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REPORT ON VISIT TO BOTSWANA, 5 - 15 JULY 1983

RECOMMENDATIONS FOR DEVELOPMENT OF NUTRITIONAL SURVEILLANCE IN BOTSWANA

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BACKGROUND

The clinic-based nutritional surveillance system that has been operating in Botswana since 1978 was recently evaluated by the Ministry of Health in cooperation with UNICEF and Cornell Nutritional Surveillance Program (CNSP). This evaluation produced recommendations for improving the quality of the data on children's nutritional status, and for simplifying the system of data collection and analysis. Suggestions were made for ways to improve the usefulness of information for policymakers concerned with the food and nutrition situation in Botswana, including those outside the Ministry of Health, and in particular drought-relief operations.

During the period 5-15 July, the joint CNSP/UNICEF mission visited Botswana to:

- review the results of two external inputs to evaluation (the work of V. Quinn and S. Tabor, and their respective reports (1) and (2));
- discuss priority issues to address and decisions needed, in terms of information output, data analysis, and data collection and recording.

This report summarizes the review, discussions, and our opinions on the current priorities. The immediate and longer-term needs are distinguished between:

(a) the nutritional status surveillance system (based on clinic data, through the Ministry of Health);

(b) a food and nutrition information system (which would use data from (a), as well as other data) aimed at providing more timely recommendations for drought relief; and

(c) considerations for improving drought relief measures and solving certain problems associated with relief programs.

The immediate need is for information at both central and district levels on how to cope with the current drought and to plan and manage the relief

effort. A small-interministerial technical committee has already begun to pull together information from various reporting systems (beyond the nutritional status surveillance system, they include agro-meteorological data, crop, livestock, and range condition reports, relief feeding program reports and others) to see if combined summary reports on the food and nutrition situation of the country might provide a more reliable, timely, and understandable picture to policymakers than they would get from separate, uncollated reports alone. An example of such a report, constructed during our visit, is given in Annex I. The following proposals for implementation and research in 1983-1984 are intended to support these efforts.

IMPROVEMENTS IN THE NUTRITIONAL STATUS SURVEILLANCE SYSTEM

Actions needed

- The clinic nutrition logbooks (see figure on pg. 14) need to be field tested.
- Arrangements are required with the Central Statistical Office for coding data from these logbook sheets, and transforming the data input into routine reports.
- A standard report format needs to be developed for the clinic visits of the newly-fielded Regional Health Education Nutrition Officers (RHENO's).

Short-term training needs

- Members of the nutrition unit would benefit from additional training in analysis, interpretation and presentation of nutritional data (one nutrition unit member has come to Cornell for a short-term intensive training course).
- In-service training for Family Welfare Educators (FWE's) and RHENO's is needed to explain the newly established reporting procedures.
- Reinforcement of FWE training in weighing techniques, interpretation of growth charts, and in establishing the clinic nutrition logbooks is also required.

Research and Evaluation

- Analysis of historical data from the nutritional status surveillance system is required to produce "rules of thumb" for deciding on what changes in prevalence of malnutrition should be signalled for action.
- The use of qualitative reports from RHENO's as a check on quantitative reports from clinics needs to be tested. This may lead to possible re-design of report formats, questionnaires, etc.
- After a certain period (e.g. 18 months to 2 years) the nutritional status surveillance system would benefit from a further evaluation as to improvements in accuracy and representativeness of reporting.
- Several months after the new system is in place, an analysis of data to assess clinic attendance by population group would be of value.

Which Anthropometric Data to Collect.

The nutritional data recorded in clinics should continue to be weights and ages of pre-school children. Inclusion of height measurements was not considered necessary, and where this was already being tried, it was recommended that it should be discontinued. This was because of the difficulties and additional work load of including height measurements, and the limited amount of additional information relevant to the decisions at hand that would be supplied from height data. The indicator at health district (or other area) level on which to base decisions was felt to be change in prevalence of low weight-for-age, rather than absolute values as used at present (although some further research may be needed on this). It was noted that rapid change in low weight-for-age would be primarily due to wasting, and this being so, more specific measures of wasting were probably not necessary. Hence, height measurement could be dropped.

Monthly nutritional status (weight-for-age) reports based on this system need some development, in particular to highlight points for action both centrally and by district.

Data Recording and Collection.

Six potential sources of error in reporting nutritional status data from clinics were defined. (Further analyses from the validation survey, are given in

Annex II). The potential sources of error were as follows:

1. **Completeness of reporting.** There was some question as to whether all the children who attended clinics had their weight-for-age reported, and hence how the measurements reported were selected. In particular, there was some concern that malnourished children were streamed into a separate clinic, with attendance on different days from the regular clinics, with the consequent risk that their data might not be included. Whether or not this was the case, it was clear that potential bias in selecting children whose anthropometry was reported was overwhelmingly the greatest possible problem. This can be checked and if necessary improved administratively, and this should take top priority. If in certain cases malnourished children are reported separately, over- or under-reported, the error involved would outweigh all other errors.
2. **Varying age distributions.** Decisions on standardization of ages to be reported should be made. Probably data on children of 1 - 5 years old should be reported, not necessarily on 0 - 5 years old at present. This is partly because causes of malnutrition in infants may have a different relationship to the effects of drought than for older children; and partly because standardization is anyway essential for comparisons between areas and over time.
3. **Poor weighing technique.** The evaluation showed that in certain clinics poor weighing technique was introducing substantial errors, see (1), p10, and Annex II. Additional supervision and training is needed to remedy this.
4. **Poor recording.** A revised reporting/tallying form is recommended. Beyond this, a regional summary form is desirable, and checks at this stage as to the possible introduction of errors in tallying at clinics are likely to be useful. Finally, again, training and supervision may need to be tightened up.
5. **Inaccurate scales.** Again, the evaluation showed that in certain clinics systematic errors in scales were introducing substantial error. A system for checking on the accuracy and regular standardization of scales may need to be introduced. The potentially large benefits in

removing sources of error due to poor weighing technique and inaccurate scales are illustrated in Annex II.

6. **Varying coverage or selection of those attending clinics.** It seemed clear from our discussions that the number of children attending clinics varied substantially depending upon the season, the drought situation, and the availability of food relief in clinics. This introduces important potential error into the reported prevalences. One solution which was reviewed was to record a classification variable highly associated with nutritional status (such as education in the survey, see (1) p12) at the time of recording the child's weight and age. This means, firstly, that changes in the composition of the sample can be detected; and, more importantly, that the changes in prevalence within groups thus defined can be assessed. If consistent changes are found controlling for such variables, more confidence can be placed in reports indicating substantial changes in prevalence.

