Projections of HIV infections and AIDS cases to the year 2000*

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After the recognition of AIDS (acquired immunodeficiency syndrome) in the early 1980s, uncertainty about the present and future dimensions of HIV (human immunodeficiency virus) infection led to the development of many models to estimate current and future numbers of HIV infections and AIDS cases. The Global Programme on AIDS (GPA) of the World Health Organization (WHO) has developed an AIDS projection model which relies on available HIV seroprevalence data and on the annual rate of progression from HIV infection to AIDS for use in areas where reporting of AIDS cases is incomplete, and where scant data are available to quantify biological and human behavioural variables.

Virtually all models, including the WHO model, have projected large increases in the number of AIDS cases by the early 1990s. Such short-term projections are considered relatively reliable since most of the new AIDS cases will develop in persons already infected with HIV. Longer-term prediction (10 years or longer) is less reliable because HIV prevalence and future trends are determined by many variables, most of which are still not well understood. WHO has now applied the Delphi method to project HIV prevalence from the year 1988 to mid-2000. This method attempts to improve the quality of the judgements and estimates for relatively uncertain issues by the systematic use of knowledgeable "experts". The mean value of the Delphi projections for HIV prevalence in the year 2000 is between 3 and 4 times the 1988 base estimate of 5.1 million; these projections have been used to obtain annual estimates of adult AIDS cases up to the year 2000. Coordinated HIV/AIDS prevention and control programmes are considered by the Delphi participants to be potentially capable of preventing almost half of the new HIV infections that would otherwise occur between 1988 and the year 2000. However, more than half of the approximately 5 million AIDS cases which are projected for the next decade will occur despite the most rigorous and effective HIV/AIDS prevention efforts since these AIDS cases will develop in persons whose HIV infection was acquired prior to 1989.

The Delphi projections of HIV infection and AIDS cases derived from the WHO projection model need to be periodically reviewed and modified as additional data become available. These projections should be viewed as the first of many attempts to develop estimates for planning strategies to combat the HIV/AIDS pandemic in the 1990s.

Introduction

Accurate data on the occurrence of human immunodeficiency virus (HIV) infection and AIDS (acquired...
by several groups using statistical extrapolation from
the observed temporal curve of reported AIDS cases
(1, 2). These models assume that after adjustment for
inherent reporting delays (and in some models,
the additional delays for incomplete reporting), past
trends of reported cases will continue in a similar
pattern over the next few years. Such extrapolation
models are relatively simple and are not based on
any biological or epidemiological data. Thus, they
are limited and can be used only for short-term pro-
jections in areas where case reporting is relatively
reliable and complete.

The other type is the more complex process or
deterministic model. Such models attempt to incor-
porate the biological and behavioural variables
which describe HIV transmission and natural history
in order to simulate the infection and disease
process. If such models were valid and the data sets
used in them were accurate, they would be able to
forecast future trends of both HIV infection and
AIDS cases, and in addition be of great utility in
evaluating the effectiveness of different HIV control
or prevention measures. However, the major
problem with these more complex models is that
they require detailed data or reliable estimates of the
many potential determinants of HIV transmission
and natural history which currently are generally not
available.

This article presents the work of the Global
Programme on AIDS (GPA) of the World Health
Organization (WHO) to provide short-term projec-
tions of AIDS cases with an AIDS projection model
as well as projections of HIV infections to the year

Methods

WHO projection model for AIDS cases

In many areas, reporting of AIDS cases is either
markedly incomplete or has been started only since
1986–87. In addition, detailed data to quantify HIV
transmission variables are frequently scant or absent.
In such situations, neither the extrapolation nor
deterministic projection models described above can
be used. For these areas WHO has developed an
AIDS projection model which relies on available
HIV serological survey data and on annual progress-
sion rates from HIV infection to AIDS (3). The basic
data or estimates needed to operate this model are:

(a) The number of persons newly infected with
HIV, by year of infection. Such estimates may be
based on available HIV serosurvey data and epidemi-
ological observations about when HIV infection
first began to spread extensively in any given popu-
lation.

