

AN ABSTRACT OF THE THESIS OF

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Title: PHYSICAL FITNESS PARAMETERS OF MALE YOUTH IN
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Over 1,000 9th and 10th grade male high school youth in the Country of Belize, Central America, were administered the AAHPER Youth Fitness test during the 1972-73 academic school year. Results were analyzed and compared to similar data in the United States. Of 41 comparisons utilizing the Student t for uncorrelated groups, 25 were significant at the .05 level of confidence. American youth tended to have better performance in the Sit-up, 50-Yard Dash and Softball Throw. The Belizean youth tended to have better performance in the Pull-up, Shuttle Run, Standing Broad Jump, and 600-Yard Run-Walk.

Physical Fitness Parameters of Male Youth in
U.S.A. and Belize, Central America

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PHYSICAL FITNESS PARAMETERS OF MALE YOUTH IN U.S.A. AND BELIZE, CENTRAL AMERICA

CHAPTER I

INTRODUCTION

During the last twenty years, many physical educators throughout the world have taken a keen interest in cross cultural comparisons of physical fitness levels. The catalyst for this interest originated in the United States with the 1953 published results of the Kraus-Weber Minimum Muscular Fitness Test (33, 34), which compared United States and European children, and with the 1958 findings of the National AAHPER Youth Fitness Survey (23).

The present study represented a continuation of this international interest in youth fitness. In this research, the AAHPER Youth Fitness Test Battery (1) was utilized to survey the physical fitness of male high school youth in Belize, Central America and to compare those results to similar data obtained in the United States. This study was the first such comparison made between these two countries.

Purpose of the Study

The purpose of this study was two-fold. First, the investigator planned to obtain physical fitness norms for Belize male high school youth using items of the AAHPER Youth Fitness Test. Second, these

norms would be compared to those previously established for the United States.

Hypothesis

The scores of the physical fitness test administered in Belize would not differ significantly from the AAHPER test norms obtained in the United States. A .05 level of significance was selected for acceptance or rejection of the null hypothesis.

Definition of Terms

Educational Institutions in Belize

Belize (36) has a dual system of state controlled and church-state controlled educational institutions which range from elementary to limited post secondary education. The curriculum and syllabii orientations are those of the British educational system.

Form Levels

Students who took part in this study consisted of first and second form boys from fifteen participating schools throughout the country. First form is comparable to the American ninth grade level. Second form is comparable to the American tenth grade level.

Physical Fitness - Motor Performance

The terms physical fitness and motor performance as used in this study refer to a limited phase of motor ability: 1) strength, 2) endurance, 3) power, 4) flexibility, 5) agility, and 6) balance (37).

Limitations

1. The sampling used in the Belize survey represented an attempt to test the total designated population, whereas the American survey utilized a multi-staged probability sample (26).
2. The arrangements were made so that the researcher either administered or supervised all testing done; however, testing was not completed in Belize City due to time limitations.
3. Some data were deleted from the study because it was felt that they were significantly affected by varying weather conditions such as wind and poor footing caused by rain.
4. The AAHPER Youth Fitness Test Manual suggests that testing be conducted in two periods: the indoor tests should be administered during the first period; and the outdoor tests, the second period. The suggested sequence was generally followed, but it was departed from in the following instances:
 - a. During the first meeting with the subjects, body weight was recorded followed by administration of the Sit-up test.

- b. Weather conditions, such as rain and wind, occasionally caused disruptions during testing periods.
 - c. Large classes and lack of sufficient time influenced the amount of testing that could be completed in one period.
5. The United States data used for norm comparisons were collected fifteen years before the Belize survey was conducted. If important physiological differences existed fifteen years ago in the Belizean population, they could not be determined from present statistical information.

Assumptions

1. The AAHPER Youth Fitness Test Battery was judged to be a valid criterion instrument to measure physical fitness.
2. The national physical fitness norms established in the United States during the 1957-58 survey were appropriate for use in comparison with Belize.
3. The students performed the tests with maximum effort.

CHAPTER II

REVIEW OF LITERATURE

AAHPER Youth Fitness Test

During the past seventeen years, the AAHPER Youth Fitness Test Battery has been used as an instrument to measure physical fitness in the United States and in several foreign countries. The battery has widespread acceptance as a motor performance test, and was also the first such evaluation made in the United States under uniform conditions on a nationwide basis (26). Three national surveys have been conducted since 1957, each under the directorship of Hunsicker (10). Official recognition of the test was given by the American Alliance for Health, Physical Education and Recreation and the President's Council on Physical Fitness and Sports (10).

Creation of the AAHPER Youth Fitness Test was stimulated by the 1953 publication of the Kraus and Hirschland (33) findings on the minimum muscular fitness differences between American and European children. In these findings, American children exhibited a failure rate of 57.9 percent as compared to a 9.5 percent failure rate by Austrian, 9 percent by Italian, and 8.8 percent by Swiss children. The resulting nationwide publicity of these results and the concern shown by President Eisenhower prompted the American Association

for Health, Physical Education and Recreation to select a committee from its Research Council in 1957 to organize a nationwide survey of youth fitness. The Research Council selected motor performance tests which they decided would evaluate certain basic components such as strength, speed, agility, endurance, and power. Consideration was also given to shoulder girdle skill and coordination. Other factors were taken into account in creating the motor performance test: 1) tests which require little or no equipment, 2) tests which could be used by both boys and girls, and 3) tests which could be used for the entire age range of grades five through twelve (26). From these criteria, a test battery was created which consisted of the following items.

1. Pull-up for Boys, Modified Pull-up for Girls (for judging arm and shoulder girdle strength).
2. Straight Leg Sit-up (for judging strength and endurance of abdominal and hip flexor muscles).
3. Shuttle Run (for judging speed and change of direction).
4. Standing Broad Jump (for judging explosive muscle power of leg extensors).
5. 50-Yard Dash (for judging speed).
6. Softball Throw (for judging skill and coordination).
7. 600-Yard Run-Walk (for judging cardiovascular efficiency) (2).

Over 8,500 boys and girls took part in the first survey in 1958.

Percentile norms based on both age and the California Index were established.

In 1964-65, a second survey was undertaken in which the girls' Modified Pull-up was changed to a Flexed Arm Hang Pull-up. New percentile norms were also developed. A third survey was conducted during the 1974-75 school year. Other changes were made over the preceding revision: The 600-Yard Run-Walk was retained with the addition of two optional runs: 1) 1-mile or 9-minute run for ages 10-12, and 2) a 1-1/2 mile or 12-minute run for ages 13 and over (10).

A closer examination of specific test items in the AAHPER Battery, indicated factors which should be recognized:

1. The Pull-up test measures muscular endurance. The truncated distribution of this test indicated that the Pull-up, as a test instrument did not measure strength endurance of those who could not perform one pull-up.
2. The Sit-up test measured strength and endurance of the abdominal and hip flexor muscles. One questionable procedure of this test was the straight knee position of the testee, which can cause strain on the lumbar vertebrae (37). Limiting the maximum number of sit-ups to 100 has a tendency to distort the frequency distribution of the results and thus reduce the value of the test as part of a composite criterion (47).

3. The 600-Yard Run-Walk was designed to measure cardiovascular fitness. Extensive research by Cooper (11) had shown that energy derived through aerobic metabolism during running events occurred in distances of over one mile in length. Although test-retest reliability coefficients for the 600-Yard Run-Walk had been shown to be high, Cooper's evidence indicated that the longer run was more stable as a measure of cardiovascular fitness(11, 37). Alternate runs of 1 mile and 1-1/2 miles have been included in the 1975 revision of the AAHPER Youth Fitness Test (10).
4. The Softball Throw, which is a sports skill item, was intended to measure skill and coordination of the arm and shoulder girdle. Hunsicker (24) did not consider the softball throw consistent with testing of motor fitness because of the coordination and learning elements involved in this activity. He was supported by Clarke (8), who felt that tests of motor fitness should include all aspects of general motor ability except arm-eye and foot-eye coordination. When the AAHPER Test Battery was constructed, it was felt that inclusion of the softball throw would broaden the scope of the tests (24). This test item was omitted from the 1974-75 survey.

The reported reliabilities of test items in the AAHPER battery had a wide range of variation, but appeared to be reliable as indicated

in Table I (31, 3). Reliabilities should be .90 or higher for a physical fitness test to be considered excellent (37, 47, 51).

During the early 1960's, Fleishman (22) conducted extensive research to identify the components of motor performance. From this research, a battery of ten tests was developed, known as the Fleishman Basic Fitness Test. Through multiple correlations with the Fleishman Battery, the following coefficients were found in the tests similar to the AAHPER Test Battery: Shuttle Run .77, Softball Throw .66, and, Pull-up .81.

In an attempt to ascertain the validity of the Canadian Association for Health, Physical Education and Recreation Fitness Performance Test, the Fleishman Basic Fitness Test was used as the criterion for physical fitness (28). Table II indicates the validity coefficients of each CAHPER Test item with the Fleishman Basic Fitness Test composite score (Average T-score of the Fleishman items).

Maximal oxygen consumption in liters per minute, as obtained from the Balke Treadmill Test, was used as a criterion of physical fitness in an evaluation of the AAHPER Test Battery validity. Results indicated a significant positive relationship between each of the AAHPER Test items and the maximal oxygen intake per kilogram of body weight per minute (41).

TABLE I. AAPHER TEST BATTERY RELIABILITIES AS REPORTED
IN THE LITERATURE.

Test	Range in Literature
Pull-up	.89 - .98
Sit-up	.62 - .96
Standing Broad Jump	.82 - .95
50-Yard Dash	.76 - .93
Shuttle Run	.69 - .88
Softball Throw	.89 - .96
600-Yard Run-Walk	.66 - .92

TABLE II. VALIDITY OF CAHPER FITNESS PERFORMANCE TEST.

CAHPER test	Fleishman Composite <u>r</u>
One Minute Sit-up	. 58
Standing Broad Jump	. 51
Shuttle Run	. 72
Flexed Arm Hang	. 44
50-Yard Dash	. 66
300-Yard Run	. 67

International Comparisons of Physical Fitness
Kraus-Weber Test

Physical fitness studies comparing the United States with other countries were first done using the Kraus-Weber Minimum Muscular Fitness Test (33). This evaluation test consisted of six items which were developed after 18 years of clinical observation and were found to be highly correlated with low back pain (37). Five of the tests were designed to measure minimum muscular fitness, and the sixth measured flexibility. Specifically, the Kraus-Weber test measures strength in the abdominal muscles, back muscles, and hip flexors; however, it is not considered a true measure of muscular fitness (30, 42). Kraus (34) administered the battery to over 4,000 normal American children aged 6-19. The same examination was also administered to over 2,000 Austrian, Italian, and Swiss children. These studies revealed a sharp difference in performance between American and Western European children. American children failed in one or more of the test items (Table III). The main cause for this difference was attributed to the more sedentary life style of Americans (33, 34).

During 1956, Noguchi (39) administered the Kraus-Weber Test to over 6,000 children in four cities of Japan. The results were compared to the European and American studies. The Japanese children did far better than their American or European counterparts in the flexibility test. Noguchi suggested the index of leg-length/height

TABLE III. KRAUS-WEBER TEST FAILURES.

Country	Percentage of Failures on One or More Tests
Austria	9.5%
Italy	8%
Switzerland	8.8%
U.S.A.	57.9%

of the Japanese children may have been a major factor in the results. In 1958, 2,325 East Pakistani boys and girls were tested (29). The results indicated that East Pakistani children performed better than the American children in all six of the test items.

Although the Kraus-Weber Test of Minimum Muscular Fitness was not a true test of motor fitness, it did play an important role in arousing people's interest in the fitness movement. Hunsicker (24) stated that the Kraus-Weber Test was the single most motivating force behind the fitness movement of that time.

International Comparisons of Physical Fitness AAHPER Youth Fitness Test

The first AAHPER Youth Fitness Survey was conducted in the United States during the 1957-58 academic school year. First editions of the test manual were published in October 1958(10). Soon after the publication of the test results, a number of investigators used the data to make comparative studies with other national groups. Among the countries involved in these studies were Great Britain, Denmark, Japan, Australia, Canada, New Zealand, the Philippines, and Peru (24, 38).

During 1958, the AAHPER Youth Fitness Test was administered to over 10,000 British subjects aged 10-17 years (7). Mean scores were compared at each age level with data from the United States;

however no tests of significant difference were applied. From a visual comparison of mean scores the British boys and girls appeared to perform better than their American counterparts on six of the seven test items. The only test on which the Americans appeared to do better was the softball throw. Results of the softball throw were suggested to be a reflection of a skill practiced much more in the United States than Great Britain (7).

From April to June 1959, the AAHPER test was administered to 18,000 Japanese boys and girls. The sample was drawn by physical educators from about twenty universities throughout Japan. In a comparison of mean scores between Japan and the United States, the Japanese youth registered superior performance in the Pull-ups, Standing Broad Jump, 50-Yard Dash, 600-Yard Run-Walk and the Shuttle Run. The Americans performed better in the Sit-up, while no noticable difference in the Softball Throw was reported. The differences in results were concluded to be due to contrasts in the physical make-up, social backgrounds, life style, curriculum, and teaching methods of physical education between the two countries (40).

Between September 1959, and May 1960, Knuttgen (32) administered the AAHPER Youth Fitness Test to 343 Danish boys and girls. This sample was very restricted because it was drawn from only two schools, both of which represented a high academic level in Denmark. A comparison of mean scores revealed that Danish boys exceeded

American boys in six of the seven test items, with the Americans superior only in the softball throw. Furthermore, Danish girls exceeded American girls in all seven of the test items. Knuttgen suggested three major differences in American and Danish life styles which could account for the differences in scores: 1) Danish children participate in more physical activities than do American children, 2) the Danish physical education program was different from the American, and 3) a higher interest is apparent in sports participation in Denmark than in the United States (32).

In 1962, the results of an Australian and American comparison study using the AAHPER Battery were published. Findings revealed no significant difference between any of the various test items. From a visual comparison of mean score results, the American boys were slightly better than their Australian counterparts. The reverse trend was noticed for the girls' results (49).

The AAHPER battery was administered to 6,000 South African boys and girls at 15 high schools in or near Cape Town. Results were compared to British and American data, as reported by Campbell and Pohndorf (7). The South African children performed better than the Americans in all events except the softball throw. A more active outdoor life style of South African children, as compared to that of the American children, was suggested as the reason for the better South African performance (45).

Updated Surveys - AAHPER Youth Fitness Test

Publication of the AAHPER Youth Fitness Survey in 1958 accented the renewed national interest in physical fitness. The 1956, 1957, and 1960 September issues of the Journal of Health, Physical Education and Recreation reflected this interest.

When fitness activities were increased in physical education programs, a positive change was noted in students' physical condition (26). In 1964, a second physical fitness survey was conducted in the United States. Two of the primary reasons for this survey were to determine how the results would compare with data gathered during the 1957-58 school year and to update the original percentile scores. A multi-staged probability sample design consistent with the 1957-58 survey was used. A groups by trial examination was conducted and a five percent level of significance was accepted as the criterion. Over 80 percent of the comparisons were significantly different. No significant difference was observed for the following girls' comparisons: 50-Yard Dash scores for ages 11 and 16; Softball Throw scores for ages 12, 13, 14, 16 and 17; and Shuttle Run scores for ages 16 and 17. Among the boys, significant difference was attained in all age groups and all tests except the 50-Yard Dash and the Softball Throw items for age 17. Hunsicker and Reiff (26) have suggested that the improvement of performance in 1965 was due to the greater familiarity that

students had with the test battery and an increased emphasis on physical fitness in the school curriculum.

The 1958 British survey was re-examined in light of the updated American data. Since measures of variance were not included in the earlier investigation, the comparison was again limited to the comparison of mean scores. Results indicated that American girls' attained improved mean performances in the following tests: Sit-up, age 10; Shuttle Run, age 10; 50-Yard Dash, ages 10 and 11; and Softball Throw, ages 11, 12, 13, 14 and 15. The American boys achieved higher mean scores than their British counterparts in the Pull-up, ages 14, 15, 16 and 17; Sit-up, ages 11, 12, 13, 14, 15, 16 and 17; Shuttle Run, ages 10, 11, 13, 14, 15, 16 and 17; Standing Broad Jump, ages 14, 15, 16 and 17; 50-Yard Dash, ages 10, 12, 13, 14, 15 and 16; and in the Softball Throw, all ages (26).

During 1967, a second physical fitness survey was undertaken in Japan. About twenty universities assisted in the survey. The sampling procedure was not stated in the literature. Comparisons were limited to mean scores. The results indicated that no major differences existed for the 50-Yard dash. In the shuttle run, the Japanese performed better in each age group except age 10, boys and girls. Noguchi (40) attributed the Japanese superiority in the shuttle run to the short anthropometrical construction of the Japanese as compared to that of the Americans. The Softball Throw results for both countries were

similar. Since baseball is a popular sport in Japan, Noguchi (41) suggested that the similarity of scores was a reflection of similarly practiced skills. American boys and girls performed better in the Sit-up at every age than the Japanese. Noguchi (40) suggested that the larger index of leg-length/height of Americans over the Japanese creates an advantage for the Americans over the Japanese in the test. Japanese had superior mean scores in all age groups of both sexes in the Standing Broad Jump. The Pull-up test results were very similar for both the Japanese and American boys. Japanese mean scores in the 600-Yard Run-Walk were better at all age groups for both boys and girls. In this survey, as in a number of others, the Americans demonstrated a lower level of cardiovascular endurance than those to whom they were compared.

This review of the literature, indicated that most foreign physical educators were of the opinion that the American life style was conducive to poor physical fitness (33, 7, 29, 32, 38, 39, 40, 45). Although these opinions are expressed by various researchers, the fact should not be overlooked that the AAHPER Youth Survey conducted in the United States represented the only national study reported in the literature which was truly representative of a national population.

Belize, Central America - Background

Belize is farthest north of the countries in Central America.

The country is bounded on the north and west by Mexico and on the south and west by Guatemala. The entire eastern shoreline facing the Caribbean Sea, is protected by the second largest barrier reef in the world. Most of the coastal belt with the cayes is covered by mangrove. The country, including the cayes has an area of 8,866 square miles and is 174 miles long and 68 miles wide at its widest point. Belize is located in a subtropical region with a rainy season extending roughly from June through December each year.

Racial background of the Belizean population is varied. The Creole population, a mixture of African, European and Spanish ancestry, accounts for approximately 52 percent of the population. Twenty-two percent are Mestizo, a mixture of Spanish and Indian ancestry. The Maya and Ketchi Indians represent approximately 13 percent; and the Black Caribbean Indians, seven percent. Approximately seven percent of the population consists of East Indian, Mennonite, Lebanese, Chinese and Caucasian peoples.

Belizeans enjoy sports competitions and young people take an active part in various sporting activities. Soccer is the most popular boys' sport while girls' prefer softball. Sport competitions are conducted through schools and sports clubs.

Few technical conveniences are found in Belize. In both urban and rural areas, the most common means of transportation are bicycle and foot.

The 1970 census population of Belize was 120,000, 54 percent of whom were urban dwellers. The rest of the population was scattered throughout the country with a population density of approximately 14 persons to the square mile. Belize City, the largest urban center, had a population of over 40,000. Apart from Belize City, no other urban area had a population of more than a few thousand people (35).

CHAPTER III

METHODS AND PROCEDURES

Arrangements to Conduct the Study

From September, 1971 until August, 1973, the investigator served as the National Track and Field Director for the Country of Belize, Central America. He was responsible to the Ministry of Local Government, Community and Social Development. During the investigator's first year in Belize, he discovered that no standard form of physical fitness measurement for school children had been devised for the country.

First official suggestion that a national physical fitness survey be conducted for Belize appeared in a report to the Minister of Local Government, dated December, 1971 (see Appendix A). The final decision in favor of a physical fitness survey for the country was made in June, 1972, by the Ministers of Local Government and of Education. Testing was to commence during the 1972-73 academic school year.

The AAHPER Youth Fitness Test was selected as the criterion instrument in the survey for the following reasons:

1. The test battery contains simple test elements which are easy to administer and easy for students to understand.
2. The test administration requires only a minimum of equipment.

3. The test is specifically designed for the age range including grades five through twelve.
4. The test has been used for international comparisons previously.
5. The scores obtained from the administration of this test enabled the investigator to make comparisons with similar scores in the United States.

During the last week of September (1972), personal contact was made with secondary school principals in Belize City. Each was provided with information explaining the project, and then asked for permission to conduct testing at his respective school. All principals in Belize City granted permission for testing to be conducted.

In November, 1972 letters which provided similar information and requests for permission to test physical fitness, were mailed to eight secondary schools in the outlying districts (see Appendix B). Replies were received from seven of these schools which agreed to participate in the testing program (see Appendix C).

Test Procedures

The test consisted of the following items: 1) Pull-up, 2) Sit-up, 3) Shuttle Run, 4) Standing Broad Jump, 5) 50-Yard Dash, 6) Softball Throw, and 7) 600-Yard Run-Walk (1, 2). The testing followed the guidelines as specified in the AAHPER Youth Fitness Test Manual.

Pull-up

The overhand grip was used by the testee. After assuming the hanging position, the subject raised his body by his arms until his chin could be placed over the bar, and then lowered his body to the starting position. The testee repeated this exercise as many times as he could (see Figure 1).

Sit-up

The testee lay on his back, with legs extended and his feet about two feet apart. His fingers were interlaced on the back of the neck. A partner held the ankles down, keeping the heels in contact with the floor at all times. The testee sat up, turning the trunk to the right and touching the left elbow to the right knee. The testee repeated this exercise, alternating sides (see Figure 2).

Shuttle Run

Two parallel lines were marked 30 feet apart. Two blocks of wood, 2 in. x 2 in. x 4 in. were placed behind one of the lines. The testee started behind the other line. With the signal "Ready? Go!," the testee ran to the blocks, picked one up, ran back to the starting line and placed the block behind the line. He then ran back and picked



Figure 1. Pull-up, St. John's College

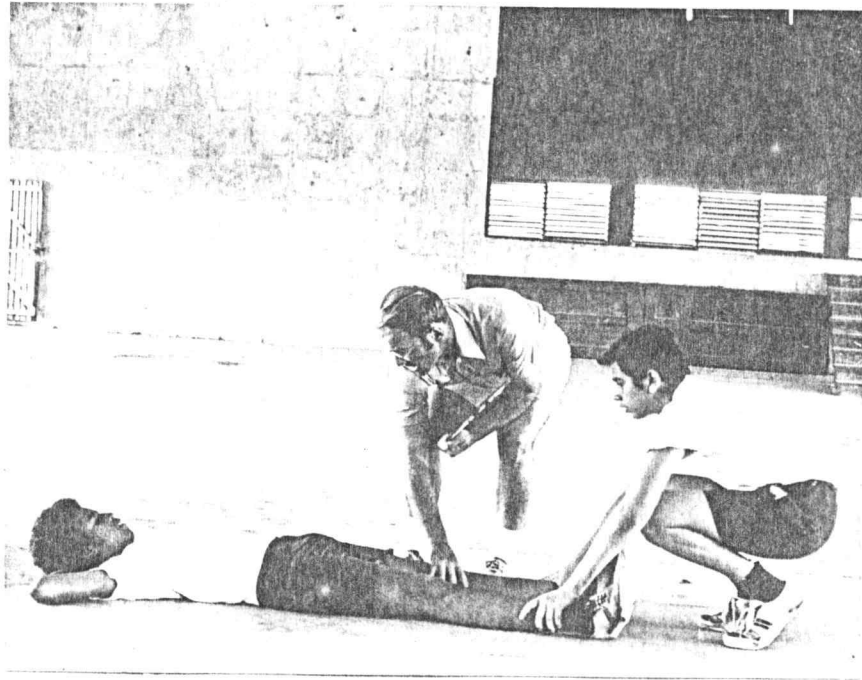


Figure 2. Sit-up, St. John's College

up the second block which he carried back across the starting line. Two trials were allowed for this test, which were timed with a stop watch to the nearest tenth of a second (see Figure 3). The best time of the two trials was recorded.

Standing Broad Jump

The feet were a few inches apart and the toes were just behind the take-off line. The jump was accomplished by swinging the arms and extending bent knees. Three trials were allowed. Measurement was taken from the take-off line to the heel or other part of the body that touched the floor nearest the take-off line. The score was taken to the nearest inch (see Figure 4).

50-Yard Dash

The testee took a position behind the starting line. The starter used the commands "Are you ready?" and "Go!". The starter accompanied the command "Go", with a downward sweep of his hand to give the timer a visual signal. The score was taken from the time between the starter's hand signal and the instant the testee crossed the finish line. Time was recorded to the nearest tenth of a second (see Figure 5).

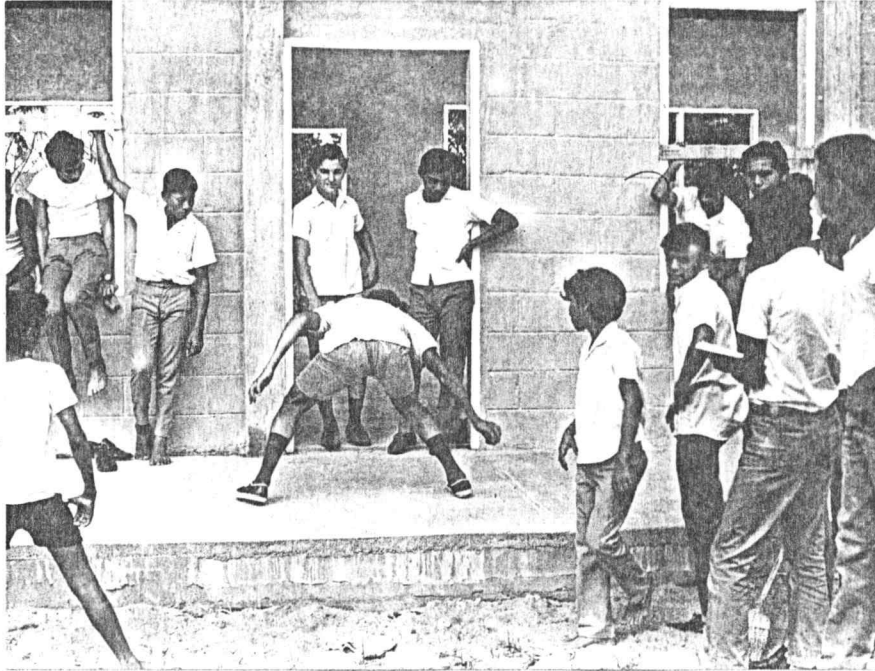


Figure 3. Shuttle Run, Muffles College.



