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Cambridge, Mass.

**HARVARD STUDIES ON MEASUREMENT OF SOCIAL AND  
ECONOMIC DEVELOPMENT IN TUNISIA**

**Report on Research:  
USAID Contract AID/csd 297 and Extension**

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## INTRODUCTION AND SUMMARY OF FINDINGS

The grant of 28 June 1963 by AID<sup>1</sup> to Harvard University helped launch an exploratory multidisciplinary study under the auspices of four divisions of Harvard University – the School of Public Health, the Center for Middle Eastern Studies, the Center for Studies in Education and Development, and the Department of Social Relations. The inquiry has focused on the measurement of health and education conditions and their relation to economic and social development in Tunisia. Total costs of the venture have been met by drawing approximately fifty per cent on AID funds and another fifty per cent on Harvard University sources. The Tunisian Government has also provided modest financial help. AID's contribution totaled \$205,822 for the period ending March 31, 1969.

There is considerable theoretical discussion in the literature and among policy makers and planners on applying allocation theory and cost-benefit analysis to assist developing countries plan their investments in such "human capital" areas as health and education. Almost no information exists, however, which has enough specificity to be of practical value to them when they make decisions on what portion of national resources, and at what time, should be allocated to health and education, or what suballocations should be made within these sectors. Decisions are now made without systematic data and with considerable ignorance of economic and social ramifications. The principal reason for lack of needed information on effect of investments in human resources is the failure, so far, to develop measures or indices which are capable of linking changes in health, educational status, and attitudes, with economic and social behavior. The studies outlined below concentrate on the development and application of better measures in these areas than are now available.

Before presenting these proposals, we should briefly describe two distinct phases of Harvard's past interest in North Africa. The first phase was that of initial planning, and the second of feasibility and pilot studies.

In 1959, the basic aim of the project was sketched by a group of senior members of the University from different disciplines, all of whom had given advice to developing nations. An additional bond was their general dissatisfaction with the type of advice that they had been able to give. Lack of a comprehensive methodology and insufficient data were among the major reasons for their attitude. These inadequacies, therefore, made it most difficult to establish meaningful measures of social and economic development.

In the hope of remedying these deficiencies, they suggested that they cooperate in establishing a project for research which would define better measures and, at the same time, be so structured as to enable faculty members of different disciplines to work in one area over an extended period of time. All had realized at first hand the limitations of a single disciplinary study for achieving a comprehensive understanding of a nation's development. At the same time, they also realized the difficulty of locating those few rare individuals in the social and medical sciences who are professionally qualified in more than one discipline. The members of what had then become a committee suggested that the proposed project be of a multidisciplinary nature and involve faculty members who pursued research which would benefit from interaction and discussion with members of other disciplines.<sup>2</sup>

In order to locate a suitable area for study and test the feasibility of their proposal, the Committee began the second phase (1963-1966) of the project. First, in 1963-64, Professor McClelland, Chairman, Department of Social Relations at Harvard, with an assistant and extensive consultation with

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1. Contract Number HU/AIDcsd 297.

2. The six articles edited by Robert E. Asher in *Development of the Emerging Countries: An Agenda for Research*, Brookings, 1962, each emphasize the need for long-term multidisciplinary research.

government and university officials, examined the Middle East, East Africa, and North Africa as possible locations for such a project. Among the numerous countries considered, it appeared to them that Tunisia was the best location for longitudinal multidisciplinary research of this type. In the past, members of the Harvard Project had worked in countries, especially elsewhere in the Arab world, where suspicion or lack of support sapped the energies of research and disrupted research programs. The initial experience in Tunisia during this exploratory period indicated that here the situation was quite different. The country was relatively stable and the Tunisians were both receptive and cooperative. It is not a coincidence that in 1966 AID identified Tunisia as one of the nine underdeveloped countries best fitted for satisfying criteria for self-help.

The next task was to select a geographical area for pilot studies. With the active assistance of the Tunisians, a project team investigated a series of possible sites and chose the community of Djebel Djelloud, a poor settlement on the outskirts of Tunis. This is a Tunisian version of the type of slum which has appeared throughout the developing world as a result of urban migration.

Djebel Djelloud is also a community selected by the Tunisian Government as a pilot area, receiving special inputs from such programs as WHO and Food for Peace. This situation of an impoverished population with low standards of health and education being exposed to new health programs and schools provides an ideal opportunity for measuring change. Moreover, this site allowed later study of the rural area from which most of the population came, as well as more privileged urban sections which would produce valuable comparative data. Results were to include insights into the causes and effects of urban migration, a problem which is of great concern to the government.

Early in the project, the Committee decided not to plan on having a single team in the field over a period of years which would work within a set research model. The resources of the University and the time limitations of qualified personnel made such a scheme problematic. Instead, it proposed to have several research groups working in close association on different aspects of the common problem.

It should be stressed that this approach is both interdisciplinary and multidisciplinary. Each Research group deals with the problem primarily from the standpoint of its own discipline, but is interdisciplinary in that it draws on methodology and data from other disciplines. The consultation and collaboration between the separate groups makes the total undertaking a multidisciplinary one. The development of a complementary body of research is facilitated by a number of factors: the researchers have a common base of operations in the University and in the field, they have a long-term involvement that keeps them in contact in one place or the other, and they focus on the same research site.

Between 1964 and 1966, three different pilot studies were carried out in Djebel Djelloud to test the feasibility of measuring change and development in this context.

First, a psychologist and a physician (Drs. Goethals and Rolde) established a working relationship with Tunisian Ministries and the University of Tunis, selected the research site, and began a profile study of the community. This study includes interviews with families which are or are not having contact with different types of health programs. It is concerned with identifying the variables associated with utilization of health services. It also attempts to determine why the inhabitants came to Djebel Djelloud, the nature of their lives there (diet, disease incidence, education, family budgets, aspirations), and how they have adapted to urban life.

Second, a Middle East specialist-educationalist (Dr. Kinsey) extended the cooperative ties with Government and University and began a study of the returns on educational programs.<sup>3</sup> Tunisian educational policy has attempted to combine a rapid spread of primary education among the masses with a limited selection of pupils for specialized or general education on the post-primary level. The study seeks to identify the comparative influence of these different levels and types of education on the lives of individuals after they drop out or otherwise leave school. Influence, or returns, are measured in terms of social and economic roles, tendency toward migration attitudes, and level of residual literacy. Potential non-educational influences are also considered. To this end, community surveys and preliminary case studies were carried out in Djebel Djelloud. The procedure was subsequently repeated in the rural area from which the inhabitants came and more recently in an urban area of higher socio-economic status.

Third, a team of physicians, a psychologist and a statistician (Dr. H. Boutourline-Young and associates), inaugurated a study of the effects of environment on physical and psychological development. This development represented an involvement of the Harvard-Florence Project<sup>4</sup> in the Tunisian study. For ten years, this group had been studying the effects of environment on young Italians with similar ancestors who were growing up in Boston, Rome, and Palermo. Drawing on this inquiry, the group developed a set of measurements to examine environmental effects in Tunisia on body size and composition, physical function, resistance to disease, and psychological development. Methods of assessment of specific environmental variables have also been devised. Children and their families were studied in Djebel Djelloud and then compared with more privileged counterparts in Tunis.

Fourth, an economist specializing in both agriculture and education (Dr. John L. Simmons) began two studies at the end of 1966. Improving institutional support to agriculture has been a major Tunisian policy for increasing productivity per hectare. The first study examines the role of credit institutions and schooling as well as the usual economic and physical inputs on productivity. Hypotheses are tested by regression models with data from a sample of small farms which have relatively homogeneous bio-climatic conditions and cropping patterns. The second study examines the efficiency of investment in rural primary education, and its role in producing the type of future farmers the nation will require. Most of the agricultural development literature stresses the need for functionally literate farm decision makers to promote sustained increases in productivity. Most Tunisian rural school boys do not go beyond primary and become farmers. To what extent are they functionally literate: (1) when they finish primary school, and (2) five to ten years later? The study examines the economic implications of the findings.

The results of these pilot studies are currently in different stages of tabulation and analysis, and several monographs will discuss methodology and findings in detail. In anticipation of these, tentative results may be listed as follows:

First, the Djebel Djelloud profile study conducted by Drs. Goethals and Rolde (described in Section B) reached several conclusions: It pointed to the persistence of beliefs in folk medicine in Tunisia, despite substantial efforts by the Tunisian government to introduce modern medical practices and facilities; it provided further statistical evidence in support of the well-known conclusion that there is widespread unemployment in Tunisia; it provides evidence of the strength of the family in Tunisia and its role in resisting societal disintegration caused by rapid economic and social change over the past two decades; it suggested that the educated Tunisian woman of the future

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3. This research has been almost entirely supported by funds from Harvard University.

4. This research unit has been given financial support by the Grant Foundation of New York. It is also supported by General Research Support Funds from the Harvard School of Public Health.

may be much less willing than were her mother and grandmother to hold the Tunisian family together, and hence provide a stabilizing element in national growth in Tunisia.

Second, the study by Professor David Kinsey (described in Section A) has reached the following tentative conclusions: the number of students who had previously attended Koranic schools (kuttabs) is considerably higher than generally supposed and those having attended a kuttab were more likely to reach the end of primary school than those who had not; youths from a higher income urban area are more likely to enter secondary school, and much more likely to achieve 10 or more years of education than those from a poor urban area or a provincial community; the major product of the investment in expanded education is youths who leave school with 5-9 years of modern education; primary school leavers are "push-outs" more than "drop-outs", and 5-6 years of primary education is necessary for observable social returns; early secondary drop-outs are more likely than primary leavers to migrate to the city and less likely to adapt their aspirations and accept modest, non-white collar jobs in the modern sector; in the short run there is no positive correlation between the amount of education received by primary and early secondary leavers and annual income; a massive problem is beginning to face the country in the form of partially educated and unemployed primary or early secondary leavers, and unless more effective schemes of supplementary education and socio-economic involvement are developed there is an increasing risk of such youths producing social unrest.

On the basis of this study Professor Kinsey suggests that several policy priorities be considered. Within the system of government academic education, it would seem that attention should be focused on getting students to complete an educational cycle rather than on expanding entries on the primary and secondary levels. Special training and social programs should increasingly concentrate on the leavers with 5-9 years of education; vocational training at work sites would probably be more effective than the present form of separate apprentice schools, and imaginative social programs are needed for this group since most current programs only involve students. And serious consideration should be given to low-cost methods of promoting, and improving the quality of private educational efforts on the post-primary, and perhaps pre-primary, levels.

Third, the health enquiries conducted by Dr. Harben Boutourline-Young and associates (see Section C) have reached the following tentative conclusions: such research is possible in Tunisia and, in contrast to many developing nations, the Tunisian government offers great assistance and cooperation; there are widespread differences in health levels, incidence of disease, morbidity and mortality rates between higher and lower income citizens in Tunisia; there may be differences in levels of psychological development between such income groups; there is widespread malnutrition among children in lower income levels in Tunisia.

The recommendations of Dr. Boutourline-Young and associates are these: (1) that more definitive studies be undertaken, using the data and experience accumulated in the past four years as a base; (2) that young Tunisians and Americans be trained in a course of these studies; and (3) that lysine enrichment of flour in selected communities in Tunisia be undertaken, and the results of this be compared to communities where such diet supplements are not available.

Fourth, the observations of Dr. John L. Simmons suggest that the costs of producing literate citizens may be much higher than supposed; that primary education has little, if any, impact on the lifetime earnings of primary graduates as compared to those who had little or no attendance; and that a redistribution of present education resources could increase educational quality. Agricultural observations suggest that the lack of marketing and production incentives to producers and the minimum use of macro planning tools – such as domestic pricing and export policies – are major reasons for low productivity in citrus farming.

The Project has had considerable impact on Harvard itself, as reflected in courses now offered by various departments. One of the Project's original sponsors was Professor Adam Curle of the Harvard School of Education. Aside from Curle's interest, there had been no tradition of teaching or research on the Middle East or North Africa at the school. In 1964, the Project appointed Dr. David Kinsey as field director in Tunisia. An historian, Arabist and specialist in education in developing countries, Dr. Kinsey remained in Tunisia until 1966. At this time the Harvard School of Education created a new assistant professor teaching post for Dr. Kinsey – giving him responsibility for courses and research on problems of education in North Africa and the Middle East. Last year one of his courses was a seminar on Education in North Africa for Harvard and Radcliffe freshmen. The education faculty sees its commitment as a continuing one – including future field research by graduate students in educational planning or related specialities and an increasing involvement of other faculty members.

A similar impact has been registered on the Harvard School of Public Health. Through the efforts of Dean John Snyder, the Harvard-Florence Project resources have been in large part committed to research in Tunisia. The results of the several enquiries by the team (of MD's, a statistician and a psychologist) will be largely research articles and monographs. Moreover, through his field work, Robert Younes, M.D., has embarked on a teaching-research career in public health based on North African material. One Radcliffe student has spent a summer in Florence on the Project. Ultimately, it is hoped, the Project's findings and staff will be utilized in teaching at the School of Public Health. The proposed entry of the Department of Nutrition into a five-year study of lysine fortification of wheat is a further commitment by the School of Public Health in North Africa.

Further impact has come from a marked strengthening, and expansion, of work at Harvard on the Economics of North Africa. Professor A.J. Meyer's undergraduate courses and seminars in the Economics Department have been expanded to include North Africa; a graduate student in economics, Mr. Robert Walker, is now resident in Tunis, studying Arabic, and investigating Ph.D. thesis topics associated with the Tunisian economy; Dr. John Simmons (Director of the Project in Tunisia for the past two years) has now returned to Cambridge as Research Fellow in the Center for Middle Eastern Studies and associated with both the Center for Studies in Education and Development and the Project for Quantitative Research in Economic Development. A teaching post at Harvard is a strong possibility for Dr. Simmons, once he completes the write-up of his Tunisian research. Professor Samuel Bowles, of the Harvard Department of Economics, is spending several months this year in Tunisia – analyzing the economics of adult education, using Project data and facilities. Two undergraduates and two graduates in the Economics Department have used Dr. Simmons' data for papers, and one did summer field work.

The Harvard Department of Social Relations is also taking on a North African look, Professor McClelland's assistant, Malcolm Slavin, has already made two trips to Tunisia and will be using material collected in Tunisia about motivation in his graduate thesis. As mentioned before, Dr. Goethals has involved several undergraduates in analyzing his Tunisian data.

The Project has also contributed to the build-up of Harvard's library resources. Dr. Labib Zuwiyya has made two "collection" tours of North Africa on behalf of the Widener Library. On each of these he used the Project offices as headquarters and its staff for introductions. From these tours (and Professor Meyer's frequent visits) has come a greatly augmented flow of government documents, newspapers, and microfilmed archival material (from Tunis, Morocco, Algeria and Libya) to the Harvard Library. Several Private libraries (including Maitre Goulven's 4000 volume collection on the Portuguese in North Africa, acquired in Casablanca) have been bought intact.

While the Harvard-Tunisia Project has drawn Harvard University into North Africa, it has also led to a new involvement on the part of Princeton University. It is hoped that the Harvard Project might eventually become a joint Harvard-Princeton Project.

In this context, Professor Carl Brown, who is now at Princeton, has just returned from a year in Tunisia, where he was in close contact with the Harvard Project. One Princeton student, Russell Stone, is already using the Project's facilities while carrying on doctoral research in Sociology. Mr. Stone's expenses are being met from Princeton sources. Equally important, Professor Stephen Klineberg (formerly a faculty member in the Department of Social Relations at Harvard and now Assistant Professor of Social Psychology at Princeton) has agreed to serve as Field Director of the Project during the academic year 1969-1970 – while pursuing research in attitudinal development and socialization under the impact of modernization in Tunisia. Professor Klineberg's salary will be paid by Princeton.

The Project has several plans for the future. In addition to the actual and prospective involvement of Princeton, there is one new, separately funded study being undertaken by Harvard researchers in Tunisia, and a second is under consideration.

Since baseline data and trained personnel are available in Tunisia, the Project has been asked to consider undertaking the first test, in an underdeveloped country, of the effectiveness of lysine fortified wheat. The latter, a low cost (e.g., less than 1/4 cents per loaf) means of providing broad-spectrum dietary supplement to wheat-eating peoples in food-deficit areas, would undergo testing in Tunisia, beginning in early 1969. The Project would be financed by AID, the U.S. Department of Agriculture, and the Tunisian Government. The Research will be directed by Dr. Fredrick Stare (Chairman of the Department of Nutrition, Harvard School of Public Health) and the field work will be conducted by Dr. Samir Miladi and Dr. Richard Brown, assisted by Dr. H.B. Young and associates, using child development data accumulated by the Project over the past four years.

A second project just under way is directed by Dr. John Simmons. Financed by UNESCO and the Government of Tunisia, Dr. Simmons has been asked to use the techniques and information Harvard has already acquired to evaluate the nation's adult education program.

Further studies building on existing social and educational baseline data are under consideration. However, top priority is currently being given to finding funds to assure the continuation of the field research center that has been built up during recent years and has played such a central role in promoting faculty and student involvement in North Africa.

Detailed descriptions of the Project's several ventures follow, in Sections A, B, C and D.

The Project acknowledges with gratitude the considerable support rendered it, in many ways by the following: H.E.M. Ahmed Ben Salah, Minister of Planning, Government of Tunisia; the Honorable Francis Russell, American Ambassador to Tunisia; Mr. Brahim Hayder, Assistant Director of the Destourian Party; and Mr. Leonard Kornfeld of the USAID Mission to Tunisia.

