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A study of the potential economic effects of AIDS

Some preliminary thoughts

By Per Granberg

BIDPA Working Paper No. 2

March 1996

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Abstract

Given the current high rate of HIV / AIDS infection in Botswana, there seems a need to analyse its economic impact. It is suggested that BIDPA may take an initiative towards this end. The paper presents some preliminary and tentative ideas about such a project.

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Some Preliminary Thoughts

1. Introduction

1. In a recent newspaper report, the Minister of Health, Mr Chapson Butale, was quoted as saying that Botswana had some 180,000 HIV-infected persons in 1995, and that projections indicate that at current rate of infection the number of HIV infected persons will be about 330,000 by the year 2000, with more than 60,000 having developed AIDS.

2. It seems evident that if such a large portion of the total population is suffering from HIV/ AIDS, serious repercussions will be felt throughout the Botswana society at large, as well as in the economy in particular, and that these will begin to surface in the near future. If so, it would seem that one is well advised to start analysing the situation as an urgent priority.

3. BIDPA's general mandate includes the task of analysing and monitoring the nation's future economic prospects. It is therefore suggested that BIDPA may take an initiative towards the formulation of a project aimed at analysing the potential effects of HIV/AIDS. It is emphasised, however, that the intention is *not* to suggest that BIDPA undertakes an "all-purpose" HIV/AIDS study, confronting the problem in all its various ramifications. BIDPA has neither the resources, expertise or mandate for such an undertaking. Rather, it is proposed that the present project, at least initially, should be strictly limited to deal with the potential economic effects of HIV/AIDS

4. This paper attempts to present some thoughts related to such a project. It should be understood, however, that the ideas presented are of a highly tentative and preliminary nature, and focused largely upon those aspects of the problem that the present BIDPA staff feels most familiar with. These ideas are presented to the BIDPA board, not as a concrete or complete project proposal, but merely in order to introduce the subject for its initial consideration. It is intended that a concrete and comprehensive project proposal may be drawn up at a later stage, *if* the board gives BIDPA the go-ahead for so doing.

2. Tentative project outline

a. Population dynamics

5. The fundamental cause of all HIV/AIDS related problems is its effects upon the population's general level of health and mortality. Any attempt to analyse the economic effects of HIV/AIDS ought therefore to take as its point of departure the specific nature of the underlying population dynamics in the years ahead.

6. Firm and comprehensive information on these dynamics may not at present be readily available; such data and forecasts as do exist typically being of a fairly incomplete and tentative nature. In order to achieve our aim of analysing questions relating to the economic effects of HIV/AIDS in a more comprehensive way, we must therefore *first* attempt to build a simple population model capable of illustrating the effects upon the future size and composition of the population, under a variety of possible assumptions.

7. Such a model should address questions such as:

- What will the total size of the population be in future years?
- How many people will suffer from various stages of HIV/AIDS in any given year?
- How many of these will fall ill, terminally ill or die prematurely within the year?
- How will these factors be distributed with respect to age, sex, educational status etc.?

8. In order to achieve this aim, questions such as the following will first have to be addressed:

- What is the number of people already infected, what is the present rate of new infections and what are the associated mortality rates?
- What is the breakdown of these totals with respect to age, sex, educational/professional background and similar?
- What are the likely future developments of these variables?

The answers to these questions are not as yet fully known; all we can hope for are "presently best guestimates" and similar. This being the case, we should also try to obtain feasible maximum and minimum estimates for these variables, defining their "area of possible variation".

9. We do not as yet have much information or knowledge about these issues at BIDPA, but expect that the Ministry of Health and other relevant organisations may be able to supply us with what information they do have, as well as to guide our efforts in the right direction.

10. Even so, it is acknowledged that whatever information we may obtain will tend to be of a tentative nature only. This, of course, is not unique to the HIV/AIDS questions; most attempts at forecasting the future will by definition have to be based upon some tentative guestimates about that same future. However, even allowing for such a perspective, the *degree* of uncertainty associated with the presently available HIV/AIDS information is unusually high.

11. The degree of uncertainty associated with any analysis of the HIV/AIDS problem consequently promises to be considerable. This may seem to militate against the rational for making such an analysis. However, the very nature of the above information provided by the Minister of Health, however tentative, should in itself be disturbing enough to warrant some efforts at analysing these matters in further detail, not in the expectations that we may come out with firm forecasts, but with a view to learn about the possible extent of such effects, the economy's sensitivity towards alternative HIV/AIDS scenarios etc.

b. Simulation model

12. In order to provide a comprehensive illustration of these various aspects of the HIV/AIDS problem, the project must be prepared to analyse a considerable number of potential scenarios. For instance, the basic population dynamics being a matter of conjecture rather than fact, we must be prepared to run a considerable number of alternative population scenarios. This will be necessary in order to cover what is currently considered the "area of possibility", but also in order to take account of new or revised information that may become available during project execution.