Figure 4. Standing Broad Jump, St. John's College

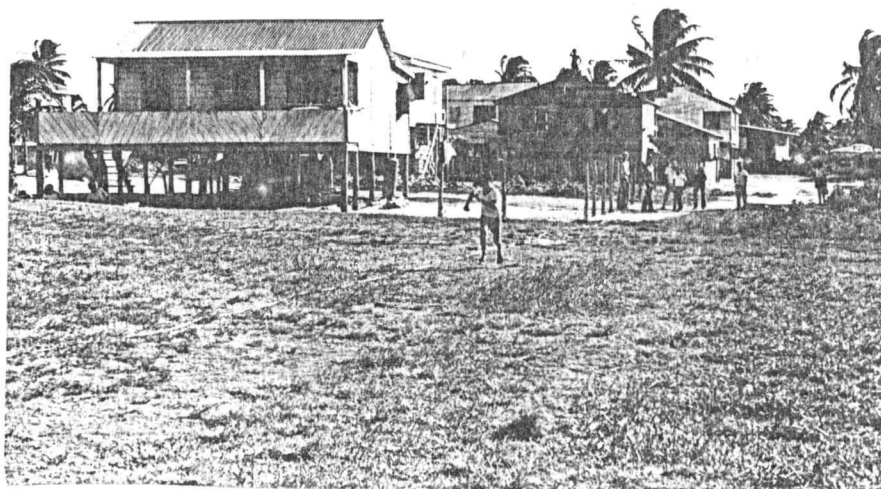


Figure 5. 50 Yard Dash, St. Peter's College

Softball Throw

The testee threw the ball while remaining within two parallel lines six feet apart. Only an overhand throw was allowed. The distance scored was from the point of landing to the nearest point on the restraining line. The farthest of three throws was recorded to the nearest foot (see Figure 6).

600-Yard Run-Walk

The testee used a standing start. At the signal "Ready? Go!" he started running the 600-yard distance. Walking was permitted, however the object was to cover the distance in the shortest possible time. Time was recorded in minutes and seconds (see Figure 7).

Population Tested

During the 1972-73 academic school year, Belize had a total of 22 secondary schools throughout the country. Three of the schools were exclusively female in enrollment. The total enrollment of the 22 schools, (boys and girls in forms one through four), was approximately 4,831. First and second form boys numbered 1,242.

The total number of students who were originally registered to take part in the survey was 1,083. Table IV indicates the breakdown of those registered to take part according to chronological age.



Figure 6. Softball Throw, Belize Junior Secondary No. 1.

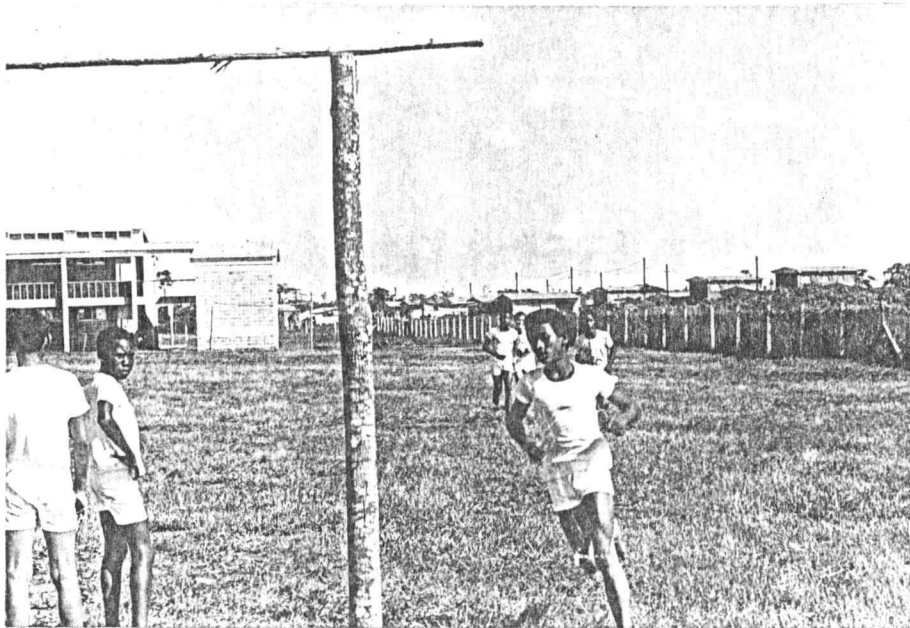


Figure 7. 600 Yard Run-Walk, Belmopan Comprehensive

TABLE IV. SUBJECTS REGISTERED FOR BELIZE SURVEY.

Age in Years	Number Registered
11	5
12	75
13	255
14	319
15	255
16	39
17	5
18	2
Total	1,083

One hundred fifty-nine first and second form boys, enrolled in the secondary schools of Belize, did not take part in the testing. Most of these students were enrolled at two schools in Belize City where testing was not conducted because of scheduling problems.

Of the 1,083 students who registered to take part in the survey, (see Table IV), fluctuations in the number of raw test scores accepted or available for statistical treatment occurred. Some scores were deleted due to unreliable testing conditions. Other scores were not recorded because of student illness, medical excuses, or scheduling problems.

Table V illustrates the numbers and percentage of students who participated in each test. The percentage is taken from the 1,242 possible population tested.

Collection of Data

The testing was conducted in Belize City from October through December 1972, and in the outlying districts from January through March 1973 (see Appendix D).

The general data collection procedures followed at each school were as follows:

1. The testing schedule was arranged with the assistance of the school principal.

TABLE V. PERCENTAGE OF POPULATION TAKING PART IN
BELIZE SURVEY.

Test	Population	Percentage
Sit-up	1,018	82%
Pull-up	1,014	82%
Shuttle Run	928	75%
Standing Broad Jump	987	79%
50-Yard Dash	907	73%
600-Yard Run-Walk	805	65%
Softball Throw	910	73%

2. Faculty were notified of the upcoming testing program and were encouraged to serve as testers. Those participating were given instruction and practice training in testing procedures prior to test administration. Only those faculty having prior knowledge and experience in using the stopwatch administered the timed tests.
3. For recording of data, a composite score sheet identical to the one suggested in the AAHPER Youth Fitness Test Manual was used (2).
4. Throughout the testing period, a written record was kept.
5. Information concerning ages of subjects was obtained from the school registrar and was recorded prior to testing. Students who were between 144 months and 155 months of age when tested were considered to be 12-year-olds; 156 to 167, 13-year-olds; 168 to 179, 14-year-olds; 180 to 191, 15-year-olds; 192 to 203, 16-year-olds; and 204 to 215, 17-year-olds.
6. During the first meeting with the subjects, the following events occurred:
 - a. Explanations about the testing were given.
 - b. Nude weight (except for shorts) and height data were recorded.
 - c. Subjects were given a warm-up period.

- d. The Sit-up test was demonstrated to the students.
- e. The Sit-up test was administered according to procedures suggested in the AAHPER Youth Fitness test manual.

During the second and subsequent testing periods, the testing was administered whenever possible, in the suggested order of the AAHPER Youth Fitness Test Manual (1, 2).

Treatment of Data

Prior to testing, the decision was made to compare the Belize results to the results of the first survey conducted in the United States. The 1957-58 American survey was chosen for comparison to the Belizean survey because the children in both countries were not familiar with the AAHPER Youth Fitness Test prior to these first surveys. Thus, the possibility of the results being influenced by familiarity and training was lessened. If and when a second Belize survey is conducted, the use of a more recent American survey would then seem appropriate.

Two statistical procedures were employed in the analysis. The two tailed Student t test for uncorrelated groups was used to test the null hypothesis that scores of fitness tests administered in Belize would not differ from AAHPER test norms obtained in the United States. A .05 level of significance was chosen as the criterion for rejection

of the null hypothesis. Cumulative frequency graphs were constructed for visual comparisons.

From Hunsicker and Reiff (26), standard errors for all 1957-58 data were obtained except for the 14-year olds' 50-Yard Dash. These standard errors were then compared with those from Belize.

Belize data was placed on standard IBM cards and entered into the SIPS Computer program at the Oregon State University Computer Center during May, 1974. Descriptive statistics obtained from the computer included:

1. Mean for each of the age groups on each test.
2. Standard deviations for each age group on each test.
3. Number in each age group on each test.
4. Cumulative relative frequency of each age group on each test.

From the information listed above, the standard error for each mean was calculated, and the significant difference between the Belizean and American means for uncorrelated populations was calculated. The critical ratio was then determined for the significance of each comparison (see Appendix E).

In any presentation of test results, some form of central tendency and variability is helpful. Yet central tendency alone does not adequately give the total picture of a sample measured. To facilitate a comparison of test results between the two countries, cumulative

frequency graphs were constructed for visual comparisons. These graphs may be used to interpret percentile scores, to illustrate the shape of Ogives for each population on each test item, and to facilitate making comparisons between the two populations.

CHAPTER IV

RESULTS AND DISCUSSION

The scope of this study involved the administration of seven physical fitness tests to over 1,000 male high school youth, ages 12-17, in Belize, Central America, and the comparison of the resulting data with similar data from the United States for statistical significance.

The Student t test was applied to 41 comparisons between Belize and the United States male high school youth. A t of 1.96 or larger was significant at the .05 level of confidence. One test, the 50-Yard Dash for 14-year-old boys, was deleted due to the lack of comparative data (see Appendix F).

Cumulative frequency graphs were also included in this section as a measure of variability, since a test such as the Pull-up which exhibited truncation of results was not necessarily suitable for analysis by the standard deviation. Forty-two comparisons were made, representing each age group tested in Belize and each test in the AAHPER Battery (see Figures 8 through 49).

Of the 41 comparisons listed in Table VI, 25 were found to be significant at the .05 level of confidence; and hence, the null hypothesis

TABLE VI. SUMMARY OF RESULTS OF COMPARISONS BETWEEN U.S.A. AND BELIZE.

	Age					
	12	13	14	15	16	17
Pull-up	N/S	N/S	B ^a	B ^a	B ^a	N/S
Sit-up	U ^a	N/S	U ^a	U ^a	N/S	N/S
Shuttle Run	B ^a	B ^a	N/S	N/S	N/S	N/S
Standing Broad Jump	B ^a	B ^a	N/S	N/S	N/S	N/S
50-Yard Dash	N/S	N/S	b	U ^a	U ^a	U ^a
600-Yard Run	B ^a	B ^a	B ^a	B ^a	B ^a	B ^a
Softball Throw	U ^a	U ^a	U ^a	U ^a	U ^a	U ^a

B = Performance in favor of Belize

U = Performance in favor of USA

a = Significant difference at .05 level of confidence

b = Due to incomplete information, this comparison was not made.

N/S = Not significant at .05 level of confidence.

was rejected in these comparisons. Thirteen of these comparisons were in favor of the Belizean population, while twelve were in favor of the American population.

Pull-up

Analysis of results for the Pull-up test as presented in Table VI reveals a significant difference between the two populations for ages 14, 15 and 16. The difference appears to be in favor of the Belizean population. Although no significant difference was found at ages 12, 13, and 17, a comparison of mean scores was in favor of the Belizean population (see Table VII).

Figures 8 and 9 reveal that the American children performed equal to, or better than, Belizeans throughout the cumulative percentage range. The comparison for 17-year old boys as illustrated in Figure 13 indicates that the American population performed better, except from the 50th to the 75th percentile, during which the Belizean population did better. Figure 10 reveals that 14-year-old Belizean boys had progressively better scores up to the 95th percentile. At that point, performance between the two populations was similar. Analysis of the results for the 15 year-old boys as presented in Figure 11, reveals that the American youth performed slightly better up to the 15th percentile. From the 15th percentile to the 95th percentile, the Belizean population had the superior performance in the pull-up.

TABLE VII. PULL-UP: SUMMARY OF COMPARED DATA.

Country	Age	\bar{X}	$\sigma_{\text{diff.}}$	t	Significance
Belize	12	2.7	.3	1.3	N/S
U.S.A.	12	2.3			
Belize	13	3.2	.3	1.3	N/S
U.S.A.	13	2.8			
Belize	14	4.3	.3	2.7	.05
U.S.A.	14	3.5			
Belize	15	6.1	.3	5.7	.05
U.S.A.	15	4.4			
Belize	16	7.1	.4	4.0	.05
U.S.A.	16	5.5			
Belize	17	6.5	.7	0.3	N/S
U.S.A.	17	6.3			

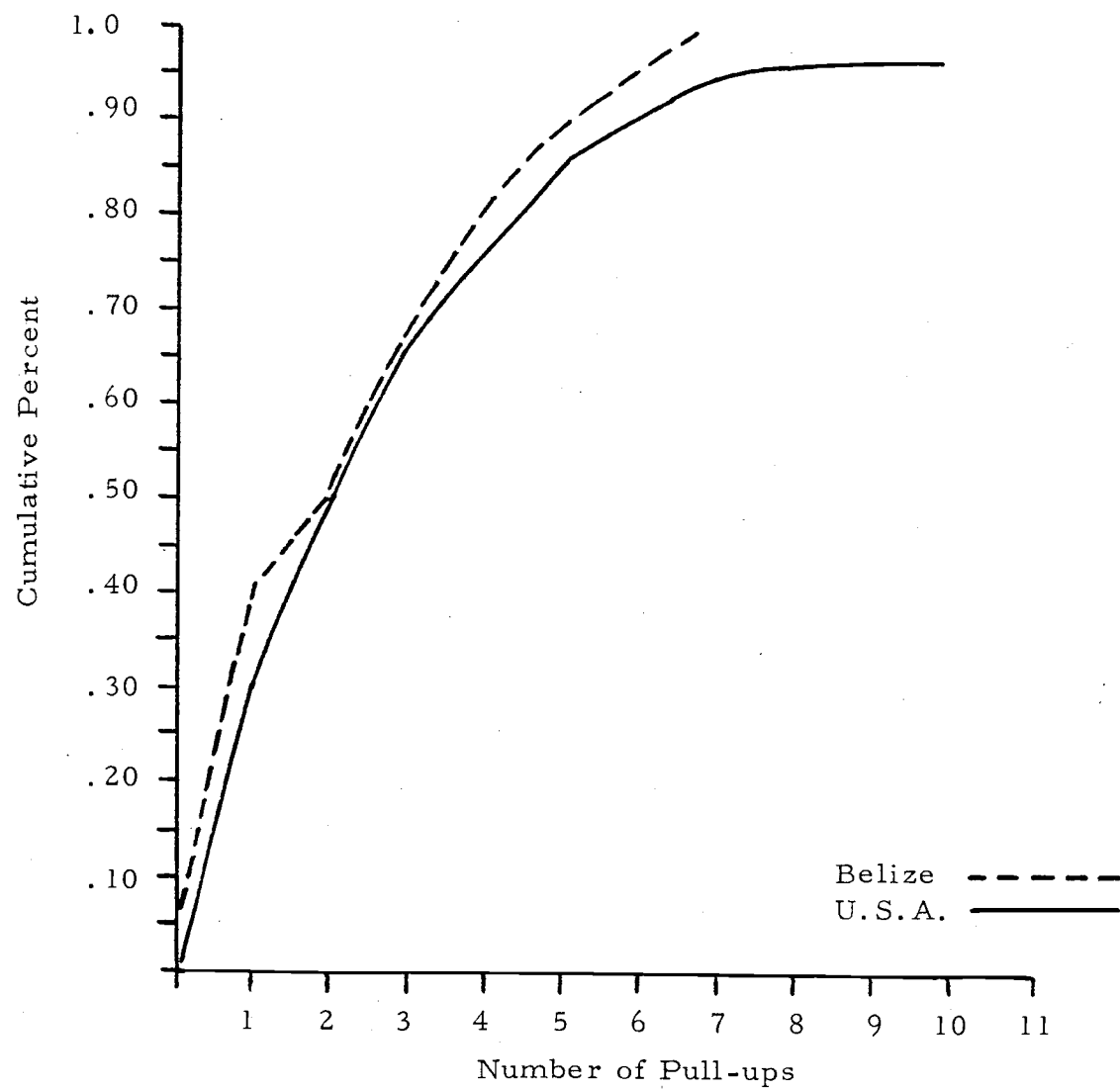


Figure 8. Pull-ups, Twelve-Year-Old Boys.