A.J. Meyer  
Project Director

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2. **John Simmons, A.B., Dr.Phil., Research Fellow in the Center for Middle Eastern Studies, Research Associate, Center for Studies in Education and Development, and Associate for the Quantitative Project for Research in Economic Development, Harvard University.**
3. **George W. Goethals, A.B., Ed.M., Ed.D., Lecturer on Social Relations, Associate Chairman, Department of Social Relations, Assistant Dean of Harvard College, Harvard University.**
4. **Harben J. Bouterline-Young, M.B.,B.S., D.C.H., M.D., Research Associate in the Department of Nutrition, Harvard School of Public Health, and Director of the Harvard-Florence Project.**
5. **Stephen Klineberg, A.B., M.A., Ph.D., Assistant Professor of Sociology, Princeton University. Dr. Klineberg will serve as Project Director in Tunisia during the academic year 1969-70.**



**Section A**

**Socio-Economic Implications of  
Mass Education in Tunisia**

**David C. Kinsey**

**Internal Report 30  
Harvard University  
Research Project in North Africa  
March 1969**

## SOCIO-ECONOMIC IMPLICATIONS OF MASS EDUCATION IN TUNISIA

David C. Kinsey<sup>1</sup>

This is a summary report on a study of the effects of different levels of schooling on the socio-economic roles or performance of youths after they have left school. The focus is on the causes and consequences of school leaving at various points during primary or early secondary school. The study provides an introduction to the assessment of returns of investments in mass education as well as a case study of the relationship between education and social change. The baseline research was carried out in three representative Tunisian communities in 1965-66. A follow-up study was done in late 1968. The first phase of the study was financed by Harvard University and two foundations; the second phase was supported by AID.

### I. Introduction

Newly independent countries in the Third World have characteristically devoted a considerable portion of their scarce financial resources and stock of educated manpower to the cause of achieving universal primary education. This has usually meant that after a brief period of years the majority of the primary school enrollment consists of children from families that have had no previous education. This broadens the base from which the most able individuals can be selected for further education and for meeting the needs for middle and higher level cadres. However, it is also assumed that partial or terminal primary education alone will in itself bring returns – such as more modern, literate individuals who will be more socially active and economically productive in the modern sector.

Tunisia is a case in point. In the decade following independence (1956-66) the percentage of primary aged children that were enrolled in school rose from roughly 30% to 70%. But in this period only about 50% of the pupils entering the first grade ever reached the sixth or final year of primary school; only 20% or so ever reached the first year of secondary school; and well less than 10% ever entered the final three years of secondary school. In other words, quantitatively the main product of the substantial investment in education has been the more than 90% of educated young people who leave school with from 1-9 years of formal schooling.

If one is to assess the returns on the investment in education it is necessary to consider this major product of primary and early secondary school leavers. Specifically, one must look at the nature and quality of their activities, skills and attitudes after they leave school, and consider how these differ according to the level of education attained or in contrast to those with no education.

Such a study speaks to a number of educational policy issues that confront a nation caught between an expanding population and increasing demands from non-educational sectors for development funds. For instance, 1) what educational levels must be reached by students for there to be observable socio-economic returns and where should efforts to avoid school leaving be concentrated; 2) are there differential effects of educational attainment in rural and urban areas that might suggest distinctions in emphasis according to milieu; 3) what are the important groups of school leavers who are unemployed, uninvolved, and neglected, and for whom supplementary training or social programs might be developed?

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1. Dr. Kinsey is Assistant Professor of Education and Middle Eastern Studies at Harvard University and Research Associate at the Center for Studies in Education and Development. During the period of this research he also served as Field Director for the Harvard Project and was Research Associate at the Center for Middle Eastern Studies.

There have been very few previous studies that attempt to view the implications of different levels of education from this post-school perspective. For the most part, research in developing areas has been concerned with attitudes or skills of students while in school, or with elite formation among the "fortunate few" reaching higher levels before leaving. Occasional manpower surveys give a rough indication of the relationship between education attainment and employment among the masses;<sup>2</sup> Callaway has looked specifically at employment and unemployment among primary leavers<sup>3</sup> and McQueen has studied psychological changes among youths who have left after primary or early secondary schooling.<sup>4</sup> But these are only preliminary studies. There is still a shortage of descriptive material, and a lack of controls (cases of individuals with no education or systematic consideration on non-educational variables) in evaluating possible returns on education – all of which are needed for the development of theory or measures that are useful for policy decisions.

Given this general shortage of knowledge and foundations for theory, a number of working principles were adopted to guide the present study. The inquiry should be descriptive and exploratory in nature, aiming to identify tentative relationships and formulate hypotheses. In order to explain relevant variables as sensitively as possible, the focus should be on a few representative settings rather than a national survey. And because of the relatively high degree of difficulty in accurately measuring changes in the areas of psychology and community relations among such a population, the initial concentration should be on social and economic returns among individuals and their families.

## II Method

In Tunisia as elsewhere, the previously uneducated majority of the population typically lives in three types of community settings: rural villages or towns, quarters of poor migrants to urban areas, and sections of cities where they are intermingled with more well-to-do inhabitants. Consequently the communities of Tadjerouine, Djebel Djelloud and La Goulette were selected as examples of these three types respectively. In addition, Tadjerouine represents the general rural area from which many of the traditionalist inhabitants of Djebel Djelloud originally came, and La Goulette is a setting where modernizing urban influences are more marked. These communities offer the advantage of interrelationship with other Harvard studies in that Drs. Goethals and Rolde, as well as Dr. Young and associates also worked in the second, and Dr. Simmons subsequently worked in the first and third.

In each community three types of data were gathered: a) Descriptive materials on the context of the community, educational inputs and socio-economic opportunities; b) A survey of 768 adolescents, giving data on their families, their educational careers, and their post-school activities; and c) An intensive baseline study of 150 male 6th graders in 1965, including their families, school and examination records, in preparation for a follow-up five or six years later. The following is primarily related to the second of these studies.

Since census data on the adolescents in these communities was not available, it was necessary to devise a new method for drawing a representative sample. With the help of aerial photographs, strips were drawn through each community in such a way that the different types of housing and

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2. U.A.R., Research Project on Employment and Unemployment Among the Educated (Cairo, Institute of National Planning, 1963).

3. A. Callaway, "Unemployment Among African School Leavers", the Journal of Modern African Studies I (1963), No. 1, pp. 351-71.

4. A. McQueen, "Aspirations and Problems of Nigerian School Leavers", Inter-African Labor Institute Bulletin XII, No. 1 (Feb. 1965), pp. 35-51.

quarters in the community were proportionately represented within each strip. Then each house within the strips was visited and, if the household included children aged 14-19 years old, questionnaires were administered for the families and for each adolescent. A subsequent comparison of questionnaire results with other hard data available for the communities, as well as local impressions, indicated that the cases selected by this method were adequately representative.

This basic survey, carried out in 1966, provided a family background education-activity profile of the age group as a whole, and indicated relationships between background characteristics and educational attainment. More importantly, it identified the adolescents who were out of school, determined the nature (or absence) of their socio-economic activities since leaving school, and allowed one to relate this to the level of education attained as well as selected non-educational variables. The fact that the sample included adolescents who had never entered school permitted an additional control.

The follow-up inquiry of late 1968 dealt with those subjects who were out of Ministry of Education schools in 1966 (N=394). There were two dimensions to this second phase of the study. (1) A follow-up questionnaire on the subject's work experience, social participation, further training, and migration to the city or abroad since leaving school. This not only provided further precision on the earlier data that was seen to be desirable during the analysis of the first questionnaires; it also gave two more years for the subject to find, or not find, work, further training or whatever. This is important since in 1966 some of the subjects were young or recently out of school, and thus there was not yet adequate opportunity for their post-school patterns to begin to emerge. (2) Intensive two hour interviews with 25 subjects, including cases who had no education, as well as 3-4 years primary, 6 years primary and 2-3 years secondary education before leaving school. The purpose of the interviews, which were partially open-ended, was to check indications coming out of the earlier survey, explore attitudes and variables not previously considered, but possibly relevant to educational attainment and post-school roles, and generate new or alternative hypotheses.

The cooperation of the Tunisian Ministry of Education and the Centre d'Etudes et de Recherches Economiques et Sociales of the University of Tunis was an important factor in this study. Two Tunisian professors assisted in the design of the study; five Tunisian sociology students, two Peace Corps volunteers and a Harvard graduate student were trained in field research methods and were instrumental in data collection.

### III. Findings

While the baseline survey questionnaires have been analyzed, the results of the recent follow-up study are currently being processed and will shortly be presented in a descriptive work.<sup>5</sup> This will be followed by a larger monograph that incorporates and analysis of all materials.<sup>6</sup> The following will give some preliminary indications of these findings.

#### (A) Descriptive Findings.

##### (1) Community Context.

Data on the three communities have been presented in a series of reports by project participants and will not be summarized here.<sup>7</sup>

5. David C. Kinsey, *School Leavers in Tunisian Communities: Profile of a Problem*. (French version being submitted for publication as a Cahier du C.E.R.E.S, Universite de Tunis)

6. David C. Kinsey, *Mass Education and Socio-economic Change in Tunisia*, (forthcoming).

7. See James Allman, *Background Information on La Goulette, a Tunis Suburb*, Internal Report 8, Harvard Project in North Africa, 1967; Edward J. Rolde, *A Community Model Approach to a Study of Djebel Djelloud, a Tunis Suburb (1966)*; Mohamed Ayad, *Observations et Impressions Sur Tadjerouine*, Internal Report 17, Harvard Project in North Africa, 1968, as well as Tadjerouine reports by J. Allman, A. Hammons and C. Steere.

(2) Educational Attainment of Adolescents.

A significant number of adolescents had attained a kuttab, or elementary Quranic school, in their early childhood (almost 50% in Djebel Djelloud, over 35% in Tajerouine and La Goulette). This finding contradicts the common assumption that kuttabs had practically disappeared by the time of Independence and the implication that past exposure to traditionalist education among adolescents is rare.<sup>8</sup>

A high proportion of the adolescents has been enrolled in a modern primary school run by the government (95% of the boys, 79% of the girls) – a figure that is above the national average due to the non-representation of small rural villages in the sample. However, 70% had attained no more than a primary education (24% had 0-4 years of education; 46%, 5-6 years; 23%, 7-9 years; 7%, more than 9 years). The majority of the adolescents are late primary or early secondary leavers.

The vast majority of adolescents who reach “senior high school”, or complete more than 9 years of education, are from the higher income and more modern urban area (where 16% of the adolescents reach this level in contrast to 2% in the other two communities). A somewhat higher proportion in the rural town reach late primary or early secondary than do so in the poor urban quarter.

(3) Activities of Those Leaving Ministry of Education Schools.

Further training. The main group that enrolls in vocational, special or private training programs are male school leavers who have already completed from 6-7 years of regular schooling. (One-third of the male 6th year primary leavers and early secondary leavers enter such institutional programs; only 1/10th of the male 5th year primary leavers and virtually none of the earlier leavers do so). It is rare for a female school leaver with 5 or more years of education to enter such programs; however, a number of those with less education receive instruction in such skills as embroidery, in courses run by the Womens' League (UNFT). Further training received by adolescents is generally of 1-2 years duration.

Economic activities. The likelihood of an out-of-school adolescent doing some work increases with age and time out of school, but not with the amount of education received. (One-fourth of the out-of-school adolescents had found remunerative work at some point, but over half of these jobs were for less than \$20 per month). The work done is generally quite irregular, and the relatively few regular jobs tend to be held by those with less education. (Two-thirds of the jobs are for one month or less per year; 1/3 are for 4-12 months per year, and more than half of these are held by girls with less than 5 years of education. There were no cases in the sample of early secondary leavers with jobs lasting more than 4 months per year). With few exceptions, working youths with less than 5 years of education were in the unskilled or day laborer category, while those with 5-9 years of education were in semi-skilled categories, often as apprentices. In general, then, a higher amount of education is positively related to occupational level, is not related to the probability of finding a job in the short run or annual income, and is negatively related, at least in the short run, to obtaining a regular job.

Social activities. All of the out-of-school males who indicated some participation in social organizations had 5, and usually 6-9 years of education. The main forms of participation were scouts and sports teams (about 1/3 of the males with this level of education participated in these groups). The participation started while the boys were in school, and dropped sharply after they left

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8. For a report on these findings, with an indication of the present persistence of traditional or semi-modernized schools in some communities and related policy issues, see David C. Kinsey "Education in the Shadow of the State: Private Elementary Schools in Tunisia," *Africa Today*, XIV, No. 2 (1967).

school. The few members of the political party (PSD) were primarily males who had received some post-primary education. For the most part, out-of-school females who indicated participation in social groups had received less than 5 years of education and were involved in Womens' League programs geared to this category of out-of-school girls.

**(B) Antecedents of School Leaving at Different Levels**

The findings confirm the general view that there is a direct relationship between parental education and socio-economic status on the one hand and the level of education attained by the child before leaving school on the other. However, there is no observable relation between the parent's participation in social groups and the child's level of education attained before leaving. School leaving does not necessarily occur earlier because a community is in a rural rather than urban area per se; for instance, in our provincial town the level of schooling attained before leaving was somewhat higher than in the poor urban quarter. Other factors, such as the extent of competition for available places in schools, the degree of residential stability of families and their socio-economic level would seem to be more important than the mere location of the community.

There is reason to question the assumption that attendance in a kuttab is either detrimental to modern school achievement, due to an exposure to traditionalist influences or the practice of rote memorization, or that it provides an advantage only during the first year of primary school. Results of this study showed that those who attended a kuttab were also more likely to enter primary school, and those entering primary school were more likely to reach the 5th or 6th year if they had previously attended a kuttab. Whether this is due to the experience of pre-school education itself or is due to characteristics of a family that elected to send the child to such a school is not clear. It does, however, suggest that the relationship between pre-school education of a traditionalist type and later school attainment is more of an open question than is sometimes assumed.

There is also reason to question the belief that dropping out of primary school is often due to the volition of the student or his family, the expense of schooling, the desire for additional income or work assistance, or the influence of friends and outside attractions. In this sample those leaving school with an incomplete or complete primary education were basically push-outs – i.e., they were excluded by the school for being overaged (due to having started late or repeated years too frequently) or for not qualifying for admission into the next level. In the case of the provincial town, the early secondary leavers were largely boys who left due to scholarship or personal adjustment problems rather than a shortage of funds.

**(C) Consequences of School Leaving at Different Levels.**

**3-4 year Primary Leavers.** Three or four years of primary education does not appear to be enough to make significant impact on social and economic patterns. When compared with an uneducated contemporary of comparable background, the mid-primary leaver is no more likely to participate in social organizations, or get other compensatory training; he is no more likely to find work or take a higher level of job. Among girls in the sample, the mid-primary leaver is even less likely to take a regular job outside the home than is her uneducated counterpart, several of whom became maids. The mid-primary leaver may show minor differences in other areas, such as manner of dress and posture before authorities, but the level of school skills, such as reading, is so low as to make no practical difference.

**6 Year Primary Leavers.** The differences between those leaving after a complete primary education and those leaving in mid-course are marked enough to suggest that the clearest social "payoff" on primary education occurs on reaching the last year (or in some cases the next to last year). For instance, this level of education appears to be the minimum necessary for a boy to become involved in modern social organizations and to have the opportunity for further training in vocational or other educational programs. Those 6 year leavers who work are more apt to be in jobs that involve or develop some skills, but in the short run at least the remuneration and regularity of such jobs is not significantly greater than those held by adolescents with less education. It is at this level that educational attainment may allow a girl to marry "better" or more clearly

orients a boy away from manual work in agriculture. The rudiments of spoken French are more apparent, perhaps in some cases giving slight advantages in regard to the level of employment opportunity. However, it is questionable if many obtain a significant level of literacy in Arabic or French, let alone are able to sustain it, with this level of education alone.<sup>9</sup>

Early Secondary Leavers. The overall differences between the early secondary leavers and an adolescent who left after completing primary school are greater than between the latter and the mid-primary leavers. The differences, however, occur more in the areas of attitudes or aspirations, potential level of work, level of literacy and tendencies to move to the city, than in actual income earned in the short run or degree of participation in social organizations.

It is a common belief that primary education has the effect of raising aspirations towards some type of white-collar work, and that given the shortage of posts in this sector the gap between aspiration and realistic job opportunities inhibits the school leaver from taking lower level jobs that are available. The findings of this study suggest that, at least in conditions where primary education has become more general and there is high selectivity for post-primary education, this assumption has to be qualified. While it is true that students still in the 6th year of primary school often have high aspirations (professions, administration) once they are out of school they appear to adjust their aspirations quickly to more modest types of jobs in the modern sector that are technically realistic (such as mechanic). The persistence of white collar aspirations and the aspiration-reality gap, appears to be more marked among early secondary leavers. The fact of being admitted into secondary level schools results in a firming up of higher aspirations that are adjusted more slowly after leaving school. This is reflected in the finding that early secondary leavers are less likely to find or take regular work than are 6th primary leavers.

In the rural area early secondary leavers, who have already left the community for their post-primary schooling, are more likely to move to the city to look for work than are the 6th primary leavers. Migration appears to be more a factor of work opportunities on the level expected than of a preference for the city over the provincial community per se; the early secondary leaver generally prefers a reasonable paying job in the city. When an early secondary leaver does return to the provincial town, it seems that his or her closest friendship ties are often with others having a comparable educational level even though they are from different extended families or tribal groups; for those with 6 years of education or less, the primary ties still tend to be with relatives.

#### IV. Implications

A careful statement of the policy implications suggested by this study must await the analysis of the recent follow-up materials. However, a few preliminary observations may be made.

At various times the government has attempted, often with limited results, to close traditionalist pre-primary schools in the private sector on the grounds of their being "unhealthy", symbols of the past or detrimental to modern school success. While it would seem that the rote methods used in such schools might produce a cognitive set that would make it more difficult to adapt to newer methods later, we have seen that in the past, pupils from these schools were more likely to reach the end of primary schools (where in fact rote methods have usually been used as well). It is not likely that the government will devote funds for a significant expansion of its relatively costly, modern kindergartens. But it is likely that, as the demand for admission into primary school increasingly exceeds the number of places available, more parents in several quarters will seek to enroll their children in small private schools or courses. While some of the private schools may be

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9. Dr. Simmons' study of literacy levels uses this sample in Tadjerouine and La Goulette, and will provide clarification on this issue.

kuttabs taught by traditionalist Quranic teachers, a greater number will likely be more modern classes taught by young men with some government education. By the provision of small incentive grants the government could encourage school leavers who have attained a higher level of modern education to run such courses; a development that would provide employment for uninvolved school leavers as well as augment the modern content and quality of instruction given in private schools in this level.