Long-Term Training Needs

- A large part of the responsibility for identifying and reacting to nutritional problems is being placed on the RHENO's. Regular in-service training and seminar/meetings would keep them and the central nutrition unit staff informed and help focus the reporting on the concerns of the regional health teams and policy makers alike. As experience is gained with the nutritional status surveillance system, possibilities for improvement are bound to become apparent. Without regular seminars to discuss them, there is a danger that the whole system could become frozen as it is.
- The central staff will be called upon increasingly to serve four roles: nutritionist, data analyst and interpreter for policy makers, teacher, and manager. In practice, much of their training for these roles will continue to come from on-the-job-experience, but occasional refresher courses should also be arranged.

Re-evaluation and Redesign of the System.

Especially if changes are made in other parts of the health information system in the next few years, the nutritional status surveillance system should

be re-evaluated formally. This could take the form of a new survey of clinic catchment areas to determine how much of the child malnutrition problem is hidden from the health system in non-drought areas and/or years. It should also take the form of monitoring the workload of the FWE's and RHENO's to see that there is not too much duplication of health information systems and that the information collected is that most needed.

FOOD AND NUTRITION INFORMATION SYSTEM

Adequate warning to prevent the effects of drought is importantly to be distinguished from monitoring changes in nutritional status resulting from drought. The distinction is between a food and nutrition information (or warning) system and the nutritional status surveillance system discussed in the previous section. Essentially, a food and nutrition information system would make use of available information put out at different times in the agricultural cycle in order to provide some timely warning of possible food shortage and for targetting of measures that may be needed in the future. In practice, this means the integration of six possible sources of information, which are:

1. Agro-meteorological information, particularly when transformed as a water index for different crops, already available from the agro-meteorological department of the Ministry of Agriculture.
2. Livestock conditions, presented as an index from agricultural enumerator reports, again currently available from the Ministry of Agriculture.
3. Crop conditions, complementary to 1 above, again derived from agricultural enumerator reports.
4. Data on food and other prices, available through the Central Statistical Office.
5. Delivery of food in reponse to drought, through depots, available through the Food Resources Department of the Ministry of Local Government and Lands.
6. Nutritional status data, as discussed in the previous section.

A preliminary effort was made to integrate these reports for May 1983 (Annex I), which gave encouragement that reformatting and coordination could provide more information than was presently available with reports being issued separately. This subject is discussed in detail in S. Tabor's report (2). The decisions on organization and data interpretation, as well as for research and evaluation, that were discussed during our mission are summarized below.

Officials from several ministries, including both data producers and data users, expressed lively interest in the possibility of combining data from currently separate reporting systems into an integrated information system. Such a system could cover the various stages of food production, marketing and consumption and nutritional status. Its purpose would be to provide timely and reliable information for decisions about drought relief, regular nutrition programs, and food and nutrition policies in a wider sense. For the immediate future, the most important task would be to guide the management and planning of emergency relief measures. As it develops, the system could serve as well to provide warning of food crises and information about their likely severity. Outside of emergencies, the information could be useful for setting development priorities and evaluating programs. Tabor's report (2) discusses the rationale for such a system and lists some of the data now collected in different reporting systems in Botswana that could be used.

One advantage of linking these different reporting systems into an integrated information system would be that it is easier to interpret trends in one indicator - to distinguish meaningful change from random fluctuation -when there are independent sources of information for comparison. Indicators derived from the different sources pertain to different stages of the food economy of Botswana. Depending on the time of year some data (eg. agrometerological, cattle conditions) give warning of impending food crises, others (eg. the nutritional surveillance system and the price data) document the severity of crises in different areas and among different groups, and others (Food Resources Department reports, possibly other consumption data) monitor the success of efforts to overcome the crises.

At a meeting of the Inter Ministerial Drought Committee (IMDC) held at the Family Health Division, 14 July 1983, it was decided that the secretary of the IMDC should be responsible for seeing that data were in fact collated and interpreted along such lines before IMDC meetings. Members of the IMDC had expressed the need for interpretation of statistics, highlighting and explaining changes, rather than just regular production of standard format reports. Besides being used as background papers for IMDC meetings, the output of the Food and Nutrition Information System could also be used by Botswana's

representatives to SADCC, since Botswana is the country designated to lead in the development of Regional Early Warning Systems. Members of the Coordinating Committee that is exploring the possibility of the information system had also listed as potential users of the output the Rural Development Council, chaired by the Vice President.

Decisions are needed on the following points:

- the organization responsible for pulling together data from different systems, and for the interpretation of these data;
- a technical committee to design the report format from these data, and to develop a relationship with the needs of users of these data needs to be set up;
- the frequency and contents of reports to be put out must be decided, based on a schedule of decisions to be made at different times of the year, using different information as it becomes available.

On this latter point, experience shows that a schedule which involves setting decision points at different times in the agricultural calendar based on the anticipated information to be available may be of value. An example is given below.

JANUARY	MAY	JUNE	DECEMBER
*	*	*.....* through .....*.....*	
Agromet. data NS data	Agromet. Crop/ Livestock data. NS data	Crops/Livestock data Food management info. NS data	
Decide if & where drought threatens; check stocks; order food; prepare projects	Decide which areas affected. Initiate food distribution. Begin LBRP.	Monitor, manage relief (Food & LBRP)	

* Refers to meeting to review reports and come to decisions on action needed.

Research and Evaluation.

Immediate needs are as follows:

- Historical analysis of patterns in data from different reporting systems. Which indicators or combination of indicators provide the most suitable timely warning? Which provide reliable information about current situation, for targetting, extent of need, etc?
- Test sensitivity/specificity of indicators. Develop "rules of thumb" for interpreting data at different times of year; re-evaluation as experience is gained in integrated reports.
- Different data from different sectors refer to administrative areas which do not always coincide. Some investigation is needed on best ways to combine data by area.

Monitoring of Relief Supplies

A simple system is needed for adequate detection of logistic bottlenecks, leading to action to remove these (see Tabor report (2) Recommendation 3). An improved reporting system from clinics and from depots on availability of food supplies is needed so that failure to supply enough food to the right place at the right time can be detected and corrected. The monthly clinic reports on nutritional status could be adapted to provide one possible source of these data. A second line of communication to take care of unanticipated problems may also be needed, for example by establishing direct emergency contact of clinics to the central distribution points. Beyond this, the effectiveness of geographical targetting can be monitored if and when priority status is given to certain areas for receipt of food supplies.

The possibility of screening malnourished children and providing additional direct feeding to them has been put forward (see Tabor report (2) Recommendation 1). The feasibility of this seemed doubtful in our discussions, but the proposal is reiterated here for possible further review.