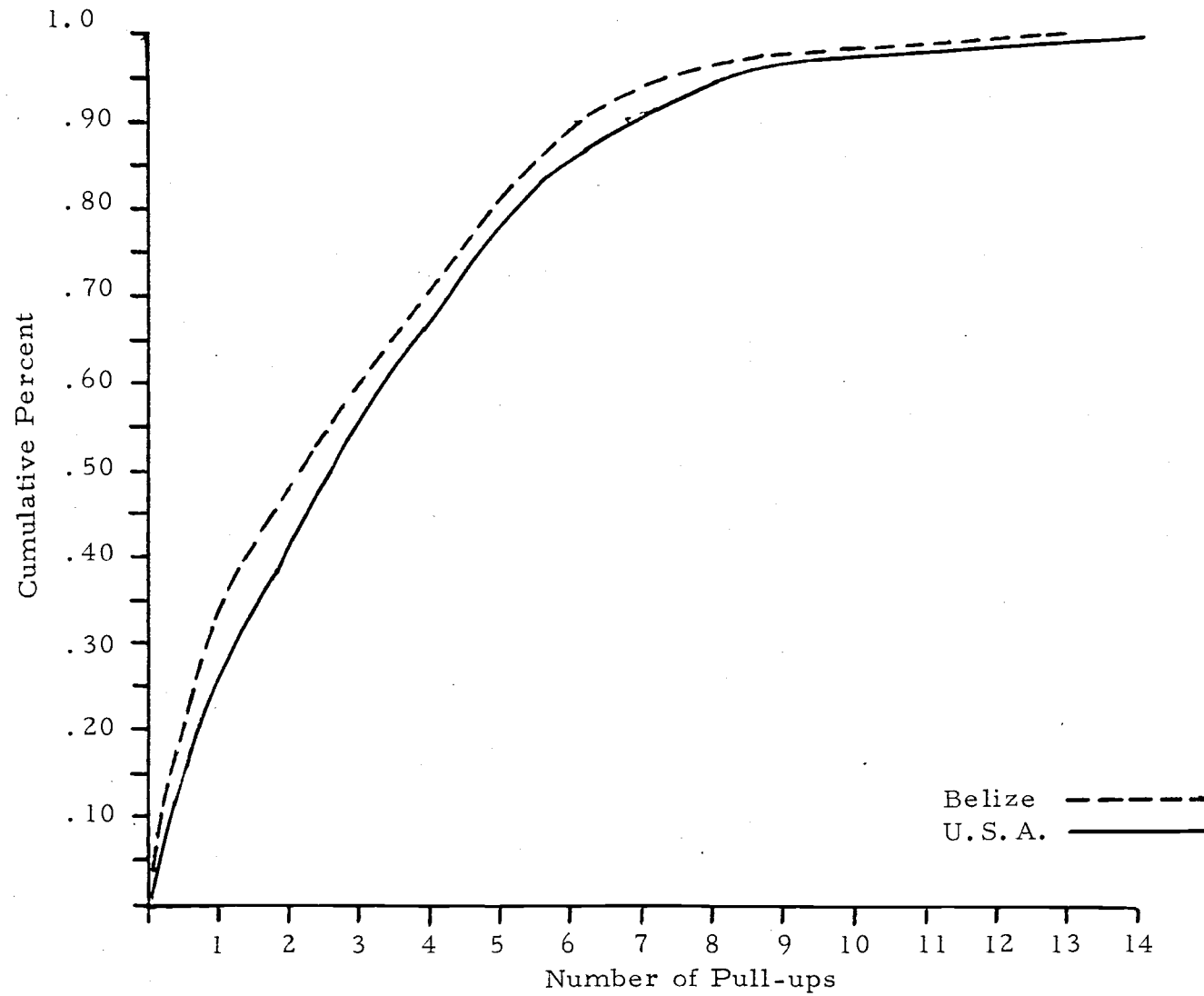


Figure 9. Pull-ups, Thirteen-Year-Old Boys

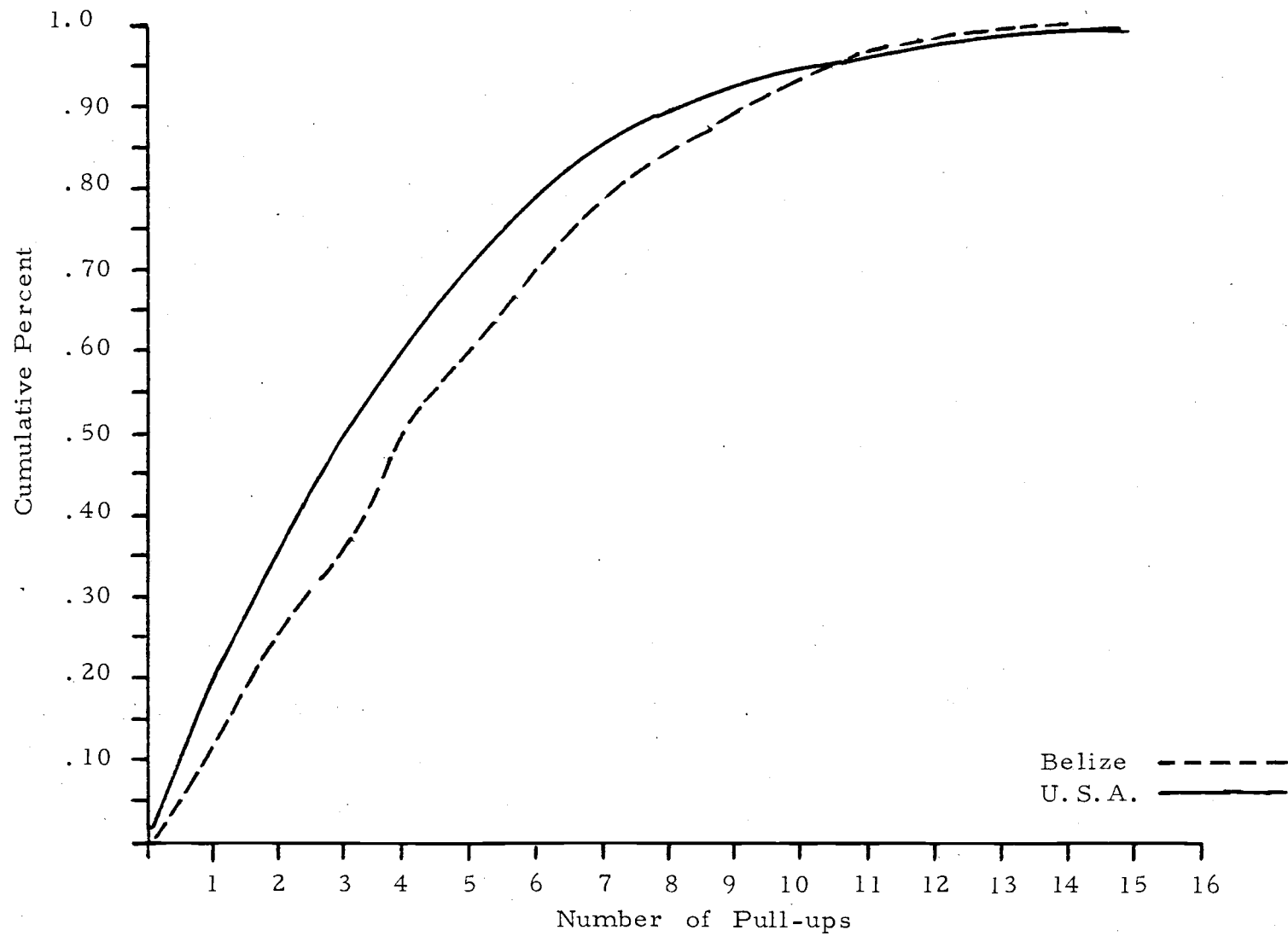


Figure 10. Pull-ups, Fourteen-Year-Old Boys

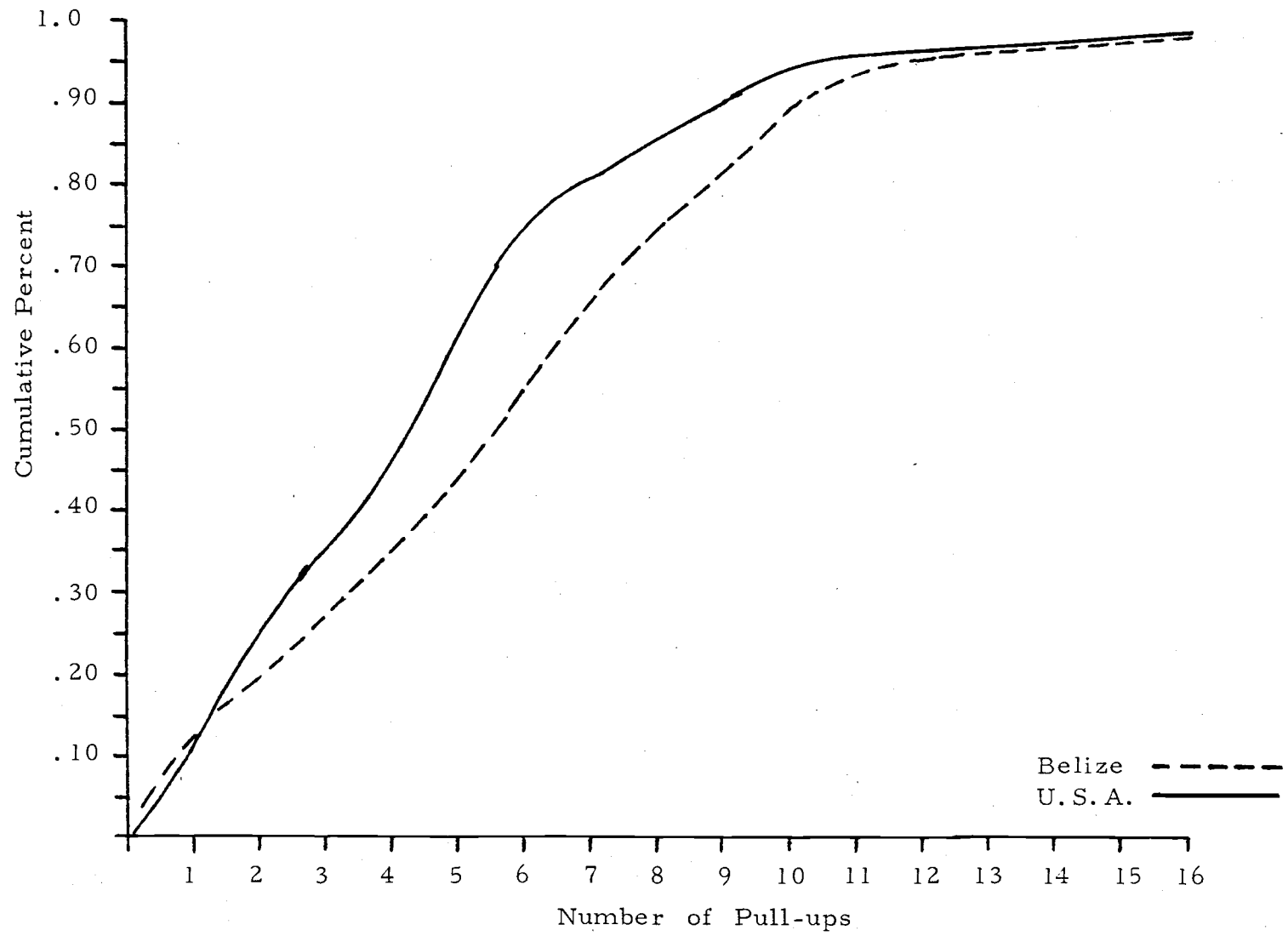


Figure 11. Pull-ups, Fifteen-Year-Old Boys

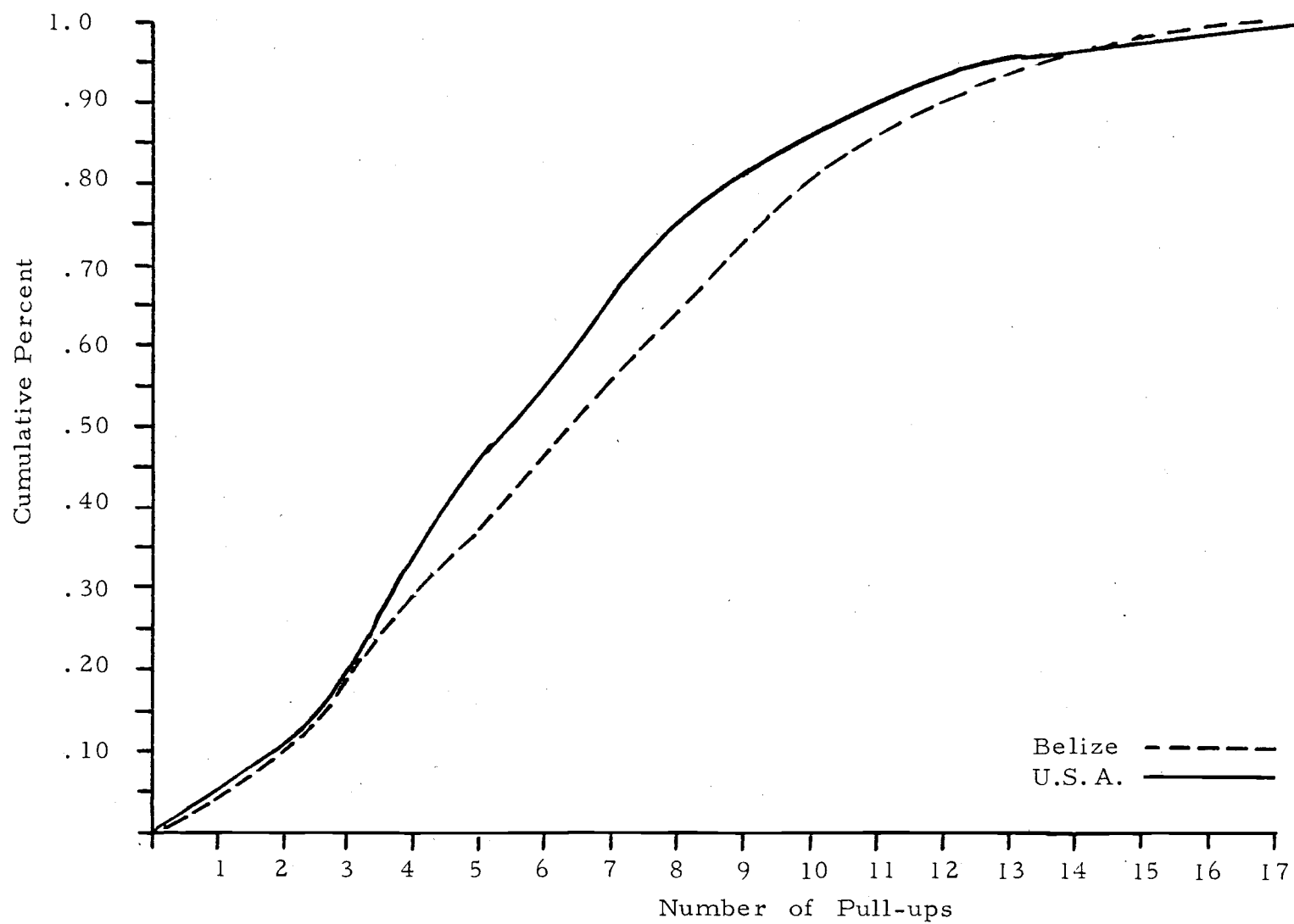


Figure 12. Pull-ups, Sixteen-Year-Old Boys

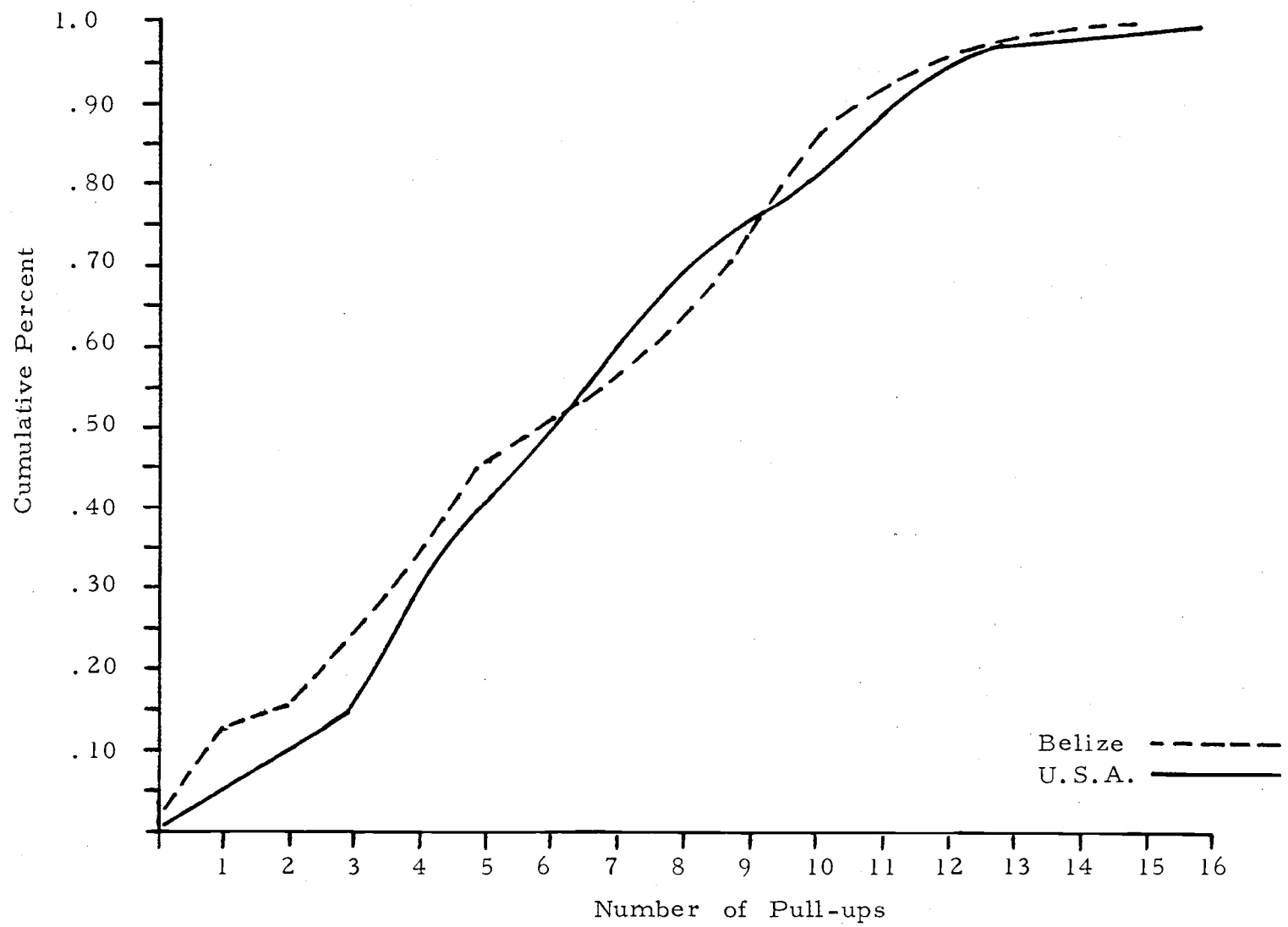


Figure 13. Pull-ups, Seventeen-Year-Old Boys

Figure 12 indicates that American and Belizean 16-year-old boys performed similar up to the 25th percentile. The Belize population had better scores from that point to the 95th percentile, after which the American boys performed slightly better.

Sit-up

Analysis of the results for the Sit-up test as presented in Table VI, indicates a significant difference occurred between the two populations for ages 12, 14, and 15. The difference appeared to be in favor of the American population. Although no significant differences were found at ages 13, 16 and 17, comparisons of mean scores were in favor of the American population (see Table VIII).

Figure 14 indicates that American 12-year-old boys performed better up to about the 12th percentile and after the 35th percentile in the sit-up test. Figures 16 and 17 indicate that the American 14 and 15 year-old-boys performed similar to, or better than, the Belizeans throughout the cumulative percent range. Although there were no significant differences in performances for ages 13, 16, and 17, Figures 15, 18 and 19 demonstrate that the Americans scored equal to, or better than Belizeans throughout the cumulative percent range. Figures 15, 18, and 19 reveals that although results for ages 13, 16, and 17 were not significant, the performance trend was in favor of

TABLE VIII. SIT-UP: SUMMARY OF COMPARED DATA.

Country	Age	\bar{X}	$\sigma_{\text{diff.}}$	t	Significance
Belize	12	32.6	2.6	2.4	.05
U.S.A.	12	38.9			
Belize	13	36.1	2.4	1.5	N/S
U.S.A.	13	39.7			
Belize	14	39.3	2.0	2.7	.05
U.S.A.	14	44.7			
Belize	15	40.6	2.6	2.3	.05
U.S.A.	15	46.6			
Belize	16	44.5	3.2	1.9	N/S
U.S.A.	16	50.7			
Belize	17	40.8	4.6	1.6	N/S
U.S.A.	17	48.3			

