and Absence of AIDS: Thailand 1990-2000

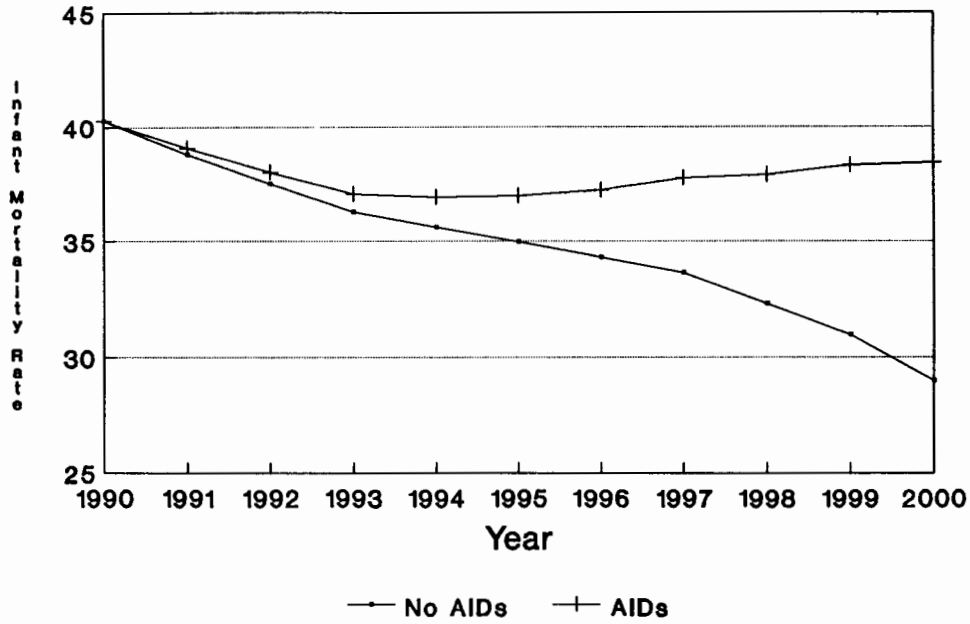
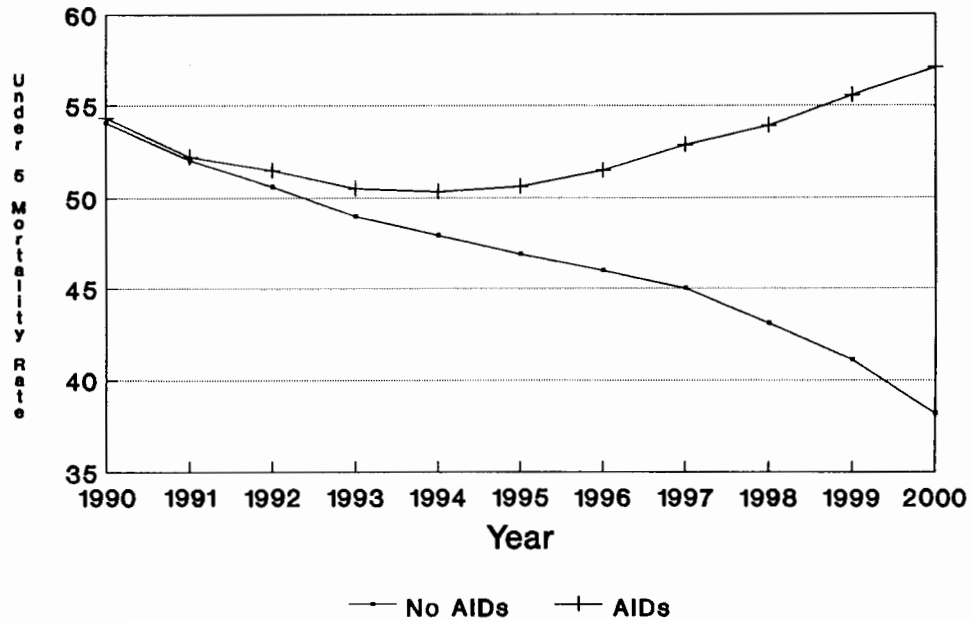


Figure 2: Under 5 Mortality Rate in Presence and Absence of AIDS: Thailand 1990-2000