In view of the finding that several important social returns on primary schooling occur only when the pupil reaches the last year of the primary cycle, it would seem that more priority should be given to efforts in getting those admitted to primary school to finish than further to expand admissions at the cost of crowding and a probable increase of mid-primary leaving.

While the findings offer some support for the maintenance of limited admission to government secondary schools, there is a massive problem of an increasing number of 5th and 6th primary leavers, in mid-course to the modern sector and with still weak foundations of literacy. These, and to some extent the early secondary leavers, have in the past tended to be the forgotten people. There is some incidence of delinquency among this group; but so far the support of the extended family and occasional job opportunities has provided some cushion and as yet they do not qualify as "social dynamite". But future waves of leavers at this level will be going into the street and an increasing strain, if not turbulence seems probable. Without a few years of additional education it is questionable how much of their literacy will be maintained. Very few are involved in social organizations or programs, almost all of which are presently geared to students in school. Some boys are taken into pre-apprenticeship centers, and even though the employment rate of graduates is discouraging, there is pressure to increase these programs to two years, primarily to keep the students occupied.

Rather than reproducing or increasing such separate vocational centers, which are expensive, it seems that other forms of post-primary training should be more earnestly explored. Vocational training programs at places of work, with government help with personnel and incentives for employers, might well be less costly and more effective. For general education, encouragement rather than discouragement could be given for the further development of privately run post-primary schools where what was learned in primary school could be consolidated. Small government grants to encourage the employment of more qualified teachers in such schools should, it would seem, be considered before giving similar incentives for private pre-primary schools. Finally, attention could be given to a more imaginative development of social programs that could interest and attract the unemployed leavers. Here, as with vocational and private educational programs, the focus should be on male school leavers with from 5-9 years of government education.

**Section B**

**A Profile of a Slum Community**

**G. W. Goethals  
E. J. Rolde**

**Internal Report 31  
Harvard University  
Research Project in North Africa  
March 1969**

## A PROFILE OF A SLUM COMMUNITY

The study carried out from September of 1964 until June of 1965 by Dr. George W. Goethals and Dr. Edward J. Rolde in the small town of Djebel Djelloud on the perimeter of Tunis, was initiated in the first instance as a feasibility study.<sup>1</sup> Under the direction of Professor Robert Hamlin, then of the School of Public Health, this work built upon earlier reconnaissance by Professor David C. McClelland. At the time the study was instituted it was hoped that certain areas could be investigated, but it must be emphasized that in September of 1964 it was impossible to ascertain whether any study of any magnitude could be accomplished in Tunisia.

Through a series of extremely fortunate encounters and circumstances, what began as a feasibility study (could work of any kind be accomplished in the Republic of Tunisia?) turned into a full-dress study of a sample of families in a small community outside of Tunis. Instead of being able in the course of the year to contact a few key people in the government and in the community who might give leads for future research, we found ourselves able within a relatively short span of time to collect data on over 380 families.

The method employed in this data collection was interview technique and the scope and variables covered by that particular study have already been reported previously to the agency in Washington. It must be emphasized, however, that the change from a feasibility study, with all that implied, to a community study, with all that that encompassed, has often been forgotten by those concerned with Tunisian research, and particularly those in Washington. With the departure of Professor Robert Hamlin from Harvard University, who was the person charged with the responsibility for the writing of the report on the feasibility aspects of the Tunisian study, it became the implicit responsibility of the principal investigators of this earlier study to submit such a report. Given these very general comments as a point of departure, discussion in more detail is now in order:

Methods: The method employed in collecting data on the sample of families was an interview based upon similar field studies undertaken in the past. Questions were asked concerning the following: family composition; family health; family educational patterns; and family aspirations.

In addition, questions were directed to the socialization of children and participant observation of the level of economic advancement of each household was obtained.

The interviews were written out in their entirety in French and with the aid of a French-speaking Arab member of the community the interviews were conducted in Arabic with the subject families. The staff was also aided by the graduate students from the University of Tunis who were fluent in Arabic as well as in French and who could thus work in the community.

These data, after their collection, were brought back to the United States and in the fall and winter of 1965-66 these data were coded. In 1967 these data were punched and various runs accomplished at the Computation Center at Harvard University. Thus the data collected is in systematic order and is in the process of being written up.

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1. Dr. Goethals is Lecturer on Social Relations and Associate Chairman, Harvard University, Department of Social Relations. Dr. Rolde is a candidate for the degree of Doctor of Science in Hygiene in the Department of Behavioral Sciences, Harvard School of Public Health.

**Findings:** There are a number of findings which should be reported at this particular time in a substantive fashion: <sup>2</sup>

One finding from this particular study has been that while inputs of both medical and educational aid have been welcomed by the Tunisian people and government, these have not necessarily solved central problems that exist in the culture at large. For example, inputs on the health side undoubtedly have value of themselves but they do not necessarily replace or eliminate beliefs in folk medicine. More important and more complex has been the fact that while inputs in education in this particular community have been highly effective in terms of raising the literacy rate, these have not been accompanied by a similar increase in employment possibilities. A follow-up study done for Goethals and Rolde by John Mordes in the summer of 1968 reveals that the employment picture is anything but sanguine and that the educational reforms proposed by the Tunisian ten-year plan may have raised expectations (about what will happen as a consequence of education) that cannot be realized or fulfilled.

Another finding, critical in a comparative sense, is that the Arab family seems to be able to take a degree of social stress and culture change which might cause other families to break up and become highly disorganized. Mordes, for example, was able to trace down over 80% of families that Rolde and Goethals had studied four years earlier. Thus in the face of a continued economic deprivation, continued frustration as a consequence of "up-grading", the Arab family seems to remain an integral unit.

A third finding which may have some significance, particularly in terms of the second, is that in Tunisia, as in many developing countries, the key problem may be what development does to the status of women. The educated woman may not be as willing as her uneducated and illiterate mother to continue in the role of head of the family. Thus the great family solidarity observed both in '64 and '65 and later may in the future go through some sort of change. Our predication is that this change will not be for the better.

**Recommendations:** The key recommendation that will be made by the investigators of this first full-fledged study accomplished in Tunisia by the so-called "Harvard group" is that the contacts and continued work in Tunisia be maintained. Subsequent investigators have found and continue to find the Tunisians more than welcoming and more than congenial with us and with our work. To cut off this kind of relationship after so many years of mutual good will would in our estimation be tragic. However, it does seem that our research does point to areas of possible future complication. Should the educational enterprise, for example, be far more diversified in a vocational sense than it is presently? Should the Agency for International Development give funds specifically not to support education as defined by the Tunisians but rather education as defined rather broadly around 1920 in the United States when the whole vocational program began after World War I?

Finally, we have felt from the very beginning the need to train and train well young Tunisian scholars in research methods and techniques, that they may return to Tunisia and help their country better itself. With the possible collapse of the French social science elite due to the recent

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2. Rolde, E.J. A community model approach to a study of Djebel Djelloud- a Tunis suburb. Harvard University, unpublished manuscript, 1967-1969. Medical practice in Djebel Djelloud, 1968. Goethals, G.W. Strategies of entrée into research in a developing country, Harvard University, unpublished manuscript, 1967-69. Culture change and personal stress, Harvard University, unpublished manuscript, 1968. Goethals, G.W., Mordes, J.W. Problems and prospects in education in Djebel Djelloud, Harvard University, unpublished manuscript, 1967-1969. Goethals, G.W. Family marriage and socialization, Harvard University, unpublished manuscript, 1968.

university riots, it becomes imperative that the United States offer training to young scholars in the objective social sciences. Previously the Tunisian looked to France. It is becoming clear to us that not only are Tunisians looking to the United States, but so too are the French. Thus it seems a prime time to expand the kinds of undertakings carried out in Tunisia, not only in the sense of supporting our people but in addition, in supporting Tunisians to come to the universities in the United States.

**Section C**

**A Study of Health, Growth and Social Behaviour of Children:  
Basic Investigation for Economic Development and Productivity**

**Harben J. Boutourline-Young**

**Internal Report 32  
Harvard University  
Research Project in North Africa  
March 1969**

**A Study of Health, Growth and Social Behaviour of Children:  
Basic Investigation for Economic Development and Productivity\***

The activities described in this report were undertaken upon the invitation of Dean Snyder (Harvard School of Public Health), in December 1965, to this research group (Harvard Florence Research Project) to consider possible applications of the concepts and techniques used in its longitudinal cross-cultural study of Italy and the United States to the exploration of relationships between investments and productivity in a developing country, and specifically in Tunisia.

Following considerable discussion on the interpretation of this task, we decided to look at relationships between potentially manipulable environmental conditions and the growth and health of the people, especially children.<sup>1</sup>

There has been little systematic collection of data on relationships between socio-economic variables and child health and growth. Some of the differences between rich and poor may be determined genetically because of rank ordering by ability. However, there is little doubt that environmental circumstances may play a considerable part in determining such differences, particularly during the periods of most rapid growth when adverse conditions may cause permanent harm.

Previous work on socio-economic class and human factors has generally been patchy. Limited groups from cities or schools with very different socio-economic characteristics have been selected, and, following various methods of social classification, have been compared on certain human variables, e.g., anthropometrics, skeletal age, psychological development. Few attempts have been made to define and measure specific environmental variables and to relate these to the human condition. Sampling procedures have mostly been open to question, and overall national figures, from birth through adolescence, have not been available. The work has been mostly confined to advanced industrial societies. Despite these drawbacks, some of the work has represented a scientific advance opening the way to further studies.

There are conceptual difficulties in determining what may be accepted as a "satisfactory" level of health and growth. Health is in some respects easier, as prenatal, infant and pre-school child mortality rates, when carefully collected and analysed together with morbidity rates, may give a broad idea of the health deficits of a population or particular strata thereof.

Growth is more difficult, as a satisfactory level may be accepted as one which approximates genetic potential. But how is such genetic potential to be determined? For many who believe that the potential growth of children is not very different across the world in at least 90% of the population, a comparison between countries may be interesting.

Thus, differences in growth by chronological or biological age between children in technically advanced and materially rich societies and those in developing countries may represent a deficit on whatever human variable is being studied, for example, total body height, cardiovascular endurance, performance on intelligence tests. However, there are good reasons that investigators interested in these problems should look even more carefully at the differences between socio-economic groups within a given society. Here, there is more assurance of genetic homogeneity and doubts about the suitability of instruments and methods are less grave as such instruments and methods may be adapted to one society but not to another.

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\* Dr. Young is a Research Associate, Department of Nutrition, Harvard School of Public Health.

1. Attention is drawn to the condensed summary of results and commendations on pages     to

Even in the United States, data are only now being collected systematically on socio-economic group differences in physical and psychological development from birth through adolescence. This work is being undertaken under the aegis of the National Center for Health Statistics. Theoretically, the richer a country and the better organized its social service the fewer differences should be seen in health and growth between rich and poor. A divergence index of this type might well serve as a guide to the social and economic situation of a country and represent a control on the effect of social investments. However, the information necessary for such an index requires careful sampling techniques, appropriate instruments, rigorous training of field research workers, adequate background information on the basic socio-economic situation of the various strata of the population, assurances of reliability, and appropriate analysis. There are, as yet, few places where all these are being carried out.

In addition to such essential acquisition of knowledge of social condition, it is necessary to define and measure relevant environmental variables and attempt to link these with the ecological situation. The definition of one of the major factors, nutrition, is easy although its measurement presents considerable difficulties of evaluation. The study of the levels of hygiene is simpler; but when one comes to the matter of measuring levels of parental nurturance or levels of use of mass media, the problem becomes much greater. Nevertheless, it is important to acquire experience in such measurements and, after the suggestive associations provided by cross-sectional material, then proceed to an attempt to demonstrate causative relationships by limited longitudinal studies.

In part because of the lack of growth data in the country concerned, the task entrusted to us at the end of 1965 involved several steps:

- a. A preliminary study was proposed for the purpose of testing the hypothesis that there would be substantial growth and health gaps between the middle classes and the poor within the culture examined. This study was planned, not with the intention of assessing the magnitude of such differences, but of finding out whether such differences really existed and in what direction. This involved measurement of human variables selected in terms of their theoretical susceptibility to environmental pressures, definition and measurement of environmental aspects considered to be important, and identification and measurement of some psycho-social variables judged important for child development.
- b. Analysis of the data gathered in the above study provided some insight as to the degree of growth and health deficits presumably related to the environment and the association of these with environmental variables; e.g., nutrition, family income, father's occupation, mother's educational level.
- c. Consideration of (b) led to the identification of sensitive areas worthy of further investigation so that appropriate investments might yield high returns. These were nutrition and infection in young children and those aspects of socio-economic condition which must affect the care afforded the child.
- d. The preliminary study (a) was planned to determine if further studies would be feasible.

e. The next step was the collection of background data which would adequately document socio-economic class differences and also provide normative growth data. Without such information, the interpretation of successive experimental work might be difficult, if not impossible.

f. The next step should be to manipulate key environmental variables in order to upset predictions. This step will probably require one or more further feasibility studies.

A description of our activities to date follows, which take us to a good part of (e) and a small part of (f).

The first step (a) was achieved by selecting two contrasting groups of boys aged 6-1/2 - 8-1/2 years from the public school system. In the area, more than 95% of boys now attend elementary school. The first group was composed of eighty-two boys who were living in a depressed peripheral area of Tunis, the greater part of whose residents had immigrated from rural areas since the last war.

The second group consisted of twenty-four middle-class boys. Christians and Jews, and in general children with one or both foreign parents, who make up less than 4% of the population, were excluded. The mean age of the impoverished area group was 7.5 years and that of the middle-class group 7.7 years. On this occasion no attempt was made to obtain a sample representative of the population, because this first phase was intended only to broadly test a hypothesis, not to extrapolate from the results.

The boys were subjected to a thorough physical examination, a number of anthropometric measurements, some tests of physical function, an assessment of skeletal maturation, and some tests of intellectual function. Information was collected on school performance. Arab-speaking university students in sociology and social psychology visited each household and obtained considerable information on relevant socio-economic and psycho-social aspects. Simple measurements were also made upon parents and siblings.

The activities of this first year have been described in a report (Appendix A1) already submitted to AID, together with a supplement (Appendix A2). I shall now present some data which will summarize some of this material.

In Table 1, social group differences for linear measurements are presented. The striking differences significant at the .001 level are characteristic of almost all the anthropometric observations with the exception of some skin folds. It is of interest that for total body height, the middle classes are about as far from the U.S. Stuart-Meredith standards as the under-privileged (Figure 1). Both these contrasting North African groups have an average of five children per family. The underprivileged have had seven born but an average of two deaths. To those of us who believe that the growth of children is potentially the same all over the world, these differences represent environmental deficits.

Table 2 presents some body mass measurements and Table 3 the skeletal age (by Greulich and Pyle) and the dental age. Skeletal age shows considerable retardation in the underprivileged group. However, dental age is scarcely affected showing once again the durability of this environment-resistant variable, and demonstrating its usefulness as a guide to chronological age in areas – unlike Tunis – where birth registration is not reliable. Figure 2 shows distribution of skeletal age in graphic form. Appendix B provides a more detailed analysis of some of these differences.

Drs. Richard Jessor and Gino Tesi adapted the following five psychological tests for use in Tunisia: Kohs' Blocks, Figure Reconstruction, Porteus' Mazes, the Raven P.M.47 and the Goodenough-Harris Draw-A-Man/Draw-Yourself test. Table 4 shows social group differences similar in level to those for the physical variables on three of the tests. The psychological test performance was also well correlated with school performance, calculated on the basis of ratings obtained at the end of the school year.

Table 5 shows some medical history and physical health comparisons.

Table 6 shows some basic socio-economic data pertaining to the groups.

A correlation matrix between variables in the underprivileged group disclosed significant associations between weight and all the psychological tests and between other growth variables and some of the tests. Performance on Kohs' Blocks, which is considered a good measure of general intelligence and spatial ability, was significantly correlated with such economic variables as animal protein intake, income, type of house, father's occupation and overall socio-economic index derived in its turn from father's education and occupational levels and quality of housing.

Such psycho-social variables as future expectations for one's child (unrealistic v. realistic) and index of religious practices were significantly correlated with a number of physical and mental measurements in the children. Not surprisingly, poor performances on the Harvard Step test were correlated significantly with such items as lordosis, lower and middle respiratory infection, and length of unemployment. Poor general physical condition was correlated with lower respiratory infection, history of gastroenteritis, enlargement of the liver, and negatively with weight, dynamometer performance, psychological test performance, perceived social position, use of mass communication media, and overall socio-economic index.

Those who work with poverty are tempted to intervene massively and rapidly and may expect rapid results. The effort may sometimes be disappointing. We believe that intervention cannot be well directed, nor can its possible results be interpreted, without a knowledge of systematic social class differences and the associations between human and environmental variables. This involves definition and measurement of environmental variables which is not without difficulties.

Our next efforts (e) in Tunisia thus involved collection of growth data, for the purpose of preparing norms. The country concerned has no reason to feel ashamed of the lack of such data as they did not exist for the United States either at the time this study was commenced. The work of the U.S. National Center for Health Statistics is now remedying this situation; until now, our working standards were derived from observation of lower-middle class families in Boston or Iowa school children.

The documentation of social class differences and the provision of normative data for the population were the objectives of the next step (e).

The area concerned is the capital city, Tunis, which, with its suburbs comprises 17% of the population of the country. In this area, more than 95% of male children now attend elementary school. Sampling from the school population is therefore acceptable. The selected children were to be transported to a central medical center for appropriate examinations.

#### Description of the City of Tunis and Suburbs

The present city of Tunis developed around a central core, the Medina. According to an estimate based on the census of 3 April 1966, the city proper has 403,000 inhabitants including the suburbs 764,000. In the city and its suburbs, there has been annual population increase of

2.3% over the past few years, accounted for in great part by the suburbs which augmented 125,000 units, with a mean annual percentual increase of 5%. Tunis proper, on the other hand, has had a mean annual increase of only 1.2%.