ANALYSIS OF THE DROUGHT RELIEF SYSTEM

Considerable interest was expressed from various sources in assessing certain effects (notably nutritional) of the drought relief measures to date. Specifically, this issue was raised initially in discussions with World Food

Program (WFP), and with a World Bank Mission appraising the proposed health services support project. The latter interest extended to considering how development of the information system under discussion here might in the future deliver better knowledge of these effects. This interest, shared by the Government of Botswana as we determined in discussions, was reviewed during our stay and it was agreed that we would set out some thoughts on this, which are contained in this section.

The general questions of interest, to be answered if possible both retrospectively and prospectively, are:

- is enough food getting to the right places and people at the right time?
- if so, is there an effect in protecting nutritional status?
- based on this, what changes and improvements in the program are needed (eg. more food, better targetting, better timing, etc.)?

Three approaches to this analysis were considered, as summarized below.

(1) **Retrospective area-level study.** Monthly stock-analysis reports for 17 depots give numbers of rations distributed (for both school and vulnerable group feeding); in principle these could have been compared with nutritional data for the same areas over time. However, our investigations indicated that the data were not sufficiently complete to promise any reliable conclusions from such an analysis. We therefore considered that this approach was not likely to be viable.

(2) **Retrospective child-level analysis,** based on data from the validation survey discussed in V. Quinn's report (1). Child welfare clinic attendees' nutritional status could be compared with that of children not attending, or other children in catchment areas where supplies ran short before the survey period. Again, however, we concluded that the data would be insufficiently complete to reach any reliable conclusions. This left the only possibility for assessment of the effects of the drought relief program as a prospective study.

(3) **Prospective study.** Inclusion of information on food receipts in clinic logbooks (see figure on p14) would allow in the future child-level analysis of the feeding program, both in terms of targetting, and in assessment of nutritional effects (for example comparing new

entrants into the program with those who have been receiving food for some time). This seemed to us by far the most viable way ahead, notwithstanding the desire to use existing data to assess effects in the past. The next steps would be to put forward details of the design and output of such a study.

Potential Negative Effects of Food Distribution

We encountered extensive concern that the use of clinics as the prime means of distributing food was disrupting existing health services. Studies of the effects of food aid could usefully include an investigation of this issue. There was not time to establish a research protocol for this, although the ways of proceeding are fairly obvious. A related issue concerns the opportunity costs of health staff time, compared with the way it could have been spent on the regular health services. Again, we note the necessity for considering this in assessing the cost-effectiveness of the food distribution program; a research protocol could now be drawn up.

A further issue concerns the long-term effects of food aid on the decisions of families receiving food aid on their production pattern and means of livelihood; in other words, food aid may be creating a dependence which is distorting the normal pattern of life. A micro-level study of these effects, including both family decision-making and larger-scale effects on agricultural production, village projects, etc., is clearly desirable. This would require a review of existing data and literature, and extensive discussions with those involved before preparing a research outline. Some details are given in S. Tabor's report (2, pg 94). A combination of anthropological and economic approaches is likely to be needed.

Implications for Relief Organization and Planning

An improved system for planning and administering drought relief would involve a number of the issues discussed above. Specifically, a system for testing out and adopting the use of integrated reports from the Food and Nutrition Information System timed to be available at crucial times of the year, is recommended. Monitoring of the drought relief effort, and eventually its evaluation in terms of nutritional effectiveness and potential negative effects, are needed.

Beyond this, the planning of relief, and the collection of utilization of data for these purposes, needs to consider longer-term uses. Apart from anything else, unless the information system has longer-term uses for development, it will fall into disuse in non-drought years, and in general it is unlikely that a well supported system can be established unless these multiple uses are perceived and made real. The uses themselves are several. In the first instance they obviously concern contingency plans for drought relief (See S. Tabor's Report, Recommendation 4 pg 4). The data needed are similar to those useful for both health planning and in more general terms for development planning. Support to the development of the system therefore is not only advisable in tackling short term problems of drought, but as an important basis for longer-term efforts to prevent malnutrition, and indeed to prevent the vulnerability to drought.

RECOMMENDED NEXT STEPS

Three sets of recommended steps were put forward during this mission. Although these are covered in previous sections, the 'points for action' discussed are repeated here to act as a summary.

A. Nutritional information system
   - Decide on tallying form (incl additional columns) and summary form
   - Decide how to ensure complete reporting
   - Decide how to train and supervise data collectors
   - Decide on further analyses of nutritional data, who does these, who interprets
   - Implement changes in system
   - Monitor and/or resurvey to check if changes work

B. Food and nutrition information system (timely warning, targetting, food management)
   - Test integrated report
   - Decide where analytical capability to be...train, etc.

- Set up decision-making schedule, based on needs of Cabinet, Interministerial Drought Committee, Rural Development Committee, District Development Committees, etc.
- Monitor progress and needs of information users

C. Research needed for A and B:

- Historical analysis to preliminarily identify food and nutrition information system indicators; and rules-of-thumb for interpreting prevalence changes in nutritional data
- See if data can be retrieved for nutrition impact study
- Ensure that necessary data are included in FNIS for regular assessment of nutritional (and other?) impact of relief programs
- Effect on health services - disruption by food aid - document

REFERENCES

1. Report on the Evaluation of Botswana's Nutritional Surveillance System. July 1983. UNICEF Social Statistics Programme Occasional Paper No. 4 1983. UNICEF/EARO - Nairobi.

2. Tabor, Steven. Drought Relief and Information Management: Coping Intelligently with Disaster 20 June 1983. Draft Copy. Gaborone, Botswana.

Note:

These references are available from CNSP, Cornell University, Ithaca, New York 14853, U.S.A. and from UNICEF's Social Statistics Programme, EARO, P.O. Box 44145, Nairobi, Kenya

Taken from Figure 2 of Reference 1

FIGURE 2

Example of a Page in the Proposed CWC Nutrition Logbook

Page .....

MONTH OF .....

Name of Clinic/Health Post/Mobile Stop: .....

Health Region: .....

Date of First Weight Recorded: ..... Date of Last Weight Recorded: .....

Completed by: .....

CHILD'S NAME	Sex 1=M 2=F	BIRTHDAY		Weight (Kg)	At Risk (✓)	No Weight Gain (✓)	Food Rations (✓)	MOTHER'S EDUCATION		
		Month	Year					None	Some Primary	Some Secondary
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
⋮										
24										
26										
TOTAL (Add up tally-marks)										

ANNEX I

SAMPLE INTEGRATED REPORT FOR FOOD AND NUTRITION INFORMATION SYSTEM

To quickly investigate the feasibility and usefulness of combining data to assess the food and nutrition situation, an ad hoc technical group, with assistance from the mission, rapidly put together certain available data for May 1983. These results were considered as illustration of what might be tried in the future at an Inter-Ministerial Drought Committee meeting on July 14. The data put before this group with summary are reproduced in this annex.