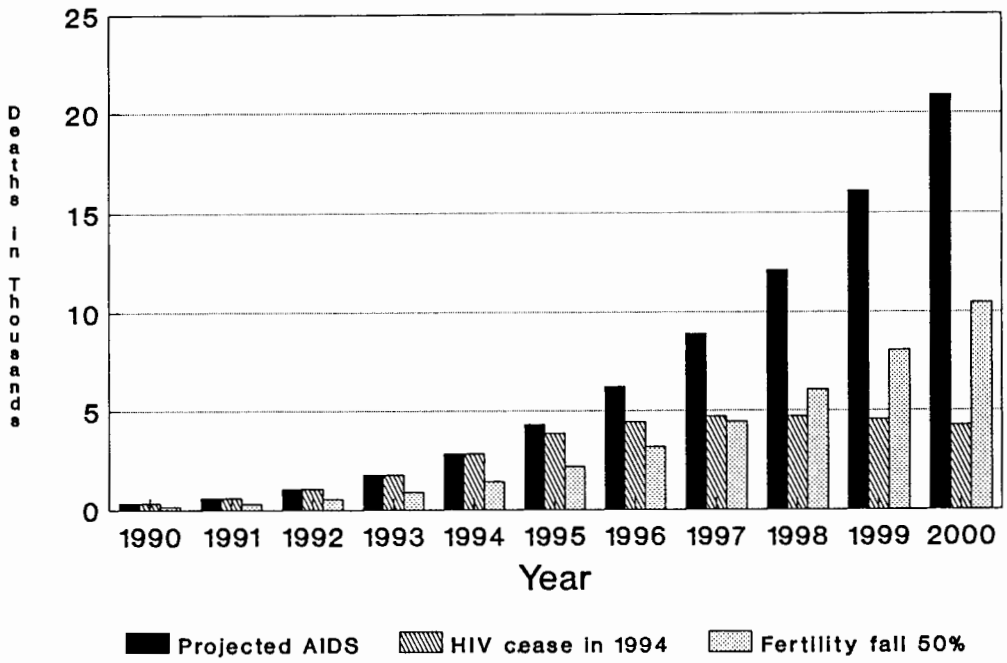
deaths and the presence of these deaths is about 10 infant deaths per 1000 births.

In a normal (ie. non-AIDS) situation most deaths that occur under the age of 5 are concentrated in the first year of life. If an infant survives to the age of 1 their chances of surviving to the age of 5 is high. Paediatric AIDS changes this situation. A large proportion of infants who are HIV positive will survive their first year of life but most of these will die before the age of 5. Hence the effect of paediatric AIDS on the under 5 mortality rate, is defined in accordance with UNICEF usage as the number of deaths of children under the age of 5 per 1000 births, is more pronounced than it is on the infant mortality rate. This can be clearly seen in Figure 2. In the absence of AIDS the under 5 mortality rate steadily declines over the decade of the 1990s. If the spread of AIDS continues as projected the under 5 mortality rate would drop to a low value of 50.3 in 1994 and subsequently climb to reach a value of 57.1 in 2000, a rate last observed in the late 1980s. The projected difference in the rates in the year 2000 is 19 deaths per 1000 births, or a 50 per cent increase on projected under 5 mortality in the absence of AIDS.

Apart from unforseen changes in the medical treatment and prevention of HIV and AIDS the only factors that can be expected to have a major impact on the trends reported above are: (1) a reduction in fertility of HIV infected women, or (2) a reduction in the level of HIV infection among women of reproductive ages. Both these scenarios would involve major behavioral changes. To demonstrate the possible effects of these changes two extreme variants of the changes are simulated (see Figure 3).

In the first simulation the fertility of women is reduced to a level half that of non-infected women. Such a change might occur where marriages of HIV infected women were disrupted early in their reproductive careers through the death of husbands who had AIDS. A reduction of this level

Figure 3: Annual Deaths from AIDS of Children aged 12 years or less: Thailand 1990-2000



might also be possible where the majority of infected women knew about their infections at an early stage and subsequently reduced their fertility, or where they found out about their infection during pregnancy and sought abortions.

The effects of the reduction in fertility are straightforward. A reduction in fertility of 50 per cent would lead to a reduction in pediatric AIDS deaths of 50 per cent. Instead of 20,000 deaths in 2000 there would be approximately 10,000. However, in reality the situation is probably more complicated. If, as has been suggested, the probability of pediatric transmission increases with the length of time the mother is infected, reduction in fertility at later stages of HIV infection would have a greater proportional effect on reducing the number of child deaths.

The second simulation involves an abrupt change in behavior: all HIV infection of women of reproductive age ceases in 1994. The effects of such a change on the number of child deaths are dramatic. In 1995 projected deaths are reduced from around 4,300 to 3,854, the largest number of deaths (4,700) occurs in 1998 and there are projected to be 4,270 deaths in 2000. This latter number should be compared to the approximately 21,000 projected deaths occurring in the absence of behavioral change. Compared to adults, children experience a rapid transition from HIV to AIDS and from AIDS to deaths. Any reductions in the levels of HIV infection among adults will bring corresponding reductions in child deaths within a relatively short period of time.