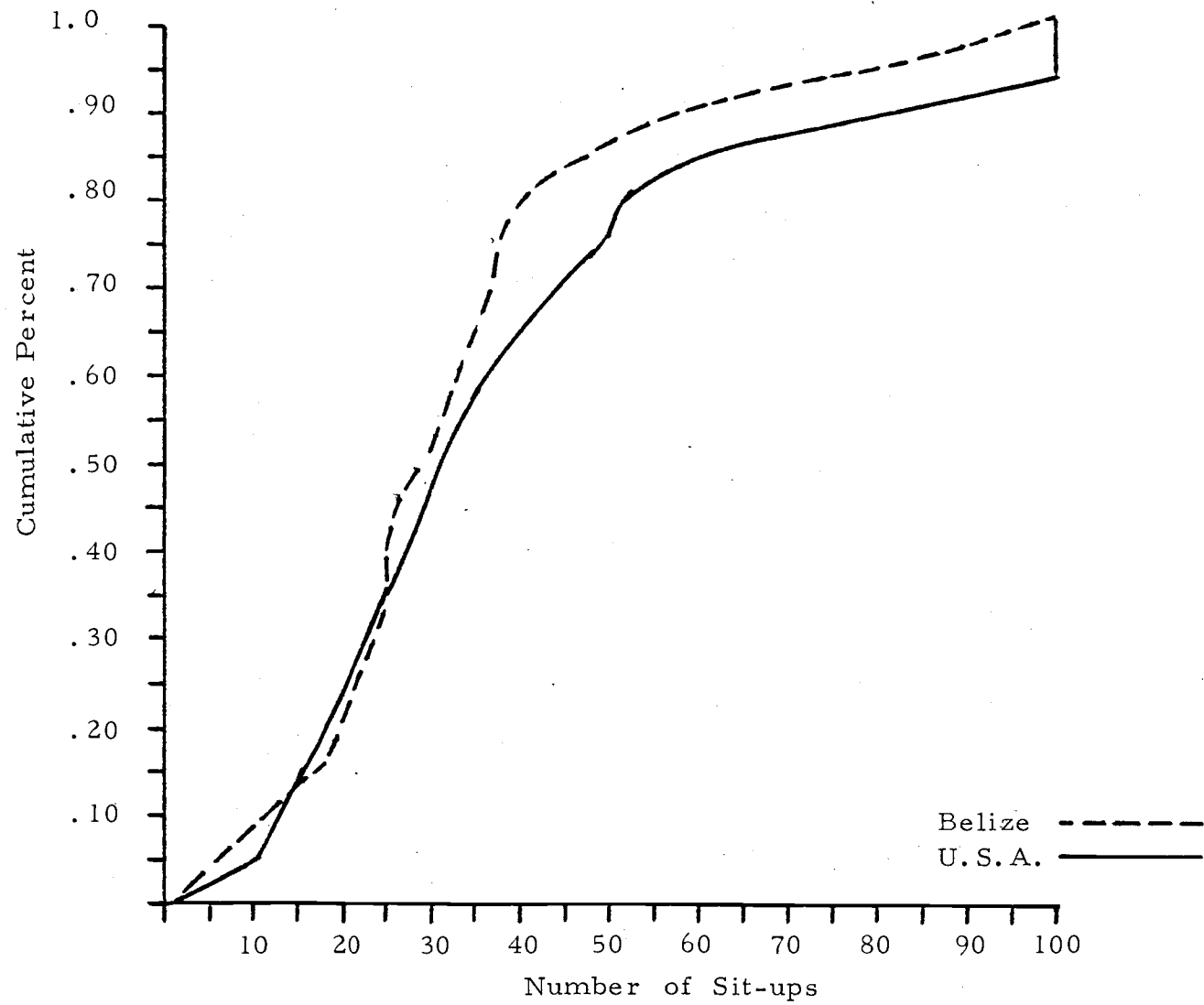


Figure 14. Sit-ups, Twelve-Year-Old Boys

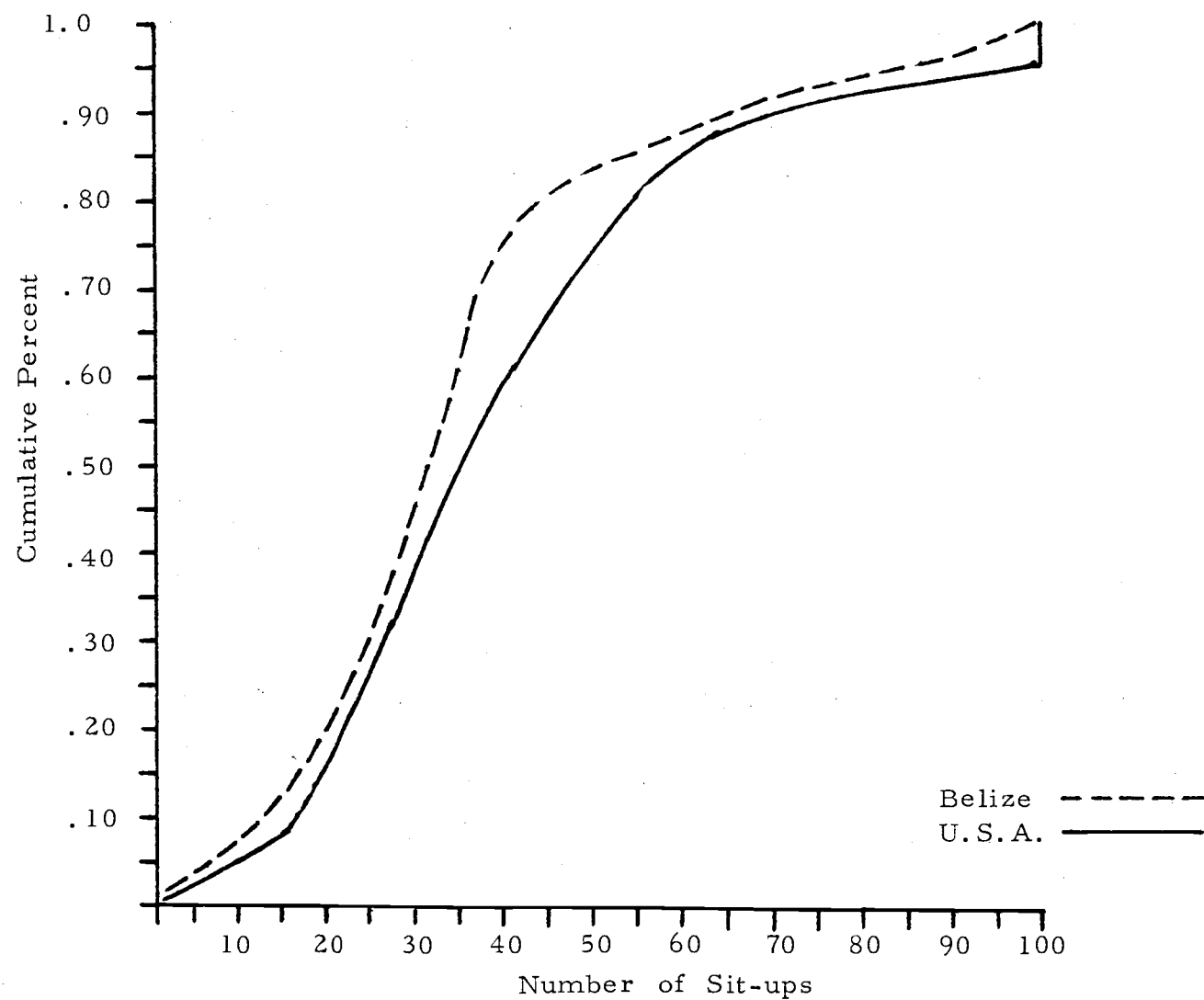


Figure 15. Sit-ups, Thirteen-Year-Old Boys

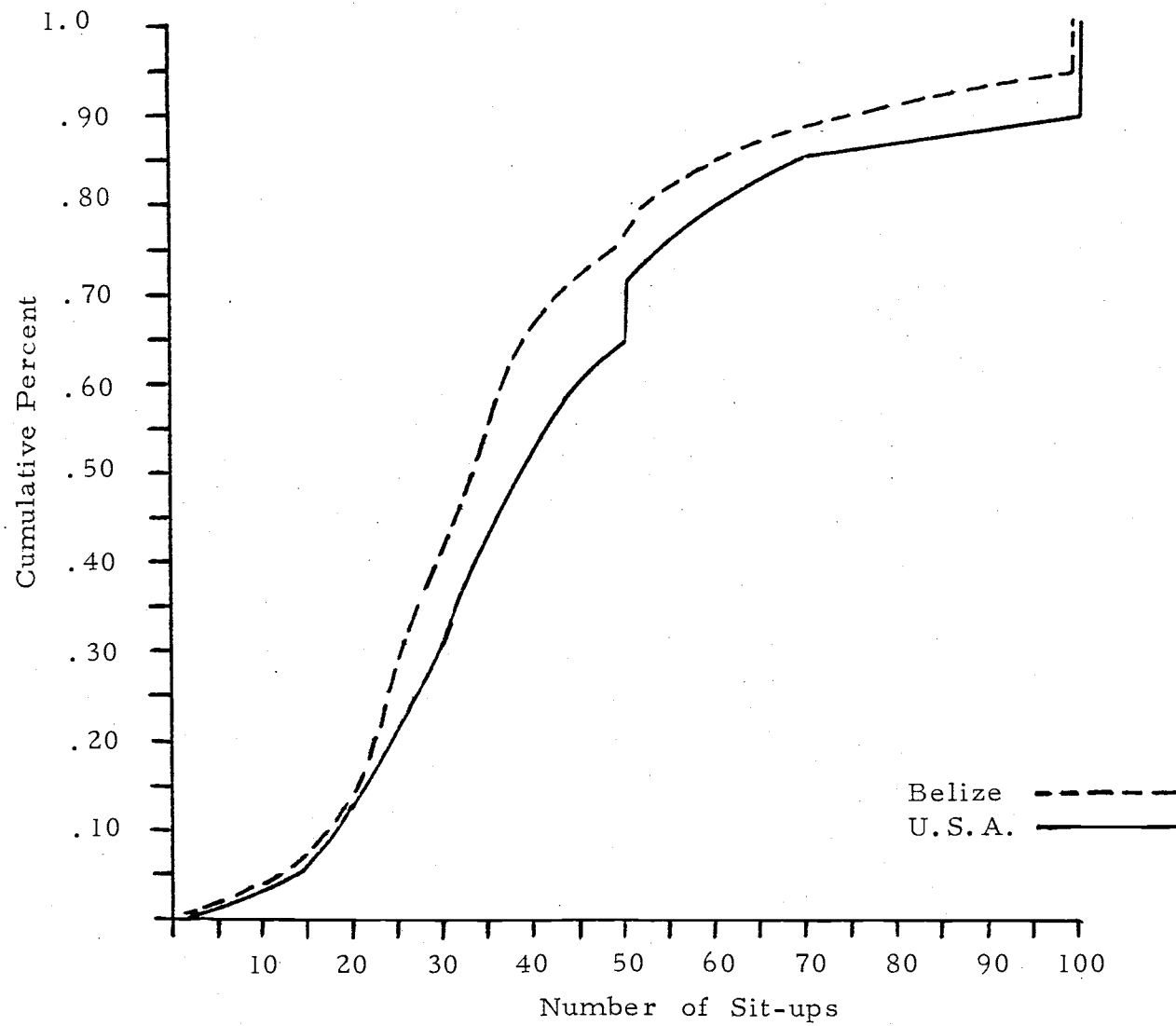


Figure 16. Sit-ups, Fourteen-Year-Old Boys

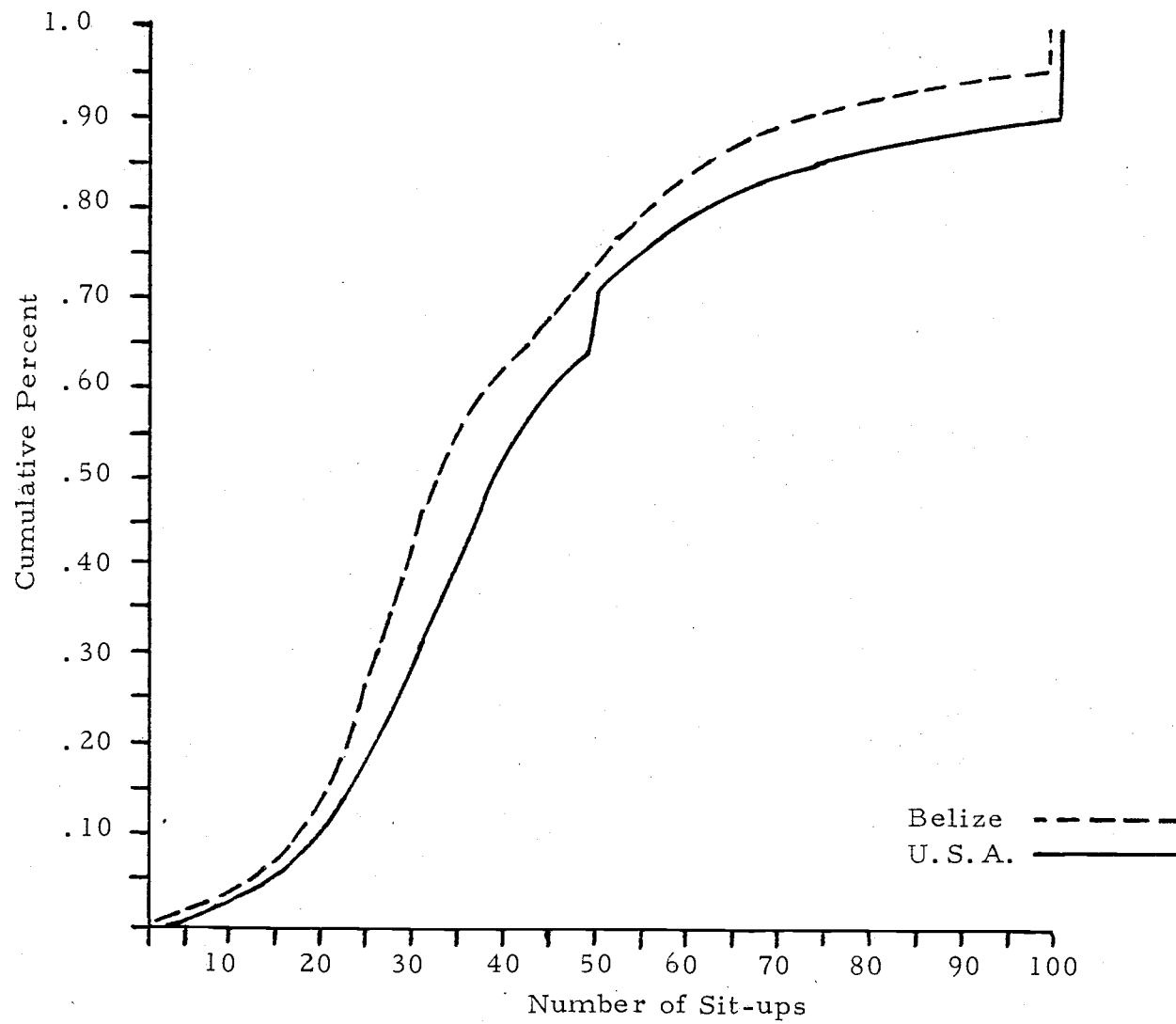


Figure 17. Sit-ups, Fifteen-Year-Old Boys

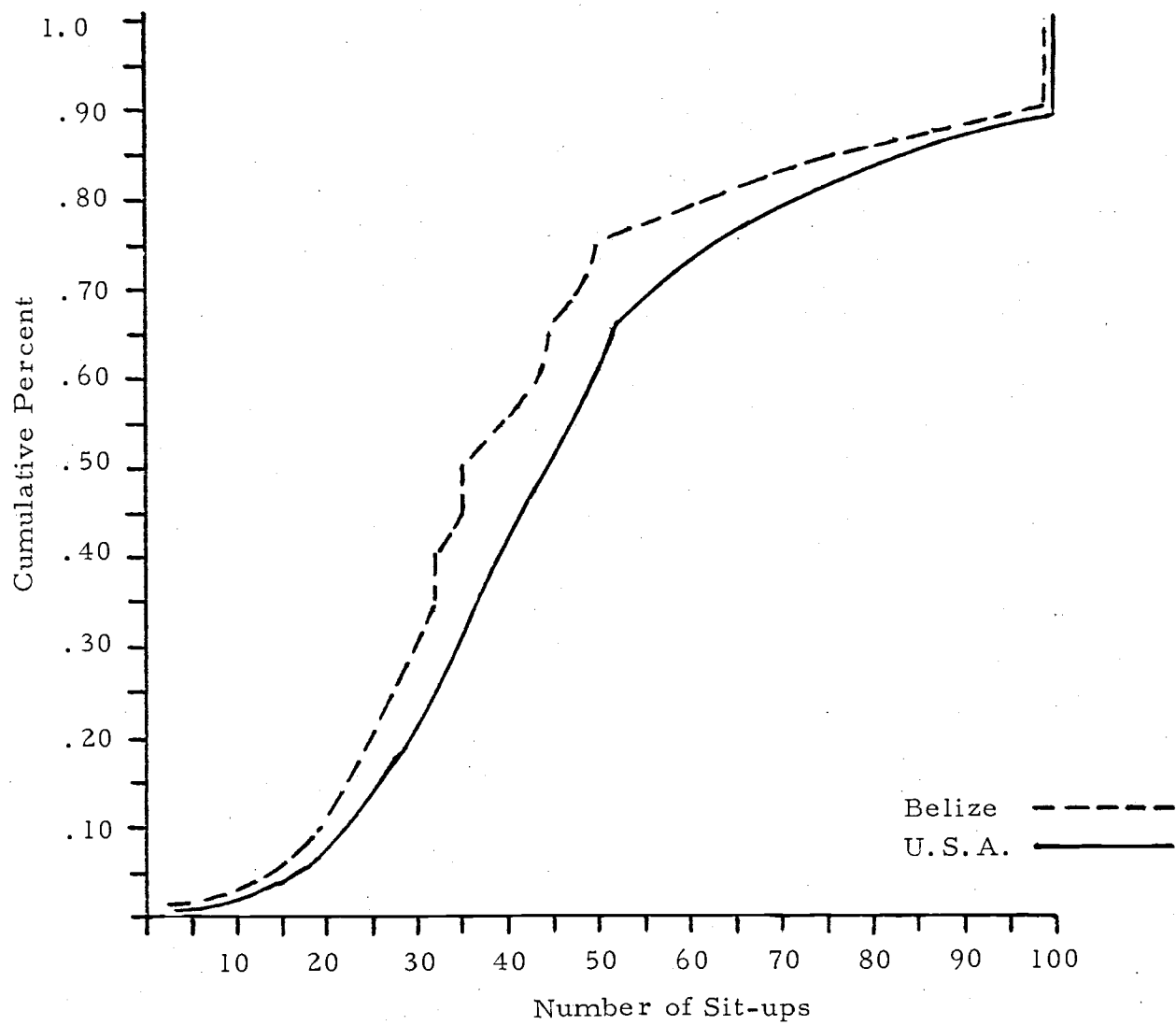


Figure 18. Sit-ups, Sixteen-Year-Old Boys

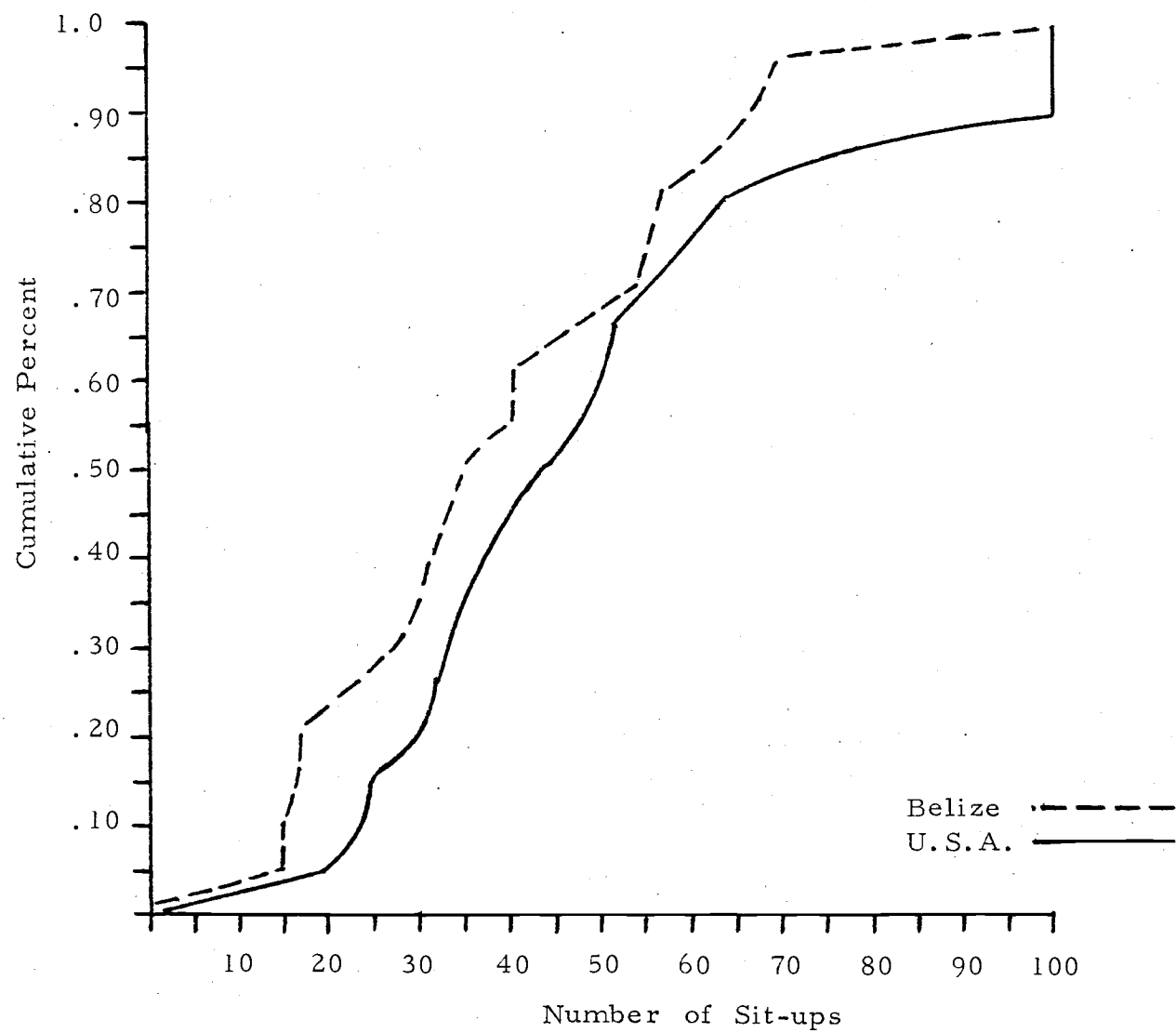


Figure 19. Sit-ups, Seventeen-Year-Old Boys

the American population. The American boys appear to have superior strength and endurance of the abdominal and hip flexor muscles as measured by the Sit-up Test.

Shuttle Run

Analysis of the results for the Shuttle Run as presented in Table VI, indicates a significant difference occurred between the two populations at ages 12 and 13. The difference seems to reveal that the Belizeans had a higher level of performance. Although no significant differences were found at ages 14, 15, 16, 17, comparisons of mean scores were in favor of the Belize population (see Table IX).

Figures 20 and 21 indicate that Belizean performance was progressively better for the 12 and 13-year-olds up to the 75th percentile. From that point on the Americans performed better. The comparison of ages 14 through 17, (Figures 22-25), although not significant at the .05 level of confidence, follow the same pattern of development throughout the percentile range as did ages 12 and 13. That is, the Belizeans recorded faster times in the lower percentiles and the Americans had better times in the higher percentiles.

The superior results obtained by the Americans in the upper percentile range may reflect the performance of skilled athletes in the American school system who took part in the survey. In general, the

TABLE IX . SHUTTLE RUN: SUMMARY OF COMPARED DATA.

Country	Age	\bar{X}	$\sigma_{\text{diff.}}$	\underline{t}	Significance
Belize	12	11.2	.1	4.0	.05
U.S.A.	12	11.6			
Belize	13	10.9	.1	4.0	.05
U.S.A.	13	11.3			
Belize	14	10.7	.1	1.0	N/S
U.S.A.	14	10.8			
Belize	15	10.6	.1	1.0	N/S
U.S.A.	15	10.7			
Belize	16	10.3	.1	1.0	N/S
U.S.A.	16	10.4			
Belize	17	10.1	.2	1.5	N/S
U.S.A.	17	10.4			