About one-third of the population resides in the Medina, one-third in very small makeshift dwellings or gourbis, and the remainder is subdivided between the modern city and the new housing developments. At present, the proportion of population living in the new housing developments appears to be increasing, owing to the influx of two distinct and separate groups: (1) workmen and minor clerical workers coming from condemned areas being demolished; and (2) at the other extreme, the more well-to-do inhabitants of the Medina.

The density of the population is highest in the Medina where figures oscillate between 590 and 790 persons/hectare. The only exception in this section is due to the center occupied by Souks or markets, which because of their essentially commercial character, present much lower figures. In the modern section of the city, there are about 300 inhabitants/hectare. In the new housing developments, density varies between 70 and 100 inhabitants/hectare.

#### Division of the City in Sections.

We have divided the city of Tunis into sections, each of which presents homogeneous characteristics in regard to urban structure, type of housing, and density of population.

The term "urban structure" covers the following classifications of the various sections of the city according to the type of city lay-out prevalent in each of them:

1. Gourbiville: consisting in irregular agglomeration of gourbis, lacking any kind of public service, with open drains.
2. Traditional structure: the most characteristic aspect of this type of lay-out is that it consists of large irregular blocks of one or two storey houses limited by narrow streets where cars can just get through. Within each block, houses can only be reached on foot through tortuous alleys and extremely narrow dead-end streets, which however, are more or less adequately paved. This structure is present in the whole of the Medina and in the central nuclei of some suburban areas (e.g., Ariana, Dubosville, Radès).
3. Modern structure: characterized by fairly wide streets with sidewalks intersecting at right angles. The houses are mostly of European type.
4. New housing developments: here the space available has been divided into regular planned units with detached one or two storey houses or large blocks of flats surrounded by gardens.

The type of housing has been classified as follows:

1. Gourbi: with mud or makeshift roof, without windows and only one tiny door, no furniture except for one bed in some cases, mud floor sometimes partially covered by mats.
2. Improved gourbi

3. Traditional Tunisian houses in increasing  
 4. order of size and comfort  
 5.

6. European type apartment or house in  
 7. increasing order of size and comfort  
 8. from (6) very modest to (9) luxury villa  
 9.

The scale of density of population has been divided into the following categories:

1. Agglomeration of gourbis with very little space between dwellings
2. Areas of scattered gourbis
3. Over 650 inhabitants/hectare
4. Over 550 to 650 inhabitants/hectare
5. From 450 to 550 inhabitants/hectare
6. From 350 to 450 inhabitants/hectare
7. From 250 to 350 inhabitants/hectare
8. From 150 to 250 inhabitants/hectare
9. From 50 to 150 inhabitants/hectare

**N.B.** Points 1 and 2 do not cover the concept of population density as usually intended but refer to a pattern of housing which does not provide even a minimum vital space for the individual. For more detail, see Appendix C.

A list of Tunis streets has been made and a computer program has assigned geographical co-ordinates, vertical and horizontal, to each street. A map of the city has been drawn on a scale corresponding to the size of the computer print-out thus, any variables pertaining to a subject whose address is known may be automatically plotted on the map of the city. (See Appendix D, an analysis of juvenile delinquency by special request of the Minister of Justice, Government of Tunisia).

### Extraction of Samples

When working in a new setting, the sampling technique must fulfill the basic need to acquire knowledge of relevant socio-economic variables for the purpose of assessing their distribution in the population. Such a sample may later be used as a basis for the extraction of a sample of smaller size stratified by social class.

When, as in the case of the study to be described, the population consists of children, various sources of basic information for sampling can be considered: birth records, recent census data, general register offices, and list of pupils enrolled in schools.

Birth records can only be useful if one intends to cover a brief period of time very close to birth itself, insofar as infantile mortality and in and out migratory movement cause considerable bias in a more extended sample. Data from general registers require very lengthy preliminary analysis before a sample can be drawn which comprises the pertinent age groups.

Census data can only be used if they are recent, already punched on cards, and accessible. Lists of pupils may be used if attendance is almost universal and non-dependent on socio-economic reasons.

In Tunis, where this research group was planning its investigation, the only suitable source of information appeared to be the primary school which, according to official reports, could boast almost universal male attendance (only 1% of boys who have the necessary abilities to undergo education were not enrolled). It therefore seemed reasonable to assume that an adequate sized sample taken from the male primary school population should cover the universe.

By means of a sampling technique in 4 stages, a "rectangular" sample was obtained in which each six monthly age group and each social group were represented by equal numbers of subjects, Table 7. For details of the sample, procedures, and the elements used for definition of social groups see Appendix C.

The main advantages of such a rectangular sample consist in:

1. Comparison between measurements taken on children of different socio-economic background.
2. Estimation of the parameters of the universe by extrapolation from the parameters of the sample. This may be achieved by weighting each subject proportionately to the numerical importance that his social group has in relation to the total population.
3. Calculation of weightings to be given to present subjects for the estimation of the same parameters at a time when the population will have changed its social composition in accordance with anticipated economic development of the country.

### Procedures

The 967 subjects were given a complete medical examination and a series of anthropometric measurements, both by Dr. Robert Younes, and a battery of psychological tests derived from those found to be satisfactory in the preliminary study. In addition, there was an X-ray of the left hand and wrist for assessment of skeletal maturity, physical function tests, vision testing, and each child was photographed in the nude in three standard positions.

### Results

The results which I wish now to discuss are the socio-economic class differences deriving from examination of the above sample.

Figure 3 presents weight by age. The upper curve represents the privileged and so one descends to the lowest curve of the underprivileged. The deficit approaches 10%.

Figure 4 shows height by age. The deficits are in the order of 5%.

Table 8 presents hospital data for newborn babies. There are no significant social class differences. We have yet to examine possible bias introduced by selection for birth in hospital.

Figure 5 shows arm and leg circumference and log-transformed fat measurements. Considerable and consistent socio-economic class differences are to be seen. A more detailed account of these results is found in Appendix E.

Figure 6 gives the results of psychological testing. Here we have Kohs' Blocks and Porteus' Mazes. In the results of both tests, there are considerable and significant differences which persist until late childhood. There is no tendency to converge.

Figure 7 presents similar results of the Goodenough-Harris Draw-a-Man/Draw-Yourself test. The reduced form of the test, which deals with 27 instead of 73 traits and saves much time, appears as effective as the complete form. The correlation for Draw-Yourself 73/27 traits analysis is .980 and that for Draw-A-Man is .976.

A detailed account of social group differences in mental growth and male population norms, together with a full description of methodologies, may be found in Appendix F.

Obviously, it is important to know if there are differences between social groups on development scales in the first years of life. To this end, and as additional vital background information, we have selected and already examined more than two thirds of a sample of 960 young children from birth to two years. The sample is rectangular as before and is represented in Figure 8. The examinations are broadly similar, although adapted to the different age range. The Bayley Infant Development Scale, considered to measure the mental and motor abilities of babies, is being used. Application of this scale has presented no important problems.

By weighting each subject according to the numerical importance of each social class in the universe, norms were then developed for each of the three psychological measures,\* and for the most indicative somatic measures, e.g., height, leg length, weight, chest circumference, skin folds, as well as the hand dynamometer. These standards are expressed as centiles (3, 5, 10, 25, 50, 75, 90, 95, 97) and stanines. Percentual frequency distributions, means, standard deviations, skewness and kurtosis are also presented. Tables 9, 10 and 11 and Figures 9 and 10 present data for one representative variable, standing body height.

These norms have been prepared with a more appropriate technique than has previously been used for this purpose and are therefore more precise. A description of the phases of the program for the preparation of these norms may be found in Appendices E and F.

Our future plans include extending the background sample from 2½ - 6 years in order to have the whole range of 0 - 10½ years. We have already undertaken a feasibility nutrition study, and it is planned to commence a larger experiment next year with 400 infants in four channels.

### Feasibility Nutrition Study

This next step (f)<sup>1</sup> is for the purpose of identifying obstacles to a long term study and we therefore selected in October 1967, seventy-five male children aged between 12 and 24 months as follows:

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\*The validation of the tests used is still in process of completion

1. Also supported by The Grant Foundation of New York

- Group A 25 younger brothers of children in the elementary school of Sidi Fathallah, a poor outlying suburb of Tunis. No initial refusals.
- Group B 25 from the suburb of Djebel Djelloud, also poor, but a little less so than Sidi Fathallah. A number of these children were younger brothers of the children examined by us in 1966. No initial refusals.
- Group C 25 from the suburb of Sidi Manoubia with about the same degree of poverty as Sidi Fathallah. These were obtained by house-to-house visits until the 25 acceptances were obtained. No initial refusals.

Following initial observation, feeding centers were established for Groups A and B. It was planned that Group A would receive a supplement of not less than 1 gm/Kg/body weight of animal protein and Group B a supplement equal in calorie value to A but having the same protein value as the normal diet. Group C would receive only the medical attention extended to all groups.

Ingestion of food was to be supervised at the feeding centers and, at the same time, enquiries made of the background nutritional practices of the families, other socio-economic data, and their attitudes towards change and to this research work.

Examinations for Groups A and B were scheduled as seen in Figure 11.

The Group C examinations commenced in January/February 1968. There were four examinations at two monthly intervals scheduled for Groups A and B and three examinations at two monthly intervals for Group C.

Feeding commenced on February 15, six days a week, and finished on June 15, 1968. At the Sidi Fathallah center, each child was offered an egg, 150 gms of reconstituted skimmed milk, and 20 gms of cheese, constituting in all 16 gms of animal protein. This supplement was offered only in part at first, and we worked up to the full ration over 2 - 3 weeks. Each infant had a book in which the weights of the daily residues were noted. The average weight of the children at Sidi Fathallah was 9.8 kilos at an average age of 18 months.

#### Attendance of Subjects

Of the 25 subjects at Sidi Fathallah, 4 were found to live too far from the feeding center to make their attendance practicable, one child moved away, and one child died during the measles epidemic which swept Sidi Fathallah during the period. The remaining nineteen were still attending after four months of feeding when the work was terminated on June 15, 1968. During the course of this time, some of the children were absent for longer or shorter periods. Several were hospitalized, almost always by our own physician. One child, who appeared for a routine examination, was found in a state of acute marasmus with a prognosis of 24-48 hours if no treatment took place. His was the longest stay in hospital, almost four weeks.

In general, the reaction of the mothers was positive. The feeding center became for them a daily club house, and the supplements were perceived by them as substances of value which would help their children. During the last month of the study, mothers would frequently remark how much the supplement had made their children grow and develop.

The logistic arrangements were satisfactory at Sidi Fathallah. The families all lived fairly nearby. The center itself was well-organized with a clean kitchen and a separate feeding room. There was

also more continuity of our own personnel at Sidi Fathallah, so that mothers were aware of a continuing affectionate interest.

In contrast, the center at Djebel Djelloud (Group B) was a comparative failure. The center was situated much further away from many of the homes. The supplement did not have special value for the families but was "just what we eat at home". To meet this criticism, the diets were switched on a number of occasions, biscuits and honey, cous-cous, rice, etc. Enough vitamin A was added to make up to that provided by the supplement at Sidi Fathallah. Attendance started well and thereafter fluctuated from more than 20 to less than 5 a day. The distance problem could have been resolved with a mobile kitchen, but it is more difficult to make a calorie (normal protein) supplement attractive. We hope to draw on the Guatemala experience for help here.

Another factor was that there were more changes in our own staff at this center. A minimum of three people is required to do the job: a kitchen hand and two trained observers. Our observers, all of whom were Peace Corps volunteers with other part-time responsibilities, changed more at this center. This will be remedied in a well-funded long term study. It is of interest that, although attendance as the feeding center was so sporadic, almost all of the mothers still brought their children for the medical examination. At the final May-June examination, two or three children were not brought from Djebel Djelloud and Sidi Manoubia, but it is felt that more intensive social footwork would have avoided these omissions. Our Peace Corps physician left in late June. If he had been available in July, almost all of the children would have been examined on the final examinations.

#### X-rays

Protection was afforded to mothers and children by use of a lead box with a small window through which the child's hand and wrist could be inserted. As described, the machine is a Philips of late design and minimal scatter, and arrangements are being made to measure any dispersion. Some difficulties in obtaining optimal degrees of penetration were resolved with the help of the friendly and efficient Bulgarian radiologist at the nearby hospital. According to our information, none of the children had received any diagnostic radiation or any isotopes.

#### Family Nutrition Enquiry

An interview schedule (Appendix G) was prepared for use in the feasibility nutrition study on the basis of preliminary experience indicating what kind of information could readily and reliably be obtained. Two Peace Corps volunteers with good knowledge of Arabic and experienced in working with impoverished Tunisian families conducted the interviews which lasted 1-1 1/2 hours. These were coded at the end of each day's work so that any omissions could be discovered immediately and remedied by a second visit to the family.

On the basis of such interviews, a number of tabulations were made showing consumption of various foods per family and per person per day in relation to income and percentage of recommended allowances consumed, thus pinpointing the major dietary deficiencies. Table 12 presents results for the center of Sidi Fathallah; other results will be available in the near future.

The groups under enquiry were small and followed for a very brief period of time, so that any findings are merely indicative. But a workable method has been evolved which may be used on a larger scale.

### Medical History

A medical history was taken for each child under study, with special attention to length of labour, birth trauma, duration of breast feeding, respiratory and gastrointestinal disorders.

For the mother, the history concentrated on number and outcome of pregnancies and cause of any deaths among the subject's siblings, as well as ordinary information on any important illnesses, hospitalizations, and chest x-rays. For the father, the history was based on days lost from work because of illness or accident, hospitalizations, and impairment of efficiency at work because of ill health.

It must be noted that such information proved extremely difficult to elicit, owing to the lack of any concept among parents of what constitutes disease. For example, constant diarrhoea containing blood and mucus is considered by most impoverished Tunisian mothers as perfectly normal in early childhood. Similarly, questions as to the cause of death of a child received very vague replies such as fever and weakness or a simple "I don't know". It thus appears evident that any information obtained from even the most careful medical history in this setting should be treated with extreme caution. Only the most objective questions should be retained, such as those dealing with number of children dead over total number born, number and duration of hospitalizations, etc.

### Results

The above experiment terminated only recently and the data are in course of analysis. At the moment, we are in a position to make only the following cautious preliminary observations:

1. The feasibility study achieved just what it set out to do. Such studies are entirely feasible in Tunisia, and we believe that the major obstacles have been charted so that they may be removed or avoided. It was not expected that four months of feeding would produce any significant changes.
2. In taking two measurements (body length and head circumference) for all the children, we see a deficit of approximately 10% and 5% respectively when the Tunisian means are compared with Stuart standards.
3. If we compare Sidi Fathallah (feeding) with Sidi Manoubia (non-feeding), there is a tendency for both groups to increase cranial growth in the spring months; but there is no superiority of Sidi Fathallah over Sidi Manoubia. A lot has to be done to improve precision of measurement, yet we believe that perhaps supplementation should be earlier, i.e. earlier than 9 months, if it is to have effect on this measurement.
4. If we compare all three groups in respect of body length, they were remarkably similar in the pre-feeding period in the winter months. In the spring and summer which corresponds to the feeding period, all increased their growth rate of the order of about 100%. There were no differences between the protein supplemented, calorie supplemented, and non-supplemented groups. It is probable, however, that a longer period of supplementation would produce differences.
5. With the numbers employed, the method of assessment of skeletal age is too imprecise to form a sound opinion. There is a general impression that in all three groups, there is a tendency to advance more in the spring and early summer. There appears to be no difference between the groups on this measure. Following collection and organization of the background material on bone age, this measure should be of considerable use.

6. The family nutrition enquiry has provided valuable information on actual nutrition practices and has indicated profitable methods of approach.

7. The whole experience has assisted in the planning of a more streamlined and concise study and has outlined the importance of control of, or at least better knowledge of, the effects of infection, infestation and nutrition.

8. Our conclusions from this feasibility study have yet to be drawn, but we believe that numbers of subjects in each group should not be less than 100, that the feeding period should extend over a period of not less than two years, that supplements should commence, if possible, earlier than 9 months, and that every effort be made to improve techniques of measurement and assessment, especially of skeletal age.

Funds from AID were available to cover only the first part of this feasibility study in nutrition.

### Discussion

The marked differences, on a wide range of variables, between social groups demand further investigation as to the role of the environment. The present series of observations has pointed a finger at certain environmental variables such as nutrition and infection. The information being accumulated creates a baseline for the prediction of what mean growth and function might be expected of children in the various socio-economic groups in this society, provided the changes in the society are not excessively rapid.

Manipulation of an environmental variable by food supplementation, for example, should demonstrate, by comparison with the above baseline data and with controls in a longitudinal study, the effects of such intervention. As in an on-going study, all participants will be entitled to medical, curative, and prophylactic care. Comparison of the control groups with the background study should determine the part played by infection in impairing growth and health;

### Summary of Results

#### 1. The 1966 Feasibility Study showed that:

- a. there are highly significant differences between middle class and underprivileged on almost all somatic measurements. It is evident that such differences should be minimized in any society;
- b. there are similar differences in many aspects of physical health;
- c. there are similar differences in many aspects of health history, including both morbidity and mortality of family members;
- d. there are similar differences between aspects of psychological development;
- e. we gained valuable background information upon socio-cultural matters, such as length of breast feeding, practice of swaddling, use of hospitals and other medical services, use of mass communication media, adherence to religious practices;
- f. there are interesting social differences on some psycho-social variables, such as aspirations for one's children;

- g. the development of a battery of psychological tests appeared to work well for male children in 6½ - 10½ year old range, and had a significant correlation with scholastic performance;
  - h. there were interesting and significant correlations within the underprivileged group between such variables as physical and mental growth, and between both of these and socio-economic factors such as animal protein consumption, family income, etc.
2. The 1967 Background Study of Male Children aged 6½ - 10½
- a. provided standards for physical and psychological measures expressed as centiles and stanines, and in respect of the somatic measurements, also provided percentual frequency distributions for each age group;
  - b. showed consistent social class gradients on the majority of somatic measurements;
  - c. showed consistent social class gradients on all three of the psychological tests considered to measure aspects of mental ability.
3. The 1968 Feasibility Nutrition Study showed that:
- a. provided certain conditions are met, such studies are feasible;
  - b. there is a necessity for earlier supplementation, if possible before 9 months;
  - c. workable nutrition enquiries can be developed;
  - d. collection of basic data on nutritional practices of poor families is needed.
4. In general, during the study, the following purposes have been achieved:
- a. development of appropriate sampling techniques;
  - b. development of map plotting technique;
  - c. development of modified scoring method for the Goodenough-Harris test;
  - d. advances in techniques for interpolation of data for development of norms.