Summary

The effects of the prolonged drought continued to be reflected in high levels of child malnutrition. Though the prevalence of malnutrition usually reaches a peak in the summer months and falls during April-June, this year the prevalence has not fallen since January (Fig. I.1). In Kweneng and Central Districts the prevalence of malnutrition has actually risen steadily in recent months (Fig. I.2). Kweneng reports the highest prevalence in the country (40%) in May, while Maun, where there has been significant improvements, reports the lowest (22%). (Prevalences by region are shown in Table I.1, with food distribution and agricultural data).

The condition of range land has deteriorated most in the West (Fig. I.3 & I.4), and the condition of crops has deteriorated most in Kweneng (Fig. I.4). Water sufficiency for the growth of sorghum and maize is below 60% everywhere except in Maun (Table I.1).

The average daily number of rations issued through the vulnerable groups feeding programme was over 200,000 (Table I.1).

TABLE I,1

REGIONAL DATA

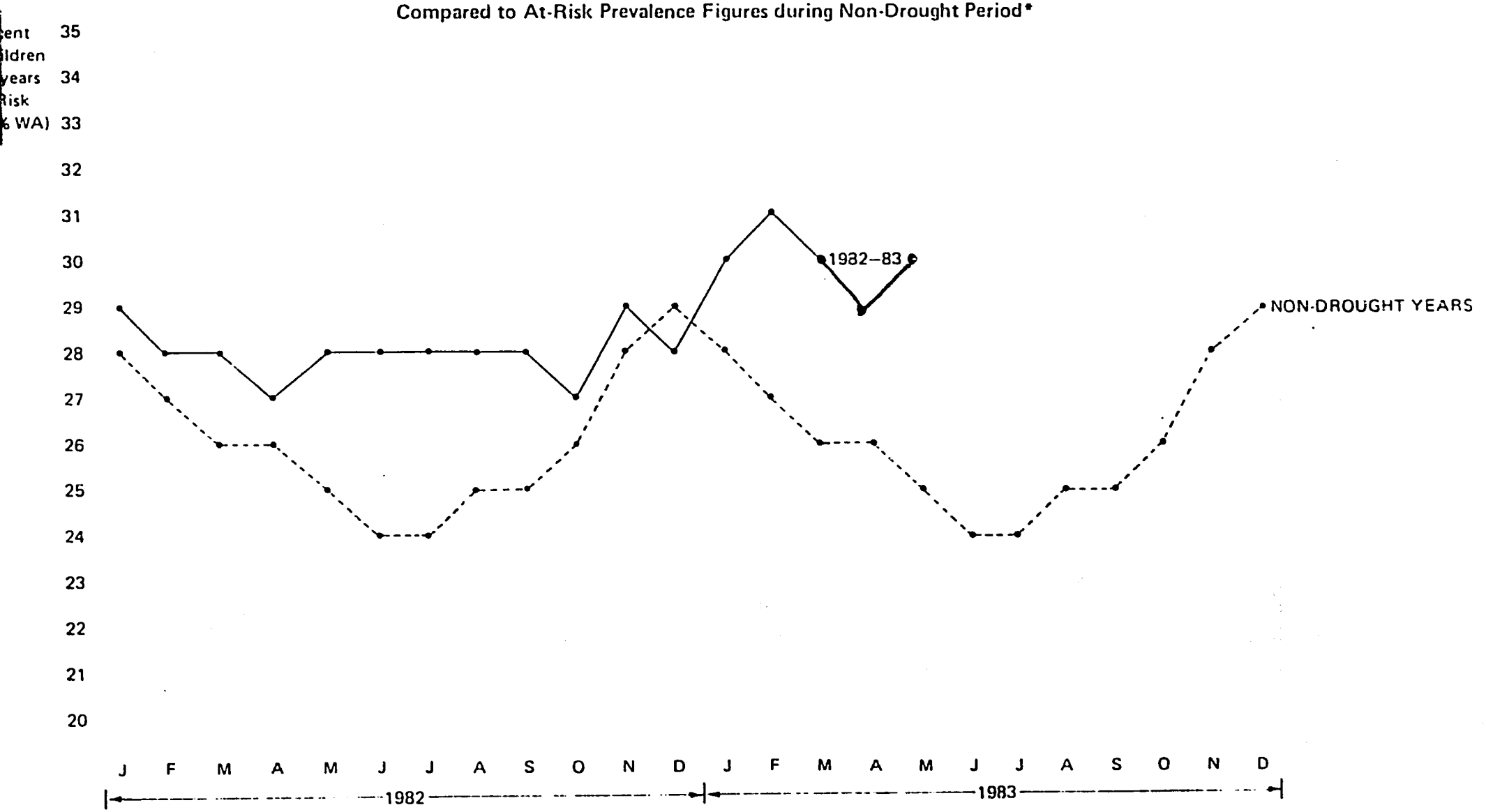
REGION	PREVALENCE OF CHILDREN AT RISK (< 80% WEIGHT FOR AGE)	CHANGE FROM PRECEDING MONTH	AVG. NO. RATIONS/DAY VULNERABLE GROUP FEEDING	AS % OF POPULATION[a]	COMBINED CROP/LIVESTOCK REPORTS RANKING*	SORGHUM/MAIZE WATER SUFFICIENCY
SOUTHERN	31%	+3%	NA		2	60
GABORONE	34	+1	45,090		5	55
CENTRAL	29	+2	110,690		4	40
MAUN	25	-2	20,760		2	75
FRANCISTOWN	30	+1	27,780		1	45
WEST	31	+1	11,400		5	—
NATIONAL	30%	+1%	> 200,000			

[a] To be calculated from 1981 Population and Housing Census data

* Note: 1 is best

FIGURE I.1

National At-Risk Prevalence Figures during Drought Period 1982-1983
Compared to At-Risk Prevalence Figures during Non-Drought Period*



* Monthly at-risk prevalence figures for non-drought period were calculated by averaging monthly figures for years of 1978, 1980 and 1981