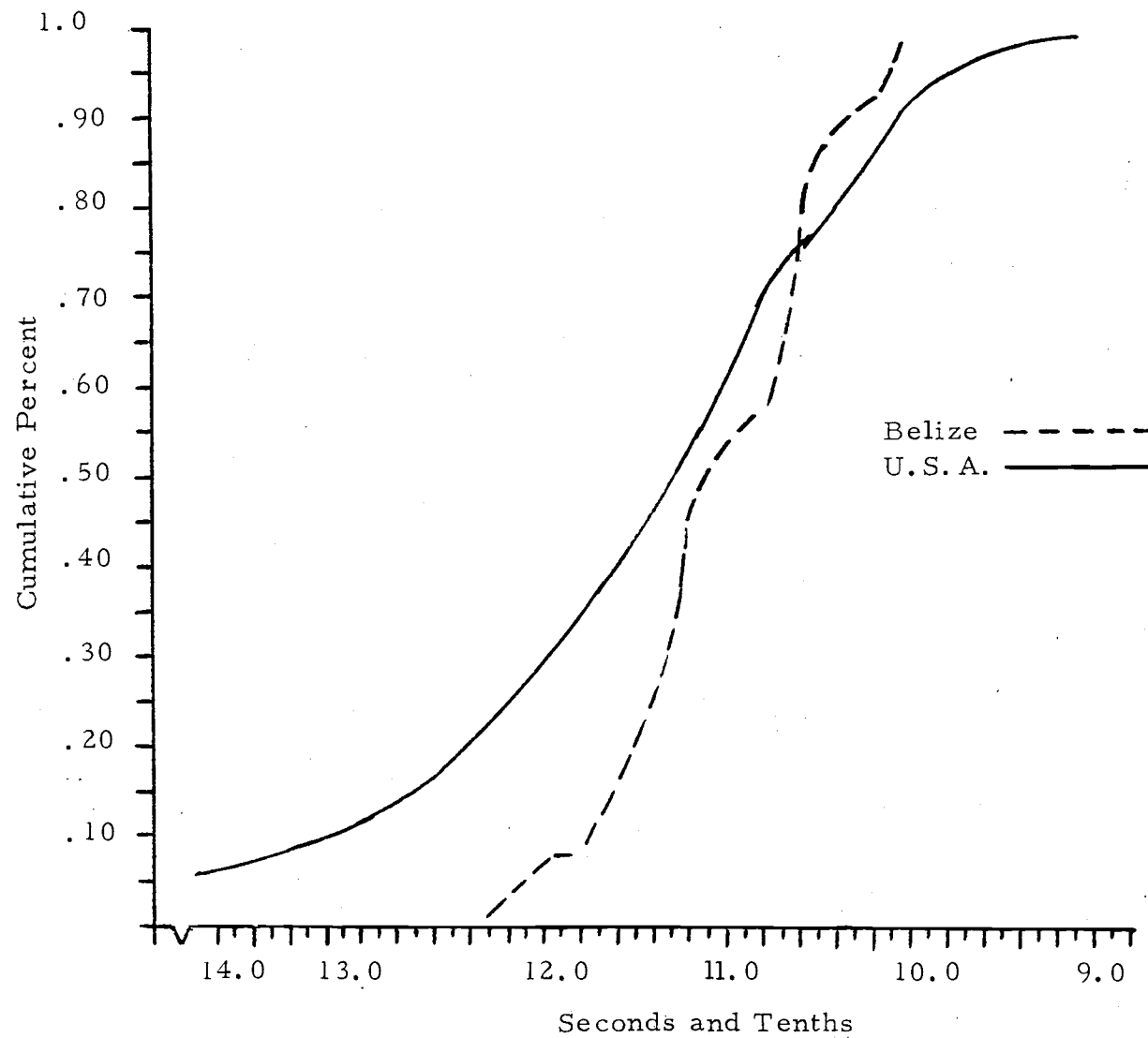


Figure 20. Shuttle Run, Twelve-Year-Old Boys

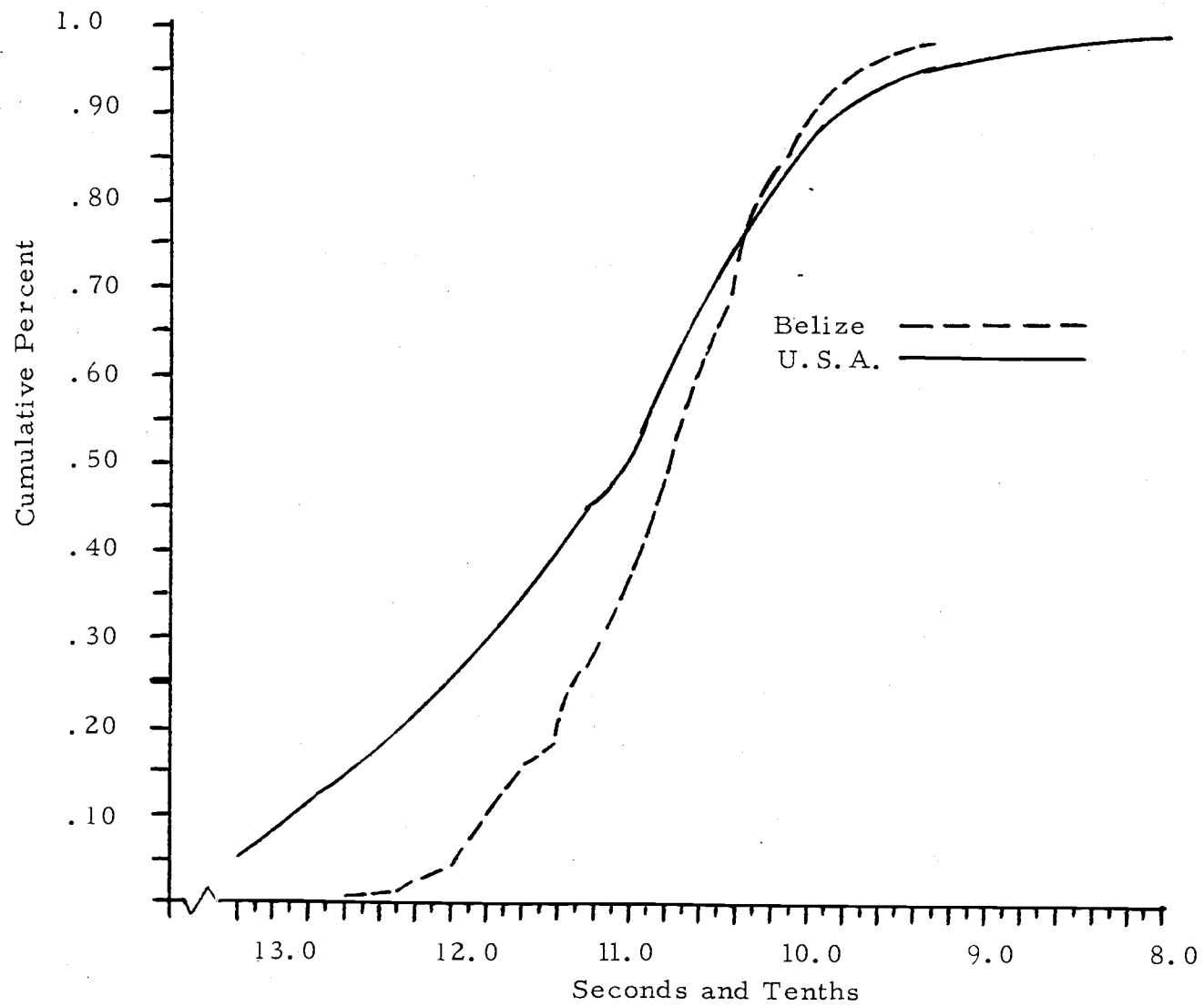


Figure 21. Shuttle Run, Thirteen-Year-Old Boys

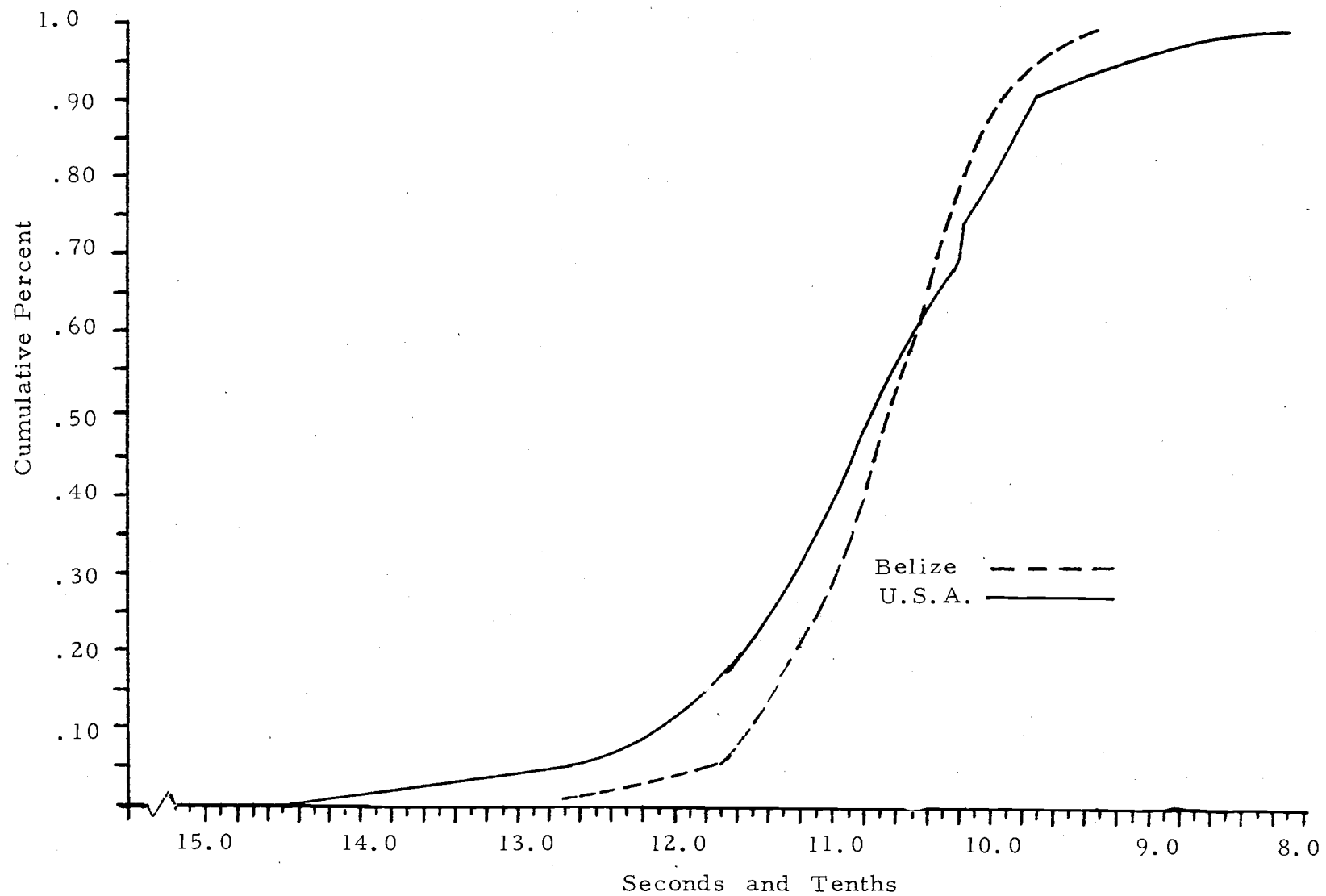


Figure 22. Shuttle Run, Fourteen-Year-Old Boys

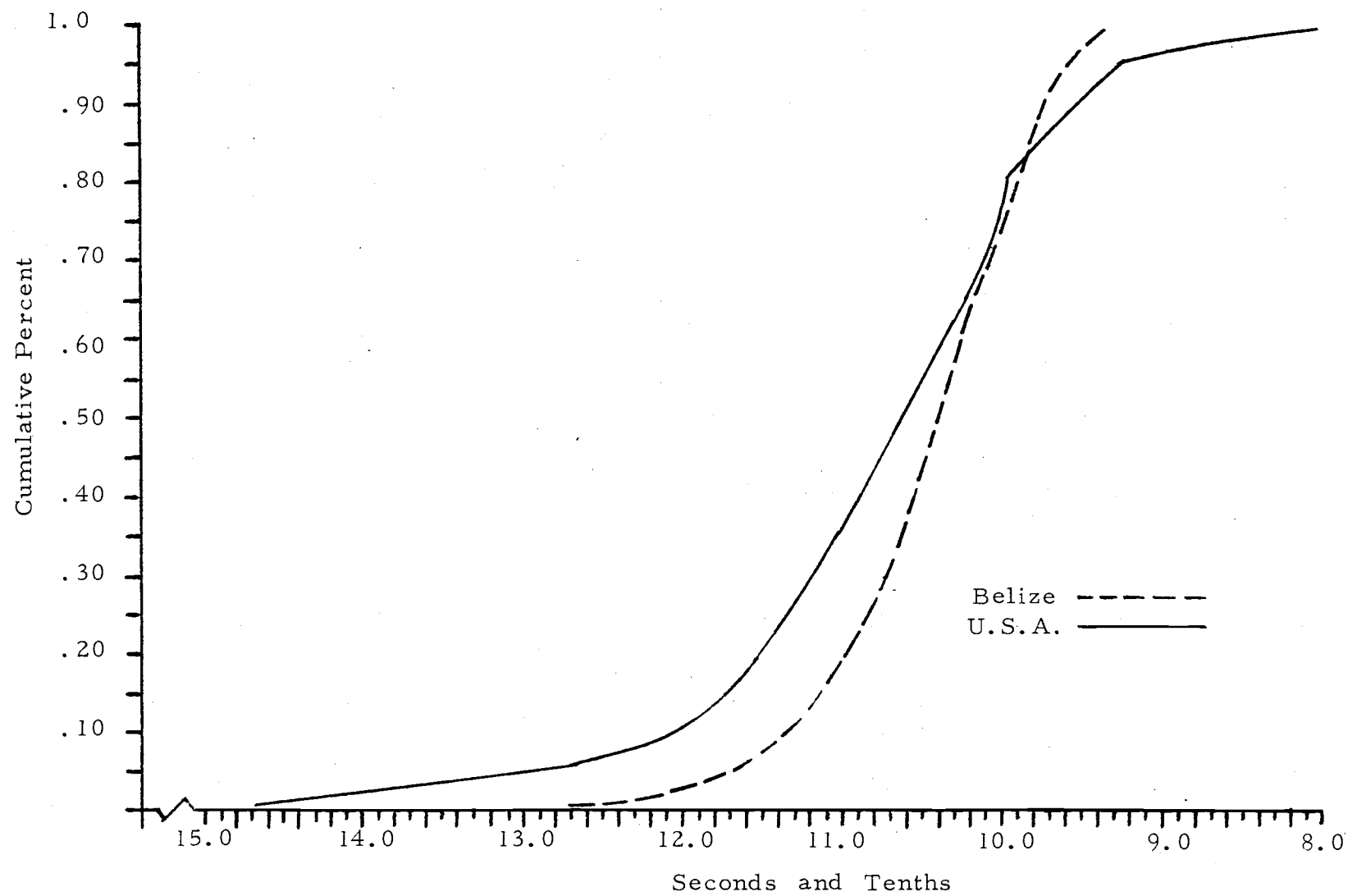


Figure 23. Shuttle Run, Fifteen-Year-Old Boys

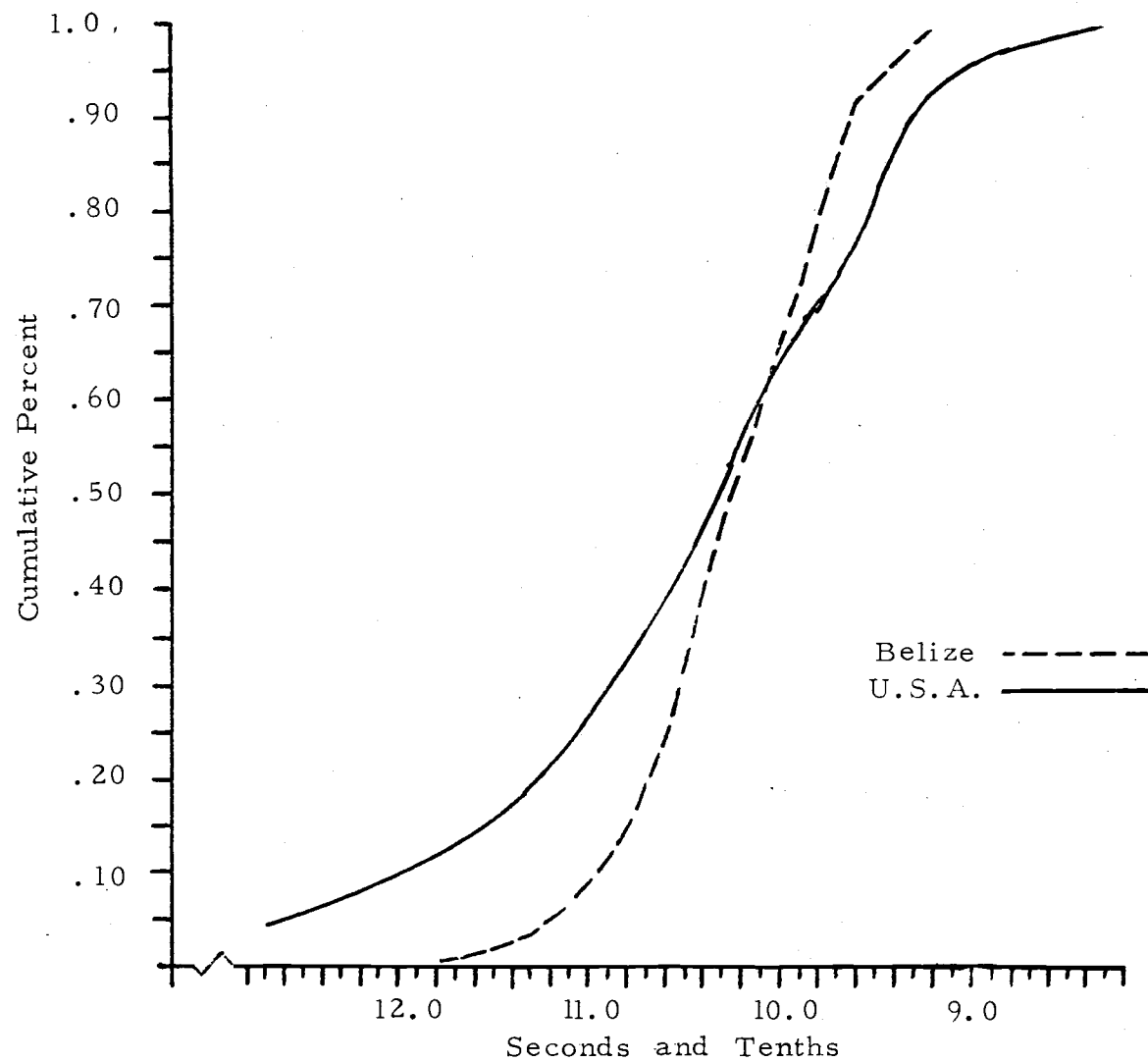


Figure 24. Shuttle Run, Sixteen-Year-Old Boys

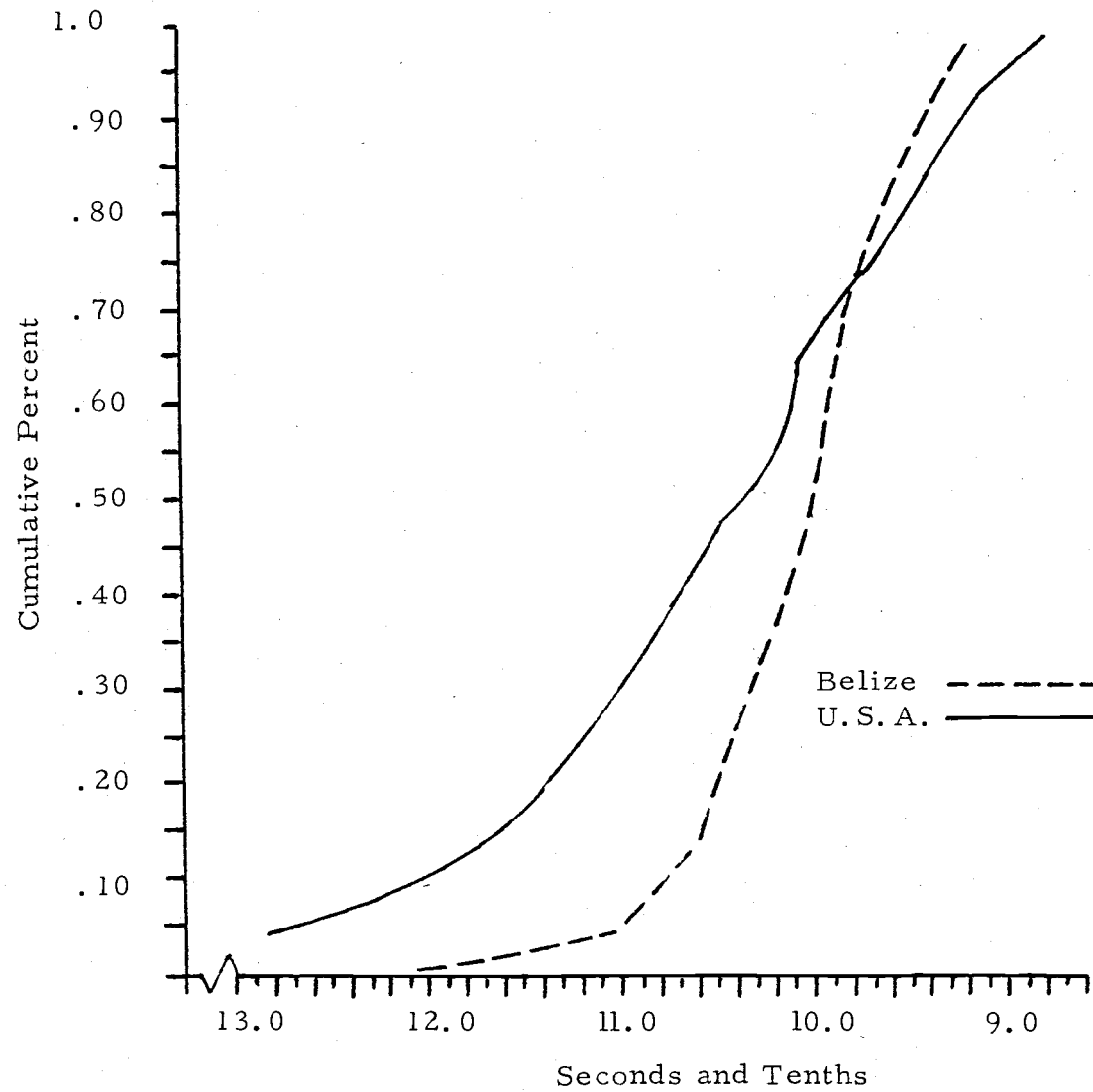


Figure 25. Shuttle Run, Seventeen-Year-Old Boys

Belizean population demonstrated superior performance in speed and change of direction as measured by the Shuttle Run.

Standing Broad Jump

Analysis of the results for the Standing Broad Jump as presented in Table VI indicates that a significant difference occurred between the two populations at ages 12 and 13. The higher level of performance appears to be by the Belizean population. No significant difference occurred at ages 14 through 17. A comparison of mean scores reveals a slightly better performance in favor of the Americans at ages 14 and 17, while the Belizeans have better mean scores at ages 15 and 16.

Figures 26 and 27 indicates that the 12 and 13-year-old Belizean boys had consistently higher scores throughout the percentile range except at the 95th percentile for 13-year-old boys. Fourteen-year-old American boys, as indicated in Figure 28, performed slightly better in the lower and upper percentiles, while the Belizeans recorded better performance from about the 18th to 50th percentile. Fifteen-year-old American boys as indicated in Figure 29, performed better up to the 25th percentile and from the 55th percentile on. Sixteen-year-old Belizean boys performed better in the Standing Broad Jump up to the 40th percentile, as indicated in Figure 30. Figure 31 indicates that the 17-year-old American performance was consistently better

TABLE X. STANDING BROAD JUMP: SUMMARY OF COMPARED DATA.

Country	Age	\bar{X}	$\sigma_{\text{diff.}}$	\underline{t}	Significance
Belize	12	64.4	1.0	3.4	.05
U.S.A.	12	61.0			
Belize	13	66.3	.9	2.0	.05
U.S.A.	13	64.5			
Belize	14	69.5	.9	.7	N/S
U.S.A.	14	70.1			
Belize	15	74.4	1.0	.4	N/S
U.S.A.	15	74.0			
Belize	16	79.1	1.1	.1	N/S
U.S.A.	16	79.0			
Belize	17	80.7	2.0	.9	N/S
U.S.A.	17	82.5			

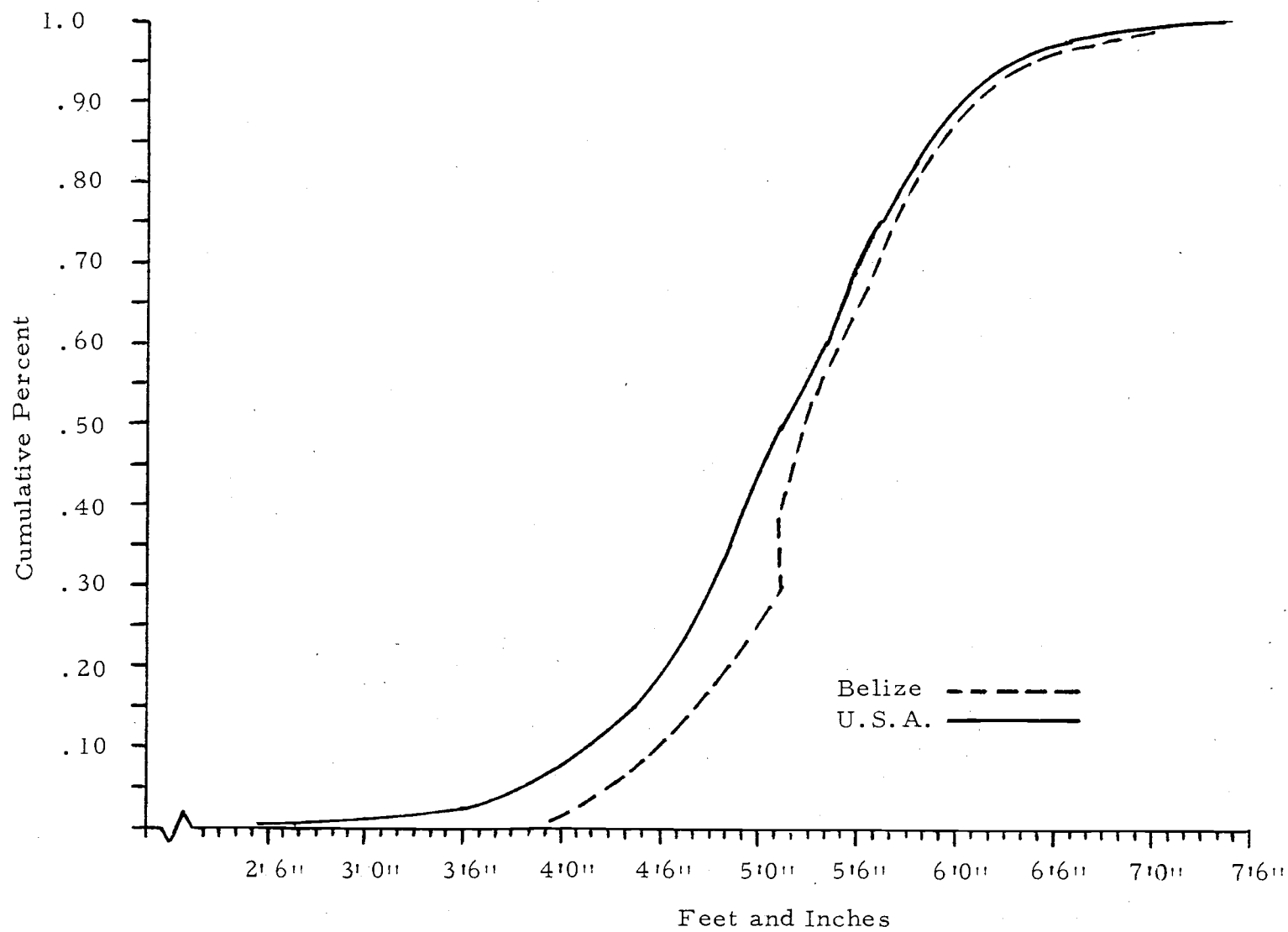


Figure 26. Standing Broad Jump, Twelve-Year-Old Boys

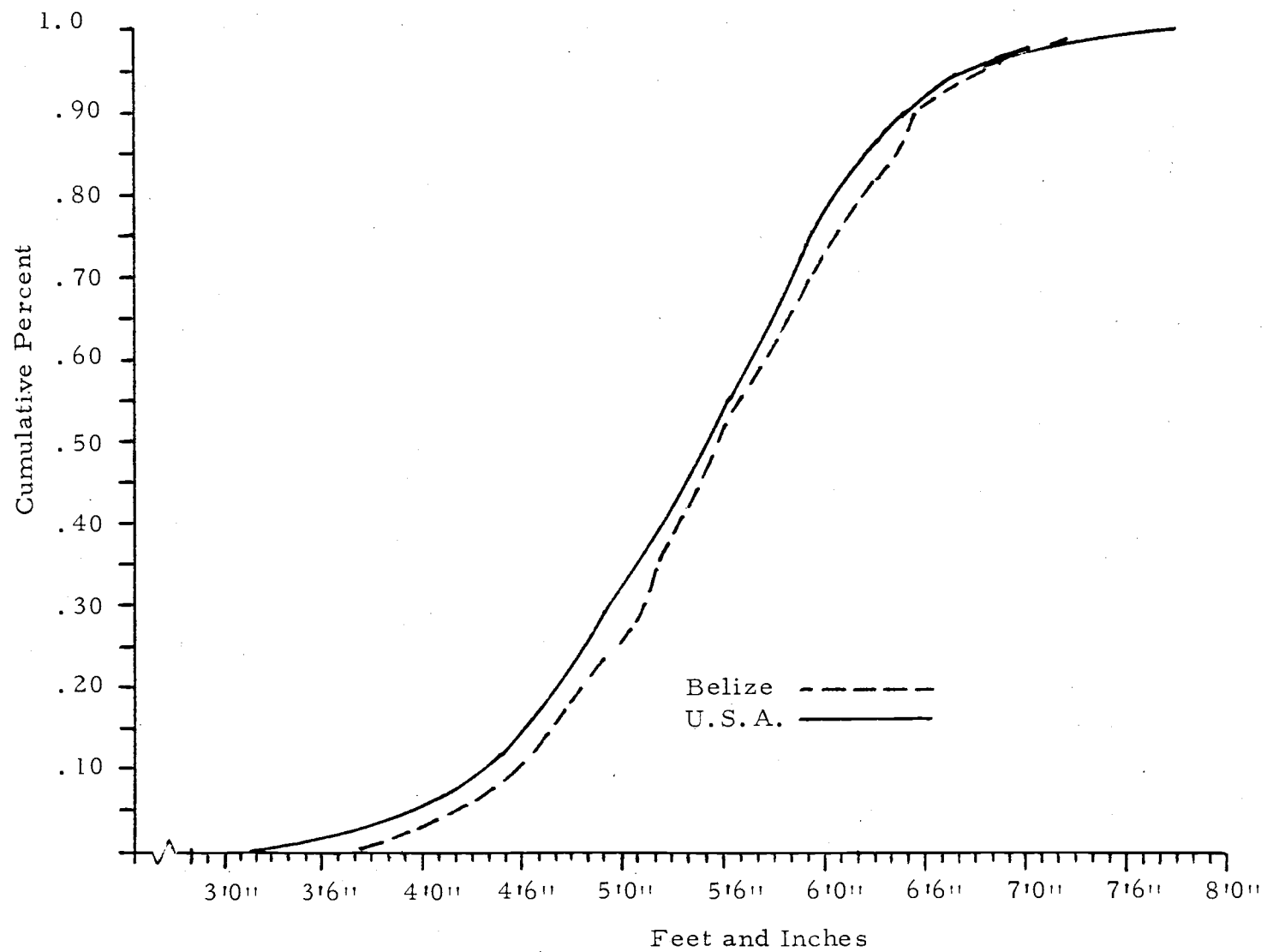


Figure 27. Standing Broad Jump, Thirteen-Year-Old Boys

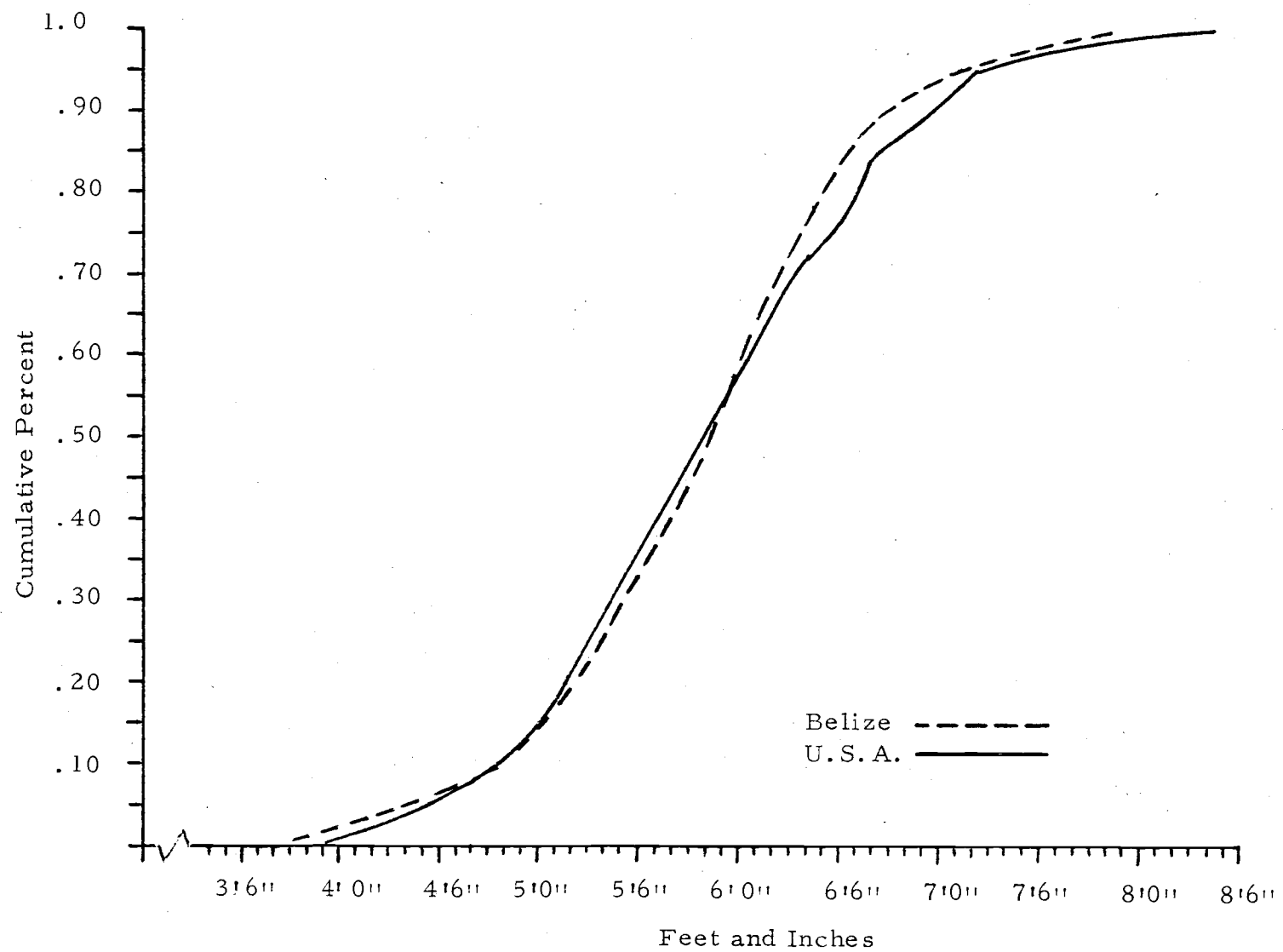


Figure 28. Standing Broad Jump, Fourteen-Year-Old Boys

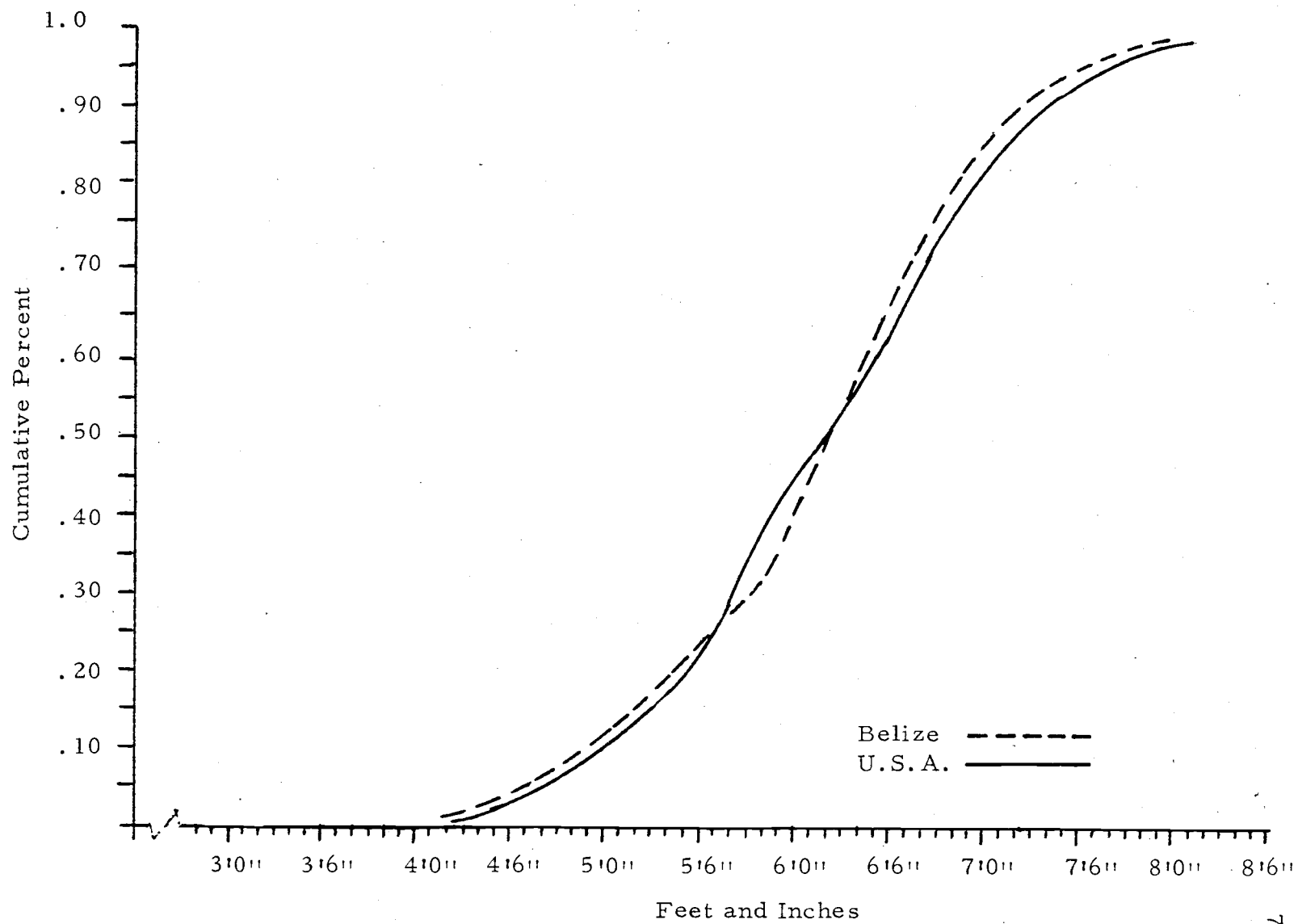


Figure 29. Standing Broad Jump, Fifteen-Year-Old Boys

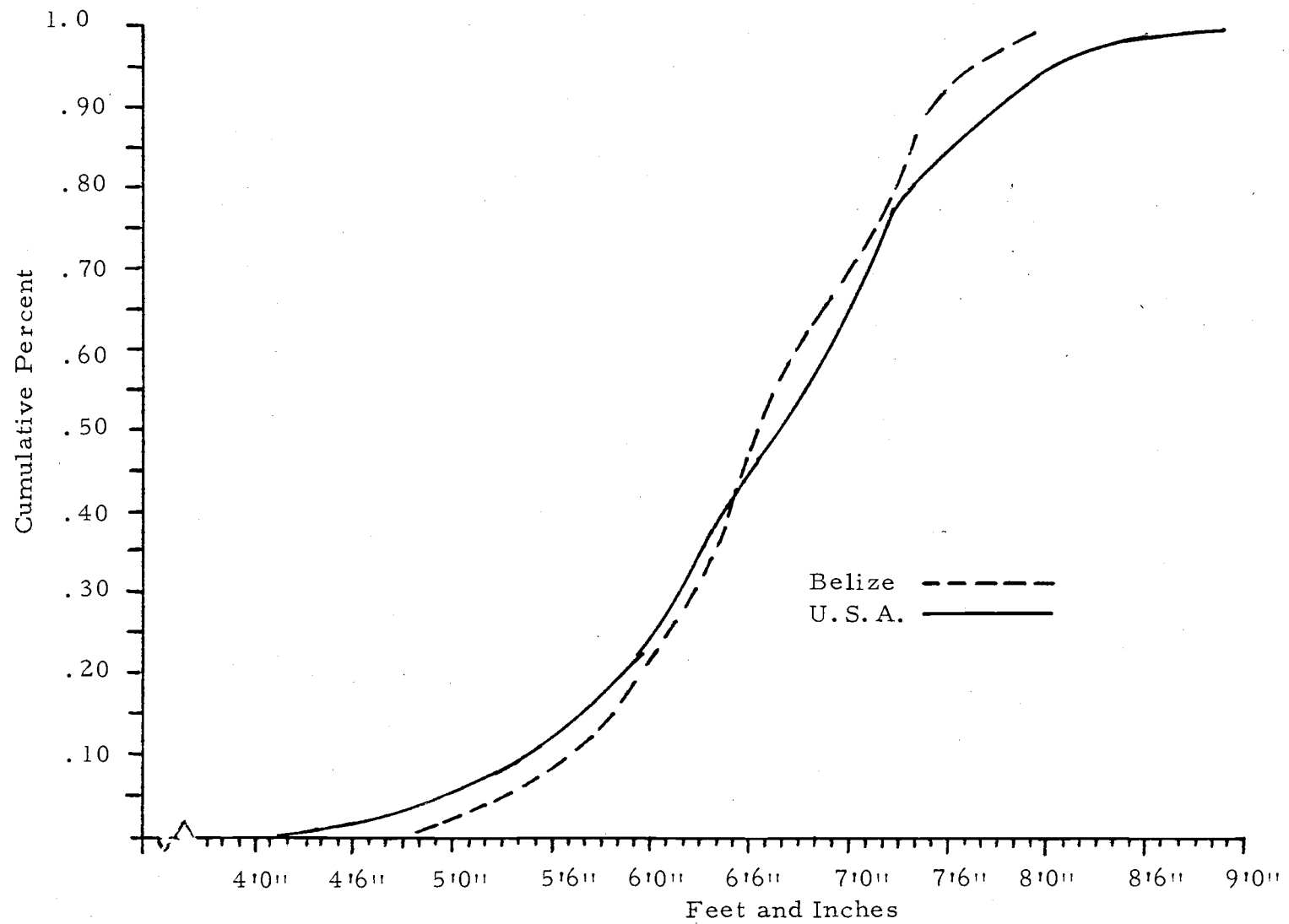


Figure 30. Standing Broad Jump, Sixteen-Year-Old Boys

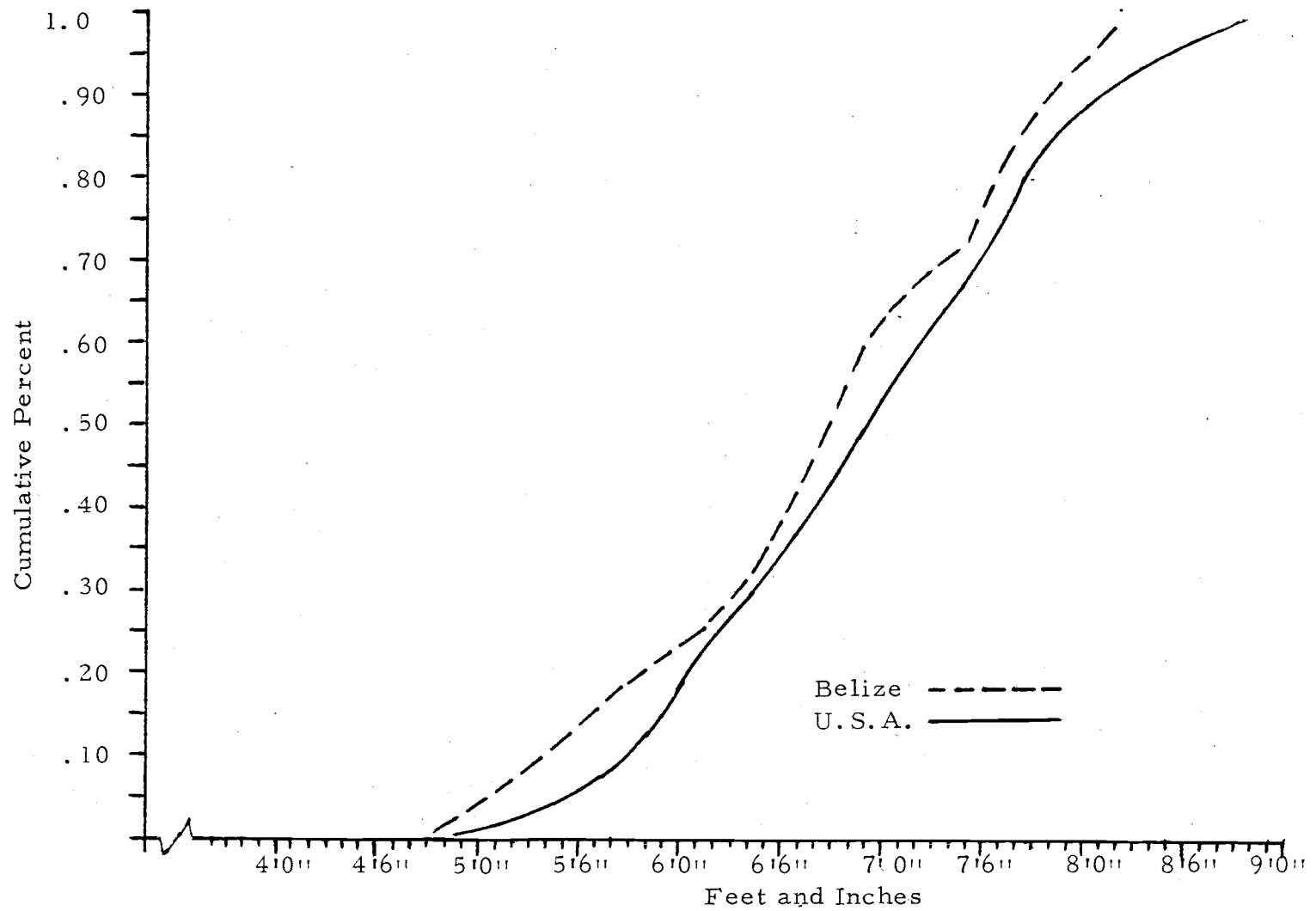


Figure 31. Standing Broad Jump, Seventeen-Year-Old Boys

than the Belizean scores; however, this comparison was not significant.