### Recommendations

It is recommended that efforts should be made to complete observations on growth and health in both males and females for the whole range from birth to sixteen years.

This will provide normative data for the population, important both for domestic use by the Tunisian Ministry of Health and also for international purposes. Knowledge of socio-economic group differences, in relation to health and productivity, will serve as a guide to community investments and provide a model for use in other countries. In addition, there are certain important technical advances which will be possible when the whole range is available. An example is skeletal age, an important and sensitive biological variable upon which this group has made considerable investments in the age ranges presently available, which are, however, too narrow for adequate analysis to be possible.

It is recommended that the present policy of employing and training as many Tunisians as is possible should be strictly adhered to, but that at the same time young American research workers should also be involved in the course of their training for advanced degrees.

It is further recommended that consideration be given to support of experimental work on nutrition and infection in Tunisia.

Thus the achievements to date are essential for the Tunisian City Nutrition Study at present being considered by the National Institutes of Health.

Similarly, if the lysine enrichment is implemented, the baseline data accumulated and the improvements in methodology effected in this AID sponsored research will prove invaluable for the success of this work.

It is considered that certain innovations and improvements in methodology, as well as general approach, will be applicable and useful in developing countries in general. For example, the map plotting technique has been requested for use in Iran. This usefulness is not confined solely to the developing countries, as this same technique has interested the National Center for Health Statistics of the Department of Health, Education and Welfare, Washington, D.C., who have also requested details of the modified technique for scoring the Goodenough-Harris Draw-A-Man/Draw-Yourself test. Use of such techniques could conceivably effect U.S. domestic savings well in excess of the sums allotted to sustain this research.

We believe that the procedures carried out by this research group and sustained by the Agency for International Development and the Grant Foundation may be useful in any country, be it developing or developed, as a guide to effective community investment.

\* \* \* \* \*

Attention is drawn to substantial partial support of all the activities here described by the Grant Foundation of New York and in respect of the Feasibility Nutrition Study also by CARE of New York.

We thank the United States Peace Corps and its director in Tunis, Mr. Francis Macy, for providing up to 12 part-time volunteers and also one doctor of medicine (Dr. George Barton) on a half-time basis from September 11, 1967 to June 30, 1968.

Senior professional personnel of the Harvard Florence Research Project continually engaged on this work over the period of three years were:

Elizabeth Boutourline Young, M.D.  
Gino Tesi, D.Sc.  
Harben Boutourline Young, M.D.

Senior professional personnel who served for shorter, but still substantial, periods were:

Robert Younes, M.D.  
Richard Jessor, Ph.D.

Cordial working relationships have been developed with the Department of Psychology, Department of Medicine and other divisions of the University of Tunis and with organs of the Government

of Tunisia, especially the Minister of the Plan and of Education, H. E. Mr. Ben Salah, and the Ministry of Health Medical Director, Mr. Amor Daly.

Subsequent to March 31, 1968 field work in Tunis by this research group has been supported by the Division of International Health Statistics, Department of Health, Education and Welfare, Washington, D.C. and the Grant Foundation of New York, and to a limited extent of CARE, New York. Work of consolidation, analysis and reports of field work prior to March 31, 1968 has been supported by the Agency for International Development.

The main body of research work after March 31, 1968 will be the subject of a subsequent report.

Harvard Florence Research Project  
Via Venezia 10, Florence, Italy.  
January 1969

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## RESEARCH DOCUMENTS

A1	Report for 1966	pp: 47 including tables & figures
A2	Supplement to Report for 1966	pp: 8 including tables & figures
B	Paper delivered at Biennial Meeting of International Children's Center, Stockholm.	pp: 9 including tables & figures
C	Description of the City of Tunis and Suburbs and Sampling Techniques	pp: 24 including maps and tables
D	Analysis of Juvenile Delinquency	pp: 17 including tables & figures
E	Somatic Variables in Males aged 6½ - 10½: Norms and Socio Economic Variations	pp: about 120 including tables & figures
F	Psychological Measures in Males aged 6½ - 10½: Norms and Socio-Economic Variations	pp: 78 including tables & figures
G	Nutrition Questionnaire	pp: 4

**NOTE:** Four complete sets of the above appendices have been submitted to AID with this report. Additional copies may be obtained by writing to:

Dr. Harben J. Bouterline-Young  
 Florence Research Project  
 Via Venezia, 10  
 Florence, Italy

## LIST OF SUPPORTING PAPERS

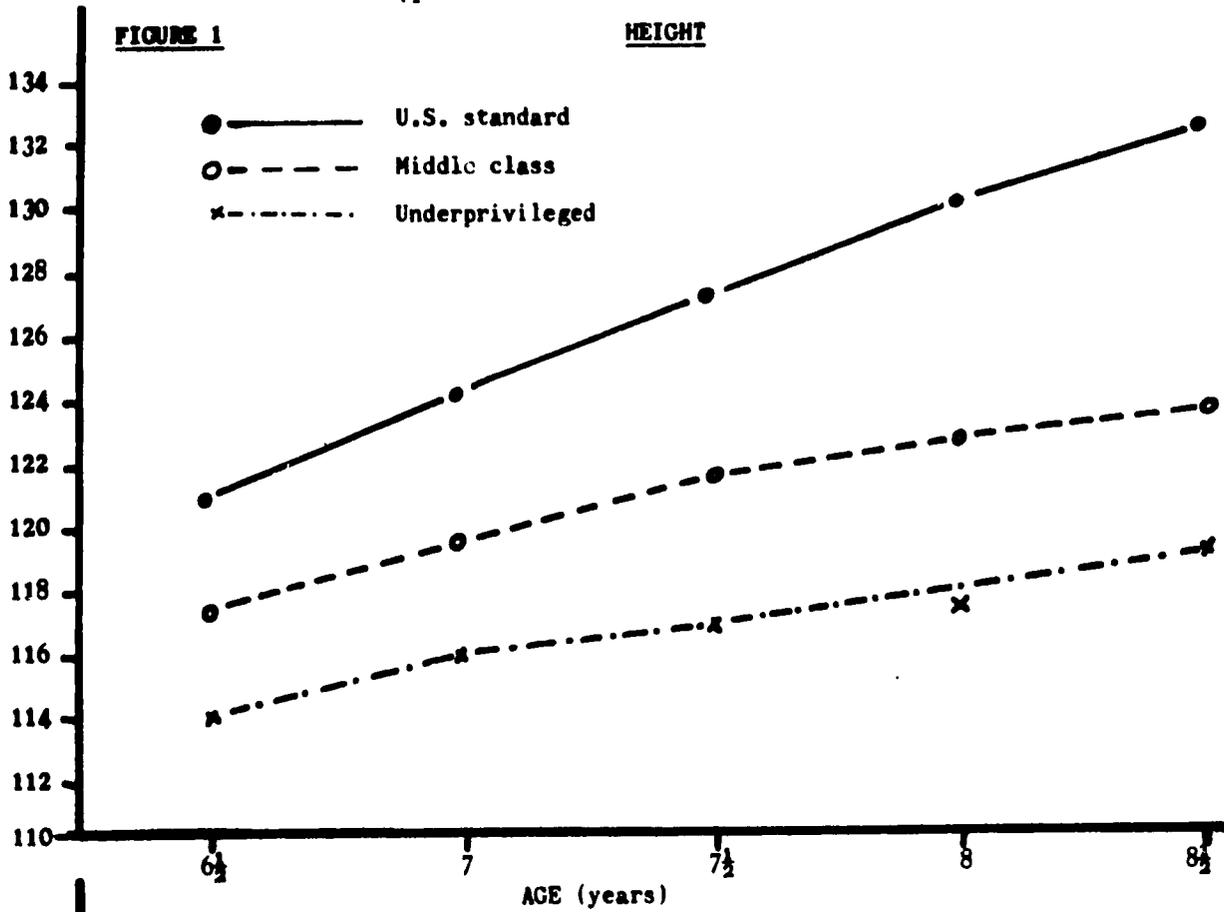
1. **Boutourline Young, E., Tesi, G., Jessor, R. and Boutourline Young, H.**  
**Some Somatic and Psychological Observations on Young Children in a Poor Suburb of a North African City.**  
 Biannual Meeting of the International Children's Center, Stockholm, June 19-24, 1966.  
 Published by International Children's Center in the report on the meeting, II, 113-121, 1966.  
 Already incorporated in Appendix B.
  
2. **Boutourline Young, H., Younes, R., Boutourline Young, E. and Tesi, G.**  
**Relationship between Child Growth and Environment in a Developing Country.**  
 American Academy of Pediatrics, Chicago, October 20, 1968, Annual Meeting.  
  
 Papers differing in detail, but similar in general pattern, were given in a seminar at the Institute of Behavior Sciences, University of Colorado, October 24, 1968, and a lecture at the University of Kansas, October 25, 1968.
  
3. **Boutourline Young, E., Tesi, G. and Boutourline Young, H.**  
**Methodological and Practical Problems in the Preparation of Anthropometric and Psychological Test Norms for a Population Stratified by Social Class.**  
 XII International Congress of Pediatrics, Mexico City, December 1-7, 1968.
  
4. **Boutourline Young, H.**  
**Socio-Economic Factors and Child Development.**  
 Chapter in "Malnutrition as a Problem in Ecology".  
 Ed: O. L. Kline, Ph.D.  
 To be published by S. Karger, Basle & New York: expected date April 1969.
  
5. **Boutourline Young, E., Tesi, F. and Boutourline Young, H.**  
**Some Socio-Economic Class Differences in Physical and Psychological Measures.**  
 Paper to be presented at the UNICEF Meeting, Tunis, February 20-22, 1969.

Table 1  
Linear Measurements

	Height		Sitting Height		Leg Length		Arm Length	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Underprivileged n 82	116.3	5.5	61.7	2.6	68.1	4.3	35.6	2.2
	t = 4.78		t = 4.17		t = 4.65		t = 4.86	
	Significant		Significant		Significant		Significant	
	P < .001		P < .001		P < .001		P < .001	
Middle class n 24	121.8	4.8	63.8	2.1	72.3	3.7	38.1	2.3

**FIGURE 1**

**HEIGHT**



**WEIGHT**

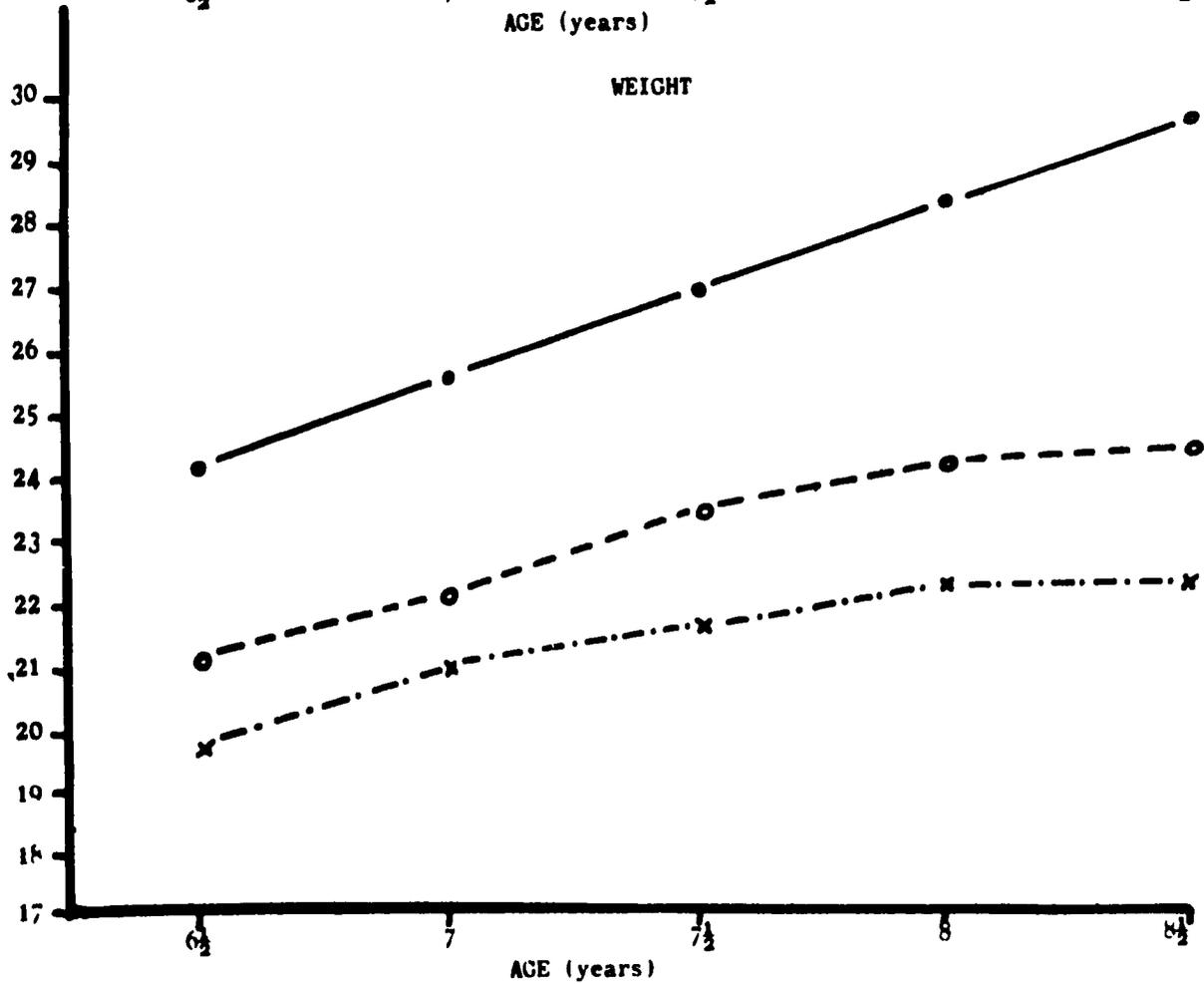


Table 2  
Body Mass Measurements

	Weight		Biacromial I		Biacromial II		Chest Depth		Chest Width		Chest Circum. I	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Underprivileged n 82	20.3	2.3	26.8	1.9	25.2	2.1	14.2	0.7	18.7	1.0	57.9	2.7
	t = 4.23		t = 3.79		t = 3.64		t = 1.93		t = 3.31		t = 3.47	
	Significant		Significant		Significant		Not Significant		Significant		Significant	
	P < .001		P < .001		P < .001				P < .01		P < .001	
Middle class n 24	22.5	2.2	28.0	1.3	26.6	1.3	14.5	0.7	19.3	0.8	60.4	3.1

	Bicrestal		Arm circ.		Leg circ.		Cranial width		Cranial length	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Underprivileged n 82	18.9	1.2	15.5	1.3	22.7	1.6	13.9	0.6	18.1	0.6
	t = 5.29		t = 4.05		t = 4.55		t = 4.49		t = 0.45	
	Significant		Significant		Significant		Significant		Not Significant	
	P < .001		P < .001		P < .001		P < .001			
Middle class n 24	20.0	0.8	16.5	1.0	24.0	1.2	14.3	0.4	18.2	0.6

Table 3  
Skeletal Age and Dental Age

	Skeletal Age		N° permanent teeth present	
	Mean	SD	Mean	SD
Underprivileged n 82	5.9	1.1	7.2	3.0
	t = 4.61		t = 1.12	
	Significant		Not Significant	
	P < .001			
Middle class n 24	7.0	1.0	8.0	3.0