(b) The proportion and rate at which HIV-
infected persons are expected to develop AIDS.
Initial speculation suggested that the progression
rate from infection to AIDS might differ depending
on route of transmission and possibly racial group.
However, the most recent data suggest that,
although some minor variations may occur, the pro-
gression rate to AIDS after HIV infection (for the
purpose of this article only HIV-1 infections are
included) does not differ much from area to area or
by route of transmission (4). The one clear exception
to this is the progression rate for paediatric AIDS
which is much more rapid than for adults. In the
WHO model, the following progression rates based
on large cohort studies are used for adult case pro-
jections: 20% within 5 years; and 50% within 10
years. No data are available beyond 10 years, but for
modelling purposes it has been assumed that pro-
gression to AIDS will continue to be about 75%
within 15 years and 95% within 20 years.

Details of the WHO projection model, es-
specially for paediatric AIDS cases, have been published
(3, 5).

Delphi projection of HIV infection to the year 2000

The Delphi method was developed in an attempt to
improve the quality of the judgements needed in
relatively uncertain situations as well as to provide a
means of quantifying such judgements (6, 7). The
method requires that a group of experts be identified
and asked to respond to a standard questionnaire.
The responses are analysed, and the analysis is then
distributed to all participants. In search of a con-
sensus, participants are asked to complete a repeat
questionnaire after being informed of the results of
the first survey.

To obtain the projections given here, 14 persons
with extensive experience and knowledge of the epi-
demiology of HIV/AIDS were selected. The majority
were from developed countries, but over half of the
participants had worked extensively in or were from
developing countries. No Delphi participant was
aware of the identity of the other participants and
thus could not be influenced by their specific
responses. The two-stage Delphi was conducted from
mid-December 1988 to mid-April 1989.

A questionnaire together with mid-1988 base-
line estimates and assumptions about the four global
epidemiological patterns of HIV/AIDS, as of mid-
1988, was first pretested internally, and then sent to
the Delphi survey participants (Table 1). Table 2
outlines other basic assumptions which were pro-
vided to participants for making their HIV projec-
tions up to mid-2000. Participants were asked to
provide a projection of cumulative HIV infections
for each global epidemiological HIV/AIDS pattern
(Fig. 1), and were also asked to estimate the relative
Table 1: Delphi projection of the HIV/AIDS pandemic: estimated or assumed situation as of mid-1988

<table>
<thead>
<tr>
<th>Epidemiological pattern</th>
<th>Estimated situation, mid-1988</th>
<th>Assumed HIV prevalences, mid-1988 (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Patterns I and II</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Australia/New Zealand, Canada/USA, most of western Europe, and most of Latin America)</td>
<td>HIV prevalence, 2.5 million</td>
<td>Homosexuals and bisexual males* 1.88</td>
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<tr>
<td></td>
<td>Cumulative adult AIDS cases, 150,000</td>
<td>Intravenous drug users (IVDU)* 0.83</td>
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<td></td>
<td></td>
<td>Blood/blood products transfusion* 0.04</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other, including mother-to-infant transmission* 0.03</td>
</tr>
<tr>
<td><strong>Pattern II</strong></td>
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</tr>
<tr>
<td>(sub-Saharan Africa, and parts of the Caribbean basin)</td>
<td>HIV prevalence, 2.5 million</td>
<td>Heterosexual transmission* 2.00</td>
</tr>
<tr>
<td></td>
<td>Cumulative adult AIDS cases, 150,000</td>
<td>Mother-to-infant transmission* 0.27</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Blood/blood products transfusion* 0.15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inadequately sterilized skin-piercing instruments (health sector and outside) 0.04</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other, including IVDU, homosexual and bisexual males. 0.04</td>
</tr>
<tr>
<td><strong>Pattern III</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(eastern Europe, the Far East, the Near and Middle East, North Africa, south-east Asia, and most of the Pacific basin)</td>
<td>HIV prevalence, 100,000</td>
<td>Homosexual and bisexual males 0.03</td>
</tr>
<tr>
<td></td>
<td>Cumulative adult AIDS cases, &lt;1000</td>
<td>Intravenous drug users 0.03</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Heterosexual transmission 0.022</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Blood/blood products transfusion 0.015</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other, including mother-to-infant transmission and inadequately sterilized skin-piercing instruments (health sector and outside) 0.003</td>
</tr>
</tbody>
</table>

distribution of HIV infection for different HIV-risk behaviours or transmission categories within each epidemiological pattern up to mid-2000.