50-Yard Dash

Analysis of the results for the 50-Yard Dash as presented in Table VI indicates significant differences occurred between the two populations for ages 15, 16, and 17. The differences are in the direction of the Americans. There was no test of significance administered for age 14 due to the lack of the standard error from the American data. Mean scores for 12-year-old boys are the same for the two populations. Mean score comparisons between 14 and 15 year-old boys are in favor of the American population (see Table XI and Appendix F).

Results between 12-year-old boys, as indicated in Figure 32, reveals that the Belizean population had times equal to or better than the Americans up to about the 70th percentile. The 13-year-old American boys, as indicated in Figure 33, performed consistently better than the Belizeans from the 15th percentile. No test of significance for 14-year-old boys was applied due to the lack of comparable data. Analysis of Figure 34 indicates a cumulative curve similar to that found for ages 15 through 17, with the American performance consistently better from about the 10th percentile on.

TABLE XI. 50-YARD DASH: SUMMARY OF COMPARED DATA.

Country	Age	\bar{X}	σ diff.	\underline{t}	Significance
Belize	12	8.1	.1	0.0	N/S
U.S.A.	12	8.1			
Belize	13	8.0	.1	1.0	N/S
U.S.A.	13	7.9			
Belize	14	7.8	*		
U.S.A.	14	7.6			
Belize	15	7.5	.1	3.0	.05
U.S.A.	15	7.2			
Belize	16	7.2	.1	2.0	.05
U.S.A.	16	7.0			
Belize	17	7.1	.1	3.0	.05
U.S.A.	17	6.8			

* Complete data for the U.S.A. sample were not available.

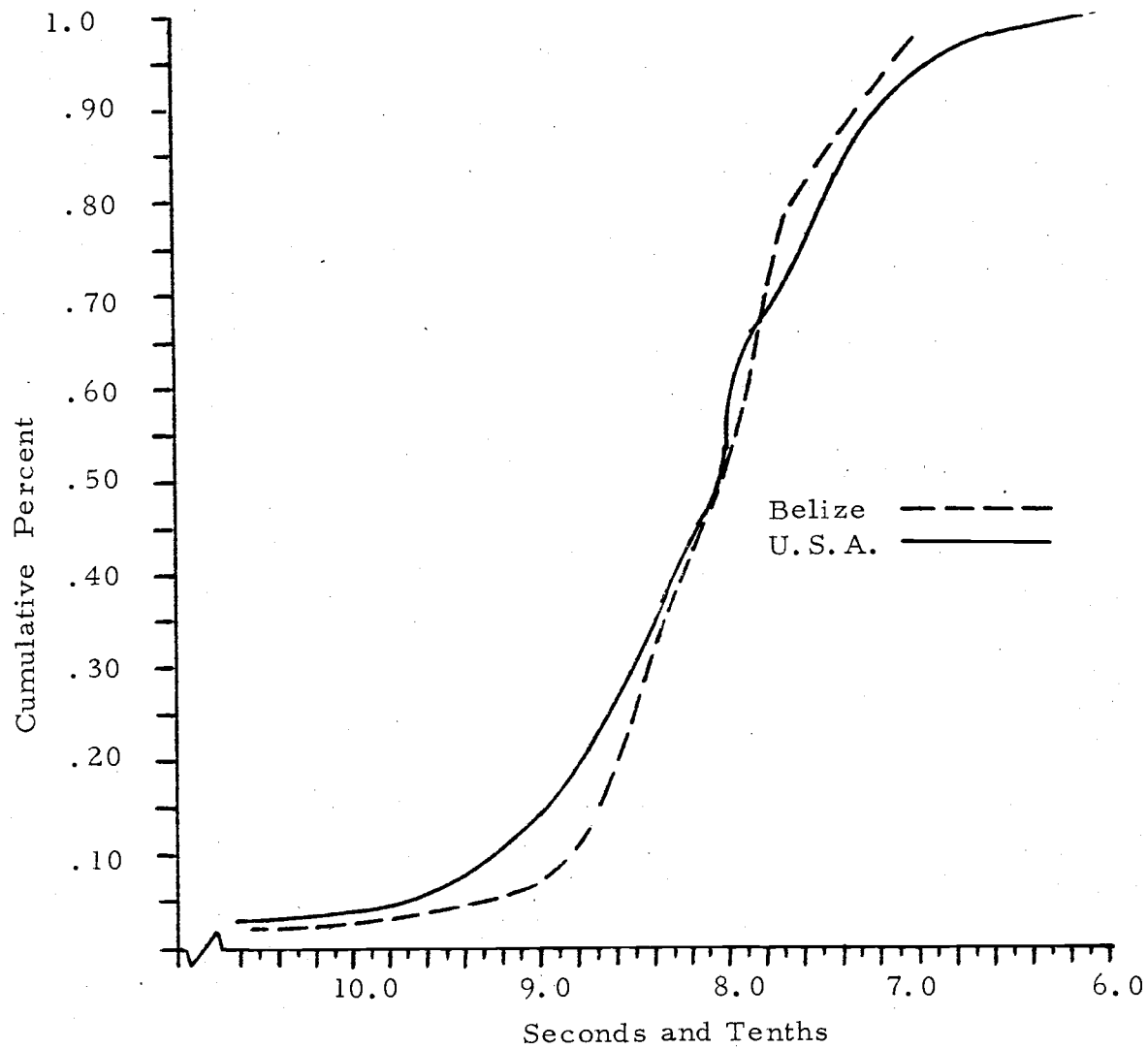


Figure 32. 50-Yard Dash, Twelve-Year-Old Boys

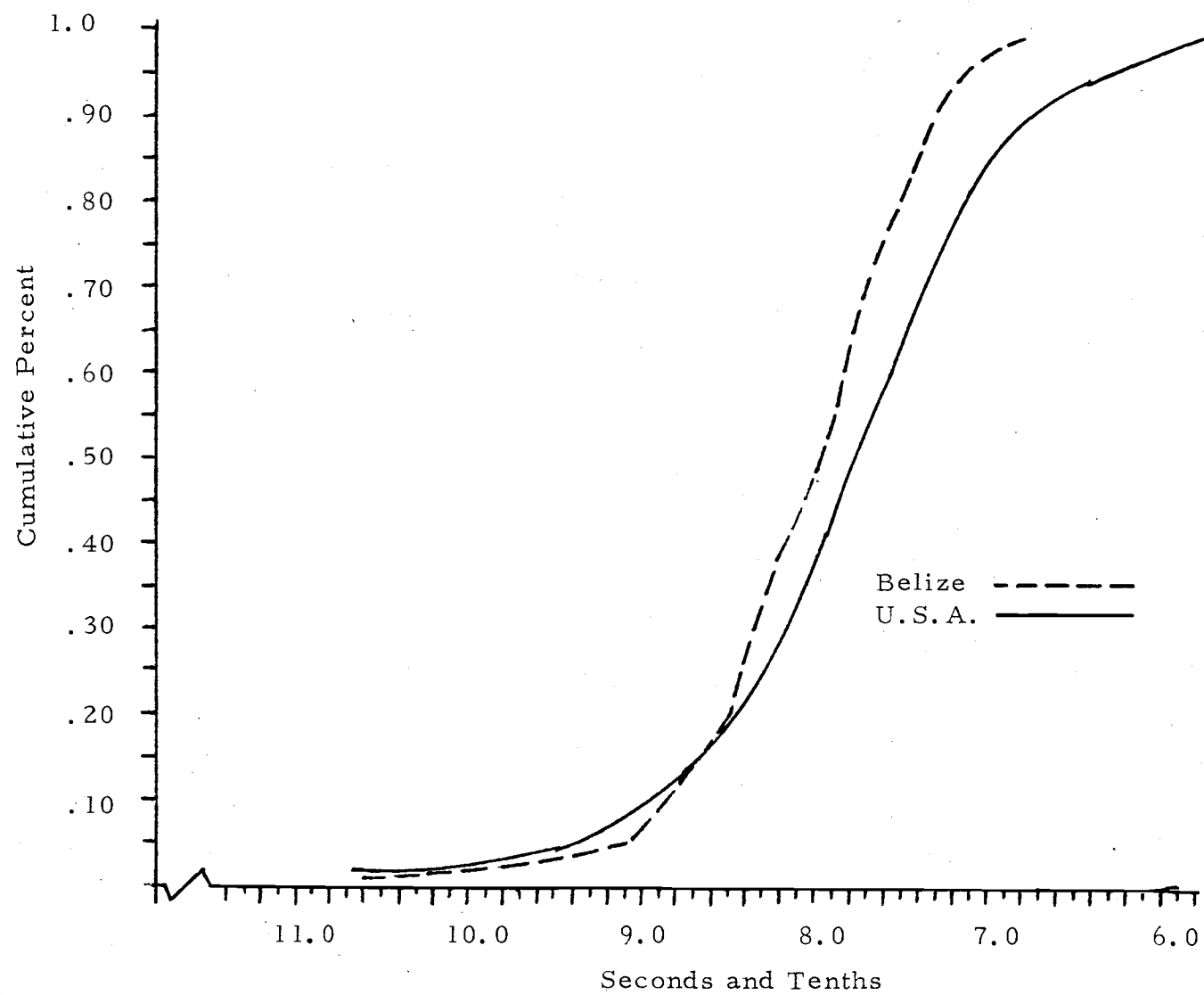


Figure 33. 50-Yard Dash, Thirteen-Year-Old Boys

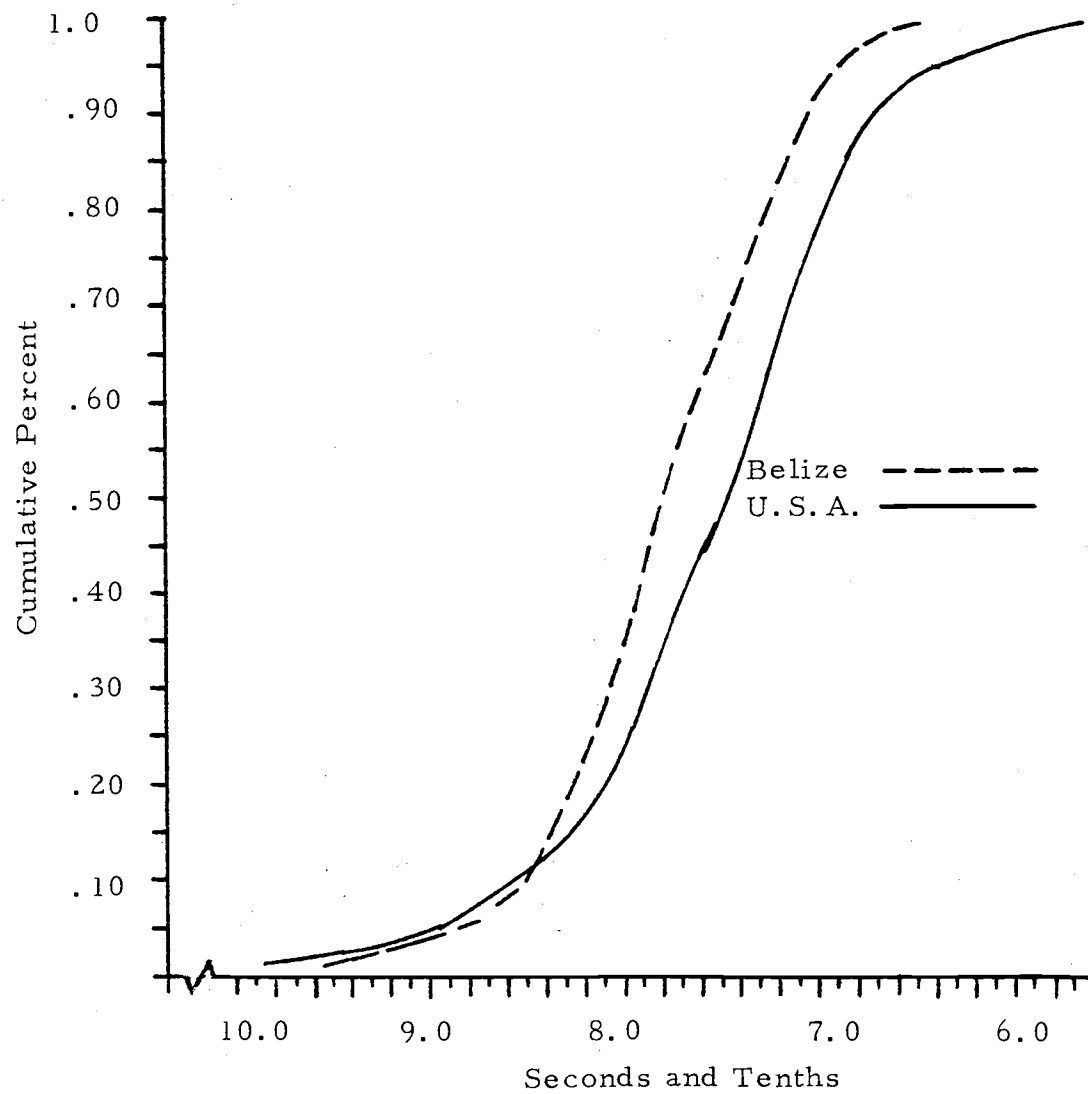


Figure 34. 50-Yard Dash, Fourteen-Year-Old Boys

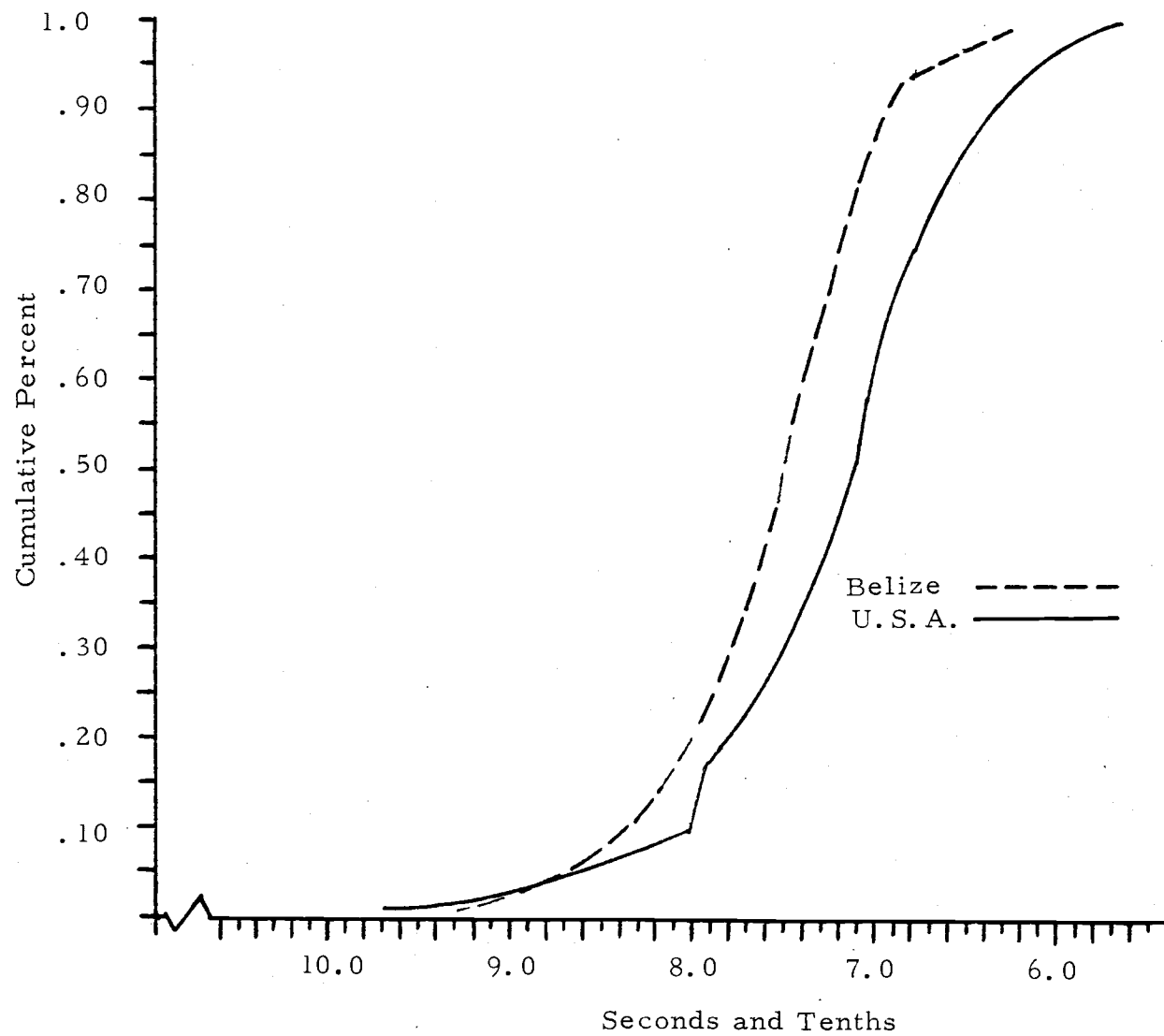


Figure 35. 50-Yard Dash, Fifteen-Year-Old Boys

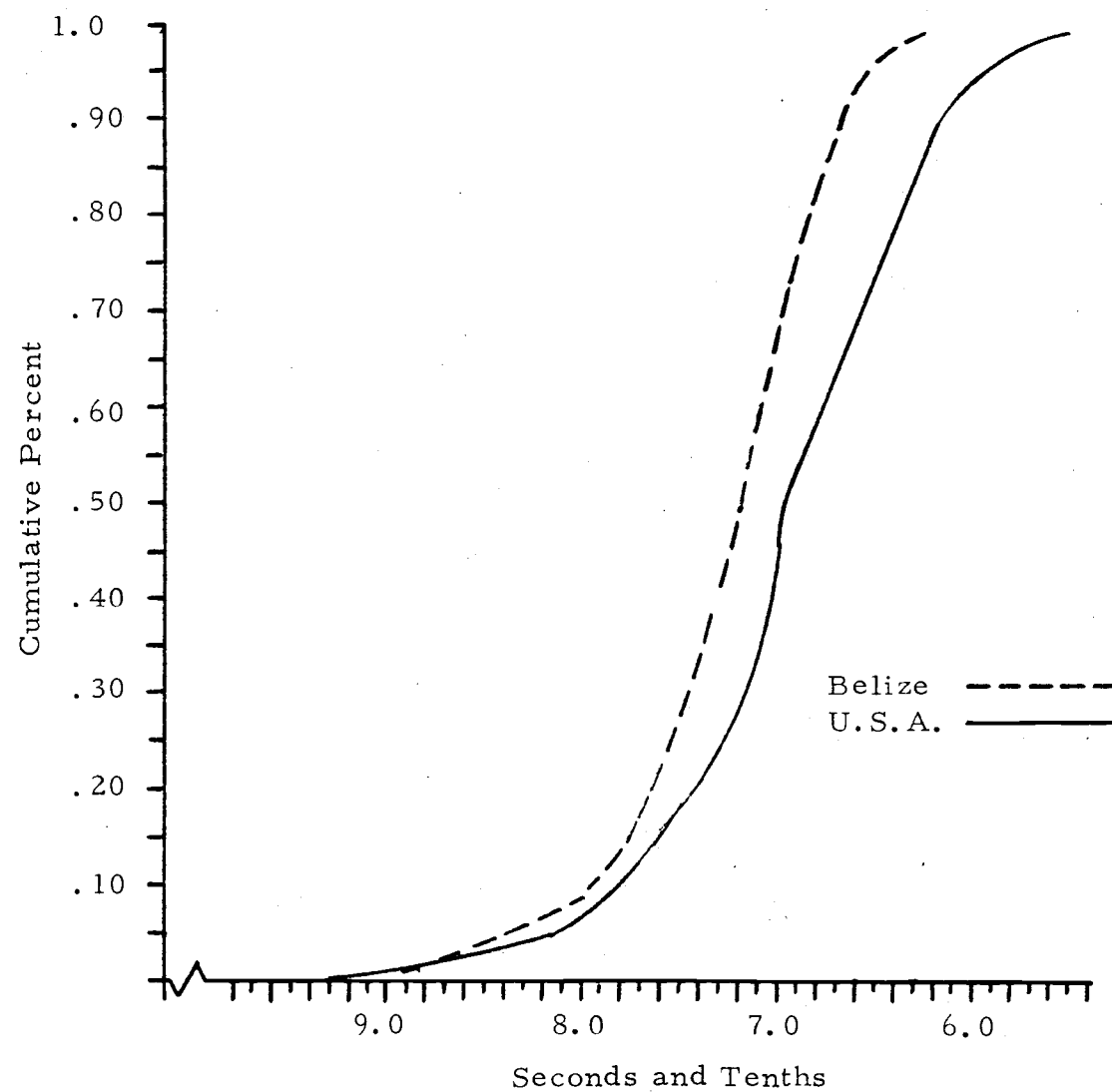


Figure 36. 50-Yard Dash, Sixteen-Year-Old Boys

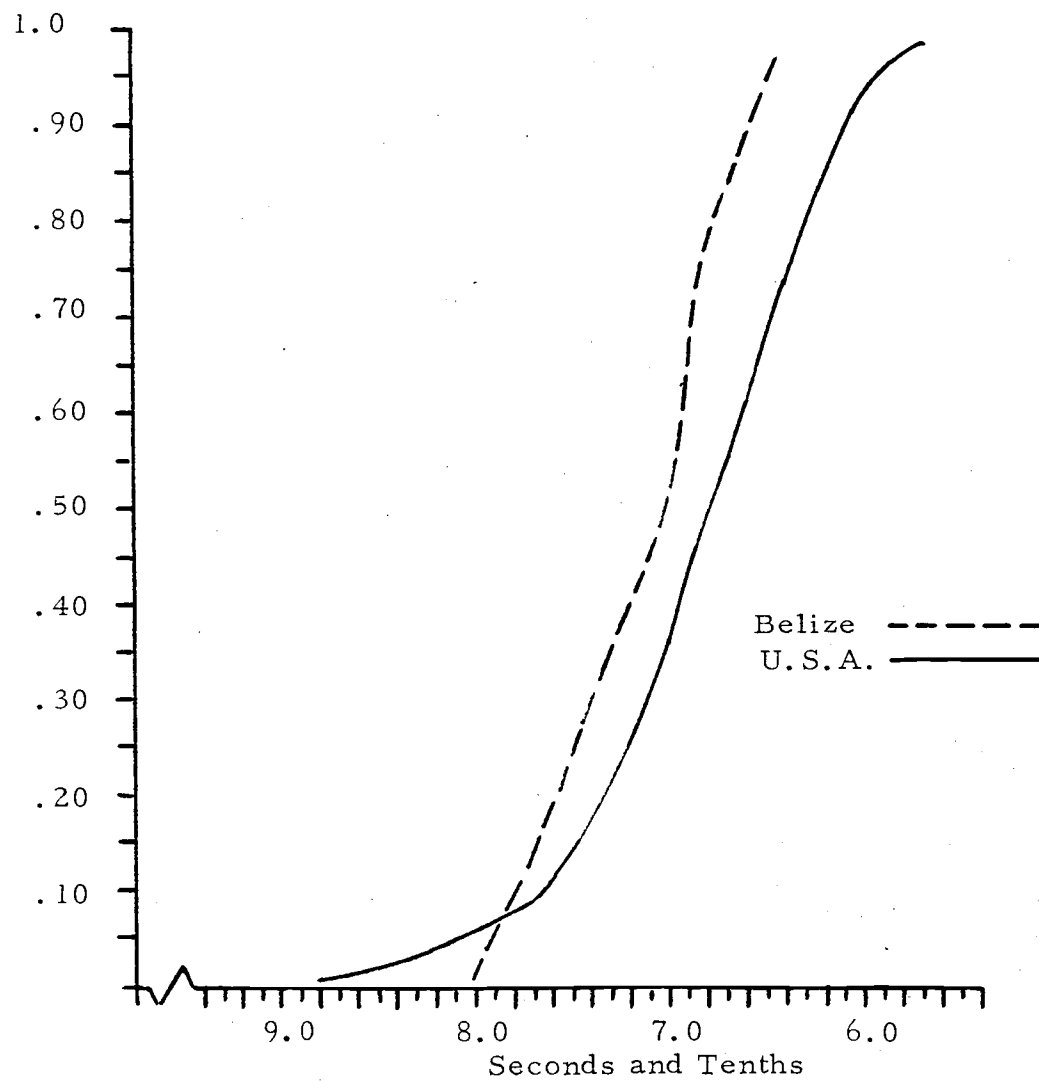


Figure 37. 50-Yard Dash, Seventeen-Year-Old Boys

Figures 35, 36, and 37 indicate the American performance was consistently better from the 5th percentile on for 15, 16, and 17-year-old boys.

