

**COMPUTATIONAL ANALYSIS OF NUTRITIONAL
STATUS OF UNDER- FIVE CHILDREN – CASE
STUDY OF WASAGU, KEBBI STATE.**

BY

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PGD/MCS/97/98/691

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CERTIFICATION

This project is certified to be an original work, written and compiled by ILEVBARÉ UDUGBAI, with registration number PGDD/MCS/97/98/691 for the requirement of the award of Post-Graduate Diploma in Computer Science, Federal University of Technology, Minna, Niger State, Nigeria.

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DEDICATION

To Sarah Solomon, Monica, Martina and Peter

ACKNOWLEDGEMENT

Dr. S.A. Reju guided this work with interest, care and understanding.

I owe him a great debt on that account.

I am also indebted to all the lecturers in the Department of Mathematics and Computer Science, F.U.T. Minna for their support and guidance which enabled me = a student and Medical Doctor = go through a programme that was relatively new, and which has now become useful to me in Public Health research.

Finally, I wish to express my profound gratitude to F.U.T., Minna for admitting me into the Computer Science Programme.

ABSTRACT

Computers have become useful in patients' monitoring, clinical decision making, health and health services research and in health management information systems. The usefulness of computers is due to their speed of operation, accuracy and memory. And these useful features are being utilized in health services research to improve the planning, implementation and evaluation of health services.

The project – " Computational Analysis of Nutritional Status of Under – Five Children – Case Study of Wasagu, Kebbi State", is a software developed to classify Under – five Children into the nutritional states of (1) Normal children (2) Under nourished (3) Kwashiorkor, (4) Marasmus (5) Marasmic Kwashiorkor and (6) "Indeterminate" State.

The programme of this software was written in visual FoxPro and the input criteria are age of the subject, weight of child and presence or absence of oedema in the child.

Using this software, it was possible to determine the numbers and percentages of each diagnosis type in each of the age categories.

This software could be used to determine the impact or efficiency of health programmes aimed at improving the health status of this vulnerable group of people – the under – five children.

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CHAPTER ONE

INTRODUCTION

Introduction:

Decision theorists and decision analysts, using algorithmic and statistical approaches became interested in medical diagnostic and management problems at least two decades ago. This interest has since grown and now involves analyzing and describing the manner in which physicians actually solve problems.

A great deal of Clinical research has occurred through the study of medical records for clues to illness, its precursors, and its management.

This has led some futurists to suggest that within 4 or 5 decades, the record of physicians will be routinely recorded, maintained and accessed within computer-based systems, and that physicians in a sense would become obsolete and their jobs taken over by paramedical staff interacting with patients and with computers to make clinical diagnosis and manage patients².

However, those familiar with the role and activity of the physician would see this assertion as provocative as medicine occupies a complex area of intellectual activity and the mere

management of patients using a fixed set of rules would amount to treating a patient as a 'case' instead of as a 'person'. That unique psychological disposition which makes every single person to be different from another-even when they have the same illness-would not have been considered.

Computers have become useful in patients monitoring, clinical decision making, health and health services research and in health management information systems. This usefulness which is due to their amazing power is derived from three features: speed, accuracy and memory. These features particularly useful in health services research, have led to improvements in the planning, implementation and evaluation of health services.

1.2 Why Assess Nutritional States of Children ?

Children (and indeed women!) constitute a vulnerable group of people in the Community. They react sharply to adverse changes in the environment. They suffer more when there is famine, drought, wars and in places where government policies detract from adequate provision of efficient health services.

The nutritional status of children, particularly those under five years of age, could help in determining the health status of the community.

Under-five Mortality Rate (U5MR) reflects the nutritional health and the health knowledge of mothers the level of immunization and Oral Rehydration Therapy (ORT) use; the availability of maternal and child health services (including prenatal care); income and food availability in the family; the availability of clean water and safe sanitation and the overall safety of the child's environment.³

It is important to note that there are other direct and indirect indicators for the assessment of the health status of the community. These include Mortality indicators, Morbidity indicators, Disability indicators, Healthcare delivery indicators, Socio-economic indicators, Health policy indicators, indicators of quality of life and Health services utilization indicators.

1.3 **Problem Identification**

When the nutritional status of Children is lowered, it shows in various forms of malnutrition for example under- nutrition, Kwashiorkor, and marasmus (see definition of these terms in 1.5)

Normal growth and development is a continuous, ordered process with consecutive and predictable changes in body composition, physiological maturity and mental development.⁴

Any insult may cause a cessation or stuttering of this process.⁴

Any useful system of identification of children according to nutritional states should have a practical value, either in identifying those individuals who require intervention or to indicate the extent of malnutrition so that preventive measures can be taken.

During Childhood, a sensitive indicator of malnutrition is a failure of growth, in that, the individual falls behind time.

1.4 **Objectives of the project**

1.4.1 **General Objectives:-**

To assess the nutritional level/status of children in Wasagu, Kebbi State.

1.4.2 Specific Objective

To determine the percentage of children (under five years of age) who are (or who have):-

- i) Well-nourished
- ii) Under – nourished
- iii) Kwashiorkor
- iv) Marasmic – Kwashiorkor
- v) Marasmus
- vi) “Indeterminate” Status

Using the following indicators

- i) Age (of child)
- ii) Weight (of child)
- iii) Weight – for – age
- iv) Presence or absence of oedema

*(please see 1.5 below for definition of terms)

1.5 Definitions of terms/Concepts

- 1) **Computer**:- An electronically controlled equipment or device capable of automatically executing a series of

controlled sequence of operations on a very fast basis.

Computers can be digital or analog computers.

2) **Diagnosis**:- Determination of the nature of a disease

The definitions (3) to (6) below are according to the “Welcome Classification” of nutritional states.