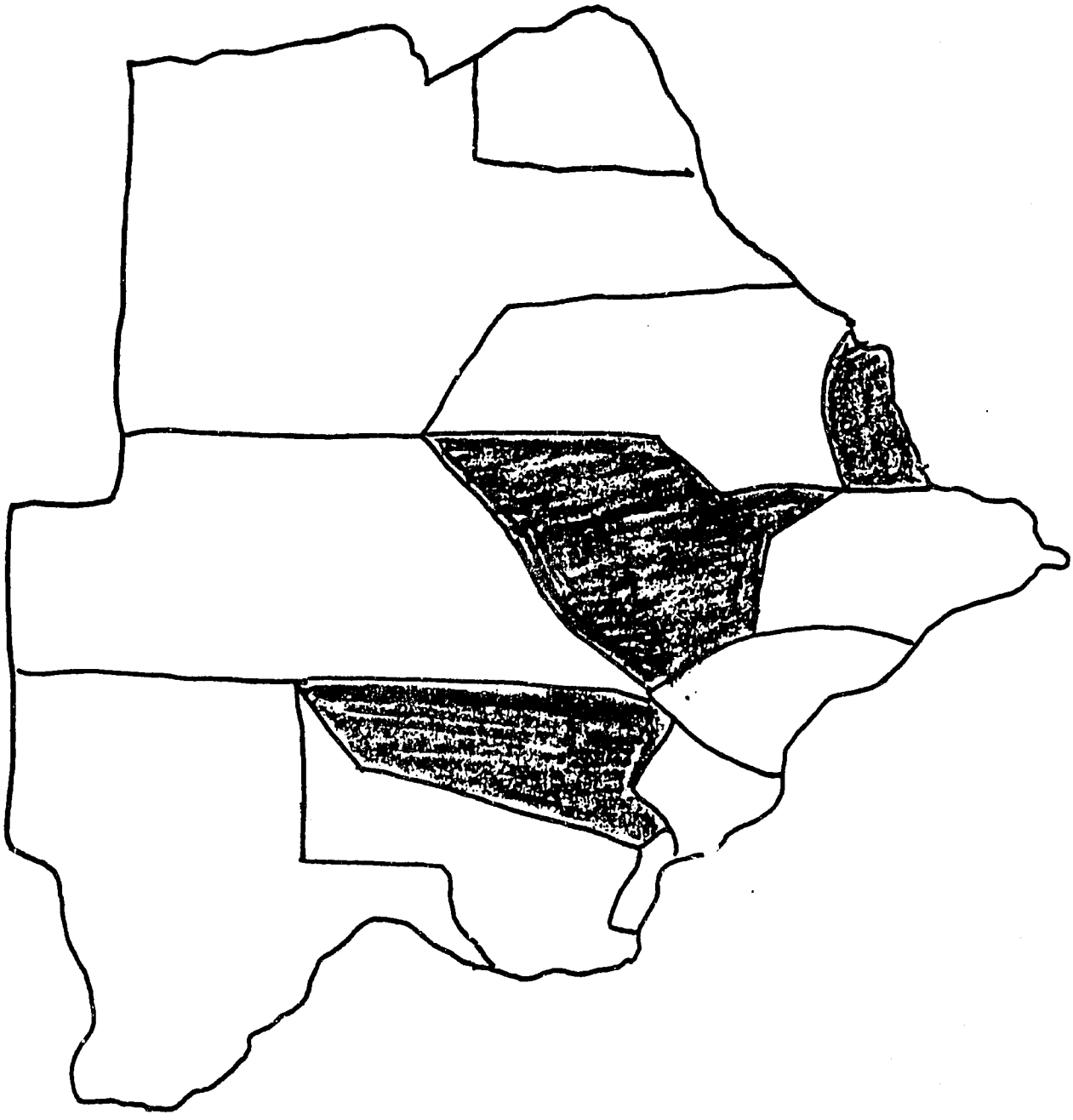


FIGURE 1.2

REGIONS IN WHICH PREVALENCE OF CHILD MALNUTRITION HAS NOT DECREASED SINCE JANUARY (shaded areas)