Apart from increasing numbers of paediatric AIDS cases the spread of HIV infection in the adult population effects children in other ways. The most important of these effects is death of one or both parents due to AIDS. In this study orphans are defined in terms of the death of the mother, although as discussed in other sections of the paper the death of the mother will normally follow that of the father because of adult transmission patterns in the Thai population.

In Table 2 projections of the numbers of AIDS orphans aged under 5 and 12 years and under are shown for each year from 1990 to 2000. The number of living children aged under 5 of mothers who died from AIDS is only 90 in 1990 but increases to almost 31,000 by the year 2000. The numbers aged 12 and under increase from 239 to 85,663 over the same period. In both instances increases are greatest after the middle of the decade as the number of AIDS deaths among women of reproductive age escalates.

Two features of the projections shown in Table 2 which may appear counter-intuitive need to be explained in more detail. Firstly, the cumulative number of paediatric AIDS deaths shown in Table 1 is only slightly below

Table 2

Projected Current and Cumulative Numbers of: Orphans Under the Age of 5, Orphans Aged 12 and Below, Living Children Ages Under 5 and 12 and Below Born to Women with HIV - Thailand, 1990-2000

Characteristic	Year										
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Orphans Under 5											
New	51	149	278	494	866	1448	2273	3539	5115	7071	9523
Cumulative	90	239	517	1010	1876	3324	5598	9137	14251	21321	30845
Orphans 12 Years and Under											
New	141	406	765	1361	2389	4008	6307	9778	14146	19648	26618
Cumulative	239	645	1410	2771	5159	9167	15474	25212	38298	59045	85663
Children Under 5 of HIV Mothers											
Total	4994	9009	15917	26166	42090	64450	93667	131015	178110	235155	303217
Children 12 and Under of HIV Mothers											
Total	5053	9223	16445	27295	44300	68402	100801	143620	198804	268512	354345

Source: Project projections

that of the number of orphans shown in Table 2 (all paediatric deaths in the projection occur before the age of 12). This is possible as most paediatric deaths occur before the death of the mother owing to a much shorter incubation period in adults compared to children. Also, children infected with the HIV virus are subject to the same non-AIDS mortality risks as are non-infected children. Where infant mortality rates are high a large proportion of HIV infected children will die from non-AIDS causes related causes. The numbers of projected orphans shown in Table 2 are those children who at the time of their mothers death from AIDS were still living.

Secondly, the number of orphans aged 5-12 is greater than the number aged under 5. Because of the young average age of women dying from AIDS it might be expected that their living children would be concentrated in the youngest age group. However, there are a number of factors balancing this age structure effect. Most children who die from AIDS or other causes die within the first five years of life, therefore those children that survive to the age of 5 have a high probability of survival to age 12. In addition, those children that are born to women before they are infected with the HIV virus have a much higher probability of survival than those children born after the mother is infected. The more recent the birth the higher the probability of HIV infection and hence the greater the likelihood of death before the death of the mother. The human outcome of these demographic forces is that the majority of the children who are orphaned will be aged between 5 and 12 when that event occurs and hence will face a great deal of emotional pressure, as well as pressure associated with looking after a dying mother.

In the bottom two panels of Table 2 are displayed indicators of the potential number of children who may be orphaned. These are children who are born to HIV mothers and, in the indicated year, are still alive. There are a number of factors that need to be kept in mind when interpreting these numbers. Firstly, a substantial number of the children, especially those born

towards the end of the decade, will die from paediatric AIDS before their mothers die from AIDS and hence will not be orphaned. Secondly, the numbers reported in the table only refer to children that women gave birth to after being infected with the HIV virus. In balance these two factors result in an overstatement of the actual numbers who will be orphaned, but that overstatement is no more than 30 per cent of the total.

The potential numbers who may be orphaned are very large by the end of the decade. In the year 2000 there are projected to be over 300,000 living children who were born to mothers infected by HIV. Most of these children are aged under 5 and the majority who survive to the age of 5 will be orphaned within a few years of their fifth birthday. The majority of the approximately 50,000 children aged 5-12 in 2000 whose HIV infected mothers were still living would be orphaned within the following two years.