**Results**

**Short-term projection of AIDS cases using the WHO projection model**

Fig. 2 shows the results of the WHO projection model for the USA compared with reported AIDS cases data for the USA and the Centers for Disease Control (CDC) statistical extrapolation of AIDS cases. Even in the USA, a country believed to have one of the better surveillance systems for AIDS, the reported AIDS cases represent at most 80–90% of the actual AIDS cases that have occurred (9, 10). In addition, delays in reporting AIDS cases in the USA have been increasing in recent years (11). The WHO projections for the USA were based on an estimate of one million HIV-infected Americans up to 1988 and on the assumption that HIV infection began to spread extensively about 1980. Fig. 2 shows that the WHO's annual AIDS projections are about 20% to 25% per year higher than the reported cases—except for 1988 for which the reporting, as of mid-April 1989, was still relatively incomplete. For 1988 to 1991 the CDC projection is almost identical to the WHO projection.

Epidemiological observations and available HIV seroprevalence data from other areas were also used in this model to formulate estimates of total AIDS cases up through 1988, and cumulative case totals at the end of 1991. The results are presented for each continent and major area in the world in Table 3. Over one million AIDS cases are projected worldwide by the end of 1991, and for Africa and the Americas a threefold increase in cumulative cases during this period. Asia may expect a tenfold increase in AIDS cases by the end of 1991 because the AIDS epidemic in most Asian countries is still at a very early stage when the doubling time for AIDS...
Four global epidemiological patterns of HIV infection and AIDS are apparent worldwide as of 1998. Pattern I is found in North America, western Europe, Australia and New Zealand (about 90% of the cases are homosexual males or users of intravenous drugs). Pattern II is found in sub-Saharan Africa, and parts of the Caribbean, the primary mode of transmission in these regions is heterosexual and the number of infected females and males is approximately equal. Latin America appears to be evolving from pattern I to pattern II epidemiology and is currently classified as pattern II. Pattern III has so far had few cases, and is typical of eastern Europe, North Africa, the Middle and Near East, Asia and the Pacific (excluding Australia and New Zealand).
Fig 2. Comparison of reported and projected annual AIDS cases in the USA, 1980–92.

In the USA, where reporting of AIDS cases is regarded as relatively timely and complete, the WHO projection model is consistent with the reported AIDS cases until 1988. The model is also consistent with projections made by the Centres for Disease Control (CDC) in the USA using a different modelling approach.

Table 3: WHO/GPA estimates and projections of cumulative HIV/AIDS

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Africa</td>
<td>2.5 million</td>
<td>200,000</td>
<td>575,000</td>
</tr>
<tr>
<td>Americas</td>
<td>2.0 million</td>
<td>150,000</td>
<td>425,000</td>
</tr>
<tr>
<td>Asia</td>
<td>0.05 million</td>
<td>500</td>
<td>3000</td>
</tr>
<tr>
<td>Europe</td>
<td>0.5 million</td>
<td>25,000</td>
<td>100,000</td>
</tr>
<tr>
<td>Oceania</td>
<td>0.03 million</td>
<td>1500</td>
<td>6000</td>
</tr>
<tr>
<td>Total</td>
<td>&gt;5 million</td>
<td>377,000</td>
<td>1,111,000</td>
</tr>
</tbody>
</table>

As mentioned earlier, modelling adult rather than paediatric AIDS requires the use of different estimates of progression from infection to AIDS. Fig. 3 presents the annual number of paediatric and adult AIDS cases which the WHO model projects for sub-Saharan Africa through 1991. This model estimates that up to 1986 the cumulative number of paediatric AIDS cases in Africa exceeded that for adult AIDS cases but that from 1985 onward, the number of adult AIDS cases has been increasing at a greater rate than paediatric cases. A total of over 200,000 new AIDS cases (paediatric and adult) is projected for Africa during the year 1991 alone.

Delphi projections of HIV infection to the year 2000

Delphi participants were asked to make HIV prevalence projections for mid-year 2000 for areas which exhibit each of the four global HIV/AIDS epidemiological patterns. These projections were made in the context of two scenarios (Table 2). For brevity, scenario 1 will be referred to as “no coordination” and scenario 2 as “with coordination”.