Softball Throw

Analysis of results for the Softball Throw presented in Table VI indicates a significant difference occurred between the two populations for each age groups. The better performance appears to be that of the American sample. Comparisons of mean scores, as represented in Table XII, reveals a large spread between scores.

Figure 38 through 43 indicate that American boys had consistently better performance in the Softball Throw after the 5th percentile.

The superior skill demonstrated by the American boys in the Softball Throw, may reflect the emphasis placed on this type of over-hand activity in America. Similar findings have been reported in other studies (7, 24, 32).

600-Yard Run-Walk

Analysis of results for the 600-Yard Run-Walk as presented in Table VI indicates a significant difference occurred between the two populations in each age group. The better performance was in favor of the Belizean population. Comparison of mean scores as

TABLE XII. SOFTBALL THROW: SUMMARY OF COMPARED DATA.

Country	Age	\bar{X}	$\sigma_{\text{diff.}}$	t	Significance
Belize	12	97	2.8	5.3	.05
U.S.A.	12	112			
Belize	13	104	2.9	6.7	.05
U.S.A.	13	123			
Belize	14	114	2.5	10.5	.05
U.S.A.	14	140			
Belize	15	129	2.8	10.1	.05
U.S.A.	15	157			
Belize	16	139	3.8	6.9	.05
U.S.A.	16	165			
Belize	17	143	5.1	6.7	.05
U.S.A.	17	177			

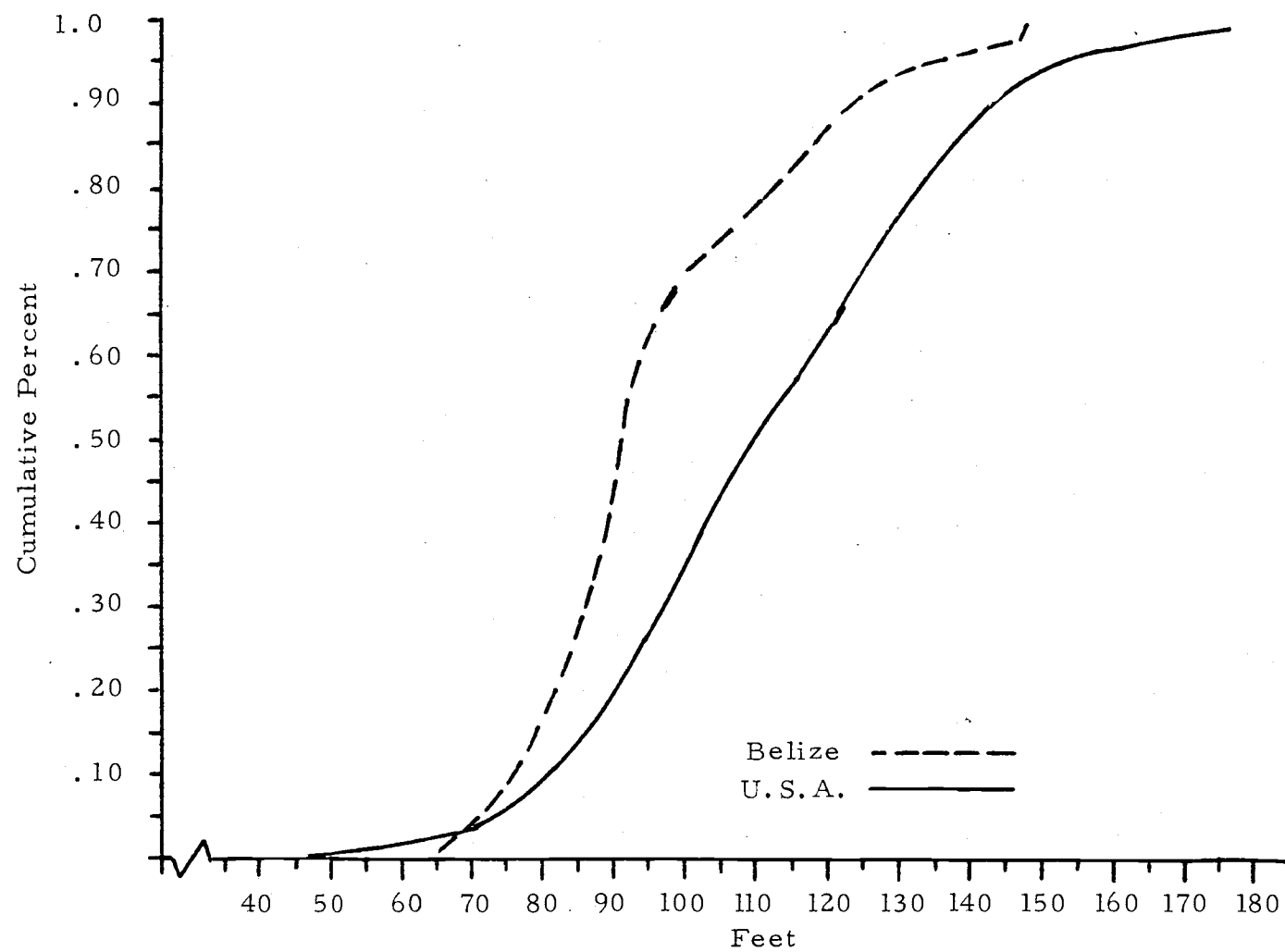


Figure 38. Softball Throw, Twelve-Year-Old Boys

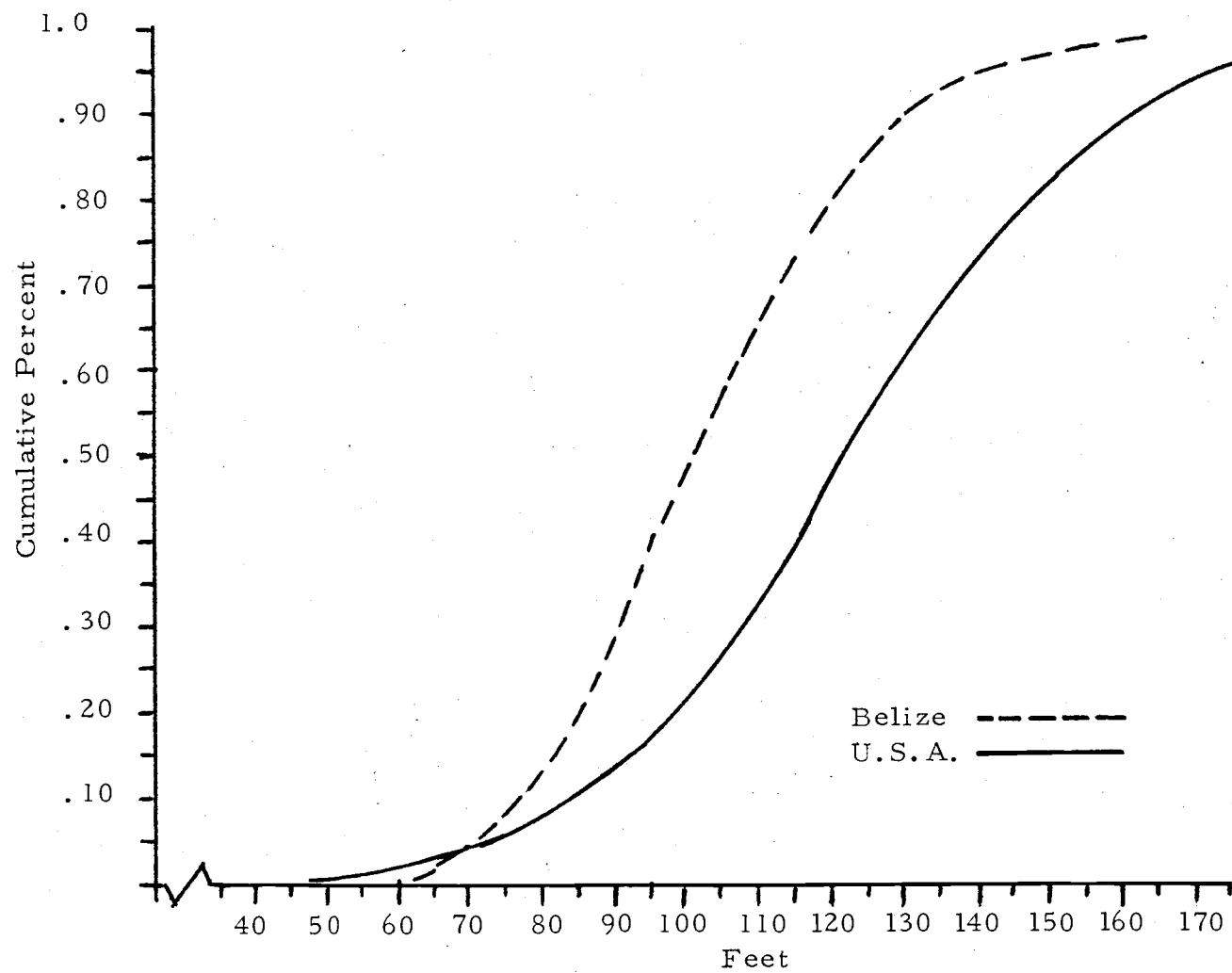


Figure 39. Softball Throw, Thirteen-Year-Old Boys

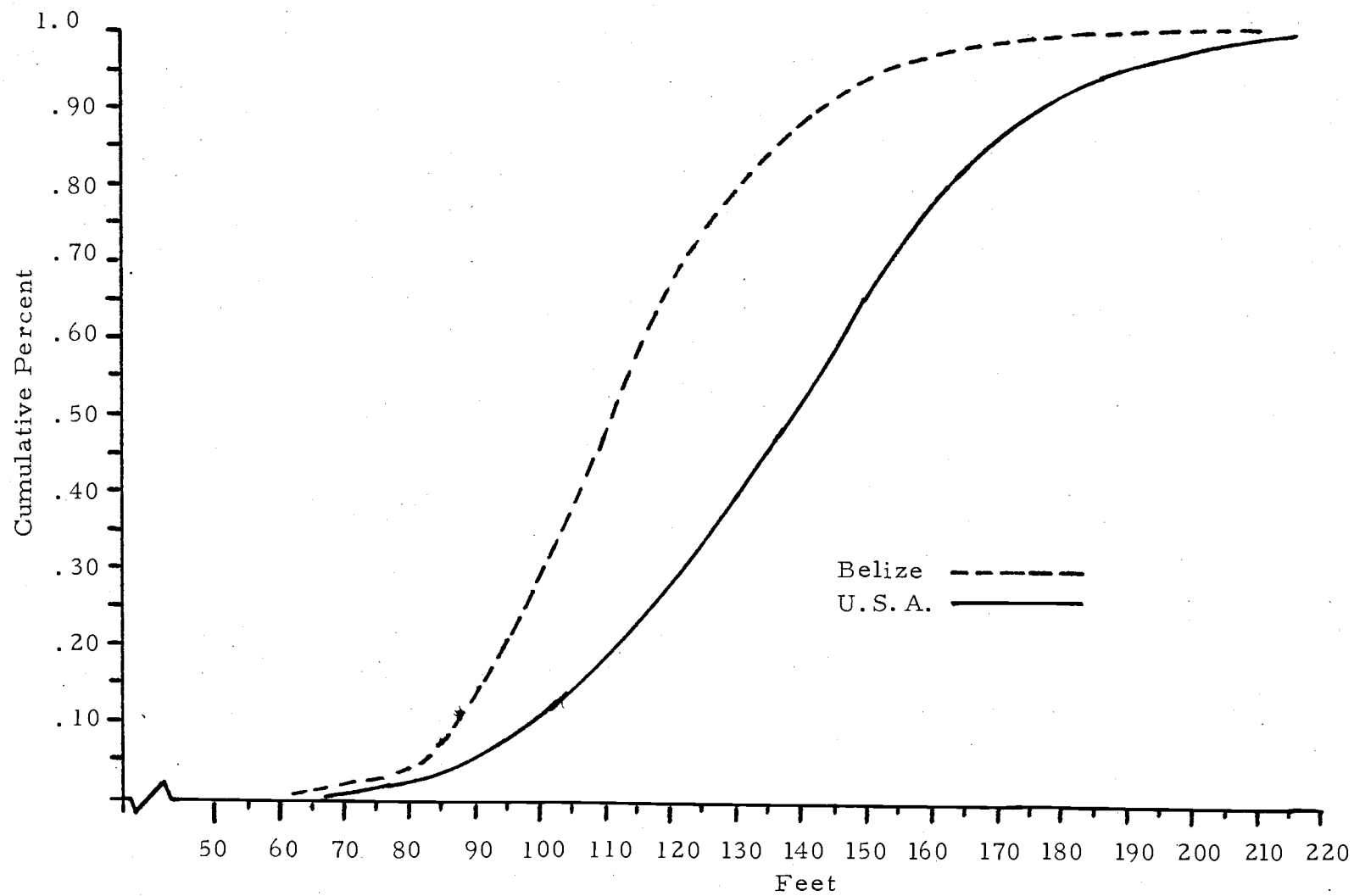


Figure 40. Softball Throw, Fourteen-Year-Old Boys

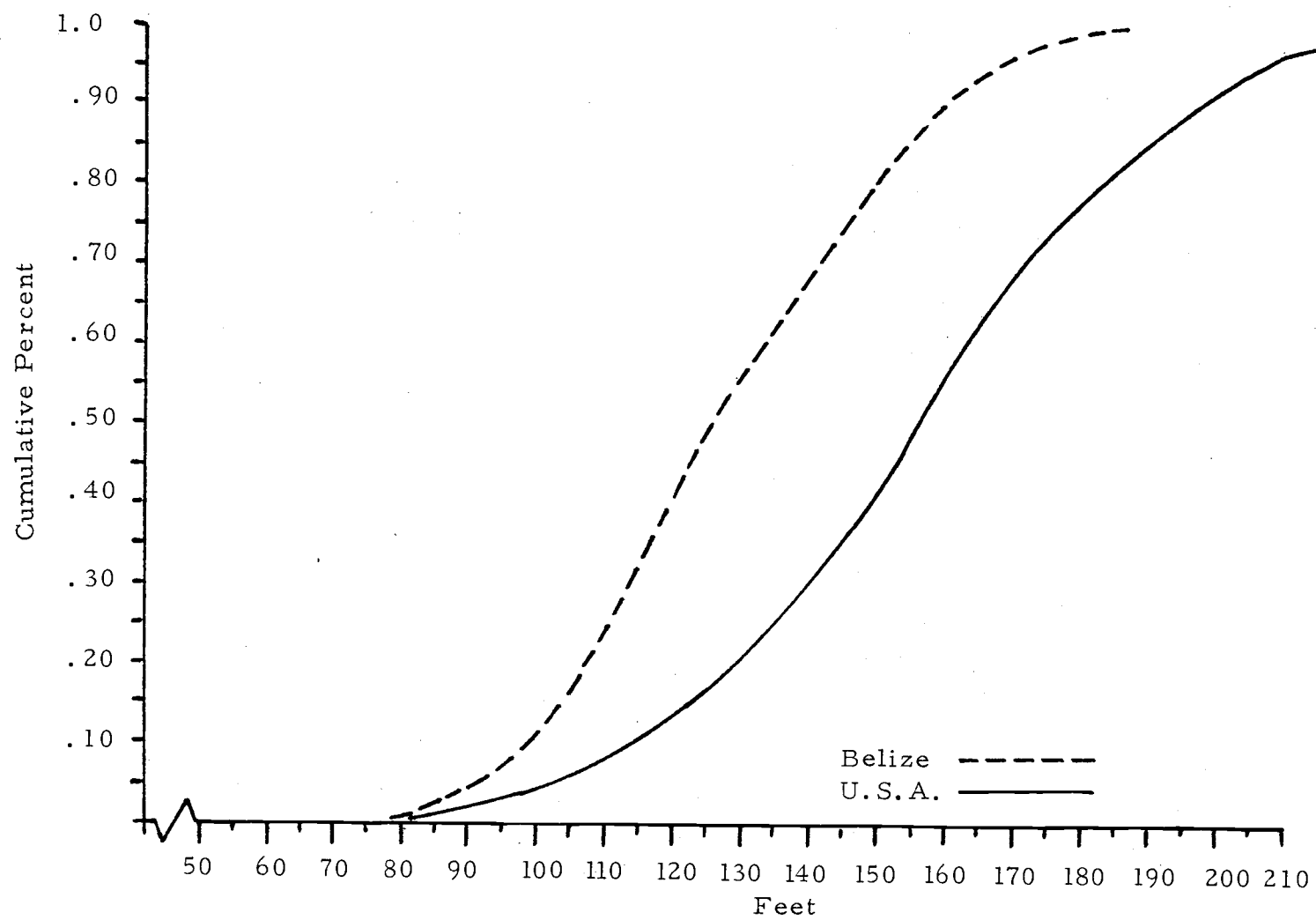


Figure 41. Softball Throw, Fifteen-Year-Old Boys

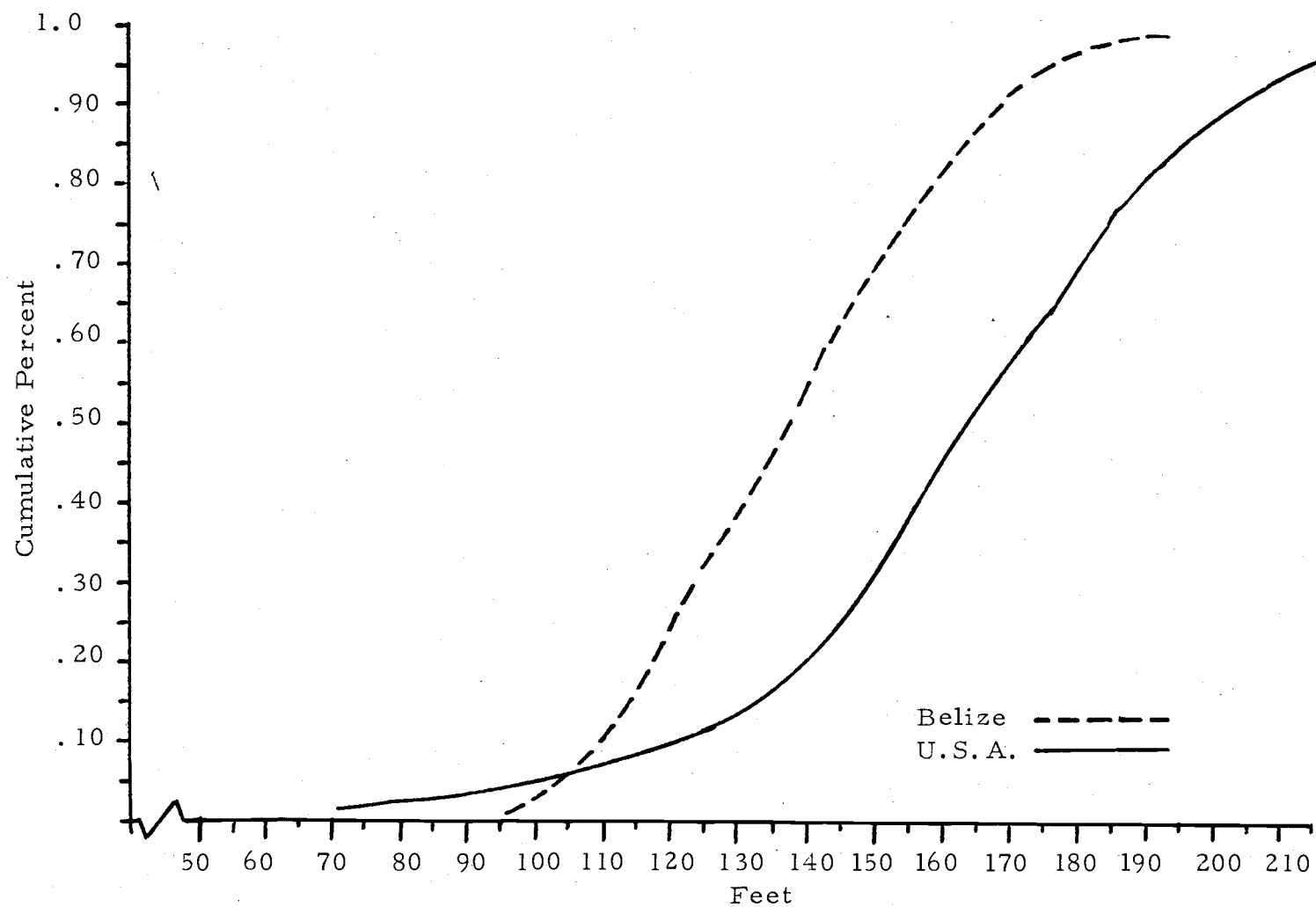


Figure 42. Softball Throw, Sixteen-Year-Old Boys

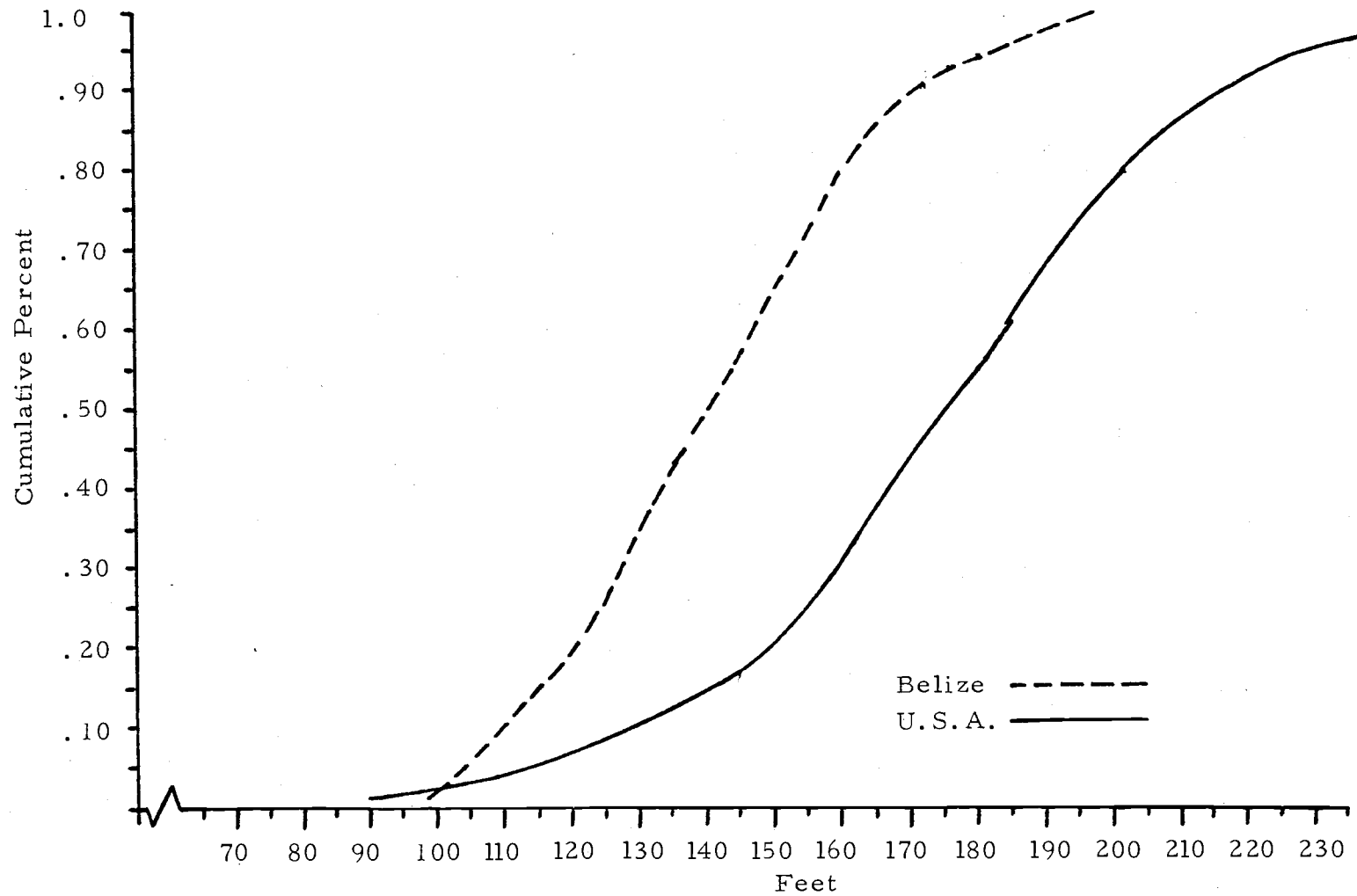


Figure 43. Softball Throw, Seventeen-Year-Old Boys

represented in Table XIII demonstrate a large spread between scores.

Figures 44 through 49 indicate that Belizean boys had consistently superior performance in the 600-Yard Run-Walk throughout the cumulative percent range, except at the 95th percent for ages 15 and 17 as indicated in Figures 47 and 49.

The superior cardiovascular fitness exhibited by the Belizean boys over the American population would seem to be directly related to the life style of Belizeans which is much less mechanized and less dependent upon motorized transportation. These results reflect similar findings previously reported in the literature (7, 32, 45).