13. In order to achieve this aim in a cost effective manner it is intended that a simple simulation model be constructed. This will represent a central "tool" for the present project, as well as an independent output in its own right, available for subsequent efforts of a similar nature.

14. The model should contain:

- Firstly: the simple population-block already mentioned above, containing the type of population variables indicated, and their relationship to one another. These will represent the fundamental setting for any scenario investigated, and serve as a core input in the economy- block of the model.
- Secondly: an economy-block, aim at drawing out the potential implications for the economy at large. This block should cover all relevant economic variables, and specify their structural relationships to the population variables, as well as their relationships to each other. The adopted model structures should consequently be able to address questions such as:
 - ♦ What are the potential implications for the total labour force?
 - ♦ What are the potential implications for employment and unemployment?
 - ♦ What are the potential implications for manpower planning in respect of professional and skilled labour?
 - ♦ What are the potential implications for production and investments?
 - ♦ What are the potential implications for savings and capital finance issues?
 - ♦ What are the potential implications for the households' incomes, expenditures and general economic status?
 - ♦ What are the potential effects upon demand for government services, especially health services, and their implications in respect of capital and recurrent costs?
 - ♦ What are the potential implications for the total Government Budget (total revenues, expenditures and cash balances)?
 - ♦ What are the potential implications for the Balance of Payments and the foreign reserves?

The question of *how* these issues may be addressed is further discussed in Annex I.

c. Regional aspect

15. Botswana is not alone in having an HIV/AIDS problem; also other countries in the region are effected, some of them perhaps even more so. Therefore, if HIV/AIDS is found to have serious implications for the Botswana economy, we may safely assume that such implications may effect also other countries in the region. Consequently, if we accept the hypothesis that Botswana's future economic prospects will depend upon the economic development in the region as a whole, a new line of pertinent questions arise, such as:

- How will HIV/AIDS effect the economic outlook of the region as a whole?
- How will this effect Botswana's economic growth prospects?
- How will this effect Botswana's prospects for foreign investments?

16. Thus, a further dimension may be added to the picture: The effects of HIV/AIDS may not only be those *directly* created within the nation itself. In a wider perspective one should also take into account the *indirect* effects that may result if the regional economic outlook changes. Such indirect effects may result, of course, even if the direct effects are small or manageable within Botswana, but large and unmanageable in other countries.

17. If HIV/AIDS related data are scarce for Botswana, they are probably no better for other countries in the region. Thus, it may be some time yet before we can analyse these aspects with any confidence. But, again, we may be able to present some "representative guestimates", allowing us to analyse various scenarios with a view to illustrate potential indirect effects upon Botswana.

d. Organisation of work

18. It is acknowledged that BIDPA will not have available among its present staff all the manpower resources or specific expertise that may be required for the current project. BIDPA may therefore have to adopt an organisational model similar to that adopted for the ongoing poverty study. If so, BIDPA will be the principal "contractor" for the study, but parts of it will be "sub-contracted" to other persons or institutions, hired by BIDPA to supplement its own staff and expertise.

19. But other organisational models may also be possible and acceptable. Thus, although BIDPA may seek to take an initiative in this area, it does not follow that it want to *monopolise* the exercise by insisting on BIDPA's sole responsibility for its execution or similar. Neither does it follow that BIDPA's initiative is necessarily the only initiative under way in the area of HIV/AIDS related analysis.

20. This being the case, BIDPA may seek to identify co-operating partners in this venture, with a view to broaden the project, or to share in the presently proposed analysis. Such partners may for instance be:

- MoH, which may have a particular interest in the potential implications for the health sector.
- MFDP, which may have a particular interest in the potential implications for the overall government budget, man-power planning, and the economy as a whole.

- BoB, which may have a particular interest in the potential implications for Balance of Payment related issues, and the economy as a whole.
- UoB (Economics), which may see this as an important topic for research.
- BNPC, which may have a particular interest in the potential effects upon productivity issues.
- BOCCIM, which may have a general interest in the potential effects upon private sector industries.
- Other institutions and groups, for instance the "private sector initiative" made up of a group of private sector firms jointly trying to address the issue of "AIDS in the workplace".

BIDPA may consider serving as the secretariat for such a co-operating partnership.

3. Proposal

21. It is proposed that BIDPA initiates moves towards the establishment of a project aimed at analysing the potential economic effects of HIV/AIDS in Botswana. The project focus may be largely as illustrated in the present paper, but broadened, revised and refined as appropriate, following further deliberations upon the matter.