Figure 2

# DIFFERENCES BETWEEN SKELETAL MATURITY AND CHRONOLOGICAL AGE

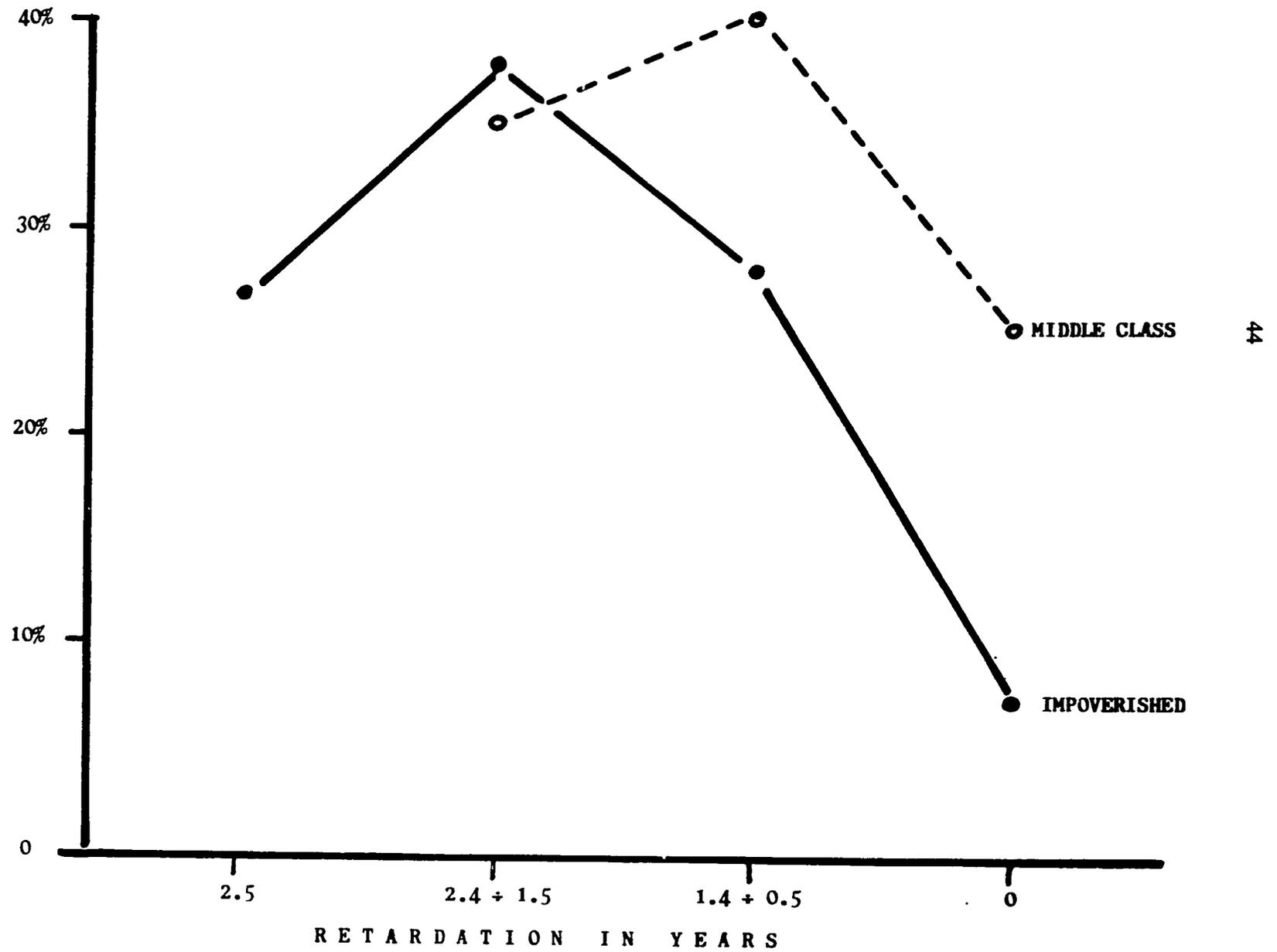


Table 4  
Results of Psychological Testing

	KOHS'		BLOCKS				Mazes		Figure Reconstruction		Progressive Matrices 47		Goodenough	
	11-20		ABC		1-10		Mean	SD	Mean	SD	Mean	SD	Mean	SD
	Mean	SD	Mean	SD	Mean	SD								
Underprivileged n 80	42.1	16.4	12.5	6.5	4.3	4.8	26.8	6.1	22.0	8.2	15.3	4.4	9.4	4.4
	t = 5.41		t = 2.86		t = 1.66		t = 3.07		t = 0.73		t = 0.77		t = 4.66	
	Significant		Significant		Not Significant		Significant		Not Significant		Not Significant		Significant	
	P < .001		P < .01				P < .01						P < .001	
Middle class n 20	53.5	5.2	15.5	3.4	6.5	5.7	31.1	5.9	23.4	7.8	16.0	3.7	15.7	5.9

Table 5

Respiratory Infections

	Few	Frequent 1st Year	Frequent to present	Severe	Confirmed T.B.
Underprivileged %	47	3	36	11	3
Middle class %	95	0	5	0	0
<u>Gastroenteritis</u>					
	None	Single Episode	To 3 years	Frequent to present	Frequent & Severe (blood in faeces)
Underprivileged %	34	11	8	46	1
Middle class %	60	40	0	0	0

Table 6

		1	2	3	4	5	6	7	8	9
Underprivileged	H O	18	10	35	24	5	8	-	-	-
Middle class	% U S E	-	-	5	5	5	5	25	50	5
Underprivileged	% Social Economic Condition	5	14	23	28	20	7	3	-	-
Middle class		-	-	-	-	-	-	5	10	85

Table

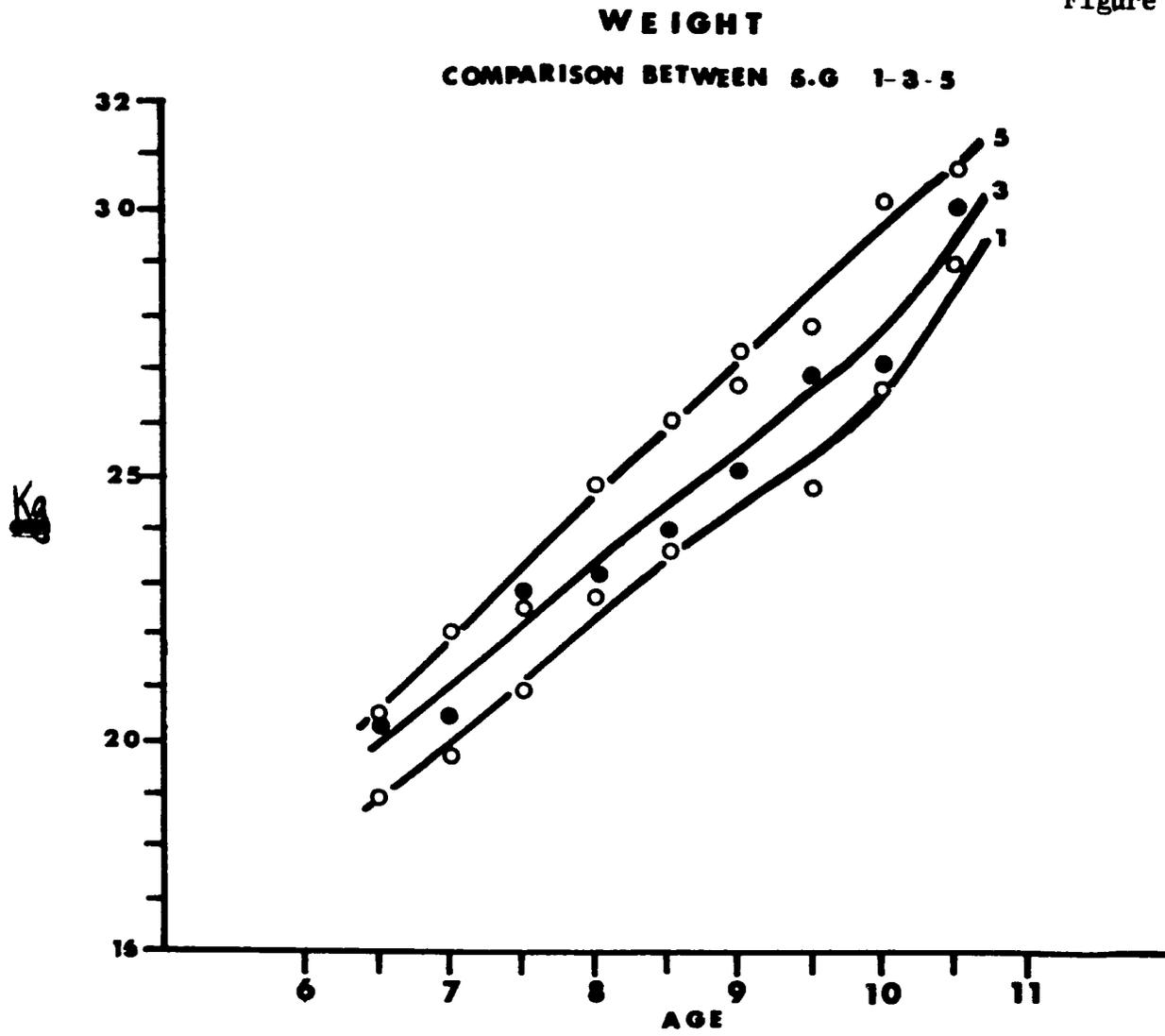
	Consumption Animal Protein		Income Father		N° of children living	
	Mean	SD	Mean	SD	Mean	SD
Underprivileged n 80	8.5	7.3	25.7	27.0	5.0	2.1
Middle class n 24	23.2	7.5	126.4	62.0	5.6	2.9
Unit of Measurement:	g./day		dinars (1D = \$2)			

TABLE 7

Grouping of Subjects by Social Groups and Age

Age	Unemployed	Unskilled	Skilled	Middle	Upper	Total
6 $\frac{1}{2}$	20	20	20	20	20	100
7	20	20	20	20	20	100
7 $\frac{1}{2}$	20	20	20	20	20	100
8	20	20	20	20	20	100
8 $\frac{1}{2}$	20	20	20	20	20	100
9	20	20	20	20	20	100
9 $\frac{1}{2}$	20	20	20	20	20	100
10	20	20	20	20	20	100
10 $\frac{1}{2}$	20	20	20	20	20	100
<b>Total</b>	180	180	180	180	180	900

Figure 3



# HEIGHT

Figure 4

## COMPARISON BETWEEN S.G. 1-3-5

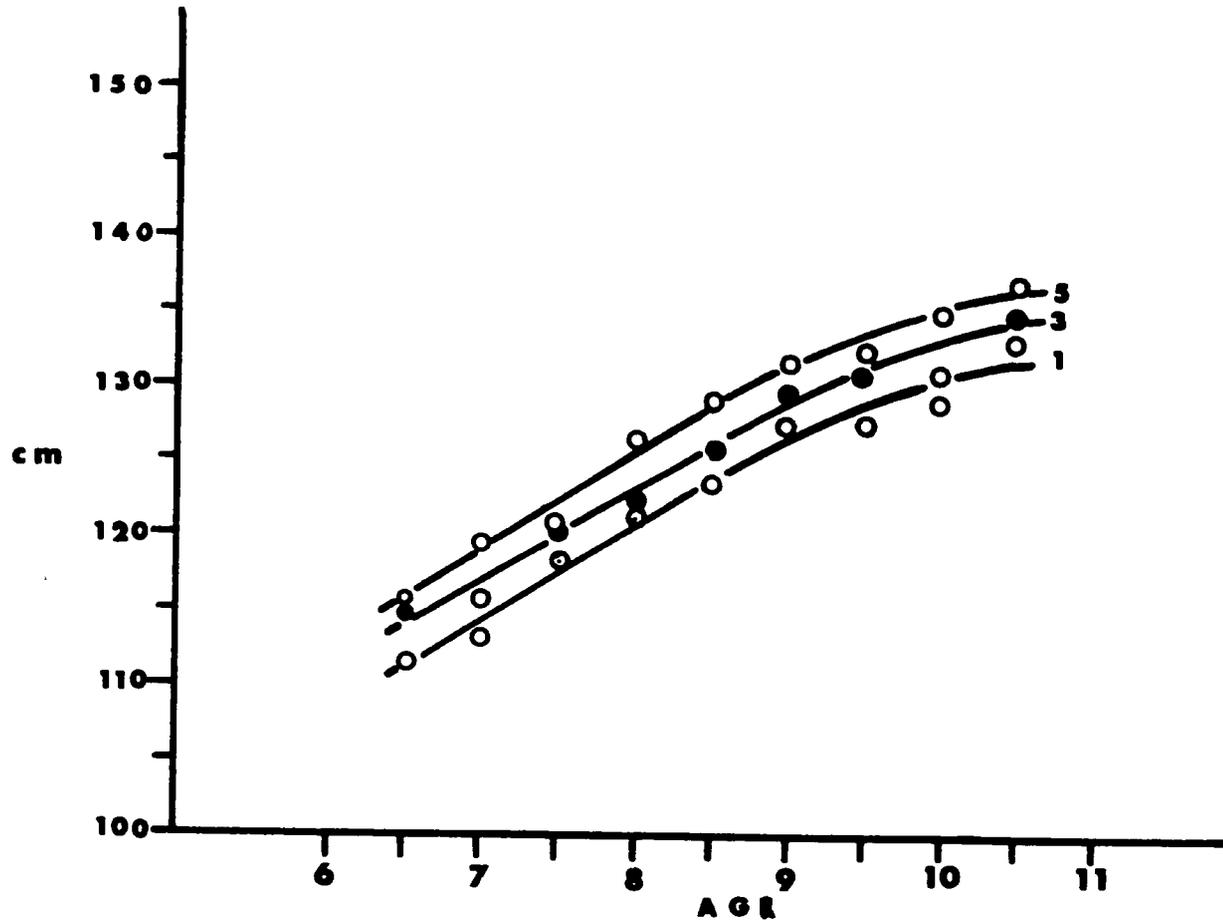


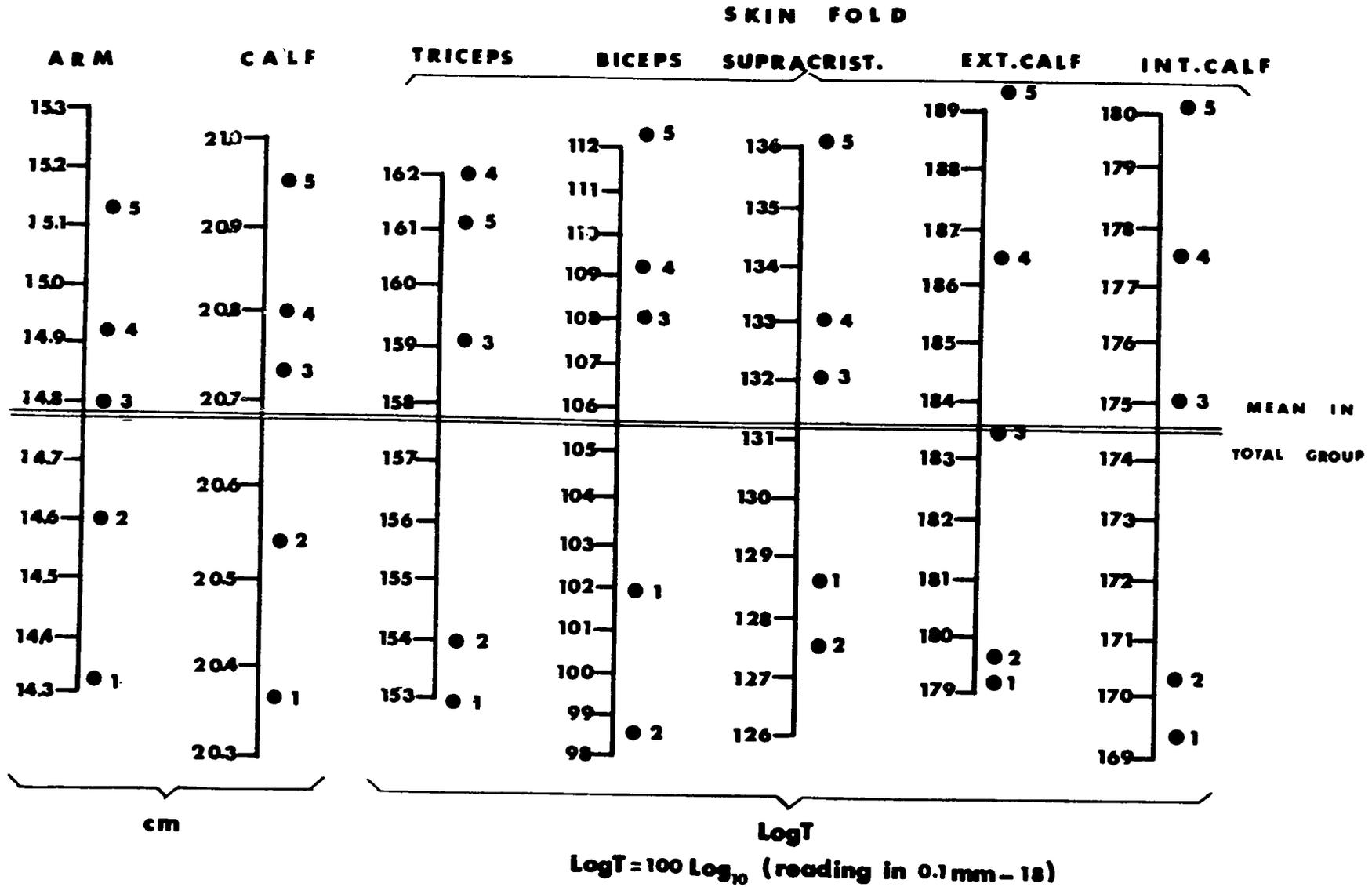
Table 8Newborn Hospital Babies

Similarities in three measurements in different occupational groups from 1 (unemployed) to 8 (highest category)

FATHER'S PROFESSION	LENGTH		WEIGHT		CRANIUM CIRCUMFERENCE	
	Mean in cm.	N°	Mean in Kg.	N°	Mean in cm.	N°
1 - 2	48.9	73	3.32	73	34.4	40
3	48.7	77	3.31	77	34.4	43
4	49.5	87	3.28	87	34.5	44
5	48.9	28	3.29	28	34.3	10
6 - 7 - 8	48.9	30	3.43	31	34.6	16
TOTAL	49.0	295	3.31	296	34.4	153

MEANS IN FIVE SOCIAL GROUPS

Figure 5

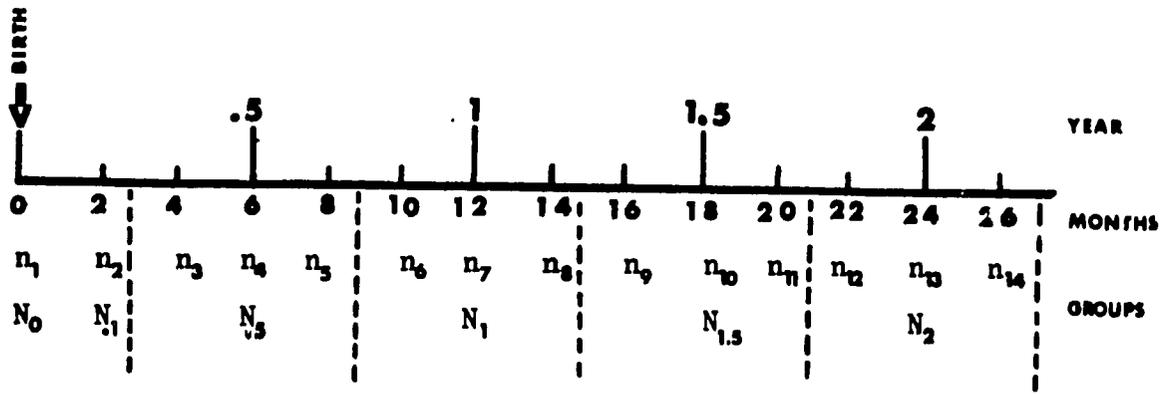


● SOCIAL GROUPS from 1 (underprivileged) to 5 (privileged)