3) **Kwashiorkor**:- This is when a child has 60-80% of weight for his/her age with the presence of oedema.

4) **Marasmus**:- When a child has less than 60% of weight for his/her age, with the absence of oedema.

5) **Marasmic-Kwashiorkor**:- When a child has less than 60% of weight for his/her age with the presence of oedema.

6) **Undernourished or under nutrition**:- When a child has 60-80% of weight for his/her age

7) **Normal**:- When a child has at least 80% and $< 100\%$ of expected body weight with absence of oedema.

8) **“Indeterminate”**:- All cases which do not fall into the “Welcome Classification” that is (3) to (6) above. These are also classified as abnormal.

- 9) **Oedema:-** Is an effusion of fluid into the tissues. If a finger is pressed upon affected part, the surface pits and regains slowly, its original contour.
- 10) **Patient:-** A sick person receiving (medical or surgical) care.
- 11) **Physician:-** One who practices medicine as opposed to surgery
- 12) **Physiology:-** The science of the function of living bodies
- 13) **Weight for-age:-** $\frac{\text{Weight of child (or subject)}}{\text{Weight of normal child of same age}} \times 100$

How does this software accomplish the task of classifying children into the various nutritional states (2) to (8) above ?

The decision tree is as follows:-

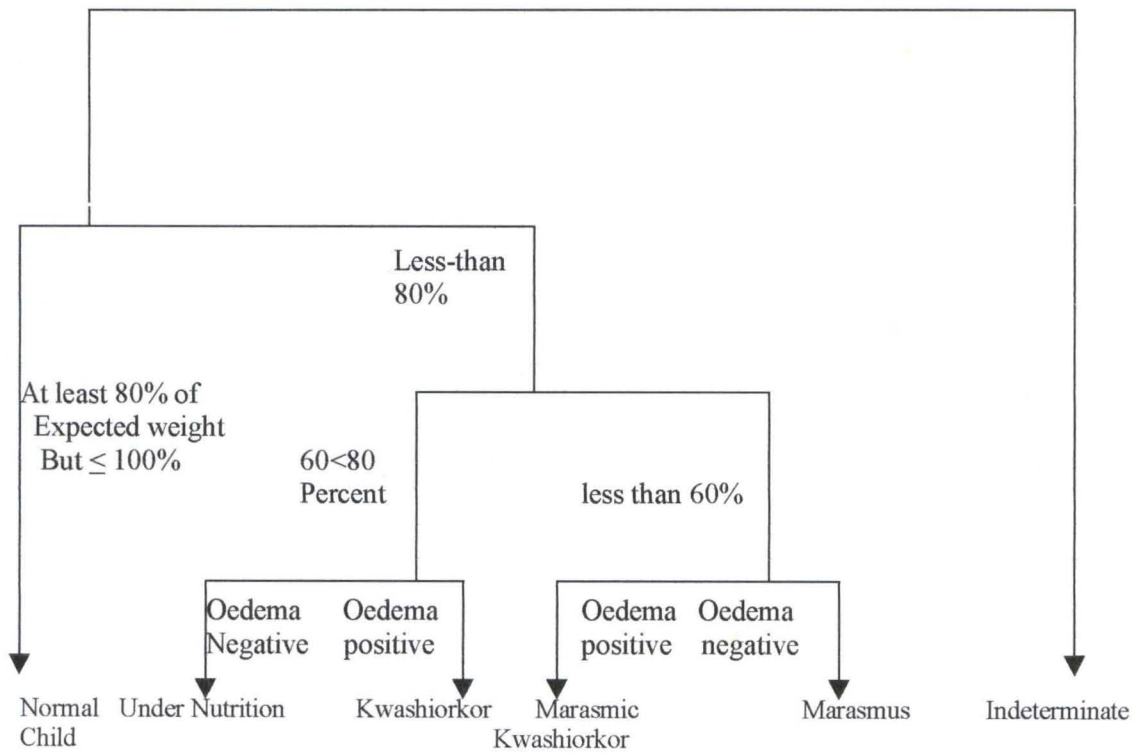


FIGURE 1: DECISION TREE

Description of Study Location

Wasagu is a small town of about fifty thousand people. It is located in Danko/Wasagu Local Government Area of Kebbi State, in Northern – Western Nigeria.

More than 80 percent of the people of Wasagu are engaged in peasant farming.

It has a pre-primary school, 2 primary schools, a post primary school, a government General Hospital and a private clinic.

It is also the headquarters of Wasagu District in Zuru Emirate.

1.6 Scope of the Project and Research Methodology:

1.7.1 **SCOPE:-** The scope of this project is limited to developing a software which can accept as input, weight of child, age of child, presence or absence of oedema, to determine the nutritional status of children under the age of five and be able to determine the number in each nutritional state, the percentage in each nutritional state, in relation to the total number of subjects (children) in the sample.

The mean weight of normal children of specific ages was got from apparently normal subjects, randomly selected (after stratification for age) at the Nursery School of Government Islamic

and Arabic Secondary School Wasagu and Kunjiri Medical Clinic, Wasagu (for children who are 1-3 years of age accompanying their mothers to Ante-natal Clinic). A minimum of 300 subjects were examined in each age category. The mean weights of the apparently normal children conformed to the internationally accepted average of:

$$\text{Weight} = 2N + 8, (\text{in kilograms})^5$$

$$\text{Where } N = \text{age of child in years}$$

$$\text{Therefore weight at 1 year of age} = 10\text{kg}$$

$$\text{At 2 years of age} = 12\text{kg}$$

$$\text{At 3 years of age} = 14\text{kg}$$

$$\text{At 4 years of age} = 16\text{kg}$$

$$\text{At 5 years of age} = 18\text{kg}$$

This project does not aim to find causes of, or factors contributing to the said nutritional disorders or states.