Table 4 presents the Delphi results for the world and for each global epidemiological pattern. Results are given as the mean ± 1 standard deviation. When a range of values was given by a Delphi participant, the mean of that range was used as the response. Missing values were excluded, as were extremely high and low responses (outliers). Transmission and risk-group percentages used for mid-2000 projections by Delphi participants were adjusted to total 100%. These percentages and the projected HIV prevalence by epidemiological pattern formed the basis for calculations of the estimated transmission/risk-group-
specific HIV prevalence in mid-2000. Projected HIV infection as a result of mother-to-fetus/infant transmission was subtracted from the total projected HIV prevalence in order to obtain estimates of adult infection.

\[\text{Table 4: Delphi-projected HIV prevalence by global epidemiological pattern} \]

<table>
<thead>
<tr>
<th>Estimated, mid-1988 (millions)</th>
<th>Projected mid-2000 (mean ± 1 SD)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Scenario 1</td>
</tr>
<tr>
<td>Global</td>
<td></td>
</tr>
<tr>
<td>5.1</td>
<td>18.3 ± 7.4</td>
</tr>
<tr>
<td>(11.0–32.4)*</td>
<td>(3.8–26.1)</td>
</tr>
<tr>
<td>Pattern I and I/II</td>
<td>2.5</td>
</tr>
<tr>
<td>(4.6–10.0)</td>
<td>(1.8–7.0)</td>
</tr>
<tr>
<td>Pattern II</td>
<td>2.5</td>
</tr>
<tr>
<td>(4.3–22.7)</td>
<td>(1.2–19.1)</td>
</tr>
<tr>
<td>Pattern III</td>
<td>0.1</td>
</tr>
<tr>
<td>(0.3–3.2)</td>
<td>(0.1–2.4)</td>
</tr>
</tbody>
</table>

*Figures in parentheses give the range of responses (in millions).

From the estimated mid-1988 global HIV prevalence of about 5.1 million, Delphi participants projected that there would be a 3- to 4-fold increase to a projected mean prevalence of 18.3 million by mid-year 2000. Comparison of the projected mean HIV prevalence in mid-2000 to the estimated mid-1988 HIV prevalence indicates that those areas currently classified as epidemiological pattern II can anticipate the largest absolute increase of HIV infection (8 million). The largest relative increase in HIV prevalence (13-fold) is expected in areas currently classified as pattern III.

Fig. 4 presents cumulative HIV infection estimates among adults in mid-2000 for the world and for each of the epidemiological patterns. Each bar is divided into three parts. The base represents the cumulative HIV infections in mid-1988; the middle segment represents the increase in HIV infection expected from mid-1988 to mid-2000 even if there is a coordinated prevention and control effort (not preventable); and the top segment represents those additional HIV infections which Delphi participants believe might occur in the absence of a major coordinated global and regional coordinated effort.
Fig. 4. Delphi projections of HIV prevalence in adults in the year 2000.*

MILLIONS

GLOBAL    PATTERN I&II    PATTERN II    PATTERN III

HIV pre-1988  Not preventable  Preventable

* Despite a coordinated effort to prevent and control HIV/AIDS, a substantially increased number of HIV-infected persons will have occurred worldwide by mid-2000. This anticipated increase in HIV-infected persons could be reduced to the level of the top of the hatched portion of each bar, if a coordinated effort to prevent and control HIV/AIDS is implemented (see text: scenario 2—with coordination). Such a reduction is thought to be more likely in patterns I and I/II areas rather than pattern II areas.

(prevetable). Delphi participants estimated that about 6 million HIV infections worldwide might be prevented with such a coordinated effort. The Delphi projections suggest that prevention efforts are more likely to be effective in pattern I and I/II areas when compared with pattern II areas.

Delphi participants felt that efforts to prevent and control sexually transmitted HIV infections could potentially reduce such transmission by more than 50% in pattern I and I/II areas, but only by about 30% in pattern II areas. It was also apparent that prevention of HIV infection transmitted through intravenous drug use was considered a much more difficult goal to accomplish, and that a reduction of only about 20% was expected.