LIVESTOCK CONDITION
JUNE 1983

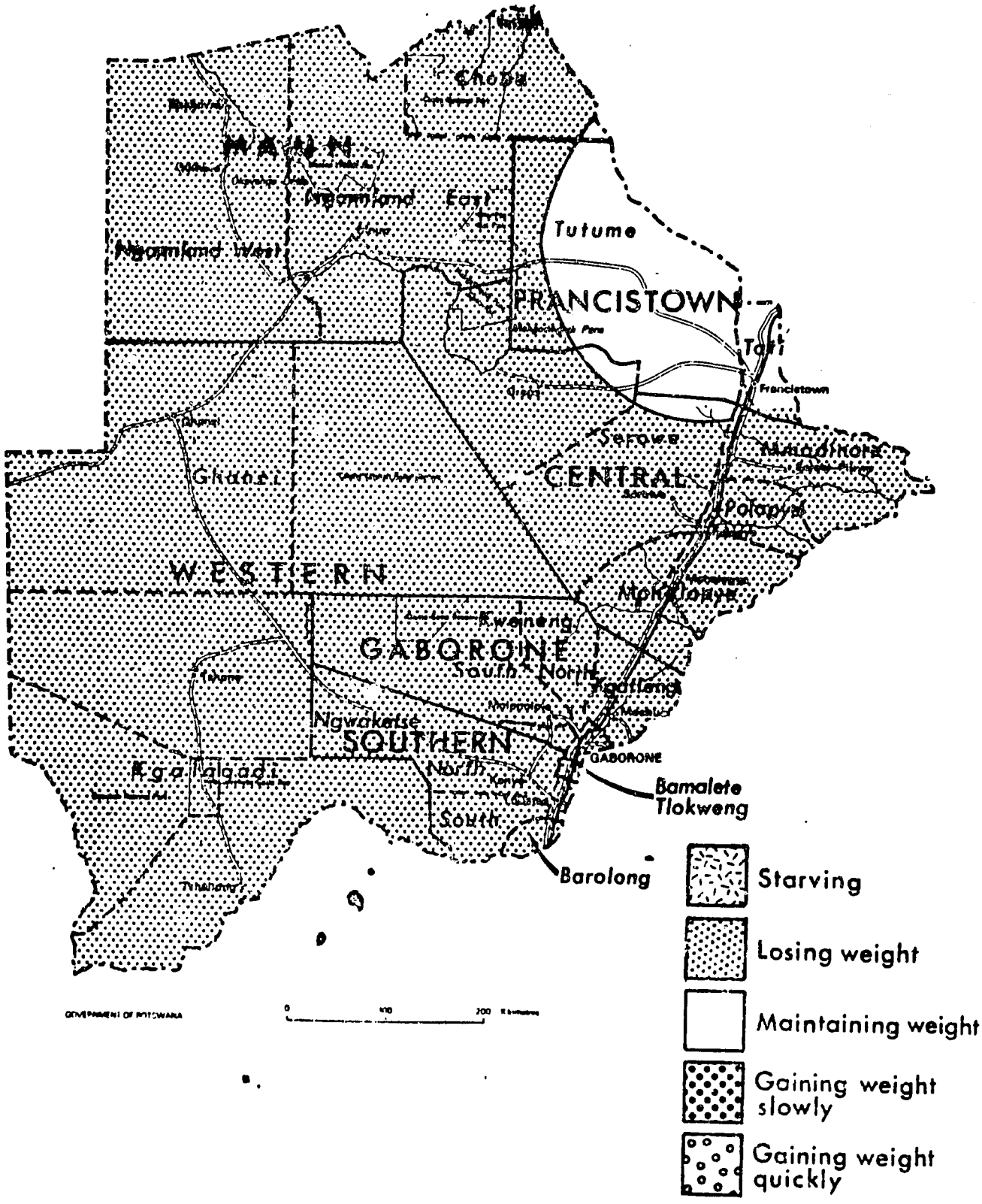


FIGURE I.3

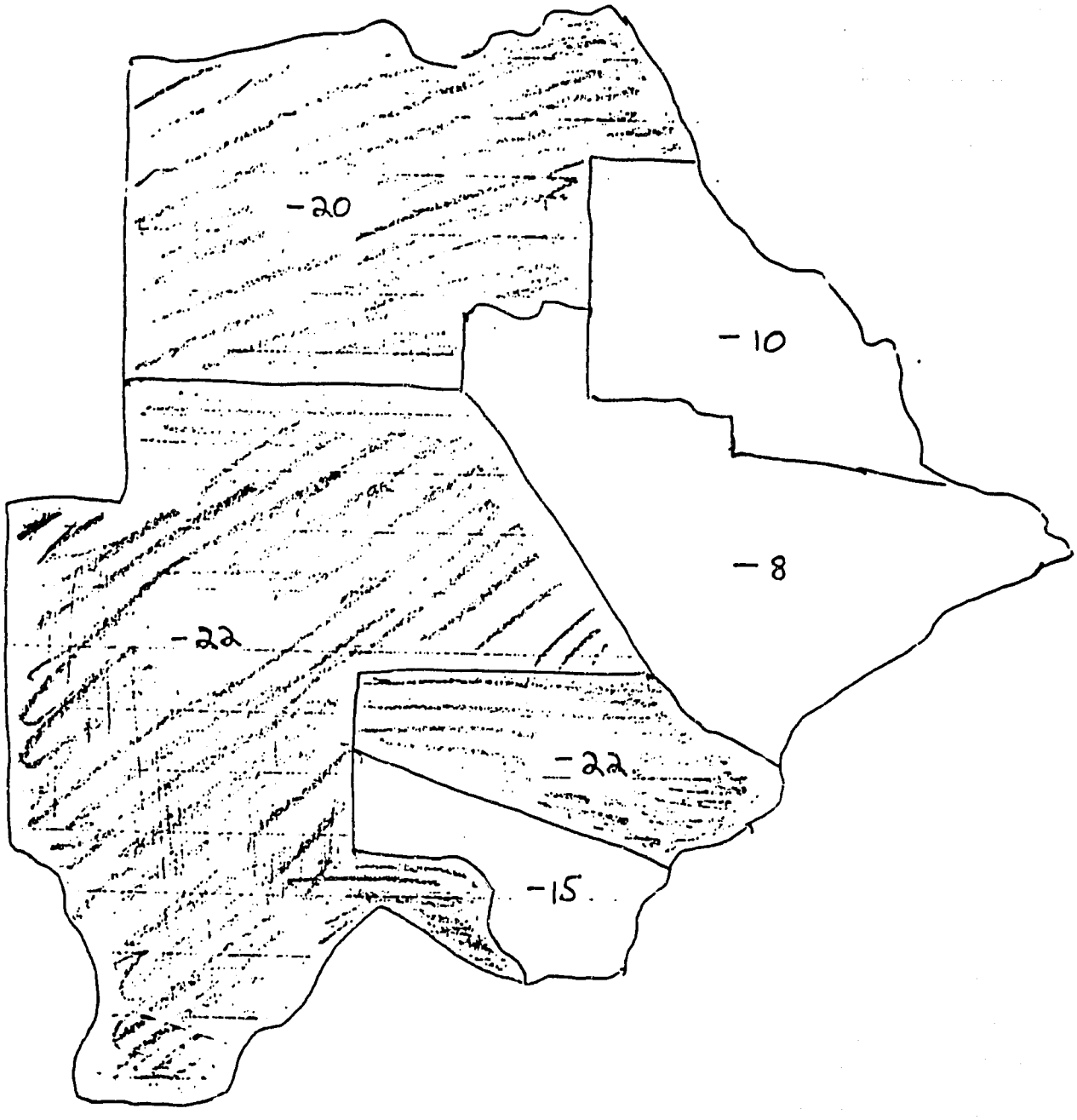


FIGURE 1.4

CHANGE IN CROP/LIVESTOCK CONDITION SINCE JANUARY
PERCENTAGE INDEX BASED ON EXTENSION AGENT REPORTS
(shaded areas had deterioration more than 20 index points)

ANNEX II

FURTHER ANALYSIS OF RELIABILITY OF CLINIC-REPORTED DATA FROM THE SURVEY RESULTS GIVEN IN (1)

The validation survey (1) had as a major objective an assessment of how far the data from clinic-reporting accurately reflects actual prevalences in the clinic catchment areas. Certain operational concerns can be more specifically defined as:

- how many clinics (or areas) genuinely in need of assistance are picked up by the clinic reporting
- how many are missed (how many false negatives)
- how many falsely identified, etc.

The relation between the prevalences estimated from the representative sample survey compared with the most recent clinic reports are shown in Figure II.1. This figure displays the data given in Table 1 of (1). The 45° solid line represents where estimates agreeing from both sources would fall; points above the line mean that clinic reports underestimate the prevalence compared to survey results; points below the line mean that clinic reports give higher prevalences than survey results. On inspection, it is clear that the correlation between the two estimates is not very high (in fact the correlation coefficient is 0.38, which is significant at the 10% level). This somewhat weak correlation is partly because clinics were chosen in high prevalence areas, so that there was only limited variation in prevalences anyway. However, if account is taken of two major sources of error - weighing techniques and accuracy of scales - five clinics with high error rates (greater than 0.3 kg) can be identified (see Table 2 of (1)), and these are marked with arrows in Figure II.1. These cases of known error account for two of the extreme data points, those furthest above the 45° line in Table II.1 and for another outlying value below the line. If these values are removed, the correlation between clinic estimates and prevalences from the survey is substantially higher (correlation coefficient = 0.59, which is significant at the 1% level). On average, prevalences reported from clinics were found to be about 4 percentage points lower than prevalences derived from the survey; moreover from fitting a line to the points in Figure II.1, there is some indication that high clinic reported prevalences tend to over estimate the prevalence, and low prevalences tend to under estimate it. However, there

are insufficient data for statements such as that a reported prevalence from clinics of 40% has a certain chance of lying between 20 and 60% - and indeed such statements would not be the best way of assessing the value of prevalence estimates from clinics.