22. For this purpose, BIDPA will hire a consultant, with a relevant background, for a period of approx. 3 months. The consultant will:

- make a detailed assessment of the issues and options involved in such a project;
- assess the possibilities and options for financing the project;
- investigate the extent and nature of related activities under way or planned by other institutions;
- recommend on possible or potential co-operation partners for the project;
- based on above: prepare a concrete project proposal.

23. The said project proposal will:

- in the first instance: serve as a basis for final decision by the BIDPA board;
- in the second instance: serve as a basis for seeking project funding and co-operating partners (provided the board decides to go ahead).
- in the third instance: serve as a plan of action for project activities (provided funding can be secured).

Annex : Outline of a Simple Simulation Model

a. Background

24. In order to analyse the various aspects of the HIV/AIDS problem in a comprehensive manner, the proposed project should be capable of handling a considerable number of potential scenarios. In order to achieve this aim in a cost effective manner, it is intended that a simple simulation model be constructed. The model should contain:

- Firstly: the simple population-block already discussed in the main text of this paper. This block will represent the fundamental setting for any scenario investigated, and serve as a core input in the economy-block of the model.
- Secondly: an economy-block, aim at drawing out the potential implications for the economy at large. This block should cover all relevant economic variables, and specify their structural relationships to the population variables, as well as their relationships to each other. The adopted model structures should consequently be able to cover the whole economy; i.e. they should essentially amount to a simple macro-economic model in their own right. The distinction between private and public (government) activities, as well as between various major production sectors etc., will however for many purposes be important. Feasible disaggregation should therefore be introduced. As concerns the disaggregation of production sectors in particular, it is suggested that a distinction between typical "leaders" and "followers" (defined as in MEMBOT) may be adopted.

b. Economy block variables

25. The economy-block of the model should "aim at drawing out the potential implications for the economy". An illustration of what this may typically imply in terms of economic variables and relationships is given below. Note that the illustration is neither complete nor final; it is expected that additional variables and revised relationships may be introduced during project formulation and execution.

i. Labour force

26. The total size of the working age population, and its various strata in terms of age, skill category, HIV/AIDS-infection status etc., may be calculated directly from the annual population estimates. Introducing assumptions about the rate of labour participation for the various strata, it is then a simple matter to estimate the total labour force. Deductions should however be made for persons prevented from seeking "gainful employment" by their obligation to care for AIDS patients (ref.: home care).

ii. Production

27. MEMBOT-type assumption for the growth of various production sectors may be introduced initially, reflecting the distinction between "leaders" (with exogenously given growth rates) and "followers" (with endogenously calculated growth rates). These may however only serve as "first approximations". Having subsequently calculated various other supply and demand estimates (see below), one may return to the production estimates and revise them with a view to balance supply against demand. A new set of production estimates will be the result, leading to a new set of derived demand estimates etc. The process is repeated until all relevant markets balance.

iii. Investments

28. The volume of investments required by various sectors is a function of their production growth, and their incremental capital output ratios. The latter must be introduced exogenously, and should reflect our assumptions about the type of production techniques adopted by various industries (labour or capital intensive).

29. Above estimates represent investment *requirements*. But investments also have to be *financed*; above estimates should consequently be supplemented with capital finance estimates. The latter will essentially reflect estimated total domestic savings (by private sector firms, households, government etc.). Any shortfall in domestic savings will have to be covered by foreign loans and investments, the availability of which may be the subject of separate analysis and scenarios.

iv. Employment and unemployment

30. The growth of employment (in reality: *demand* for labour inputs) in various broad skill categories may be calculated as a function of the growth of production, as adjusted by the growth of labour productivity. The latter should reflect the composition of the labour force in terms of its average health status. Unemployment may then be calculated as a residual (labour force minus demand for labour inputs). Note that the labour market should not be automatically balanced by the model, except in so far as demand may not exceed supply in any skill-group. The latter restriction could easily translate into a constraint upon the growth prospects of the economy, if (as is often maintained) HIV/AIDS hits especially hard amongst the educated "elite".

v. Household incomes & expenditures

31. Household incomes may be estimated as a function of labour costs, i.e. essentially of employment, with the addition of operating surplus from some production activities.

32. *Regular* household consumption expenditures may then be estimated as a function of these incomes (although the increase in population may also be important, especially if income per capita decreases).

