

TEACHING STATISTICS IN DEVELOPING COUNTRIES: SOME EXPERIENCES AS A STATISTICS TEACHER IN AFRICA

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What I intend to present are various impressions based on experiences as a teacher and examiner of statistics in Ethiopia, Tanzania, and Lesotho. It is natural that I use Sweden, my home country, as a frame of reference.

1. Thinking and Reasoning with Quantitative Information

In Sweden we are indoctrinated with quantitative information long before school-going age. Certainly, we do not understand why we have a cake on our first or second birthday, but when we turn three, we begin to understand. Without formal education, we recognize the terms ONE, TWO, and MANY. Through television, Swedish children and adults assimilate information on all sorts of quantitative occurrences around them; when one decimal in the price index changes so that the state pension benefits, it is an incident worthy of comment because it affects many people. The Swedish society is permeated with quantitative thinking.

In many developing countries, the situation in this regard is different. Birthdays are not celebrated; one does not even keep track of one's age. Existence generally is not as quantified as in so-called developed countries. In Sweden, political debates make much use of quantitative arguments and reasoning – whether it applies to taxes, wages, stocks or costs of social reforms. Studying political newspaper articles from some African countries, one gets the impression that the debate is generally much more concerned with the principles than with the (numerical) facts.

In Africa I have not encountered difficulties in teaching statistical theory, but when students are asked to apply statistical methods to actual data, the numerical results are not often linked with reality. My impression is that many students lack a feeling for magnitude of numerical results. If this is true, *the teaching of statistics must be much more directed towards training students in reasoning with quantitative information.*

At a training programme, involving Tanzanian Regional Statistical Officers, conducted in Uppsala and Dar es Salaam, we were teaching *number appreciation*, using the summary volume of the latest census. The students were presented series of quantitative statements concerning the population and they had to find out whether these statements were correct or not. They were then trained in descriptive statistics by presenting their own home province in figures, taken from this volume. The approach seemed to work very well and they also learned something about their own country and the products of their own employer, the Central Bureau of Statistics, Takwimu.

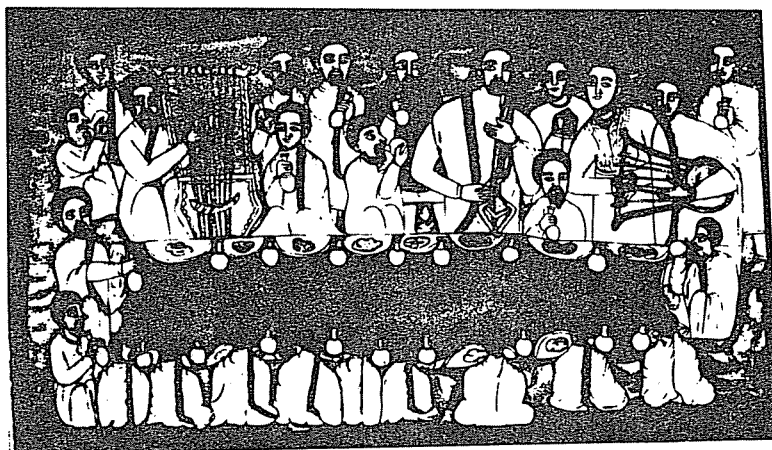
2. Looking at Pictures

Swedes are used to having simple pictures or diagrams to aid their understanding of quantitative information. We seldom pause to ponder whether the observer understands an illustration correctly. In Africa that is exactly what we ought to do.



The Ethiopian leaders, 1975, painted by a local artist. Reversed perspective and the three important persons are also much larger than the others (value perspective).

African art often depicts so-called *value perspectives*, important persons are enlarged even though they might be further away in the picture. This might be one reason why an African viewer could easily misinterpret a Western picture. To perceive three dimensions in a picture presented on a single plan requires a training which we in Sweden begin to receive long before school-going age, without being aware of it.



Ethiopian feast. No right angles. Not even the strings on the instruments appear to be straight. Reversed perspective.

Swedish communities are constructed in straight edges, right angles, level surfaces and cubic structures and even the articles around us are most unimaginatively angular. Our children are trained in handling certain structures before commencing school; the use of "lego" pieces give them an effective introduction to our all too rectangular existence. Most African children lack this training.

Working on a simple mathematical problem, it is often of value to be able to draw a neat figure in order to get a conception of a possible solution. It is then important, not only to have correct proportions in the figure, but also to maintain parallel lines and other characteristic properties. Too many of my African students seemed to have difficulties in utilizing this approach.

One day in Ethiopia, when I had to display a number of graphical regression problems on the blackboard, I received a shock when I saw how my students copied these simple drawings. It was not only the lack of rulers that made their sketches meaningless – some basic characteristics had simply not been grasped.

I think there is a general problem of *pictorial illiteracy* in Africa and even fairly advanced students can have difficulties in interpreting pictures. Teachers need help in dealing with it and there are many questions that need research. Firstly, *how to accommodate the students' lack of training in picture interpretation and drawing whilst teaching statistics?* Secondly, *are there preferable ways of displaying quantitative information to people brought up with different pictorial traditions?* All western statistics textbooks have adopted certain stereotypes in graphical representation, which need to be scrutinized from this point of view. New ideas are indeed welcome.