More operationally, we can examine the numbers of correctly or incorrectly identified clinics with high prevalence, using various cutoff points. The two cutoffs of obvious interest are the 40% level currently in use, and secondly the averages for both clinic and survey estimates. This can be done by examining true and false positive and negative identification of high prevalence areas, which can be illustrated as counting points falling in the graph as shown in Figure II.2, shown for the 40% prevalence cutoff point. Results are summarized in Tables II.1 to II.4.

In Table II.1, the cutoff value of 40% prevalence in clinic reporting (as presently used) is evaluated. Clinic data identified seven clinics with greater than 40% prevalence, of which three were found to have such prevalence by the survey. But the survey showed that six clinic areas (3 correctly identified by clinic data) had greater than 40% prevalence, of which three were missed (false negatives). The efficiency of clinic-based identification of needy areas can thus be assessed: (a) it was better than random (sensitivity + specificity = 1.3), (b) of the seven clinics that were identified as needy from clinic data, three were confirmed as needy from the survey (43%), and this should be compared with 27% (6 out of 22) in the population overall - a 1.6 fold increase in targetting efficiency.

If the five clinics with known sources of error (weighing technique or inaccurate scales) are removed, the classification becomes as Table II.2. Here, two of the six clinics identified as needy were actually so, almost twice the proportion overall (3 out of 17); and only one genuinely needy clinic was missed. On this limited evidence, if measurement errors were reduced, the system would be quite effective in not missing needy clinics (2 out of 3 detected), but at the expense of including a number (4 out of 6 in this case) which were not needy.

Finally, we can examine the effect of changing cut-off points in detecting worst-affected areas, conveniently by dividing clinics into approximately equal groups (i.e. taking the mean values of clinic- and survey-derived prevalences). Table II.3 gives the results including those known to be inaccurate due to

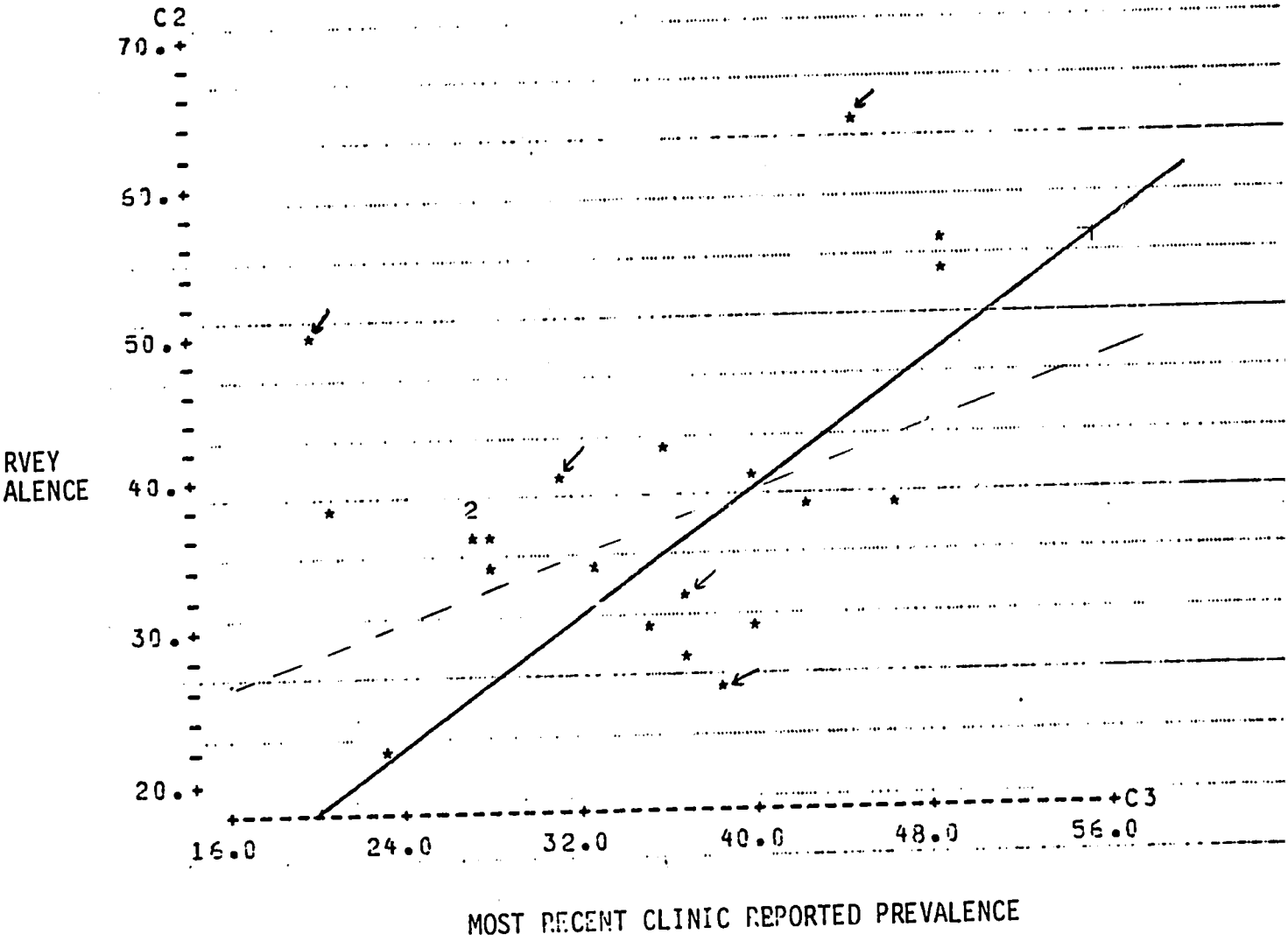
weighing errors, and in Table II.4 these are removed. These results again show that there is some predictive power in the clinic data: even with errors, 30% better than random targetting (positive predictive value = 1.29 x population prevalence); removing error-affected data points, this becomes 63% better than random.

The conclusions are:

- Unknown and varying representativeness of clinic derived data do not invalidate their use for detecting affected areas; the cost is that incorrectly identified needy clinics are included, but fewer needy clinic areas are missed.
- The effectiveness of this identification could be substantially improved by removing the obvious sources of measurement error.