In Figures 4 the numbers of orphans, expressed per 1000 children, is shown for age groups under 5 and for 12 years and under. For both age groups the trend of the orphan rate is similar. In 1990 approximately 0.015 per 1000 children in either age group is an orphan as a result of AIDS. By 1996 the rate increases to 1 and by 2000 exceeds 6. In Figure 5 the number of living children of HIV infected mothers, expressed per 1000 children of the relevant age groups, is shown. The potential proportion of children aged under 5 who might be orphaned through AIDS is about 0.8 per 1000 children in 1990, is projected to be 11.75 in 1995 and 59.1 in the year 2000. Therefore, it is projected that in the year 2000 approximately 0.6 per cent of children aged under five will have been orphaned as a result of AIDS while a further minimum of 6 per cent will be living in families in which their mother is currently HIV positive. There exists another group of families, not estimated here, in which a HIV infected mother remains alive while her infected child(ren) have already died. Thus by the end of the decade it can be expected that over 7 per cent of children aged 5 years and under will be in a

Figure 4: Living Children per 1000 aged

Under 5 and 12 Years or Less Orphaned by AIDS: 1990-2000

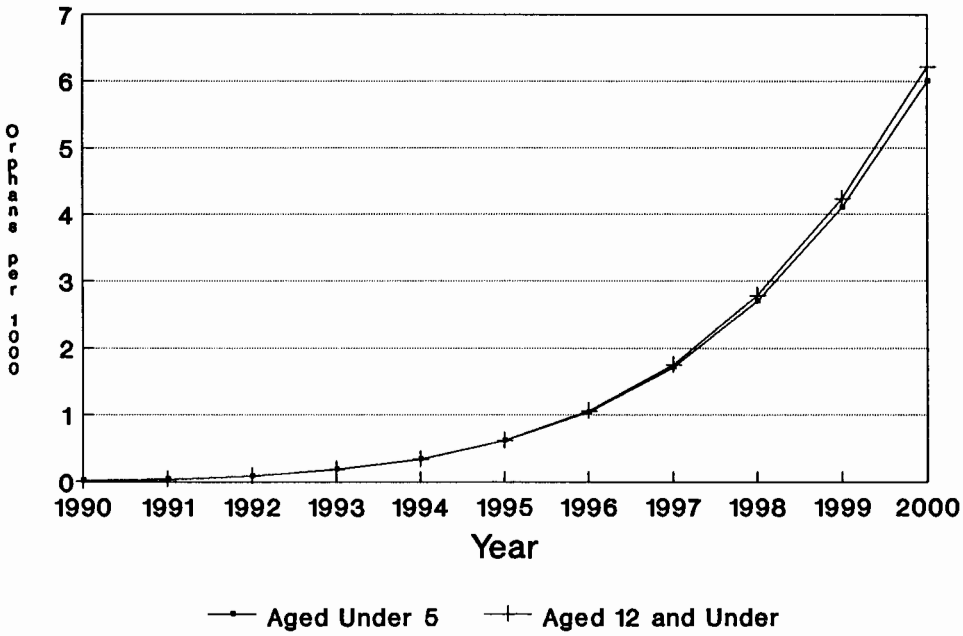
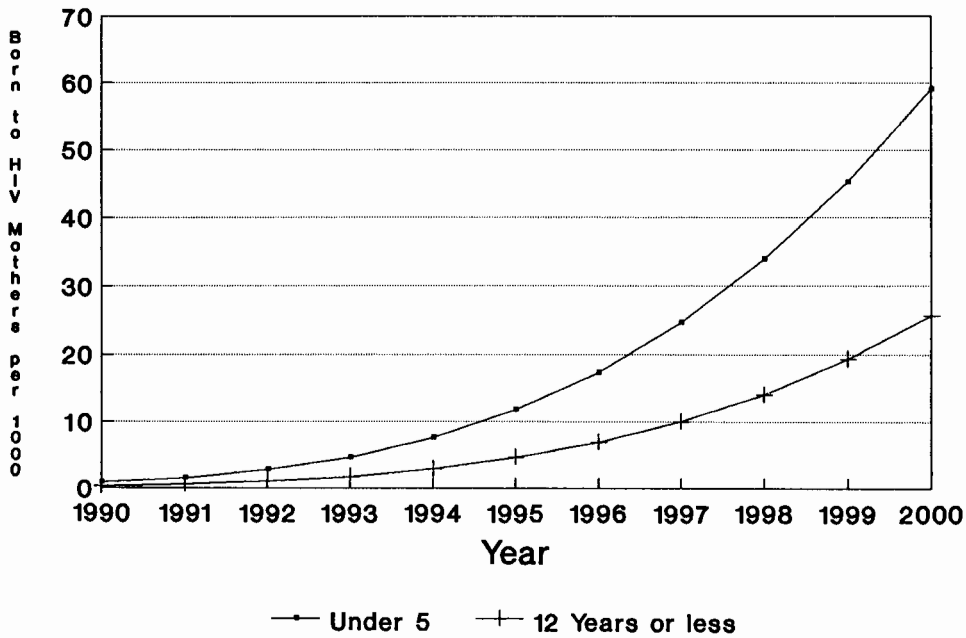


Figure 5: Living Children per 1000 aged

Under 5 and 12 Years or less, Born to Living Mothers with HIV: 1990-2000



family situation where their mother has already died or will die soon, although not always before her child dies.