**SAMPLE BIRTH - TWO YEARS**



$$n_2 = n_3 = \dots = n_{14}$$

$$n_1 = 3 \times n$$

with  $n = 60$  total sample equals 960 subjects

TABLE 9

HEIGHT

<u>Age</u>	<u>6.5</u>	<u>7</u>	<u>7.5</u>	<u>8</u>	<u>8.5</u>	<u>9</u>	<u>9.5</u>	<u>10</u>	<u>10.5</u>
<u>Mean</u>	<u>114.48</u>	<u>116.32</u>	<u>119.28</u>	<u>122.51</u>	<u>124.40</u>	<u>127.11</u>	<u>129.67</u>	<u>130.41</u>	<u>135.03</u>
<u>S.D.</u>	<u>4.61</u>	<u>5.00</u>	<u>5.26</u>	<u>5.54</u>	<u>5.57</u>	<u>5.77</u>	<u>5.64</u>	<u>5.72</u>	<u>6.45</u>
<u>Asym</u>	<u>0.23</u>	<u>-0.13</u>	<u>-0.25</u>	<u>0.16</u>	<u>0.02</u>	<u>0.18</u>	<u>0.32</u>	<u>0.40</u>	<u>0.06</u>
<u>Curstosis</u>	<u>3.01</u>	<u>2.94</u>	<u>3.56</u>	<u>3.01</u>	<u>3.07</u>	<u>3.15</u>	<u>3.43</u>	<u>3.23</u>	<u>2.12</u>

H E I G H T

Table 10

A G E

CENTILE	6.5	7	7.5	8	8.5	9	9.5	10	10.5
3	106.7	107.2	108.7	110.8	113.4	116.6	119.2	121.4	122.9
5	107.5	108.5	110.8	112.8	115.3	117.6	120.0	122.1	123.2
10	108.7	109.8	112.5	115.3	117.6	119.7	121.9	124.0	125.0
25	111.9	113.0	115.3	117.9	120.3	123.3	125.7	127.5	128.3
50	115.2	116.5	119.3	122.1	124.6	126.9	128.7	130.7	132.1
75	118.4	120.0	123.0	125.5	128.0	130.8	133.1	135.7	137.6
90	121.3	122.5	125.7	128.8	131.7	133.9	136.1	139.0	140.7
95	122.8	124.5	128.1	131.6	134.4	137.0	139.6	141.2	141.8
97	124.3	125.7	128.9	132.5	135.6	138.5	140.7	142.7	143.9

H E I G H T

Table 11

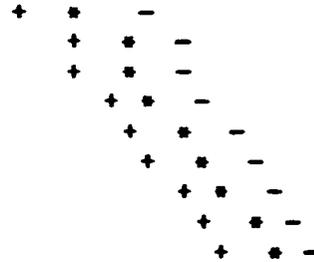
A G E

STANINE	6.5	7	7.5	8	8.5	9	9.5	10	10.5
1	107.1	108.1	109.7	112.3	114.0	117.2	119.6	121.9	123.1
2	108.9	110.0	112.6	115.5	117.9	120.0	122.1	124.2	125.2
3	111.5	112.5	115.0	117.5	119.8	122.6	125.0	127.1	128.1
4	114.2	115.5	118.4	121.0	123.5	125.6	127.7	129.6	130.8
5	117.0	118.2	120.8	123.5	126.1	128.6	130.7	132.8	134.4
6	118.6	120.2	123.5	126.2	128.7	131.4	133.4	136.2	138.1
7	120.7	122.1	125.5	128.6	131.2	133.7	135.7	138.6	140.5
8	123.2	124.8	128.3	132.1	134.7	137.8	140.1	141.7	143.0
9									

THE ABSOLUTE VALUES ARE DIVIDED BY 2.00

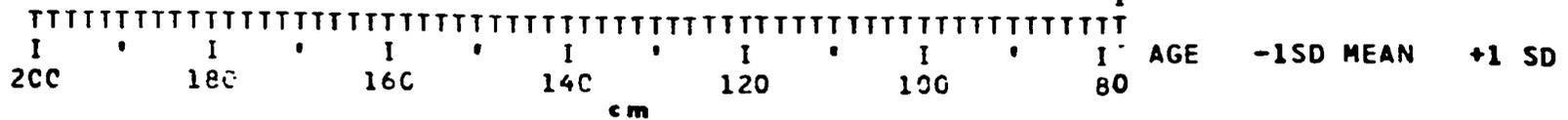
Figure 9

HEIGHT



I	19.5			
I-	19.0			
I	18.5			
I-	18.0			
I	17.5			
I-	17.0			
I	16.5			
I-	16.0			
I	15.5			
I-	15.0			
I	14.5			
I-	14.0			
I	13.5			
I-	13.0			
I	12.5			
I-	12.0			
I	11.5			
I-	11.0			
I	10.5	128.6	135.0	141.5
I-	10.0	124.7	130.4	136.1
I	9.5	124.0	129.7	135.3
I-	9.0	121.3	127.1	132.9
I	8.5	118.8	124.4	130.0
I-	8.0	117.0	122.5	128.1
I	7.5	114.0	119.3	124.5
I-	7.0	111.3	116.3	121.3
I	6.5	109.9	114.5	119.1
I-	6.0			
I	5.5			
I-	5.0			
I	4.5			
I-	4.0			
I	3.5			
I-	3.0			
I	2.5			
I-	2.0			
I	1.5			
I-	1.0			
I	0.5			
I-	0.			
I				
I				

59



40-I  
45-I  
44-I  
43-I  
42-I  
41-I  
40-I  
39-I  
38-I  
37-I  
36-I  
35-I  
34-I  
33-I  
32-I  
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2-I  
1-I  
0-I

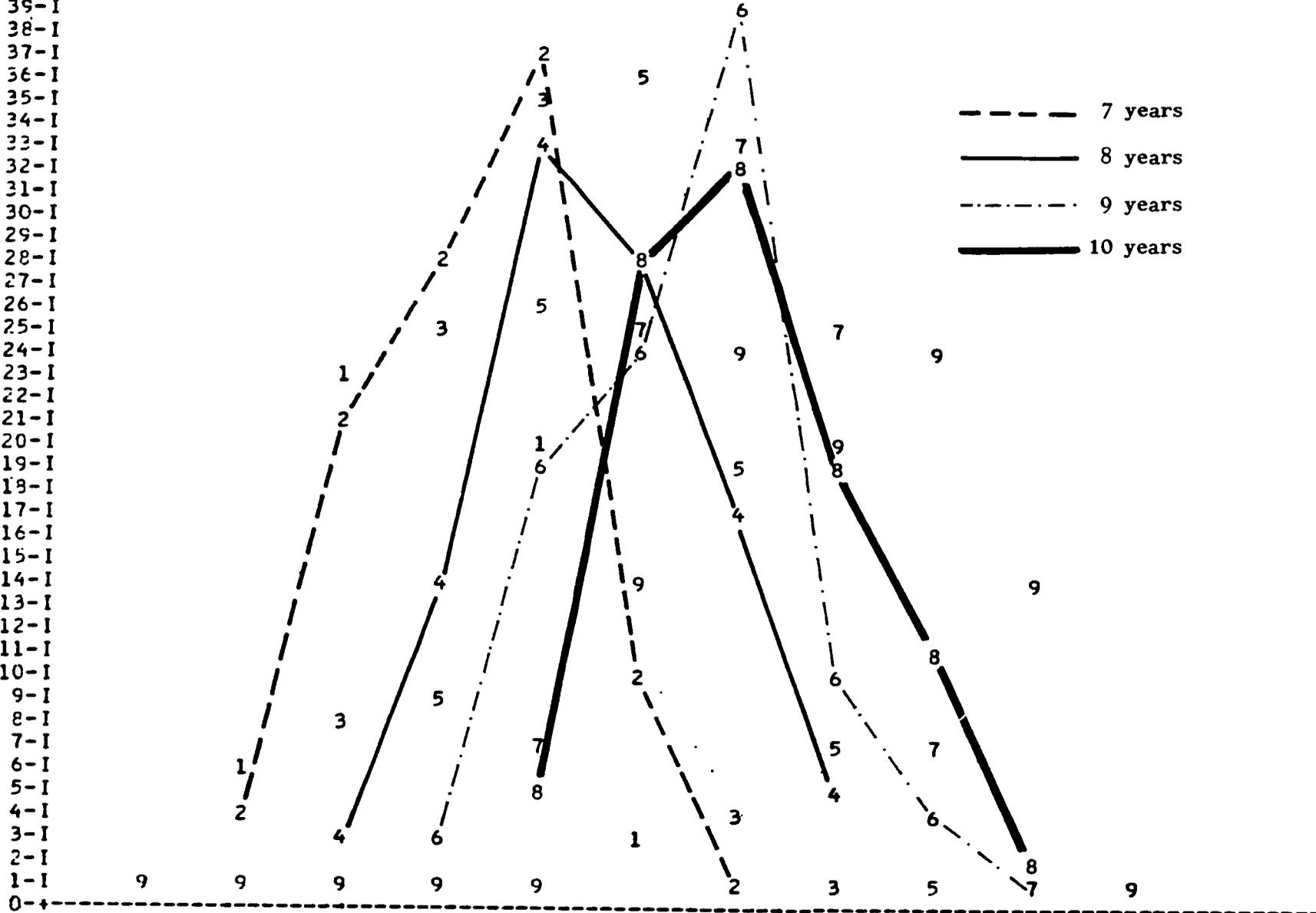
HEIGHT

Frequency distributions by age group

Figure 10

----- 7 years  
————— 8 years  
-.-.-.-. 9 years  
————— 10 years

%



VAL 100.00 105.00 110.00 115.00 120.00 125.00 130.00 135.00 140.00 145.00 150.00 155.00 cm

Figure 11

### NUTRITION FEASIBILITY STUDY

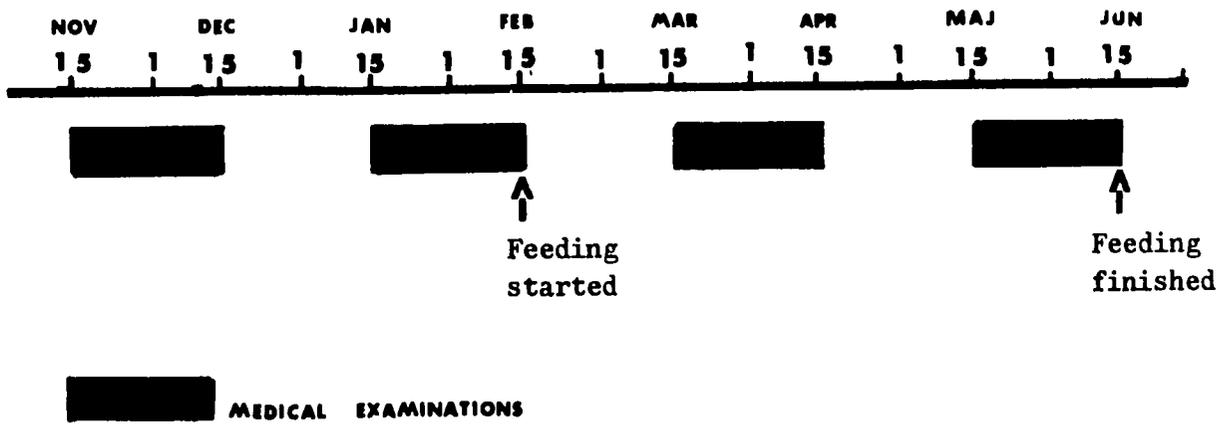


TABLE 12Sidi Fathallah - Tunis - 20 Poor Families

- a) Total family ingestion divided by number of family members  
 b) Weighted % recommended allowances

No.	Month Income Dinars	Calories	%	Protein	%	Ca	%
1	3	880	44.0	28.2	39.3	325.1	54.5
2	10	3126	156.3	79.8	114.0	385.8	64.3
3	13	2703	135.1	90.2	130.1	715.3	119.2
4	14	1872	93.5	25.0	35.7	352.0	64.3
5	14	1893	93.9	57.0	88.8	273.0	91.6
6	16	2289	162.2	74.0	148.0	287.0	90.3
7	19	1654	82.6	38.0	53.5	381.0	63.4
8	20	2909	148.4	85.0	121.1	673.0	111.8
9	20	1728	86.3	54.0	77.1	667.2	111.1
10	24	1313	65.5	36.0	51.6	334.5	55.7
11	24	2457	122.8	71.0	101.0	597.4	99.5
12	24	2483	124.1	93.0	133.7	324.7	54.1
13	25	1436	66.4	38.0	60.7	426.4	71.0
14	25	2841	142.1	83.0	118.1	893.0	115.4
15	26	775	38.7	23.0	33.0	176.0	29.0
16	28	1939	96.9	62.0	88.0	479.0	79.8
17	28	2059	102.9	38.0	54.1	266.3	44.3
18	33	2465	123.2	68.0	96.4	448.6	74.8
19	38	1611	80.4	61.0	86.9	388.9	97.2
20	40	2137	106.8	55.0	77.8	570.2	95.3

Investigations are in progress to determine reasons for anomalies between income and consumption, e.g. number in family, help by friends and relatives, supplementary activities, etc.

TABLE 12Sidi Fathallah - Tunis - 20 Poor Families

- a) Total family ingestion divided by number of family members  
 b) Weighted % recommended allowances

No.	Month Income Dinars	Fe	%	A	%	B <sub>1</sub>	%
1	3	5.74	35.8	0	0	.497	33.1
2	10	19.35	120.9	3079.0	65.8	1.508	100.5
3	13	42.14	263.4	3947.0	87.7	2.136	142.2
4	14	5.03	31.4	372.0	8.2	.481	32.1
5	14	13.10	81.8	1975.4	38.3	1.252	83.4
6	16	15.10	132.1	1090.5	7.1	1.507	140.6
7	19	11.39	71.2	595.4	13.8	.904	60.2
8	20	25.07	156.7	1550.1	34.4	1.609	107.4
9	20	30.80	191.3	706.0	16.6	.718	47.8
10	24	7.46	40.8	278.0	5.9	.614	40.8
11	24	13.28	83.0	1359.0	30.2	1.177	74.4
12	24	15.81	98.8	323.1	7.1	1.573	233.0
13	25	8.01	50.0	406.1	9.0	.665	46.0
14	25	18.83	117.6	1321.1	52.3	1.871	124.7
15	26	4.00	25.0	0	0	.313	20.9
16	28	16.05	100.3	4290.0	95.4	1.791	19.4
17	28	6.58	41.1	75.8	1.7	.530	35.3
18	33	14.77	92.3	2605.4	57.8	1.556	104.6
19	38	12.50	78.1	7729.9	171.7	1.263	84.2
20	40	8.35	52.1	466.9	10.3	.792	52.8

Investigations are in progress to determine reasons for anomalies between income and consumption, e.g. number in family, help by friends and relatives, supplementary activities, etc.

TABLE 12Sidi Fathallah - Tunis - 20 Poor Families

- a) Total family ingestion divided by number of family members  
 b) Weighted % recommended allowances

No.	Month Income Dinars	B <sub>2</sub>	%	PP	%	C	%
1	3	.421	28.0	8.42	52.5	0	0
2	10	.797	53.1	17.39	108.6	24.2	32.2
3	13	1.339	89.3	18.09	112.8	14.2	18.8
4	14	.536	35.3	5.72	35.7	20.8	27.7
5	14	.636	42.4	17.45	102.8	8.9	11.9
6	16	.749	69.9	18.28	159.9	14.0	26.8
7	19	.739	49.1	13.53	84.5	27.5	36.6
8	20	1.525	101.8	19.75	123.4	23.2	30.8
9	20	1.132	75.4	11.31	70.6	7.5	10.0
10	24	.534	35.5	7.65	47.7	13.2	17.6
11	24	1.034	68.9	13.96	87.2	42.2	56.3
12	24	1.009	67.3	18.89	118.0	17.2	23.0
13	25	.565	37.7	11.21	70.0	56.0	82.2
14	25	1.359	90.5	18.34	113.8	28.8	38.4
15	26	.252	16.7	5.70	34.5	0	0
16	28	1.062	70.8	14.66	91.6	11.7	15.5
17	28	.429	28.5	7.53	47.1	10.1	14.7
18	33	1.045	69.6	19.17	119.8	31.7	42.3
19	38	.755	50.2	19.91	87.0	19.0	25.3
20	40	.828	55.2	10.62	66.2	25.7	34.2

Investigations are in progress to determine reasons for anomalies between income and consumption, e.g. number in family, help by friends and relatives, supplementary activities, etc.

**Section D**

**Economic Analyses of Education  
and Finance Inputs in Rural Tunisia**

**John L. Simmons**

**Internal Report 33  
Harvard University  
Research Project in North Africa  
March 1969**

**ECONOMIC ANALYSIS OF EDUCATION AND FINANCE INPUTS  
IN RURAL TUNISIA\***

John L. Simmons<sup>1</sup>

This report discusses research designed to test several hypotheses about education, finance and agricultural productivity. The field work began in October 1966 and was virtually completed by July 1968. At the time of this writing (March 1969), most of the data has been coded, punched and some preliminary analysis made. While several observations are made, results are not presented in this report. Since the proposal was less than 50 percent funded, data could not be collected to test the health hypotheses. The data and analysis evidence extensive cooperation between the members of the Project groups.

A lengthy discussion of the crucial role of agriculture and the rural economy in the development of emerging nations is not necessary. With rare exceptions, the rapid expansion of agriculture is now recognized as the necessary basis for raising levels of nutrition and income, as well as for providing essential foreign exchange.