FIGURE II.1

Plot of survey prevalences vs. most recent clinic reported prevalences.



For all data points:

Correlation coefficient = 0.38 $0.1 > P > 0.05$

(Regression: Survey prevalence = 22.9 + 0.43 Clinic Prevalence

Adj R^2 = 0.10 n = 22)

Excluding five clinics with known measurement error (marked ✓ above):

Correlation coefficient = 0.59 P = 0.01

(Regression: Survey prevalence = 18.0 + 0.54 Clinic Prevalence

Adj R^2 = 0.30 n = 17)

FIGURE II.2

Illustration of use of data in Figure II.1
to assess reliability of clinic derived data.

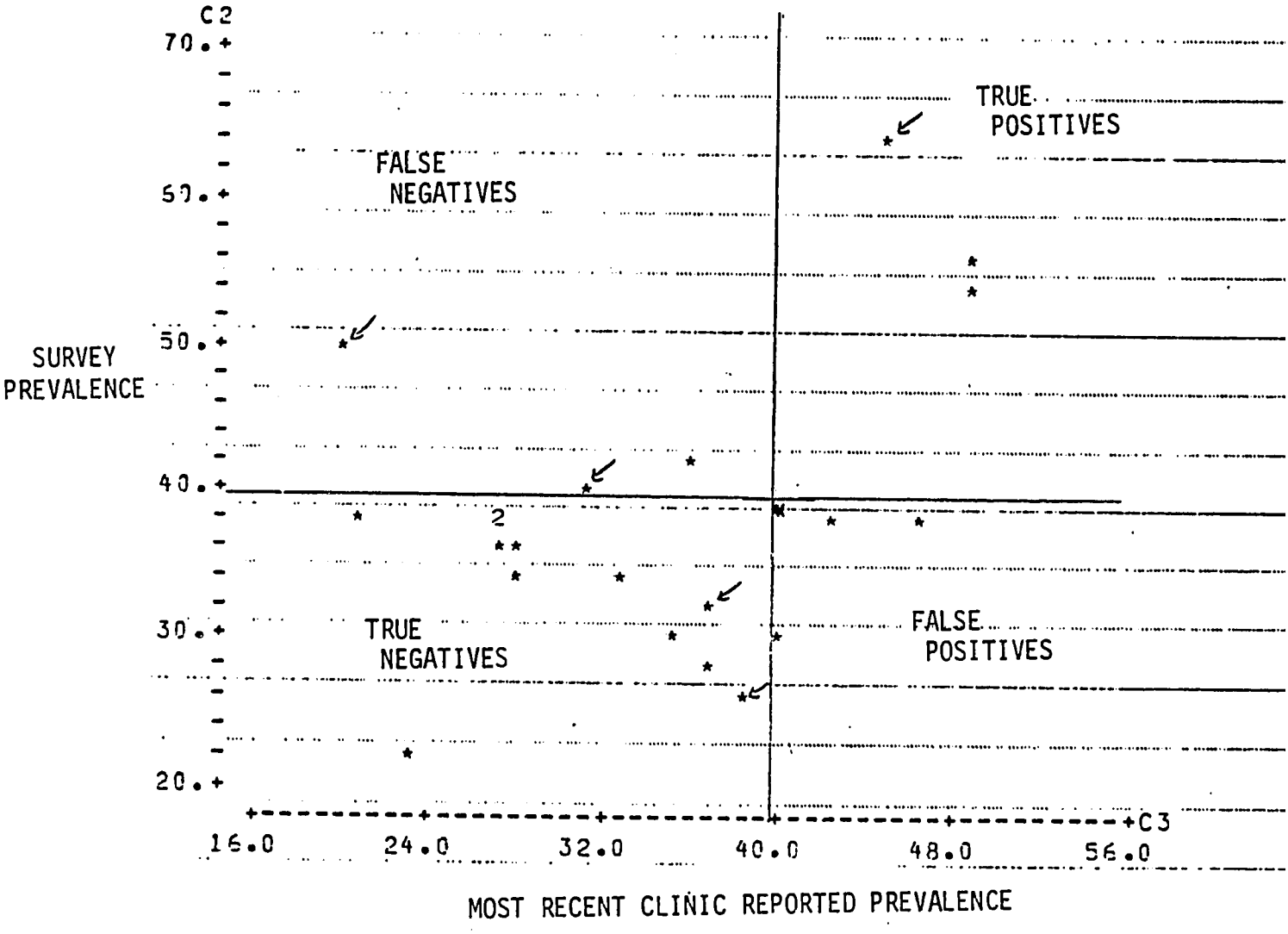


TABLE II.1

Classification of clinic area by prevalence estimated by Survey (columns) or from most recent (1 to 2 months) clinic reports.

Prevalences are of weight-for-age <80%, with 40% prevalence for both clinic and survey estimates as the cut-off

Numbers in cells are number of clinics

Data derived from Table 1 of (1)

SURVEY

CLINICS	≥40%	<40%	
≥40%	3	4	7
<40%	3	12	15
	6	16	22

sensitivity = 3/6 = 0.5
specificity = 12/16 = 0.75 } sum = 1.25

positive predictive value (PPV) = 3/7 = 0.43
population prevalence (PP) = 6/22 = 0.27 } ratio = 1.59

TABLE II.2

Classification of clinic areas, as Table II.1, removing five clinics with known measurement errors

(numbers 1, 8, 11, 16, 17 in Table 1 of (1)).

SURVEY

CLINICS	≥40%	<40%	
≥40%	2	4	6
<40%	1	10	11
	3	14	17

sensitivity = 2/3 = 0.67
specificity = 10/14 = 0.71 } sum = 1.38

positive predictive value (PPV) = 2/6 = 0.33
population prevalence (PP) = 3/17 = 0.18 } ratio = 1.83

TABLE II.3

Classification of clinic areas, as Table II.1, using mean prevalences as cut-off.

SURVEY

CLINICS	≥38%	<38%	
≥35%	7	5	12
<35%	3	7	10
	10	12	22

sensitivity = 7/10 = 0.7
specificity = 7/12 = 0.58
} sum = 1.28

positive predictive value (PPV) = 7/12 = 0.58
population prevalence (PP) = 10/22 = 0.45
} ratio = 1.29

TABLE II.4

Classification of clinic areas, as Table II.3, removing the five clinics with known errors as Table II.2

SURVEY

CLINICS	≥38%	<38%	
≥35%	6	3	9
<35%	1	7	8
	7	10	17

sensitivity = 6/7 = 0.86
specificity = 7/10 = 0.70
} sum = 1.56

positive predictive value (PPV) = 6/9 = 0.67
population prevalence (PP) = 7/17 = 0.41
} ratio = 1.63