**Projecting adult AIDS cases to the year 2000**

Adult AIDS case projections for each year up through the year 2000 was made by using the WHO model and the Delphi projections of HIV prevalence. This was done initially with HIV prevalence estimates for scenario 1 (no coordination). An increase of about 12 million adult infections from mid-1988 to mid-2000 was predicted. These infections were distributed backwards linearly from 2000 to 1988 to derive estimates of the expected annual HIV-infected cohorts. The WHO model was then used to calculate the number of adult AIDS cases which might be expected annually through the year 2000. The results are shown in Fig. 5. This figure shows clearly that according to the Delphi participants, the second decade of the HIV/AIDS pandemic, during the 1990s, will be much worse than the first full decade—the 1980s. Fewer than one million cumulative adult AIDS cases are expected up to 1990; in contrast, during the 1990s, over 5 million adult AIDS cases are projected. In addition, Fig. 5 also shows that the ratio of cumulative HIV infection to AIDS cases during the early 1980s was very high (from thousands to hundreds to one), whereas by the mid to late 1990s, this ratio is expected to fall substantially to less than ten to one.
The cumulative number of adult AIDS cases projected by the year 2000 under scenario 1 (no coordination) is about 6 million cases, and under scenario 2 (with coordination), about 5 million cases. However, the projected total by the year 2000 under either scenario includes AIDS cases which will develop in persons who were infected prior to mid-1988 as well as those infected after mid-1988. The number of AIDS cases that might be prevented in future years by a continued prevention and control effort coordinated globally and regionally is best appreciated if the projected AIDS resulting from persons infected prior to mid-1988 are clearly separated from those projected to arise from those individuals infected after mid-1988. The results of such calculations are shown in Fig. 6. Over 3 million adult AIDS cases (the lower portion of the bars in Fig. 6) are expected to develop (mostly during the 1990s) from among the 5 million persons infected prior to mid-1988. Under scenario 1, approximately 3 million additional cumulative AIDS cases are projected to occur in the 1990s in those persons infected after mid-1988 (the upper two segments of the bars in Fig. 6). However, with a coordinated effort (scenario 2) about 1.2 million of these cases could be prevented. Thus, according to the Delphi projections, a coordinated global and regional prevention and control effort with special emphasis at the country level might be capable of reducing adult AIDS cases that result from HIV infections acquired after mid-1988 from just under 3 million to about 1.8 million—a difference of about 40%.

The potential impact of global prevention and control efforts on the number of annual AIDS cases can be seen in Fig. 7. A marked increase is noted from 1985 when about 15,000 cases were estimated to about 850,000 adult AIDS cases projected for the year 2000 alone. As with the cumulative AIDS cases shown in Fig. 6, the annual totals in Fig. 7 are divided into three parts; those AIDS cases expected to develop in persons infected prior to mid-1988 are shown in the lowest part. The middle and top portions include AIDS cases expected to develop in persons infected after mid-1988; the top part represents those AIDS cases which may be preventable through a coordinated global and regional prevention and control effort. Fig. 7 demonstrates that the potential impact of global prevention efforts undertaken in the late 1980s will not be apparent until close to the mid-1990s. Even with a concerted global
Fig. 6. Cumulative adult AIDS cases by Delphi projection of HIV prevalence, 1980–2000. *

 Millions

[Graph showing cumulative adult AIDS cases by Delphi projection of HIV prevalence, 1980–2000.]

* About three million cumulative adult AIDS cases are expected to arise by mid-2000 from the pool of approximately five million individuals infected with HIV as of mid-1988. The figure illustrates that a further three million cumulative adult AIDS cases could be the additional global AIDS burden in the absence of coordinated prevention and control efforts (scenario 1). This additional three million adult cases could potentially be reduced by as much as 40% to about 1.8 million with a globally and regionally coordinated prevention and control effort (scenario 2) in the 12 years from mid-1988 to mid-2000.

Effort, Delphi participants expected less than half of the projected future AIDS cases up to the year 2000 to be preventable.

Discussion

The first decade of the HIV/AIDS pandemic is coming to a close. The world is still in the early stages of a pandemic whose ultimate dimensions remain difficult to predict. Nevertheless, enough is known about the epidemiology and natural history of HIV infection to make reasonable short-term predictions. It can be estimated with some confidence that the number of AIDS cases which have occurred up to now throughout the world will increase by at least fivefold over the next 5 years.