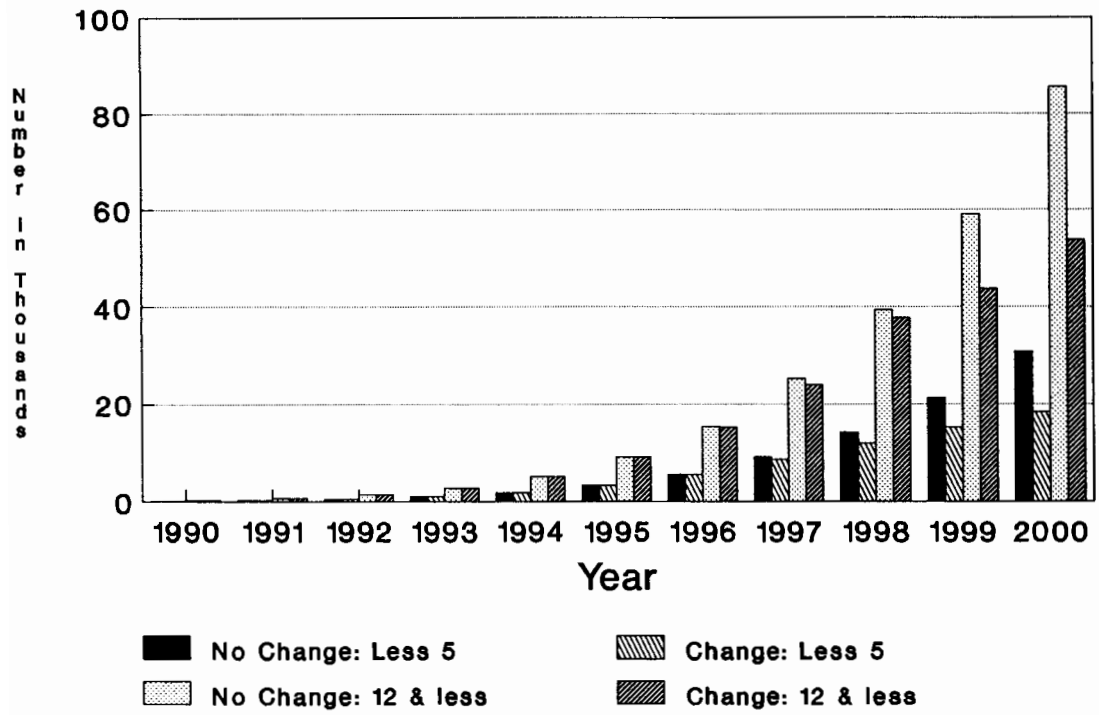
Simulations were carried out to assess the effect of behavioral change on reductions in the numbers of AIDS orphans. The results are displayed in Figure 6. As the effect of fertility reduction, if occurring at similar levels irrespective of the length of HIV infection of women, is a proportionate decrease in the number of orphans this scenario was not simulated. Instead the effect of a cessation of HIV infection in 1994 among women of reproductive age was examined.

As was the case for mortality the simulation demonstrates the rapid effects that changes in adult HIV infection patterns can have. The effects on orphans becomes noticeable within two years of the cessation of HIV infection among women. Under this scenario there is a projected number of AIDS orphans in 2000 of 18,377 compared to 30,845 if there was no change in projected levels of HIV infection. This constitutes a reduction in the number of orphans of around 40 per cent. The reduction for orphans age 12 and under is from 85,663 to 53,702. However, despite these reductions the numbers of AIDS orphans continues to increase over the latter half of the decade.

Although it is extremely unlikely that radical behavioral changes which would result in a cessation of HIV infection to women would occur by the end of 1994 the results of the simulation provide two important lessons: (1) reductions in HIV infection can have a rapid impact on the number of AIDS orphans, and (2) even if the reduction in HIV infection are dramatic, and soon, the numbers of AIDS orphans will remain large at the end of the decade.

Figure 6: Number of AIDS Orphans at Ages

Under 5 and 12 years or less: Thailand 1990-2000



Note:Change is based on the assumption of the cessation of HIV infection at the end of 1994

V. Conclusions and Policy Recommendations

The projected numbers of children who will die or be orphaned as a result of AIDS illustrates the enormity of the problem which is facing Thai families. The outcomes for the rest of the decade are not yet completely determined, although whatever happens in terms of infection levels will not affect the thousands who have already been infected by the HIV virus or whose mothers are infected.