1.7.2 **Research Methodology:-**

This project was undertaken in stages:

- a) Feasibility Study: This preliminary stage determined the desirability of this project.

- b) **Detailed Design Stage:-** The development task in this stage included describing the software structure in sufficient detail to permit coding
- c) **Coding State:-** Activity in this stage focused on turning the detailed design into a language that computer hardware can understand (that is, a programming language).
- d) **Implementation:-** This included testing, using sample data.
- e) **User Documentation:**

CHAPTER TWO

MEDICAL REVIEW IN PERSPECTIVE

2.0 Introduction:-

Intrinsic to the development and use of any medical protocol is an assumption of a particular level of training and clinical skill in the user. Similarly, a protocol which specifies that certain procedures be done assumes the equipment and facilities needed to perform those procedures are present, as well as the ability of the protocol user or other medical personnel to perform them.

2.1 Training and Facilities Required for Use of the Protocol:

2.1.1. **Training:-** Medical assistants are to be trained in the use of the protocol for determining nutritional status of children under the age of five years.

This training involves:

- a) Interviewing skills to determine correct ages of children, in circumstances where birth certificates and hospital ante-natal cards are not available.
- b) Use of weight scales, for correct measurements of weights of children

- c) Acquisition of clinical skills for determining presence or absence of oedema.
- d) Use of the computer for the processing of data on weights and ages of children and presence or absence of oedema.

2.1.2 Facilities

Facilities or equipment required are birth certificates, antenatal cards or records, weighing scales, wrist-watches or stop clocks, and computers.

2.2 Purpose of Using Protocols for Assessing Nutritional Status

The protocol offers a mechanism for bringing together two major trends in determining nutritional status of child. The first trend is the delegation of certain clinical tasks and responsibilities to health workers other than physicians, and to patients themselves. These tasks include correct age determination, correct measurements of body weight and detection of oedema, when present. The second trend is the movement towards standard setting, audit and quality assurance, and cost effectiveness of medical practice.

This protocol is particularly useful as it teaches non-physicians to master a limited set of specific tasks. And these tasks would be performed on children within the community, probably on a house-to-house basis to determine the nutritional status of children in the community.

CHAPTER THREE

3.0 SYSTEMS DESIGN

3.1 Introduction

The systems design of this software translates the system requirements into ways of classifying children into the various nutritional status.

3.2 Output Specification

The output of an information system is the end – result of processing. The output specification is essentially about how or the form in which it is formatted and this is important to the user.

3.2.1. Forms on the Screen:

The following are the types of output that can be generated from the system:

- 1 Total number of children that are:
 - a) Normal
 - b) Undernourished
 - c) Kwashiorkor

- d) Marasmic Kwashiorkor
 - e) Marasmus
 - f) have “indeterminate” status.
- 2 Percentage of children in each of the classes (a to 1f) above.
 - 3 The date the survey was carried out.

3.3 Input Specification

The input into this system is designed to produce an output classifying children into various nutritional status.

3.3.1 The data screen is mirrored thus:

Name of Subject	-----	date----	-----	-----
Village	-----	Sex-M/F-----		
Age	-----	Oedema- ve	+ve	
Wt	-----			
Diagnosis	-----			

3.4 **Requirement Specification for the Software**

The Software will be designed to fulfill the following objectives:

- a. To require details of age, sex, weight, date and Oedema
- b. It would be possible to generate reports on the screen which may be sent for printing. This report should be the age, sex, and diagnosis.
- c. Routings to add, delete or modify a record will be incorporated to maintain the integrity of the database.
- d. The proposed software should be able to handle an increasing number of patients or subjects.
- e. Processing of data should be fast and storage, retrieval, sorting, summarization and classification of data should be done spontaneously.

CHAPTER FOUR

PROGRAM/SOFTWARE IMPLEMENTATION

4.1 Preamble:

A program could be defined as a list of instructions that enable the computer in which these instructions have been fed into to perform a specific task. A program is fed through the keyboard into the CPU and its control unit, and then into the internal storage of the computer.

A computer program development involves some stages and these are:-

- a) **Program Planning:-** It is virtually impossible to write a program without first identifying and clearly understanding the problem. The planning stage is concerned with the formulation of the requirement identifying input data, the required output and the formula needed.
- b) **Program Design:-** This involves the listing and ordering of successive steps and activities to be undertaken to achieve the desired results.

- c) **Coding:-** Once the steps of the solution have been observed and outlined, the next stage is the transformation of these steps into the form understandable by the computer.
- d) **Debugging:-** As one starts to code and compile the program you may discover that one or more errors have occurred which have to be removed as they are detected. There are two kinds of errors that may occur in a program. These are logic errors and syntax errors.
- e) **Testing:-** This is also referred to as program validation and the essence is to determine whether any error still remains in the program. The testing is done by running the program with various sets of input values so as to be sure that the expected results are achieved.
- f) **Implementation:-** Once the program has been tested and found working as required, the next stage is implementation, that is, applying the program to solve the problem it is meant to solve.
- g) **Documentation:-** This is the description of the program in the proper form for users and to enhance maintainability. It describes the workings of a program and how expected

problem could be solved. This stage aids the user to understand the program and maintenance of such program.