Virtually all statistical extrapolation models applied to pattern I countries have projected several-fold increases in AIDS cases by the early 1990s. Where the reporting of AIDS cases is relatively reliable and complete, these models are considered fairly reliable for a period of about 2 to 3 years. The WHO model should also be relatively reliable over the short term, provided that estimates of HIV seroprevalence are reasonably accurate. The WHO model’s short-term projections of AIDS cases are virtually independent of future trends in HIV incidence. The vast majority (>90%) of AIDS cases expected over the next 4–5 years would occur even if all HIV transmission had ceased after 1989. This is so because the estimated median interval between infection and the development of AIDS is very long (about 10 years). Thus, the majority of new AIDS cases which become manifest over the next 4–5 years will be derived from the pool of persons who were infected with HIV before 1989. The WHO model projections of large increases in AIDS cases over the next 5 years are similar to most of the projections obtained by statistical extrapolation models.

For long-term forecasting, projections of future trends and prevalence of HIV infection are needed, but such projections are much more difficult to make. Projection of HIV infection trends has been
attempted with complex bio-behavioural models. However, these models require extensive and detailed data or reliable estimates for numerous variables about HIV transmission dynamics which are still poorly understood. Therefore, great confidence cannot be placed on such models for long-term projections at the present time.

In the face of such uncertainty regarding the future course of AIDS and HIV infection, the Delphi method was chosen to obtain estimates of HIV prevalence up to the year 2000. The Delphi method uses subjective estimates made by knowledgeable persons to assist in making policy decisions. This method was originally systematized in the 1960s for use in developing management policies; it was first applied to the health field in the 1970s. Advantages of the Delphi method are speed and low cost. It must be stressed that Delphi estimates represent the opinions and estimates of selected “individuals”. It is worth noting that the results of the initial internal pre-testing of the Delphi questionnaire were very similar to those obtained from the Delphi survey participants.

WHO has estimated that from 5 to 10 million persons worldwide were infected with HIV as of 1988, but has consistently used the lower estimate of 5 million for projection purposes. The Delphi participants were asked to assume that the global prevalence of HIV in mid-1988 was about 5.1 million and asked to project HIV infection to mid-2000 on this basis. Thus, projections based on the Delphi responses may be conservative.

The Delphi projections of HIV infection made possible use of the WHO model to project AIDS cases annually up through the year 2000. According to the WHO projections the ratio of cumulative HIV infections to cumulative AIDS cases will steadily decrease with time. The ratio falls from thousands or many hundreds to one in the first few years of extensive HIV spread in a population to less than ten to one after the first decade. It is important to understand that the ratio of HIV infection to AIDS cases
changes considerably over time, especially if such ratios are used to derive HIV prevalence from the reported prevalence of AIDS. During the early stages of the HIV/AIDS epidemic in sub-Saharan African countries, the WHO model indicated that paediatric AIDS cases were more numerous than adult AIDS cases. This finding is related to the observation that progression from HIV infection to AIDS is much more rapid in infants than adults. However, because of the much larger number of adult infections, adult AIDS cases will gradually surpass AIDS in childhood as the epidemic continues.

Perhaps more noteworthy is the suggestion from these projections that during the next decade, HIV/AIDS prevention and control programmes are potentially capable of preventing close to half of the new HIV infections which may occur (i.e., instead of an increase of 12 million HIV infections during the 1990s the increase may be limited to 6 million). Analysis also indicates that more than half of the approximate 5 million AIDS cases expected during the 1990s will occur despite effective HIV/AIDS prevention efforts since these cases will develop among persons infected prior to 1989. It is important to appreciate that in consequence, even if HIV/AIDS prevention and control programmes are adequately supported and coordinated, very large increases of AIDS cases will occur in the 1990s. For the year 1988, a global total of over 90,000 adult AIDS cases was estimated. In contrast, the annual AIDS case totals in the years 1995 and 2000, even with a co-ordinated global prevention and control effort, are projected to be about 450,000 and over 600,000, respectively. Health and social service systems throughout the world need to strengthen their capabilities to respond to this very large projected increase in AIDS cases.

The Delphi projections of HIV infection by mid-2000 should be considered speculative, since there remain major uncertainties and incomplete information about variables such as (a) the precise proportion of HIV-infected persons who will ultimately develop AIDS, (b) the efficacy of national HIV/AIDS prevention and control efforts in eliminating or modifying HIV risk behaviours, and (c) the numbers of persons who engage in high-risk behaviour for HIV infections. The Delphi projections should be considered the first of many attempts to develop planning estimates for the HIV/AIDS pandemic over the next decade. All of the WHO estimates and projections on HIV/AIDS presented in this article need to be periodically reviewed and revised as additional data suggest that changes are warranted.

References