HIV infection is behaviorally and biologically selective. In Thailand the behavioral selectivity operates on children via high rates of infection of women in the peak reproductive ages. Biological selectivity effects on children operate through the transmission of the HIV virus from mothers to children. Current levels of medical knowledge do not allow children to escape the biological selectivity of the HIV/AIDS epidemic, therefore action to reduce the numbers of children who will die or be orphaned requires behavioral change among adults.

Two possible sources of change have been identified in this report. The first, reductions in levels of HIV infection among women is among the major policy directions being pursued by government agencies, NGO's and international agencies. Attempts are being made to reduce the levels of high risk behavior of husbands and also to provide women with the ability to protect themselves from infection. Any success from these policies will reduce the number of child deaths from AIDS and reduce the number of orphans.

The second area of behavioral change that would affect the numbers of child AIDS deaths and numbers of AIDS orphans is a reduction in fertility levels of HIV infected women. This area is receiving much less policy attention but has the potential to dramatically reduce the numbers of children who are directly and indirectly affected by AIDS. The policy options in this area need to confront a number of ethical questions. If it is assumed that women, irrespective of the HIV infection status, have the right to make her own fertility choices, programs need to be designed which provide information on HIV infection status and the possible health outcomes of any birth to HIV infected women.

Although there has been only limited research on the subject, it is probable that many women who knew that they were HIV positive would

change their fertility behavior, especially if they were informed about the effects of maternal infection on children. If this was the case, any program which provided women of reproductive age convenient and affordable access to HIV screening, and subsequent counselling, should be supported. The earlier and more frequent the testing the greater the possibilities that women can make informed fertility choices. The testing of pregnant women which currently occurs should continue and counselling of those women who test positive should be mandatory. Further counselling of the mother and family members after the birth, if the woman chooses to give birth, should be carried out. The type of information provided will depend to some extent on the HIV status of the child.

The results of the projections indicate that medical facilities will be placed under a great deal of pressure because of increased numbers of children dying from AIDS. This trend is occurring at the same time that the aging of the population will require hospitals to increase the resources directed towards providing services for the aged (see Knodel et al. 1992). The pressure at both ends of the age structure will require major investments in medical facilities and personnel by the end of the decade.

Apart from the medical costs falling on families and society there will need to be major changes in childcare arrangements. A report on the situation of AIDS orphans in several African societies describes the extent of the alternative arrangements for the care of AIDS orphans that needs to be made. In many cases the primary care givers are single, and all too often they are elderly and having trouble coping for themselves (UNICEF, 1991). The problems are likely to be exacerbated where partners who die from AIDS have been a major source of economic support for their parents. Not only will many grandparents be forced to care for their orphaned grandchildren, they may be forced to do so under severe economic constraints. Policies designed

to help ease the burden on alternative care givers will help ensure that AIDS orphans are provided with opportunities to improve their lives.

Because of the numbers that will potentially be involved, and the different levels of concentration of the effects of the epidemic among communities, there will inevitably be a large number of AIDS orphans who will not be able to be cared for by relatives. For these children alternative arrangements will need to be made. Studies are now required to examine the different options available for caring for these children. These options range from institutional care to different forms of fostering.

There are several studies and sources of data which provide some indication of the geographical areas and the population groups that will be most affected by the spread of AIDS, and hence which will require special attention in programs that are intended to combat the effects of AIDS on children. Yoddumnern-Attig (1993), based on an exhaustive literature review, identifies four major risk groups: the urban poor, rural poor, southern muslims and hill-tribes. For some of these groups there is surveillance data to indicate high levels of infection, for other groups their risk status is inferred from evidence of high risk behavior. For the purposes of this study the most notable aspect of the designation of these groups as high risk is that they are also the groups who have the highest levels of fertility. The result is that the effects of AIDS on children will be disproportionatley fall within these groups. What is also of concern is that women in some of these groups, for example Southern Muslims (see review in Yoddumnern-Attig, 1993), are less likely than other women to seek ante-natal care and hence the possibilities of providing HIV screening and appropriate counselling are reduced. It is evident that special efforts at changing behavior and reducing fertility of these high risk groups must be made.

The study demonstrates that most children will lose their mothers sometime between the ages of 5 to 12. They will be living in a family situation in which there is a great deal of emotional and physical stress. This situation has been described in several African societies (UNICEF, 1991) and it appears that it inevitable that it will be repeated in Thailand. A priority would appear to be programs designed to provide support for children placed in this situation. A related problem that stems from HIV transmission patterns in Thai society is that most of the children who will eventually be orphaned because of the death of their mother will have already suffered the loss of their father. In other instances the father will die but the mother will remain uninfected. Together, these two situations will result in a considerable increase in the number of female headed households. The economic and social pressures placed on these households can be expected to be intensified because of the lack of community acceptance of individuals and families who are affected by AIDS. Special efforts will need to made to reduce the burdens placed on women heading these households.