4.2 HARDWARE REQUIREMENTS

- 1) Pentium 166456 Bak Pc 66 MTT2 and above
- 2) Minimum of 14MB Main Memory
- 3) 2.5GB Hard Disk Drive
- 4) 31/2 Floppy Disk Drive
- 5) 14" SVGA Color monitor

4.3 SOFTWARE REQUIREMENTS

The Software is the non-physical component of the computer system, while the software requirements are those software's needed to be installed on the system in order to use or implement the Building Plan software and other application packages.

a) OPERATING SYSTEM SOFTWARE

- Windows 95 or 98
- MS- DOS 6.22

b) OTHER APPLICATION SOFTWARE

- WORD PERFECT 6.1

4.4 CHANGE OVER/CONVERSION PROCEDURES

This is the process of changing from the old system to the new system. This is best carried out in the following ways:-

- 1) **Parallel System:-** Here both old and new systems are run concurrently using the same inputs and outputs compared with reasons for difference in output, which are resolved if present. The output of the old system continues in circulation until the new system in place is working satisfactorily.
2. **Direct Cut Over:-** This is the direct and abrupt change from the old to the new system, which becomes operational immediately. The change over may be over a weekend. Lack of having a system to fall back on becomes a serious disadvantage if problems arise, this may lead to stoppage of operation in the organization
- 3) **Phase-in-Method:-** This method is used when installation of a new system is not feasible within an organization at any one time. File conversion, training of personnel or piecemeal arrivals of equipment are the

possible factors which may delay the implementation of the new system in good time.

From the above highlighted change over procedures, the parallel system is recommended for implementation. This is due to its inherent advantages of comparing the output of the new system with the old, using the same data. Errors can easily be detected and where necessary corrections made, before phasing out the old system .

4.5 **POST IMPLEMENTATION AND SYSTEM REVIEW:**

Post implementation is referred to as the renewal of any system or project that has been fully implemented. It is the x-ray of the system to ascertain whether it has conformed to the proper implementation procedures.

An analyst and those who use it usually do review of systems. The review gives room for determining how well the system is working, its acceptability and to see where modification is required. Also it enables the management to know how the system will be maintained, since depreciation is bound to take

place. The main focus of post implementation is to ascertain whether the set objectives for which it was designed have been achieved.

The Analyst may ask certain questions in order to obtain or gather correct information about the system being received. These questions assist the analyst to determine the success of the system and what necessary steps are to be taken in the case of lapses.

4.6 **TRAINING OF PERSONNEL:**

The success or failure of any system design depends on its users. The type of training received by various personnel assist or prevent the successful implementation of any system.

The training should be comprehensive enough to provide a good understanding of all the operational techniques of the system. The amount and period of training for this system will depend upon its complexity and the available skills on the ground, presently.

The proposed system will be user-friendly. However, it is necessary to have an adequate and well-exposed in-house training for the various personnel in the organization.

The training should cover areas like basic computing and operation guidelines for the transfer section.

4.7 **COSTS AND BENEFITS ANALYSIS:**

The cost includes the total amount of money needed in order to put the system in place. The cost is broken down as follows:

4.7.1 <u>Development Cost:</u>		N	K
1.	System Analysis and Design for		
	4 weeks at N6,000 per week	24,000.00	
2.	Software development for 3 weeks		
	at N5,000 per week	15,000.00	
3.	Equipment purchase	350,000.00	
4.	Installations	50,000.00	
5.	Personnel Training	<u>50,000.00</u>	
	TOTAL	<u>489,000.00</u>	

4.7.2 **OPERATING COST:**

*	Supplies of Accessories and Stationaries	100,000.00
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*	Equipment Maintenance	150,000.00
*	Application Software	50,000.00
*	Miscellaneous Expenses	75,000.00
	TOTAL	<u>375,000.00</u>

GRAND TOTAL **N864,000.00**

4.8 BENEFITS OF THE PROPOSED SYSTEM:

These are:

1. Reduction in the use of paper
2. Increase in the productivity of Staff handling patients' operations and fieldwork.
3. Increased speed of operation
4. Generating information is always with quick dispatch with computerization.
5. Elimination of many repetitive works in the community or hospital.
6. Automatic updating of records and maintenance.

4.9 PROGRAMME IMPLEMENTATION

The "computational analysis of nutritional status of under-five year old" programme was developed with visual FoxPro

Visual FoxPro combines the power of graphical user interface (GUI) with database management facilities. A database programming language was necessary because of the need to keep records of children in that age category.

The Program can be executed on a Computer that runs on **WINDOWS '95** or higher. It can run independent of visual FoxPro if installed with the setup diskettes. To run the source program requires Visual FoxPro 6.0.

4.10 FEATURES OF FOXPRO

1. It has vast features ideal for a database system
2. A database package developed by FoxPro software, offers powerful features and tools for developing user-defined software.
3. It has a great Interface with Windows applications and provides Network capabilities.
4. It is possible to easily develop complete – pull down menu-driven programmes with mouse; compatibility to further ensure a user-friendly atmosphere.

5. It is possible to compile programmes and then created stand-alone softwares which can then be transferred to other users that do not make use of FoxPro.

4.11 PROGRAM DESIGN

The programme is menu-driven. Programme flow is dependent on sections made by the user. The programme makes use of two database files.

4.11b MAIN.dbf

The main database stores children records. As the name implies, it is the main database in the programme.

The Structure is as follows:-

FILE NAME	TYPE	WIDTH	DECIMAL
1. NAME	CHARACTER	25	
2. NUM	CHARACTER	6	
3. AGE	NUMERIC	1	
4. WEIGHT	NUMERIC	5	2
5. OEDEMA	CHARACTER	3	

4.11.2 SUMMARY dbf

The summary database is used to keep the summary, of percentages of occurrences of each diagnosis type. The structure is as follows:

FIELD NAME	TYPE	WIDTH	DECIMAL
1. Description	Character	20	
2. Year 1	Numeric	6	2
3. Year 2	Numeric	6	2
4. Year 3	Numeric	6	2
5. Year 4	Numeric	6	2
6. Year 5	Numeric	6	2

MAIN PROGRAM

The main program loads the main menu which consists thus:-

MAIN MENU

1. Data Entry
2. Diagnosis
3. Result Analysis
4. Quit

4.12 DATA ENTRY PROGRAM

On selection of data entry from the main menu, the data entry form is loaded.