3. The Distance From Practical Work

Sometimes you find a man in Ethiopia with a very long nail on his little finger. This is a traditional symbol that the bearer considers himself too refined for practical work. Although he might not advance to a high salary, he might reach a *high* position in the sense that he does not have to do practical work. During my stay in Ethiopia from 1972 to 1975 I found this status consciousness regarding practical work very noticeable among the students, even among those who professed very democratic ideals.

As regards statistics, it is of course a matter of status to study statistical theory. However, concrete statistical applications might not be consistent with the attitude the student covets (and theoretical contributions give more merit than applied work in the academic competition). One studies theory only to reach a certain position later in life, not to actually apply the knowledge one has gained. Therefore, the largest challenge to statistics teachers in this context is *to show that statistics can be used and that background figures are required for practical decision making.*

One important tool for changing the students' attitude is to give them good, *real-life data to analyze.* In Ethiopia, I found it surprisingly easy to identify interesting problems and data sets, appropriate for fourth year students writing papers in applied statistics. Various Ministries, hospitals and other institutions were collecting data which had to be analyzed. I think the papers we produced there were much more meaningful than corresponding activities at my Department in Sweden. It was necessary, however, for the teacher to establish outside contacts – the students could not do it, because of their status in the eyes of the authorities.

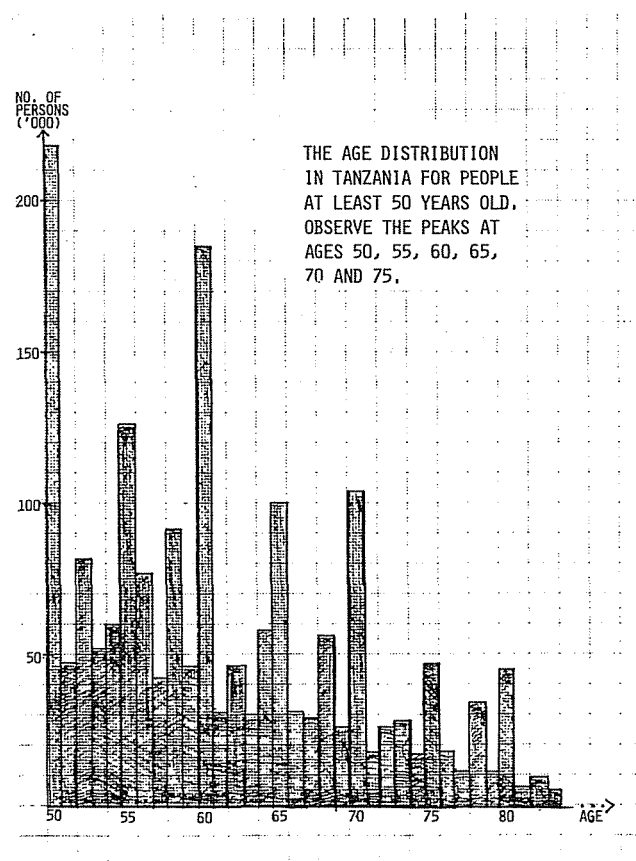
4. The Reality of Statistics in Some Developing Countries

Many African countries do not have a registration system covering the whole population and a census is very hard to execute successfully. *Migration* is also extensive. It may be only a slight exaggeration to state

that some countries, from a statistical point of view, have just reached the developmental stage described in the nativity passage ". . . / and it came to pass / . . . that all the world should be taxed." (The very first real census in Ethiopia was carried out as late as 1984.)

Because basic data are so scarce and complete surveys are too expensive and difficult to carry out, *sampling methods are of enormous importance*, in spite of the serious *frame problem*. One often has to use approaches different from those described in the typical Western textbooks. It is worth noticing that some sampling methods have been worked out specifically for, and in, developing countries because reality there does not allow for applications of earlier conventional approaches.

Collecting accurate information by putting direct questions to living persons is always hard, but this applies especially in developing countries, resulting in *observational errors*. Either people cannot answer, for instance they do not know how old they are, or they do not want to answer because they do not trust the interviewer; suspicion is rife. By tradition, in certain cultures, it is also impolite to answer a question with a *no*, although this should have been the correct reply.



From the course for Tanzanian Regional Statistical Officers. Data from Tanzanian Census, Volume IV, 1978.

5. University Teaching in Applied Statistics

In all African countries I have visited, it has surprised me how little attention is paid at university level to all the above mentioned difficulties connected with real life statistics. The course descriptions used at African universities, at least in anglo-affiliated Africa, appear to me to be to a large extent composed after English or American models. Willingness to deviate from these patterns is limited, perhaps because of an implicit belief that the graduate studies at home should be a valid basis for post-graduate studies abroad. The foreign influence is further rooted when teachers have qualifications from foreign universities where the curricula are distant from the African *statistical realities*.

An enormous number of new textbooks are currently published in elementary statistics, most of them unsuitable for teaching statistics in Africa. What is common to practically all of them are that examples consist of few, simply arranged, often foolish or trivial problems taken from applications in industrialised, so-called developed countries. There is *a great need for elementary textbooks with realistic African examples and adopted to the African students' special requirements*. To write such a book would demand a greater amount of originality than merely refurnishing matter from a dozen already written, Western textbooks.

The production of official statistics is currently under an intensive build-up in many developing countries, which is why a large portion of newly graduated university students end up within this sector. The universities should therefore take this into account and adopt course contents in such a way that an education is given which is suitable for persons who shall be handling the country's official statistics. *A collaboration between the universities and the statistics producing authorities is therefore desirable* – a collaboration which seems as difficult to achieve in Africa as in Sweden.