Demographic projection is by it's nature inexact. It is made more inexact in the projection of AIDS outcomes when basic input data is not available and tenuous assumptions need to be made. There are a number of fundamental unanswered questions, such as: What proportion of HIV infected women terminate their pregnancies? Are there differences in fertility behavior before and after knowledge of HIV infection? What is the average length of time that HIV infected women spend in sexual unions? Research is urgently required to answer these questions.

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Appendix A
Projection Techniques

The projections described in this paper are based on a number of assumptions. These assumptions fall into several areas: demographic behavior, initial distribution of HIV cases, transitions from HIV to AIDS and AIDS to deaths, paediatric transmission of HIV, transitions from paediatric HIV to AIDS and from AIDS to death. In addition there are several assumptions, particularly important in predicting the number of orphans, which cross-cut these areas. The validity of the results depends on the accuracy of the assumptions. Given the paucity of data on many of the relationships and the fast changing nature of the HIV epidemic the results of the projections must be treated with caution. Central assumptions of the projections are provided below.

1. Demographic Parameters

i). The base population used in the projections is obtained from the preliminary count of the 1990 census (NSO, 1992). Because of under-enumeration of young children the base population used in calculating the Under 5 mortality rate was obtained from the projections carried out by the National Economic and Social Development Board (NESDB, 1991). For all population data the numbers were transformed from the published five-year age categories to one-year categories.

ii). NESDB projections also provided the basis for the fertility and mortality schedules employed in the analysis (NESDB, 1991). The fertility levels chosen were based on the medium fertility projections, which predict a fertility decline from a Total Fertility Rate of 3.3 in 1980-85 to 2.03 in 1995-2000. The Coale-Demeney North series of model life tables were used to

obtain survival rates which were consistent with the levels of life expectancy reported in the NESDB projections. These assume an increase in life expectancy for males from 62.6 for 1980-85 to 67.35 in 1995-2000. The respective figures for females are 68.05 and 71.80.

2. Initial Distribution of HIV infection

The extent to which the HIV virus has entered into the Thai population is unknown. Estimates vary widely and are normally based on extrapolation from blood testing of high risk groups, whose share of the total population can only be guessed at (Muecke, 1990; Brinkmann, 1991; Sittitrai et al. 1991; Viravaidya et al. 1991; Viravaidya, 1991; Weniger et al. 1991). The only certainty is that the numbers infected are much greater than the number reported from blood testing. Adult HIV infections at the start of the projection period, and the distribution of this number by age and sex, are the most important components of the projections. The numbers infected by HIV as reported by Sittitrai et al. (1991) are used for the initial estimate of HIV infection. The proportion of this number who are female (21 per cent) and the inferred age distribution is also taken from Sittitrai et al. (1991).

3. Change in Levels of Adult Infection

The future course of the HIV infection is dependent on changes in risk behavior. Several simple epidemiological models for estimating the numbers who will die from AIDS have been constructed but these models are useful only in the short-run (see Chin and Lwanga,1991; The Futures Group,1991). Medium-term projections require making a series of behavioral assumptions. This task was beyond the scope of the present project, therefore the number of new adult HIV infections for each year up to 2000 was inferred from the projections carried out by the Thai Working Group on HIV/AIDS projection (Sittitrai et al. 1991). Unfortunately the detailed projections from this source

were not made available and therefore we had to infer the number of new HIV infections from a graph based on the projections. This was combined with the projected change in the percentage of total infections who are female from 21 per cent in 1990 to 52 per cent in 2000 and an inferred age distribution of females infected, to provide the basic information required to project the fertility of women infected by the HIV virus. Epimodel was used to back-project the year at which those women infected in 1990 first became infected.

4. Adult Transitions

The set of transition rates for HIV to AIDS that is widely used in models (for example in Demproj and Epimodel) were also used in these projections. These rates are based on research reported upon by Medley et al. (1987). The median time from infection to AIDS based on this distribution is about 9 years. The mean time used from transition from AIDS to death is 1.5 years. In the projections normal risks of mortality are applied throughout the period of HIV infection and AIDS.