On this Form are provision for the following fields:-

Child's name	-	name
Child's number	-	num
Child's Age	-	age
Child's weight	-	weight
Presence of oedema (Y/N)		

The user can add records to the database, modify records and delete unwanted records. This is possible by clicking the Add, Modify or Delete button. The same button is used to save completely entered records to the database.

Navigation buttons are also provided on this form to allow the user walk through the records in the database.

4.13 DIAGNOSIS

The diagnosis option is used to diagnose a particular child. The user is prompted to supply the child's number. When the number is supplied the user clicks the Diagnose button and the programme searches for the child record in the database. If the record is found, diagnosis of the child based on the age, weight and presence of oedema or not begins. The result of the diagnosis is displayed on the screen.

4.14 REPORT ANALYSIS

The Report option when selected loads a submenu:

General record listing
Summary analysis
Exit

4.14.1 **GENERAL RECORD LISTING**

This is a report showing each child's record that exist in the database. The report is displayed in categories of ages, that is, 1 year, 2 years, 3 years, 4 years and 5 years.

The report also shows the result of diagnosis for each child in the database.

4.14.2 **SUMMARY ANALYSIS;**

The summary analysis report is a report showing the percentages of each diagnosis type in each of the age category

It shows the total percentage of children having
KWASHIORKOR for example in each of the five different age categories. It shows the total percentage of children that are WELL – NOURISHED and UNDER NOURISHED, in each of the age categories etc.

CHAPTER FIVE

SUMMARY AND RECOMMENDATION

5.1 SUMMARY

This software could be useful in public health research as it looks at the nutritional status of a vulnerable group of people. This vulnerable group, comprising children who are under the age of five years, could be used to assess the impact of government health programmes aimed at improving the health status of the community.

Since results are obtained on a fast basis, assessments of community health status could be repeated frequently and this could be a form of “Health Opinion Poll” that could assess the impact of government health programmes, at the beginning, during and at the end of any political regime.

5.2 RECOMMENDATION:

For results to be useful and valid, it is recommended that input data be accurate. And this requires that medical assistants who obtain data be well trained on how to obtain data on age, weight and the presence or absence of oedema, of subjects.

Finally, the minimum sample size required to give a statistically valid result must be determined for any community.

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SET SYSMENU OFF

close all

clear all

CLEAR

set safety off

set color to w/b

clear

set path to c:\child

set dire to c:\child

sele a

use summary

sele b

use main

PUBLIC choice, ch

public dstatus[6], dcount1[6],dcount2[6],dcount3[6],dcount4[6],dcount5[6]

CLEAR

_screen.caption = "COMPUTATIONAL ANALYSIS OF NUTRITIONAL STATUS"

_screen.picture = "c:\wizflax.bmp"

*@ 1,55 say "MAIN MENU" color B+/W font "ARIAL",23 STYLE "BS"

ch =0

define window fed2 from 4,15 to 30,60 color scheme 3

do while ch <> 4

activate window fed2

move window fed2 center

@1,2 GET ch FUNCTION '*vt Data Entry; Diagnosis; Report Analysis ; Quit' font "ARIAL",18
STYLE "BS";

SIZE 1.5, 30, 1 VALID GOR2() DEFAULT 1

READ CYCLE

if lastkey() =27

deactivate window fed2

clear

endif

enddo

PROCEDURE gor2

deactivate window fed2

clear

do case

case ch = 1

do form frmchild

case ch = 2

do form frmstat

case ch = 3

do repmenu

CASE ch = 4

quit


```
endcase
return
```

```
Procedure repmenu
choice =0
define window fed1 from 4,15 to 24,58 color scheme 3
do while choice <> 3
activate window fed1
move window fed1 center
@1,2 GET choice FUNCTION '*vt General Report(Listing); Summary Report; Quit' font
"Roman",16 STYLE "BS";
SIZE 1.2, 30, 1 VALID GOR( ) DEFAULT 1
READ CYCLE
if lastkey() =27
deactivate window fed1
clear
endif
enddo
return
```

```
PROCEDURE gor
deactivate window fed1
clear
do case
case choice = 1
go top
do while .not. eof()
store space(20) to mstatus
do diagnose with weight, age, months, oedema, mstatus
repl status with mstatus
skip
enddo
report form general preview
case choice = 2
do summ
report form summary preview
endcase
return
```

```
procedure summ
sele b
store 0 to mage1,mage2,mage3,mage4,mage5
store 0 to dcount1[1],dcount1[2],dcount1[3],dcount1[4],dcount1[5],dcount1[6]
store 0 to dcount2[1],dcount2[2],dcount2[3],dcount2[4],dcount2[5],dcount2[6]
store 0 to dcount3[1],dcount3[2],dcount3[3],dcount3[4],dcount3[5],dcount3[6]
store 0 to dcount4[1],dcount4[2],dcount4[3],dcount4[4],dcount4[5],dcount4[6]
store 0 to dcount5[1],dcount5[2],dcount5[3],dcount5[4],dcount5[5],dcount5[6]
store 'WELL NOURISHED' to dstatus[1]
store 'KWASHIOKOR' to dstatus[2]
store 'UNDER NOURISHED' to dstatus[3]
store 'MARASMIC KWASHIOKOR' to dstatus[4]
store 'MARASMUS' to dstatus[5]
```



```

store 'INDETERMINATE' to dstatus[6]
count for age = 1 to mage1
count for age = 2 to mage2
count for age = 3 to mage3
count for age = 4 to mage4
count for age = 5 to mage5
go top
do while .not. eof()
i = 1
*? status, dstatus[1]
*wait
do while i <= 6
if age = 1 .and. status = dstatus[i] then
    dcount1[i] = dcount1[i] + 1
endif
if age = 2 .and. status = dstatus[i] then
    dcount2[i] = dcount2[i] + 1
endif
if age = 3 .and. status = dstatus[i] then
    dcount3[i] = dcount3[i] + 1
endif
if age = 4 .and. status = dstatus[i] then
    dcount4[i] = dcount4[i] + 1
endif
if age = 5 .and. status = dstatus[i] then
    dcount5[i] = dcount5[i] + 1
endif
i = i + 1
enddo
skip
enddo
sele a
ZAP
i = 1
do while i <= 6
append blank
repl desc with dstatus[i]
if mage1 > 0 then
    repl year1 with (dcount1[i]/mage1)*100
else
    repl year1 with 0
endif
if mage2 > 0 then
    repl year2 with (dcount2[i]/mage2)*100
else
    repl year2 with 0
endif
if mage3 > 0 then
    repl year3 with (dcount3[i]/mage3)*100
else
    repl year3 with 0
endif