A central development question is thus how to change the often stagnant agricultural sector of an underdeveloped country into the dynamic sector capable of leading the nation's development. Increasing agricultural productivity – per man and per unit of land – is the basic issue. As Gunnar Myrdal emphasized, "there can be no significant economic development in the poor countries of the world without substantial increases of agricultural productivity and output."<sup>2</sup>

The usual approach to increasing productivity is the introduction of improved methods, seeds and fertilizers. But such technological improvement skirts more fundamental questions. How does one explain, for example, the wide variations in output from seemingly substitutable combination of inputs? To what extent is education, or other rural institutions, responsible? What are the most efficient methods of applying the available technology? And what measures are available to determine the most efficient method? Tunisia, with a stable political system and imaginative economic institution, offered an excellent laboratory for enquiry.

The following research program was based on the Tunisian experiences of members of the project and on current research methodology. The broad dimensions of this essay, including the education, financial, and psychological aspects of agricultural productivity per unit of land, are made possible by the earlier work of project members in their several disciplines.

Agricultural Productivity. Certain ideas and inputs concerning agriculture have become fashionable in development economics. Fertilizers, insurance schemes, innovation incentives, cooperatives and credit have all enjoyed the spotlight. More recently, a package of these inputs, carefully supervised,

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\* This report has benefited by the comments from other members of the Harvard North Africa Project especially those of Dr. H.B. Young and Professor David Kinsey, and from Mr. Leonard Kornfeld and Dr. Harold Freeman of the Agency for International Development, Tunis.

1. Dr. Simmons is an economist and Research Fellow, Harvard University where he is associated with the Center for Middle Eastern Studies, the Center for Studies in Education and Development, and the Quantitative Project for Research in Economic Development. While in Tunisia, he served as Field Director of the Project's activities.

2. Gunnar Myrdal, "The U.N., Agriculture and the World Revolution," *Journal of Farm Economics*, November 1965, p. 896.

has been advertised as the solution in increasing productivity.<sup>3</sup> A certain logic supports the package approach: it seems likely that inputs that do not work in one area may work somewhere else. The basis of the package approach is usually cheap credit since it enables small farmers to purchase the required inputs and at the same time submit to simple financial control.

The Tunisian study examines the basic assumption that credit increases productivity when spent on productive inputs. For a sample of 33 farmers in one Syrian village, this assumption was not statistically valid.<sup>4</sup> Bank and non-institutional credit, though contributing to higher standards of living for the farmer, was not aiding farm production in the manner anticipated by the literature on agricultural finance.

The data collected in Tunisia will test the following major hypotheses:

1. That there is a significant relationship between the education of the sample farmers and their gross productivity per unit of land.
2. That there is no significant relationship between the net or gross income of the sample farmers and their use of credit.
3. That there is no significant relationship between the total credit used by the sample farmers and their productivity.
4. That there is a significant relationship between the total credit used by the sample and the introduction of cash crops.

A sample of 140 private farmers was stratified according to credit use. The strata consisted of four cells of 35 farmers each; farmers with no credit and farmers with small, medium and large amounts of credit. To control for ecological factors, citrus farms from a limited geographic area in the province of Cap Bon comprise the universe.

The sample was drawn from the records of regional and local agencies of the National Agricultural Bank and the major private bank lending in the area. The non-credit farmers were selected from district lists. Data was collected for three production periods. While drawn from many sources, the general methodology is similar to studies by Yair Mundlak, S.C. Hsieh, Minouru Inoue, and A.P.G. Payek.<sup>5</sup>

A set of instruments designed to measure: 1) the physical inputs and outputs of farm production, 2) the credit flow for productive purposes, and 3) the influence of migration, education and attitudes on output, are similar to those in the Syrian study. These instruments were retested and pre-coded for Tunisian conditions.

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3. In contrast, Arthur T. Mosher, *Getting Agriculture Moving: Essentials for Development and Modernization*, Praeger, New York, 1966, presents a balanced view of agricultural development requirements.

4. John L. Simmons, "Agricultural Productivity and Associated Variables: A North Syrian Village, 1965." D.Phil. dissertation, Sub Faculty of Economics, Oxford University, October 1966. In order to verify and extend the significance of the Syrian results, we used village schedules similar to those used in Syria. The variables described characteristics of the land supply, including fragmentation and total area available to each farmer, and of the labor supply, including education, communication and attitudes.

5. A.P.G. Poyck, *Farm Studies in Iraq*, Wageningen, 1962; M. Inoue, et al., *An Economic Analysis of 343 Upland Farms in Japan*, National Institute of Agricultural Sciences, Tokyo, 1963; S.C. Hsieh, *Management Decision on Small Farms in Taiwan*, reprinted by the Agricultural Development Council, New York, May 1966; and Yair Mundlak, "Empirical Production Functions Free of Management Bias," *Journal of Farm Economics*, February 1961.

Local personnel received considerable training in research methods. Senior university students in agriculture and sociology lived in the area for ten weeks during the summer of 1967. In addition to the interviewing, they made general observations on rural institutions<sup>6</sup> and customs, as well as on specific agricultural practices. Four Peace Corps volunteers made a significant contribution to the knowledge of farm decision making.<sup>7</sup> Two Harvard students studied land tenure and cooperatives.<sup>8</sup> Members of the University of Tunis, through its Centre des Etudes Recherches Economiques and Sociales, the Ecole Normal Supérieur d'Agriculture, and the Institute National de Recherche Agricole Tunisienne cooperated on the study.

At this time the coding and punching of the data is complete, and the tabulations and correlations are being run. It is, therefore, premature to discuss the results of the survey.

Impressions from field observations, however, would suggest that credit programs are neither established nor implemented with economic criteria. Rather, misleading financial criteria like percentage of loans repaid, while indicating "success", mask credit effectiveness. Furthermore, the tools of macro economic policy including input-output prices, import controls, and export incentives are inadequately used for improving agricultural productivity. Finally, while institutional support for structural change is an important part of the government programs, the practical ramifications of such institution building are often unknown by those concerned.

Education. A basic assumption underlies the rural literacy and education programs suggested by the FAO and UNESCO. The programs assume that education is a major investment for increased rates of social and economical development. Economic analysis of the role that education plays in economic development, however, indicates that education, defined as years of school or literacy, may have little effect on development during the early stages of a nation's growth.<sup>9</sup> In addition, empirical observations have pointed out that for some countries educational investment is largely wasted.<sup>10</sup>

Since education is often assumed to be a casual factor in economic development, the study examined this concept from two vantage points: present farmers and future farmers.

For the first, present farmers' education is treated as an independent variable in a regression equation as a partial explanation of the sample's output. The hypothesis is that high years of education is not correlated with the high yield farmers of the citrus sample, and education will not explain variations in output.

To study future farmers, we took a second sample of young men, aged 14-25, who had primary education in a rural town. A strip sample of the town gave 90 families. The same families had been studied by Professor Kinsey, and thus provided an excellent opportunity to combine a number of economic and education hypotheses. We primarily wanted to determine to what extent the children retain skills learned at school, and what are the social and economic factors associated with those

6. John L. Simmons, "The Context and Evolution of Tunisian Cooperatives," unpublished, mimeo, 1968.

7. Linda LaMacchia, et al., "Rural Life in Tunisia," Harvard North Africa Project, 180 pages, mimeo 1967.

8. Thomas Roberts, "Village Evolution", unpublished thesis, Harvard, 1969. Michelle Rich, "The Structure and Incentives of Tunisian Cooperatives", Harvard North Africa Project, 80 pages, mimeo, 1968.

9. For a consideration of the form and role of education in Tunisian development, see Mari Montamat, "Colonial and National Education in Tunisia: Continuity and Change in Values and Policies", unpublished thesis, Harvard, 1969.

10. See, for example, J.K. Galbraith, *Economic Development in Perspective*, Harvard University Press, 1962, pp. 46-59. For evidence to the contrary, see D. Chaudri, "Education and Agricultural Productivity in India", University of Delhi, Ph.D. thesis, unpublished, 1968.

children who have retained the skills better than the others.

The major hypotheses are that: 1) the decline in reading skills is sufficient to render the ex-primary school student with six years of education, functionally illiterate five years after leaving school; 2) the economic cost of such schooling, including alternative uses of resources devoted to schooling, yields few private or social <sup>11</sup> economic benefits from present education investment; and 3) present rural education is not providing the group of future farmers who are expected to be more receptive to innovation and change as a result of their education.

Although I have reached no conclusions from the data, impressions from field observations suggest several policy questions. Some of these could be hypotheses for future investigation.

1. How many years of education are necessary to implant functional literacy (defined as the ability to read and understand a newspaper)? Will this number of years assure that the ability will be retained for a specified length of time? Our preliminary findings indicate that most children now finishing rural sixth grade cannot now achieve this standard. The UNESCO standards of four years to gain functional literacy are not realistic for Tunisia. The training equivalent to one year of secondary, at present quality levels, is probably essential if functional literacy is the goal of rural development and present education investment remains unchanged. (Dr. Kinsey's results suggest that the training equivalent should be achieved before secondary.) What are the economic and social implications of this observation?

2. Should the goal for primary education be less ambitious than functional literacy? Perhaps achieving fundamental knowledge about citizenship, modern agriculture and initiating problem solving methods are sufficient, particularly if they can reorient children's aspirations towards desiring a rural life.

3. Access to secondary and higher education requires scrutiny. While equality of opportunity is a Tunisian goal, the limited resources imply investment choices to maximize net public benefits. To achieve these benefits, could the present system of promotion to the secondary level be improved to assure equality of opportunity? For example, could the system of examinations more accurately reflect the 6th graders' abilities than it does? Furthermore, to improve quality in the post primary years, could students be screened for their motivations, aptitudes, as well as their school skills?

4. The vocational training schools, especially those for pre-apprenticeship, but also the apprenticeship schools, are used in part to reduce the possibility of juvenile delinquency and keep teenagers and young adults off the streets. Do the social benefits accruing to such a policy have economic significance through lower "avoidance costs" like police protection and insurance rates? On the other hand, does this policy lead to lower social benefits from the total education investment by increasing the boredom and unrest among vocational students who are not being satisfied with jobs when they finish their courses? The costs which would tend to lower the social benefits would be those incurred through increased rates of delinquency among this group of trained and jobless adolescents plus the costs of specialized and unused training. A government survey in 1968 indicated that one out of two vocational graduates do not find jobs within a year of their course termination. If the new skills have not been applied by this time, their lapse is generally complete according to the standards of the International Labor Organization.

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11. Private benefits accrue directly to the individual like increased earnings. Social, or public, benefits accrue to society, or the individual indirectly. Decreased delinquency or increased community action, for example, could be social benefits from education investment.

5. Children who complete primary school and perhaps some technical training and do not continue on with secondary school usually return to live with their families for five to ten years, especially in the rural areas. While their minimum levels of literacy would enable them to take some simple jobs which are available, their aspirations seem to prevent this. They prefer to be idle rather than to work in jobs which to them appear unacceptable: Their preference for leisure time exceeds their preference for income. Living at home means that their standard of living is unchanged, and their social and marital mobility static. The number of children in this category will continue to increase rapidly in the next few years. They are already in school and the projected growth rates of the economy including an investment mix with a relative decline in the agriculture sector will mean increasing rural unemployment for them.

6. Emphasis in the primary school is on preparation for further schooling. Yet less than ten per cent of the rural universe who begin primary school will finish the first year of secondary school. Thus 90 per cent may have gained few positive benefits while having their ambitions frustrated by not completing secondary school. Unless they do complete at least the first cycle, their beginning salaries and lifetime earnings tend not to differ from those who have had little or no formal training. A final educational frustration for those among the 90 per cent who did develop literate skills may be the slow lapse back into the separate world of illiterates. Are there political as well as economic implications in these phenomena?

7. If we assume that the present primary system might consider as a goal preparing its students for the successful completion of education at least the equivalent to first year of secondary school (to guarantee a minimum probability of lapsing into illiteracy) or to the end of the first cycle of secondary (to insure an earnings differential in comparison with the less uneducated), then we can say that the 90 per cent of the annual primary budget mainly benefits those 10 per cent who complete at least the first year of secondary. Furthermore, one should note that this proportion is biased in favor of the urban population, while relatively, in fact, national priorities and resource potentials are in the rural sector of the economy.

This 90 per cent was 14 million dinars (\$1.92 equals 1 dinar) in 1965-66 and includes capital and current primary education costs. On an average basis the value of the primary investment in those students who terminated after the first year of secondary is 56 million dinars. For the 35,000 students who reached this level in 1966, 1800 dinars had been invested in each one. This is about equivalent to ten years income for an average rural family of six persons, or the cost of creating several non-industrial jobs.

If the student does not continue beyond the first year secondary level, and if this student is unlikely to draw earnings benefits from the fact of his education, then we can say that the education benefits to the nation are worth 1800 dinars. These social benefits would include increased political stability, socialization, and modernization.

8. Are frustrations, although damped among rural adults through strong fatalism, bound to increase rapidly in the next few years with the output of the 1958 education expansion program? Parents saw schools as the way for their children to gain position and a better life. Now that motivating vision, so essential to breaking the vicious circle of apathy, is dimming.

9. Although minor changes were introduced in 1968, the primary curriculum has little changed since 1958. Could one increase the use of imagination, curiosity and local environment to stress the political and social aspects of the culture? Could the true importance of agriculture in society be shown which would enable farmers' sons the chance to have increased pride in their fathers' occupation? Should increased thought be given to the fact that the vast majority of students in primary

school now, and for the foreseeable future, will not continue to secondary school? The present emphasis is on learning to read and write to then promote thinking. Neither the time nor the money may be available to promote thinking in such a way. Much is known about other avenues. Are they being investigated?

10. To what extent does the curriculum promote both the ability and the desire of the student to continue learning through life?

11. To what extent are present curricula and programs under preparation geared to an employment-oriented education system?

12. Could some of the financial burden for primary schools be shifted to local communities without further lowering rural quality? Could this mean increased mobilization of savings and important community and parent support of education?

13. Would improved subsidies to cover students' costs significantly reduce drop-out rates for secondary school students?

14. Would improved incentives to teachers, including better wages and materials and rural differentials improve the net benefits from primary investment by reducing the social costs of drop-outs?

15. Could capital and current costs of rural primary and secondary schooling be reduced by substituting transport for boarding halls or new schools?

16. Finally, would there be advantages to increasing the application of economic criteria for assessing further education investments?

Psychology. Economists have often pointed to the restraint imposed upon the optimum allocation of resources by the traditions and attitudes of the farming population. Education and contact with urban society were considered the main means of developing attitudes among rural people which would encourage a more modern outlook. Yet little attempt has been made to establish either the effectiveness or the efficiency of using traditional forms of education for attitude change. Studies of economic modernization, for example, are unable to establish causal relationships with education.

Recent research in social psychology, however, indicates that there may be more effective educational methods for changing the attitudes of a specific group than those methods of traditional education. Furthermore, these findings suggest simple psychological testing methods, similar to those used in American industry and government, for matching men with job requirements. Based on the work of Professor David C. McClelland, and the adaptations made by Professor Everett C. Rogers,<sup>12</sup> this section of the Tunisian study investigated the psychological variable of achievement. We have adapted and tested the sentence completion tests required to measure levels of need achievement in Tunisia.

The first phase of the study examines the hypothesis that farmers with high yields tend to be high achievers. If this hypothesis is accepted, then several policy implications are suggested.

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12. D.C. McClelland, *The Achieving Society*, Van Nostrand, New York, 1961; E.C. Rogers, *Achievement Motivation Among Colombian Peasants*, Michigan State University, Mimeo, 1965. Roger's work in Colombia permitted the adaptation of motivation research to the farmer level, especially in connection with the rate of adoption of innovations.

In a culture where members tend to understate income and production in the upper income strata, and overstate them in the lower brackets, then the need achievement scale with ten minutes of simple questions would objectively tend to identify the more productive farmers. To obtain better results from specific farm programs, improved inputs, and institutions, then the better farmers could be easily identified. Rather than using the shotgun approach to innovation diffusion, one could concentrate on those likely to derive the greatest benefits and most likely to act as opinion leaders in the diffusion process.

Several achievement questions if added to a credit form might yield significant information on the farmer's productivity potential.

A further policy implication is for the selection of rural technicians. While research would be needed to verify the hypothesis that high achievers make better technicians, this concept could assist in selecting better qualified personnel.

The second phase of the attitudinal research actually stimulated the farmers' achievement motivation with a 5-day course developed and tested by Professor McClelland and Malcolm Slavin. The hypothesis is that a simple course including the definition of goals and obstacles can significantly improve the physical output of a group of 12 farmers as compared with a control group.

Significance. This program analyzing rural education and finance would not have been possible without the efforts by the other members of the project. A similar combined effort, concentrating on the economic, educational and psychological variables associated with agricultural productivity, cannot be found in the literature of the several disciplines.

The policy implications of the educational, psychological and financial aspects of the economic study of rural areas are important for Tunisian and other development planners.

First, the studies will provide the descriptive and analytic information on agricultural and education investments that have not previously been available.

Second, the education analysis will indicate to what extent education may be an economic factor in rural development. Planners can then consider this when budgeting capital and current expenditures.

Third, the achievement motivation aspect is not only an attempt to define parameters, but also to alter them in a predictable and constructive direction. In the hands of policy makers, this tool could be of supreme importance in attacking attitudes which now restrict optimum resource mobilization.

Fourth, the financial analysis will establish methods to show relationships between credit inputs and productivity and thus provide third world planners and technicians an important tool for programming agricultural finance.

Fifth, given the high quality of the data available in Tunisia for these studies, and at the same time given Tunisian social and economic conditions which compare to many developing countries, the material and analyses are highly relevant to generalizing the Tunisian results. Thus the studies will contribute to solving practical investment decision problems as well as establishing a more precise framework for theoretical discussions.

Results and Recommendations. Since the coding and punching of the data is only just completed, no results are available. Impressions from field observations, and hypotheses for future investigation, are mentioned in the text of the report.

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