5. Paediatric Transmission and Transitions

There is a great deal of uncertainty about the extent to which pediatric transmission of HIV occurs and the mechanisms of transmission. While most babies of HIV infected mothers test positive for HIV infection this, in a large proportion of cases, is due to the presence of the mother's antibodies in the blood of their infants. Most estimates of paediatric transmission are between 30-40 percent. In the present study a transmission rate of 38 per cent was adopted (the same as used in the Demproj projection package). It should be noted that the paediatric projection component of the Epimodel package varies the transmission rate by length of time that the mother has been infected.

The transition rates from paediatric HIV to AIDS are those reported by Medley et al. (1987). These rates are much more rapid than those for adults. Once an infant has AIDS a 95 per cent probability of death occurring within the following year was used. The importance of competing risks of mortality cannot be underestimated at these ages. Where infant and child mortality rates are high a significant proportion of children who are infected by HIV will die from causes unrelated to AIDS. In this analysis competing causes of death were provided for by the somewhat artificial procedure of exposing children aged less than 1 who contract HIV to other causes of mortality for 90 percent of the time (based on the assumption that most deaths occur within the first month of life) and 50 percent of the time at older ages.

6. Fertility of Women Infected by HIV

There is an almost total lack of information on the reproductive behavior of women infected by HIV (United Nations, 1991). For the main portion of this study it was decided to maintain the fertility rates of the general population for those women who were HIV positive. The rationale for this choice was that in Thailand the majority of infected women do not know that they are infected. If they had knowledge of their infection this might result in a reduction of their fertility.

Because of our use of fertility rates based on the general population we are also implicitly assuming that the sexual exposure, which in the Thai situation depends mainly to marital status, of HIV infected women is the same as women in the general population. However, in Thailand this assumption is likely to be violated to some extent as the main form transmission of HIV to women is through their spouses. As the incubation period for men is also thought to be shorter than for women it can be expected that a large proportion of infected women will have lost their spouse before they contract AIDS. Thus to some unknown extent this results in an over-estimated the fertility of

HIV infected women. We have probably adjusted for this to some extent by setting the fertility of women to 0 as soon as they pass from HIV to AIDS.

Factors that operates to increase the probability of fertility of HIV women vis-a-vis women in the non-infected population, is that in the Thai situation nearly all women who have become HIV infected are by definition sexually active, and hence at risk of pregnancy. As fertility rates are based on the marital structure (and hence presumed sexual activity) of the general population this would tend to underestimate the fertility of HIV women. While this factor is not mentioned in the literature is would probably go some way towards making up for any underestimation of fertility due to marital disruption. Also, as was noted in the conclusion, fertility levels for women at high risk of contracting AIDS are probably much higher than for those women at a lower risk of being infected by the HIV virus.

One very important factor -- abortion -- has not been addressed in this study. Currently, pregnant women who seek antenatal services at hospitals receive a HIV test. Even though abortion is illegal in Thailand, it is widely practiced. An unknown proportion of the pregnant women who test HIV positive might decide to undergo an abortion rather than bearing a child. If this occurs the number of projected births will be over-estimated. The extent of over-estimation will depend on the numbers of women who abort. Informal discussions with medical experts who are knowledgeable about the AIDS situation in Thailand confirmed that many pregnant women who test positive to HIV do undergo abortions.

The situation with respect to informing women of the results of their HIV tests and the subsequent options for abortion are unclear. While some persons have reported that women are not told if they test HIV-positive we have been informed by others that women are told and that their options with respect to abortion vary considerably depending upon the philosophy of the

hospital administration involved. It seems that in some hospitals abortions are encouraged for women who test HIV positive, in other hospitals (particularly those run by some religious groups), women are discouraged from having abortions, while in some hospitals the counselling is non-directive. We were told by a doctor involved in a program that has non-directive counselling that probably around 50 per cent of women testing HIV positive seek abortions. Those least likely to have an abortion are women who have no children.

7. Orphans

Orphans are defined in this project as children whose mother has died from AIDS. Because of a lack of any strong evidence upon which to base assumptions about the joint probabilities of survival of spouses no attempt has been made to take into account the effects of male deaths on orphan levels. As discussed in the pervious section, however, because of the combination of a predominance of transmission from a male spouse to his partner, and because of the longer incubation period of HIV to AIDS for women, in the great majority of cases in which the mother has died it can be assumed that the father is already dead, and hence the child is a double orphan. In addition there would be a significant, but unestimated, number of children whose mother was alive but whose father was dead.

To carry out the projections of the numbers of AIDS orphans the fertility of women who died from AIDS is first projected back to age 15. The next step is to adjust the estimated numbers of children for mortality (both normal risks and risks of AIDS mortality), through application of appropriate survival rates. As it was not possible to link mothers with children the mortality risks associated with AIDS were reduced as a child aged. This also helped take into account the differential probability of infection by length of HIV infection of the mother.

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