```

```

if mage4 > 0 then
    repl year4 with (dcount4[i]/mage4)*100
else
    repl year4 with 0
endif
if mage5 > 0 then
    repl year5 with (dcount5[i]/mage5)*100
else
    repl year5 with 0
endif
i = i + 1
enddo
sele b
return

```

```

parameter wt, ag, mths, oed, stat
*ag = ag + (mths/12)
if mths <> 0 then
    mths = mths/12
endif
wtforage = 2*(ag+mths)+8
stat = 'INDETERMINATE'
If wt 0.8 *wtforage .and. wt = 1.0* wtforage. and. alltrim
(oed) = "No" then stat = "WELL NOURISHED"
endif
if wt >= 0.6*wtforage .and. wt <= 0.8*wtforage .and. alltrim(oed) = "Yes" then
    stat = 'KWASHIOKOR'
endif
if wt >= 0.6*wtforage .and. wt <= 0.8*wtforage .and. alltrim(oed) = "No" then
    stat = 'UNDER NOURISHED'
endif
if wt < 0.6*wtforage .and. alltrim(oed) = "Yes" then
    stat = 'MARASMIC KWASHIOKOR'
endif
if wt < 0.6*wtforage .and. alltrim(oed) = "No" then
    stat = 'MARASMUS'
endif
return

```

```

*-- Form:      form1 (c:\child\frmchild.scx)
*-- ParentClass: form
*-- BaseClass: form
*

```

```

DEFINE CLASS form1 AS form

```

```

    Top = 51
    Left = 110
    Height = 306
    Width = 524
    DoCreate = .T.

```

Caption = "Data Entry Form"
WindowType = 1
Name = "Form1"

ADD OBJECT lblname AS label WITH ;

AutoSize = .T., ;
FontBold = .T., ;
FontSize = 11, ;
BackStyle = 0, ;
Caption = "Child's Name :", ;
Left = 24, ;
Top = 46, ;
TabIndex = 7, ;
Name = "lblName"

ADD OBJECT label1 AS label WITH ;

AutoSize = .T., ;
FontBold = .T., ;
FontSize = 11, ;
Caption = "Child's Age :", ;
Height = 20, ;
Left = 24, ;
Top = 87, ;
Width = 90, ;
TabIndex = 9, ;
Name = "Label1"

ADD OBJECT cmdgrpnavigator AS commandgroup WITH ;

ButtonCount = 4, ;
Value = 1, ;
Height = 36, ;
Left = 189, ;
Top = 216, ;
Width = 177, ;
TabIndex = 10, ;
BackColor = RGB(192,192,192), ;
Name = "cmdgrpnavigator", ;
Command1.Top = 5, ;
Command1.Left = 4, ;
Command1.Height = 27, ;
Command1.Width = 42, ;
Command1.FontBold = .T., ;
Command1.FontSize = 12, ;
Command1.Caption = "<<", ;
Command1.Name = "cmdtop", ;
Command2.Top = 5, ;
Command2.Left = 46, ;
Command2.Height = 27, ;
Command2.Width = 42, ;


```

Command2.FontBold = .T., ;
Command2.FontSize = 12, ;
Command2.Caption = "<", ;
Command2.Name = "cmdprevious", ;
Command3.Top = 5, ;
Command3.Left = 89, ;
Command3.Height = 27, ;
Command3.Width = 42, ;
Command3.FontBold = .T., ;
Command3.FontSize = 12, ;
Command3.Caption = ">", ;
Command3.Name = "cmdnext", ;
Command4.Top = 5, ;
Command4.Left = 131, ;
Command4.Height = 27, ;
Command4.Width = 42, ;
Command4.FontBold = .T., ;
Command4.FontSize = 12, ;
Command4.Caption = ">>", ;
Command4.Name = "cmdbottom"

```

ADD OBJECT cmdgrpeditor AS commandgroup WITH ;

```

ButtonCount = 5, ;
Value = 1, ;
Height = 37, ;
Left = 161, ;
Top = 252, ;
Width = 234, ;
TabIndex = 6, ;
BackColor = RGB(192,192,192), ;
Name = "cmdgrpeditor", ;
Command1.Top = 5, ;
Command1.Left = 5, ;
Command1.Height = 27, ;
Command1.Width = 44, ;
Command1.Caption = "\<Add", ;
Command1.Name = "cmdadd", ;
Command2.Top = 5, ;
Command2.Left = 49, ;
Command2.Height = 27, ;
Command2.Width = 44, ;
Command2.Caption = "\<Save", ;
Command2.Name = "cmdsave", ;
Command3.Top = 5, ;
Command3.Left = 94, ;
Command3.Height = 27, ;
Command3.Width = 44, ;
Command3.Caption = "\<Delete", ;
Command3.Name = "cmddelete", ;
Command4.Top = 5, ;
Command4.Left = 185, ;