33. *In addition*, the household sector will have specific HIV/AIDS related expenditures, covering the costs of treatment (drugs and care) for such patients. The total amount of such costs will largely depend on the number of people suffering from HIV/AIDS, and their family's total ability to pay for drugs and care over and above what they may receive free of charge from the public health system. The costs in question may be covered by reducing the family's current savings and/or its regular consumption expenditures, but also by drawing down its bank deposits etc., selling its assets, or even borrowing. They therefore have the potential for reducing overall national savings on the macro level, and reducing many households to a level of destitution on the micro level.

vi. Imports & exports

34. Imports may be estimated as a function of total demand for various types of products (intermediate products, private consumption products and capital formation products), as adjusted (over time) by marginal import propensities. Exports may be estimated in a similar fashion, based on the production estimates of various industries. Initially, marginal import and export propensities may have to be introduced exogenously, but if the analysis is broadened to include the regional market it may be possible to link them to this analysis.

vii. Government Budget

35. Revenue promises to be fairly easy to estimate. Thus:

- Taxes may be calculated fairly directly from above estimates of production and incomes, given certain assumptions about future tax-rates.
- Duties may be calculated from estimates of imports, given certain assumption about the future level of duty-rates and Customs Union arrangements.
- Bank of Botswana profits may be obtained from the Balance of Payments.
- Other incomes may be projected to grow with total GDP or similar.

36. Expenditures will require a more disaggregated treatment. Total expenditures should be broken down into various expenditure categories, reflecting the fact that the demands for various kinds of government services will reflect the HIV/AIDS problem in very different ways. Thus, demands upon the health sector will be very sensitive to the development of HIV/AIDS, and much more so than other government activities.

37. An analysis of the expenditure implications for the health sector may be made along the following lines:

- The future investment requirements of the health sector may be estimated from the total number of persons suffering from various stages of HIV/AIDS, given certain assumptions about governments policy in respect of health care for these patients.
- The investments will in the next instance give rise to recurrent cost implications in respect of operating and maintaining the new institutions.
- In addition to above recurrent costs, the health sector may have specific costs related to the treatment and care of "out-patients" (drugs, "home-nurses" etc.).
- Above recurrent costs are all seen from a financial point of view. But a significant part of them will represent the costs of hospital staff etc. The manpower aspect is an important dimension in its own right, and should be addressed as such.

38. The health sector promises to be more heavily affected by HIV/AIDS than any other government activity. But it is not alone; also other activities, such as education, will be effected. These may be analysed along roughly similar lines to those illustrated above.

39. *Actual* expenditures will of course not only depend upon the type of *demands* illustrated above; it will also depend upon government's ability to respond to these demands. Hence, total government expenditure may well become a function of government revenues and cash-balances, rather than of demands and needs for public services. If this becomes a binding constraint, we may see significant indirect repercussions in all parts of the budget, as government for instance reduces other activities in order to finance a "minimum" of health care for the HIV/AIDS sufferers.

viii. Balance of Payments

40. Government's response to the HIV/AIDS pandemic may, as already indicated above, depend crucially on its revenues. The interests earned on the foreign reserves has traditionally been one of the more important sources of revenue. For this reason alone, it will be desirable to include the Balance of Payments in the current analysis. Furthermore, the estimates of foreign capital inflow requirements made earlier (as part of the analysis of capital finance) ought to be "tied in" with other relevant estimates.

41. It should however be acknowledged that the projection of Balance of Payments variables promises to be an undertaking of a somewhat "heroic" nature, its overall end-results depending upon a number of variables not readily available from the variables estimated above. A number of central Balance of Payment variables are nevertheless readily available, for instance imports and exports, and they should be utilised to introduce a simplified Balance of Payment section into the current analysis.

c. *Alternative model specifications*

42. Above description illustrates elements of a fairly standard macro-economic model, in many ways resembling the parallel elements of MEMBOT. It may be noted that this represents but one of several technically possible ways of specifying the relationships between various variables. This is not, of course, to imply that all technical options are equally feasible from the point of view of economic theory; quite the contrary is true. But some of the technical alternatives are indeed feasible, although not necessarily more so than the option adopted above. For some purposes it might be useful to have the possibility of adopting some such alternative specifications. Provided that we have managed to keep the model fairly simple and transparent in "other respects", it may be possible to build such flexibility into it. Thus, it may for instance be possible to allow for alternative ways of "closing" (balancing) the model, i.e. allow alternative variables to be calculated as residuals.

d. Links to other modelling efforts

43. AIDS promises to become a problem of some duration. The time horizon adopted for the present analysis should therefore be considerably longer than for instance a standard NDP-period or similar. A 25 years horizon seems more feasible. This corresponds to the time horizon suggested for a potential long-term economic model for Botswana. It would seem that the latter also in other important respects may have many features in common with the model constructed for the present study. Thus, also the long-term model will have to take population dynamics as its point of departure, drawing out the economic implications of various population scenarios, in much the same way as the HIV/AIDS model does. This being the case, the latter model may serve as a first attempt at constructing a long-term model, and even if the two should later be developed in different directions, the outputs of the HIV/AIDS model will still provide essential inputs for the long-term model.



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