```

```
Command4.Height = 27, ;  
Command4.Width = 44, ;  
Command4.Caption = "\<Exit", ;  
Command4.Name = "cmdexit", ;  
Command5.Top = 5, ;  
Command5.Left = 139, ;  
Command5.Height = 27, ;  
Command5.Width = 45, ;  
Command5.Caption = "\<Modify", ;  
Command5.Name = "cmdmodify"
```

```
ADD OBJECT txtname AS textbox WITH ;  
Comment = "", ;  
ControlSource = "main.name", ;  
Height = 23, ;  
Left = 144, ;  
MaxLength = 25, ;  
TabIndex = 2, ;  
Top = 43, ;  
Width = 184, ;  
Name = "txtName"
```

```
ADD OBJECT txtweight AS textbox WITH ;  
Comment = "", ;  
ControlSource = "main.weight", ;  
Format = "99.99", ;  
Height = 23, ;  
InputMask = "99.99", ;  
Left = 144, ;  
TabIndex = 4, ;  
Top = 128, ;  
Width = 45, ;  
Name = "txtWeight"
```

```
ADD OBJECT opgoedema AS optiongroup WITH ;  
ButtonCount = 2, ;  
Comment = "", ;  
Value = 1, ;  
ControlSource = "main.oedema", ;  
Height = 24, ;  
Left = 192, ;  
Top = 168, ;  
Width = 144, ;  
TabIndex = 5, ;  
Name = "opgOedema", ;  
Option1.Caption = "Yes", ;  
Option1.Value = 1, ;  
Option1.Height = 17, ;  
Option1.Left = 6, ;
```



```

Option1.Top = 5, ;
Option1.Width = 61, ;
Option1.Name = "Option1", ;
Option2.Caption = "No", ;
Option2.Height = 17, ;
Option2.Left = 96, ;
Option2.Top = 5, ;
Option2.Width = 61, ;
Option2.Name = "Option2"

```

ADD OBJECT spnAge AS spinner WITH ;

```

Comment = "", ;
Height = 24, ;
KeyboardHighValue = 5, ;
KeyboardLowValue = 1, ;
Left = 144, ;
SpinnerHighValue = 5.00, ;
SpinnerLowValue = 1.00, ;
TabIndex = 3, ;
Top = 92, ;
Width = 47, ;
Value = 1, ;
ControlSource = "main.age", ;
Name = "spnAge"

```

ADD OBJECT label2 AS label WITH ;

```

AutoSize = .T., ;
FontBold = .T., ;
FontSize = 11, ;
Caption = "Child's Weight :", ;
Height = 20, ;
Left = 24, ;
Top = 131, ;
Width = 112, ;
TabIndex = 11, ;
Name = "Label2"

```

ADD OBJECT label3 AS label WITH ;

```

AutoSize = .T., ;
FontBold = .T., ;
FontSize = 11, ;
Caption = "Presence of Oedema :", ;
Height = 20, ;
Left = 24, ;
Top = 168, ;
Width = 159, ;
TabIndex = 12, ;
Name = "Label3"

```

```
ADD OBJECT label4 AS label WITH ;
    AutoSize = .T., ;
    FontBold = .T., ;
    FontSize = 11, ;
    BackStyle = 0, ;
    Caption = "Child's Number :", ;
    Left = 24, ;
    Top = 13, ;
    TabIndex = 8, ;
    Name = "Label4"
```

```
ADD OBJECT txtnum AS textbox WITH ;
    Comment = "", ;
    ControlSource = "main.num", ;
    Height = 23, ;
    Left = 144, ;
    MaxLength = 6, ;
    TabIndex = 1, ;
    Top = 10, ;
    Width = 55, ;
    Name = "txtNum"
```

```
ADD OBJECT spinner1 AS spinner WITH ;
    Comment = "", ;
    Height = 24, ;
    KeyboardHighValue = 5, ;
    KeyboardLowValue = 1, ;
    Left = 192, ;
    SpinnerHighValue = 5.00, ;
    SpinnerLowValue = 1.00, ;
    TabIndex = 3, ;
    Top = 92, ;
    Width = 47, ;
    Value = 1, ;
    ControlSource = "main.months", ;
    Name = "Spinner1"
```

```
ADD OBJECT label5 AS label WITH ;
    Caption = "Years", ;
    Height = 17, ;
    Left = 146, ;
    Top = 76, ;
    Width = 40, ;
    Name = "Label5"
```

```
ADD OBJECT label6 AS label WITH ;
    Caption = "Months", ;
```

```
Height = 17, ;  
Left = 194, ;  
Top = 76, ;  
Width = 40, ;  
Name = "Label6"
```

```
PROCEDURE Activate  
    thisform.setall("Readonly",.t.,"textbox")  
    thisform.cmdgrpeditor.cmdsave.enabled = .f.  
ENDPROC
```

```
PROCEDURE cmdgrpnavigator.cmdtop.Click  
    go top  
    thisform.refresh()  
ENDPROC
```

```
PROCEDURE cmdgrpnavigator.cmdprevious.Click  
    IF !BOF()  
        SKIP -1  
        IF BOF()  
            GO TOP  
        ENDIF  
    ENDIF  
    THISFORM.REFRESH()  
ENDPROC
```

```
PROCEDURE cmdgrpnavigator.cmdnext.Click  
    IF !EOF()  
        SKIP 1  
        IF EOF()  
            GO BOTTOM  
        ENDIF  
    ENDIF  
    THISFORM.REFRESH()  
ENDPROC
```

```
PROCEDURE cmdgrpnavigator.cmdbottom.Click  
    GO BOTTOM  
    THISFORM.REFRESH()  
ENDPROC
```

```
PROCEDURE cmdgrpeditor.cmdadd.Click  
    thisform.setall("Readonly",.f.,"textbox")  
    append blank  
    thisform.cmdgrpeditor.cmdsave.enabled = .T.  
    thisform.cmdgrpeditor.cmdadd.enabled = .F.
```

```

        thisform.cmdgrpeditor.cmdmodify.enabled = .F.
        thisform.refresh()
ENDPROC

```

```

PROCEDURE cmdgrpeditor.cmdsave.Click
    replace num with thisform.txtnum.value
    replace name with thisform.txtname.value
    replace age with thisform.spnage.value
    replace months with thisform.spinner1.value
    replace weight with thisform.txtweight.value
    replace oedema with thisform.opgoedema.value

```

```

    THISFORM.REFRESH()

```

```

    THISFORM.cmdgrpeditor.cmdsave.ENABLED = .F.
    THISFORM.cmdgrpeditor.cmdadd.ENABLED = .T.
    thisform.cmdgrpeditor.cmdmodify.enabled = .T.
    THISFORM.cmdgrpeditor.cmdadd.setfocus
    thisform.setall("Readonly",.t.,"textbox")

```

```

ENDPROC

```

```

PROCEDURE cmdgrpeditor.cmddelete.Click
    are = messagebox('Are you Really sure',36,'Warning')
    if are = 6
        delete
        pack
    endif
    thisform.refresh()

```

```

ENDPROC

```

```

PROCEDURE cmdgrpeditor.cmdexit.Click
    thisform.release()

```

```

ENDPROC

```

```

PROCEDURE cmdgrpeditor.cmdmodify.Click
    thisform.setall("Readonly",.f.,"textbox")
    thisform.cmdgrpeditor.cmdsave.enabled = .T.
    thisform.cmdgrpeditor.cmdmodify.enabled = .F.
    thisform.cmdgrpeditor.cmdadd.enabled = .F.
    thisform.refresh()

```

```

ENDPROC

```

```

ENDDEFINE

```

```

*

```

```

*-- EndDefine: form1

```

```

*****

```


Data Entry Form

Child's Number : 564545

Child's Name : BATURE WADA

Child's Age : Years Months
1 2

Child's Weight : 5.62

Presence of Oedema : ☒ Yes ☐ No

<< < > >>

Add Save Delete Modify Exit

Perform Diagnosis

Child's Number : 564545

Child's Name : BATURE WADA

Child's Age : Years Months
1 2

Child's Weight : 5.62

Presence of Oedema : ☒ Yes ☐ No

Diagnosis Result : MARASMIC KWASHIOKOR

Diagnose Return

Data Entry
Diagnosis
Report Analysis
Quit

General Report(Listing)
Summary Report
Quit

COMPUTATIONAL ANALYSIS OF NUTRITIONAL STATUS (UNDER FIVE CHILDREN)

A CASE STUDY OF WASAGU, KEBBI STATE

SUMMARY OF ANALYSIS

Diagnosis	1 Year	2 Years	3 Years	4 Years	5 Years
(in percentages %)					
WELL NOURISHED	0.00	40.00	0.00	33.33	25.00
KWASHIOKOR	25.00	20.00	66.67	66.67	50.00
UNDER NOURISHED	25.00	20.00	33.33	0.00	0.00
MARASMIC KWASHIOKOR	25.00	0.00	0.00	0.00	0.00
MARASMUS	25.00	0.00	0.00	0.00	0.00
INDETERMINATE	0.00	20.00	0.00	0.00	25.00

COMPUTATIONAL ANALYSIS OF NUTRITIONAL STATUS (UNDER FIVE CHILDREN)

A CASE STUDY OF WASAGU, KEBBI STATE

GENERAL RECORD LISTING

Age	Num	Name (Simulated names)	Weight	Oedema	Diagnosis
1 year(s)					
	675436	IDRIS GARUBA	5.60	No	MARASMUS
	434423	JOSHUA BELLO	6.20	No	UNDER NOURISHED
	231100	RAHILA LIMAN	6.70	Yes	KWASHIOKOR
	564545	BATURE WADA	5.62	Yes	MARASMIC KWASHIOKOR
2 year(s)					
	623633	HARUNA WAKILI	10.00	No	WELL NOURISHED
	876756	JUNIOR BALA	8.00	Yes	KWASHIOKOR
	543434	USMAN DANLADI	11.50	No	WELL NOURISHED
	432132	DANLAMI BALA	7.20	No	UNDER NOURISHED
	678908	USMAN GOJE	11.01	Yes	INDETERMINATE
3 year(s)					
	676675	LADIDI GARBA	10.40	Yes	KWASHIOKOR
	653444	DANLAMI BELLO	10.00	Yes	KWASHIOKOR
	563443	KYAUTA IDRIS	11.00	No	UNDER NOURISHED
4 year(s)					
	878954	LADI SAMBO	11.02	Yes	KWASHIOKOR
	878945	OLAKS DOGO	15.70	No	WELL NOURISHED
	532445	YAHAYA MUSA	12.30	Yes	KWASHIOKOR
5 year(s)					
	343432	BELLO IDRIS	14.60	No	WELL NOURISHED
	877843	DANLAMI BALA	12.00	Yes	KWASHIOKOR
	986577	ABDUL IBRAHIM	17.10	Yes	INDETERMINATE
	543566	JOSHUA DAUDA	13.50	Yes	KWASHIOKOR