Summary of Results and Discussion

The major purpose of this study was to compare physical fitness norms between the countries of Belize, Central America and the United States. The null hypothesis, that no significant difference would exist between test results was utilized. Of 41 comparisons made, 25 were significant at the .05 level of confidence and hence the null hypothesis was rejected for these comparisons. Thirteen significant differences appeared in favor of Belize. All thirteen were in one of four test items: Pull-up, Shuttle Run, Standing Broad Jump, or the 600-Yard Run-Walk. Twelve significant differences at the .05 level of confidence were in favor of the American population. These were in the other three test items; Sit-up, 50-Yard Dash, and Softball Throw

TABLE XIII. 600-YARD RUN-WALK: SUMMARY OF COMPARED DATA.

Country	Age	\bar{X}	$\sigma_{\text{diff.}}$	t	Significance
Belize	12	140	4.3	5.6	.05
U.S.A.	12	164			
Belize	13	134	4.3	5.2	.05
U.S.A.	13	157			
Belize	14	127	3.3	7.1	.05
U.S.A.	14	150			
Belize	15	123	3.2	5.2	.05
U.S.A.	15	140			
Belize	16	115	2.8	6.2	.05
U.S.A.	16	132			
Belize	17	113	4.2	4.6	.05
U.S.A.	17	133			

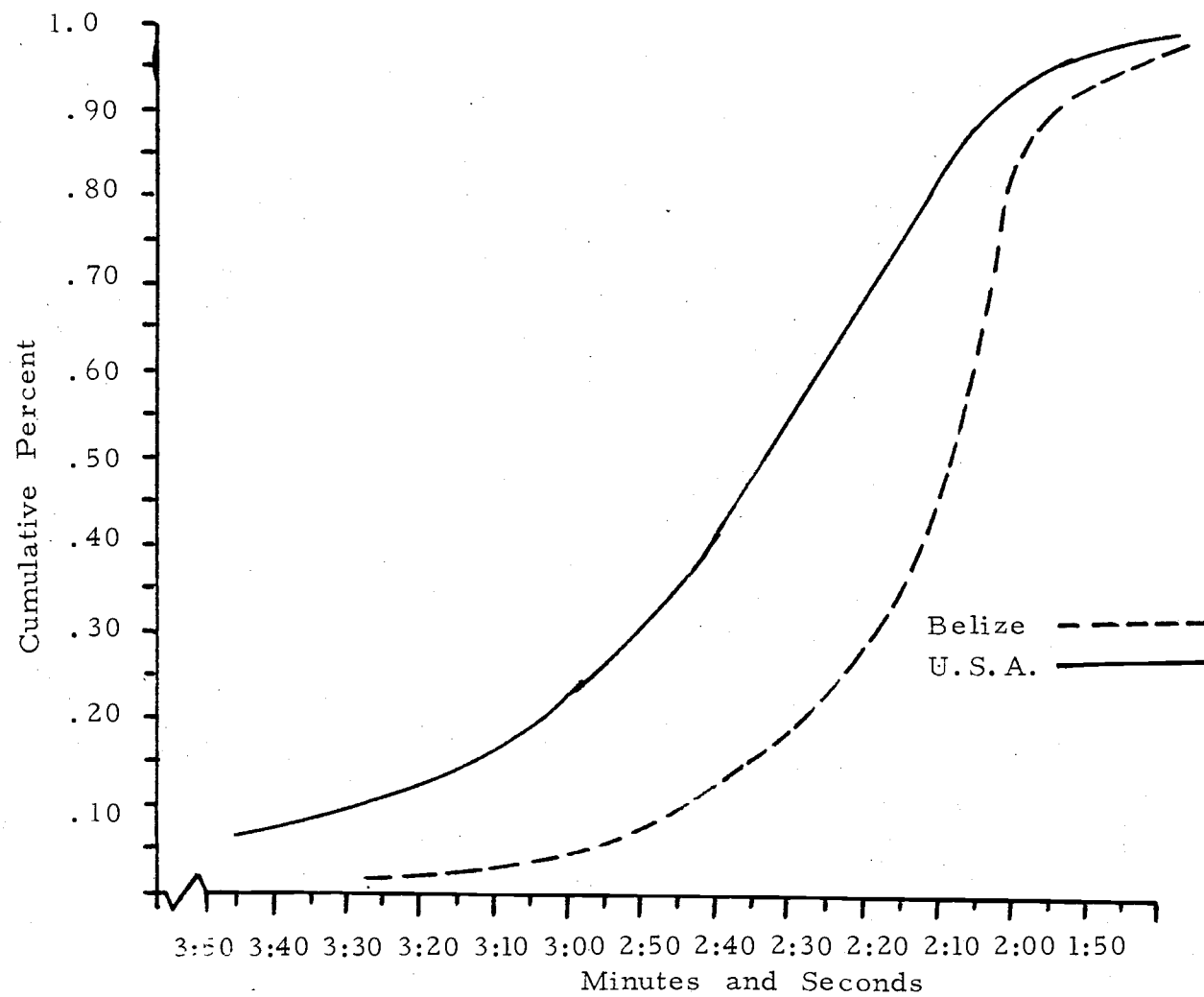


Figure 44. 600-Yard Run-Walk, Twelve-Year-Old Boys

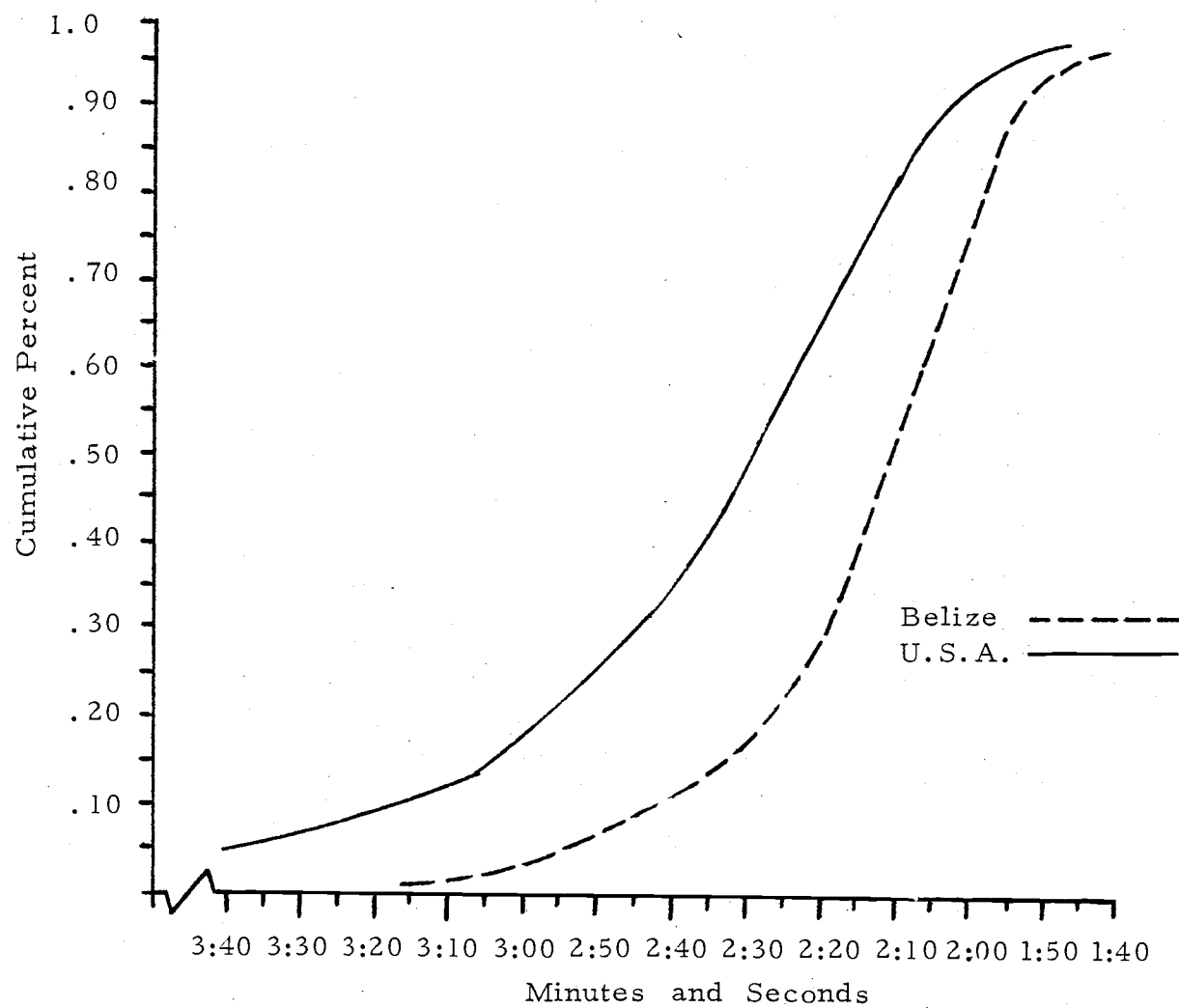


Figure 45. 600-Yard Run-Walk, Thirteen-Year-Old Boys

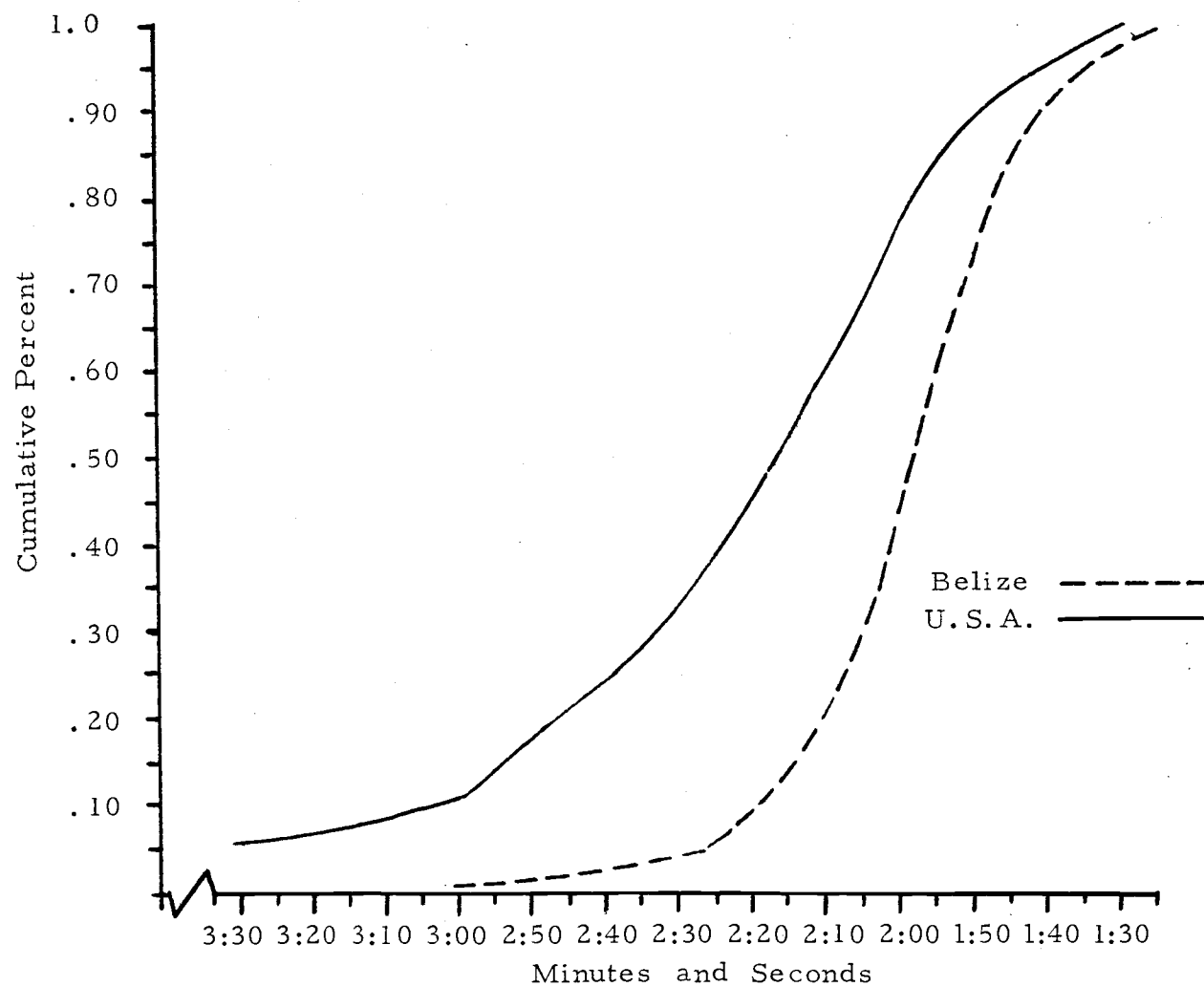


Figure 46. 600-Yard Run-Walk, Fourteen-Year-Old Boys

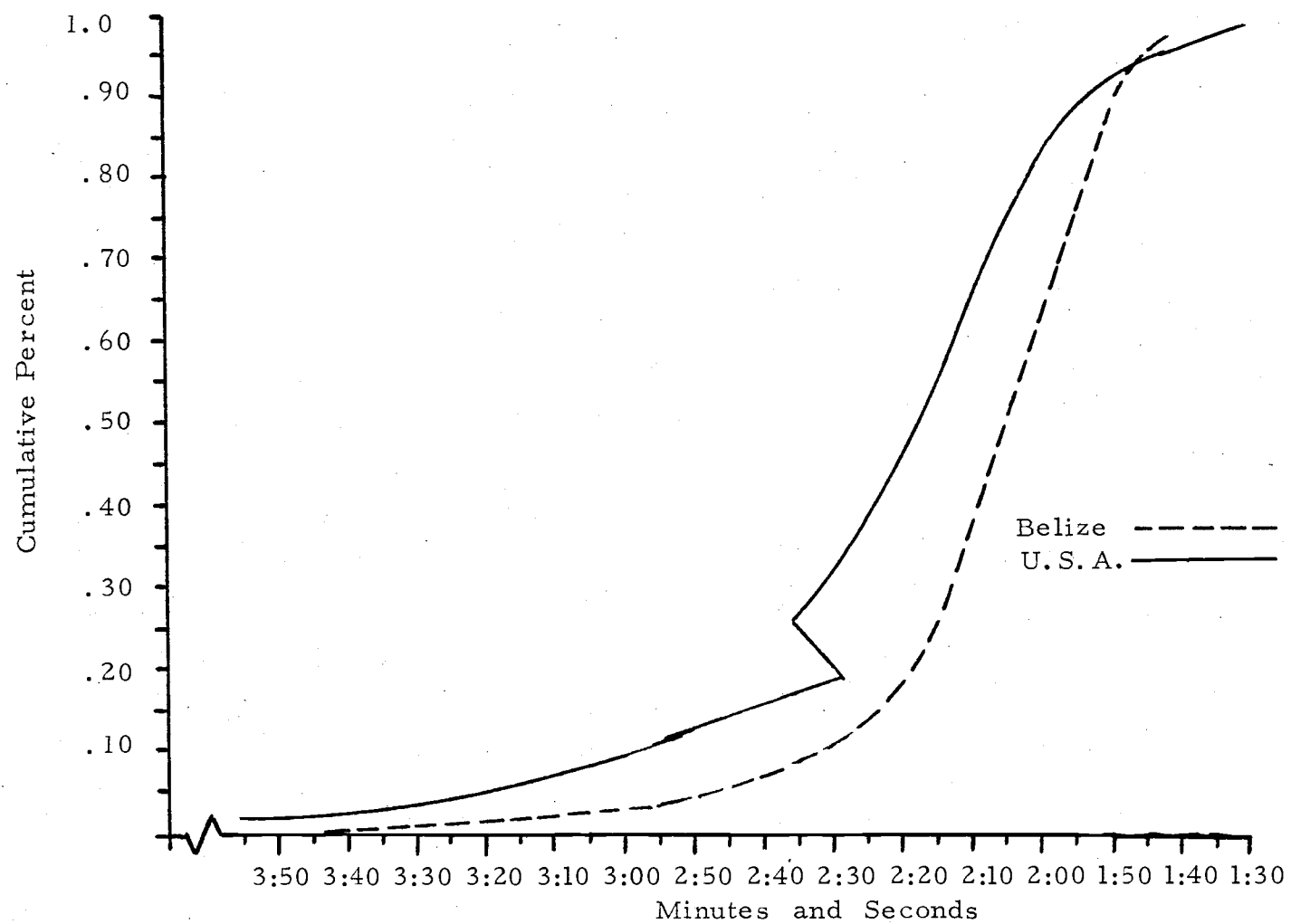


Figure 47. 600-Yard Run-Walk, Fifteen-Year-Old Boys

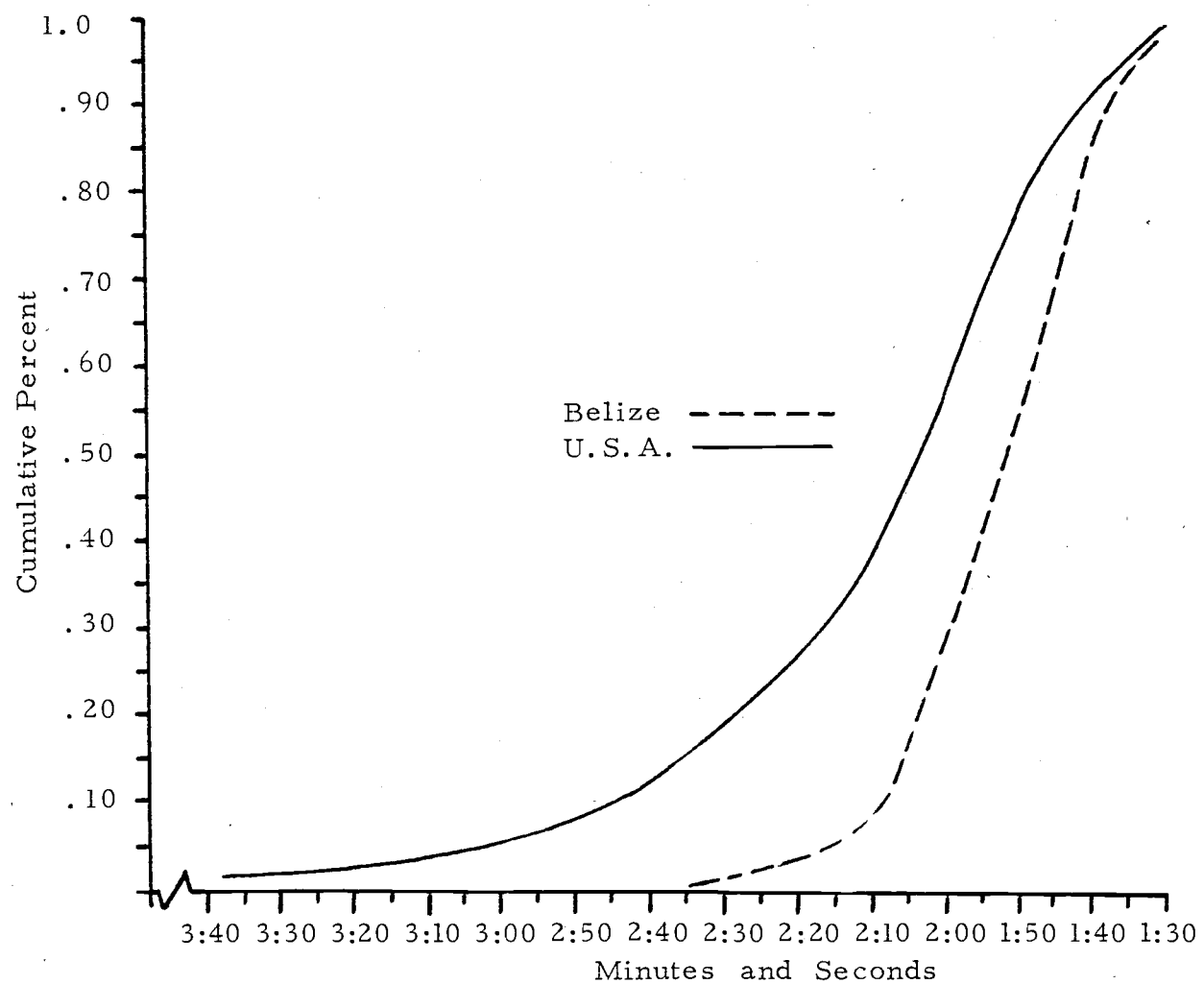


Figure 48. 600-Yard Run-Walk, Sixteen-Year-Old Boys

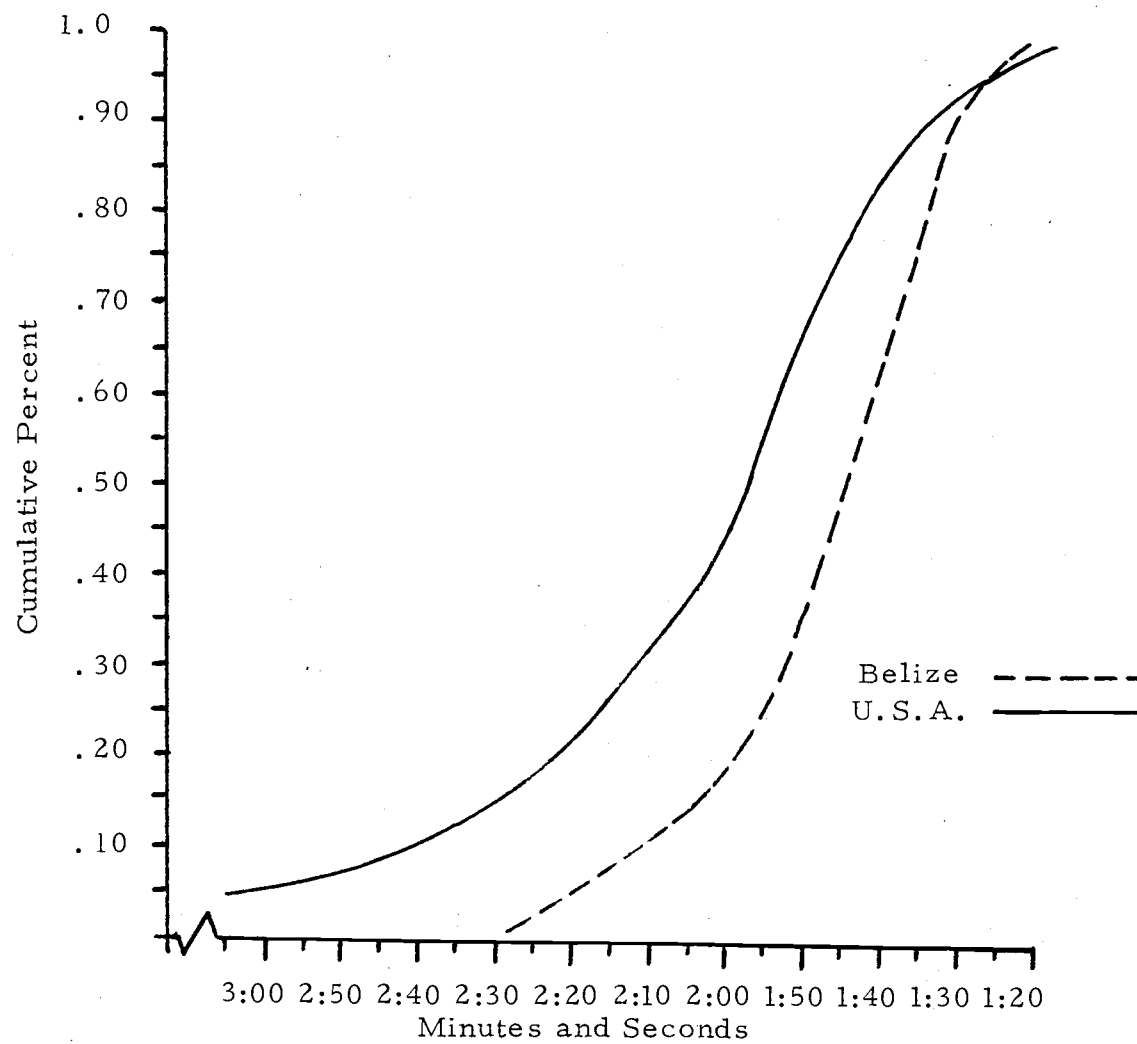


Figure 49. 600-Yard Run-Walk, Seventeen-Year-Old Boys

(see Table VI). Generally, results seem to indicate a tendency for American youth to perform better in items involving speed and skill, as indicated in the upper percentiles of the Shuttle Run, the 50-Yard Dash and Softball Throw. The Belize population tended to perform better in power and endurance items as results of the Standing Broad Jump and 600-Yard Run-Walk indicate.

CHAPTER V

SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS

Summary

The purpose of this study was to obtain physical fitness norms for Belize male high school youth in order to compare these norms with similar norms for the United States.

The subjects of the Belize survey were 9th and 10th grade male youth enrolled in the high schools of Belize. The criterion instrument selected was the AAHPER Youth Fitness Test Battery, as established for the 1957-58 American survey. Over 1,000 boys took part in the Belize testing which lasted from October, 1972 to March, 1973. Approximately 75% of the entire 9th and 10th grade male population took part in the survey.

United States data were provided by Hunsicker and Reiff (26) as included in their report. The 1958 American Survey was used for comparison with Belize because both surveys represented the introduction of a new testing instrument at those times, thus lessening outside influences on results.

Two statistical procedures were employed in the analysis. The Student's t for uncorrelated groups was used as a test for significant difference between means. Cumulative frequency graphs were

constructed for visual comparisons. These graphs may be used to interpret percentile scores, to illustrate the shape of Ogives for each population on each test, and to facilitate making comparisons between the two countries. Out of 41 Student t comparisons, 25 were found to be significantly different at the .05 level of confidence, these results do not support the hypothesis of no difference between the physical fitness of Belizean and American high school youth.

Implications

Based on the results of the survey and statistical tests, the following implications appear justified:

1. Belize youth demonstrated a tendency to be superior to their American counterparts in the Pull-up, Shuttle Run, Standing Broad Jump, and 600-Yard Run-Walk.
2. American youth demonstrated superior performance to their Belizean counterparts in the Sit-up, 50-Yard Dash and the Softball Throw.
3. Belize youth exhibited superior cardiovascular fitness to their American counterparts in all age groups as indicated by results of the 600-Yard Run-Walk Test.
4. American youth might have superior skill and coordination compared to their Belizean counterparts in the arm and shoulder girdle in all age groups as indicated by the Softball Throw Test.

Recommendations

In the realm of physical education, it must be understood that physical performance, or "physical fitness", is only one of the objectives of physical education. More concern should be shown for the program that results from testing and not so much with the test itself.

The following recommendations are made on the basis of this study:

1. That physical performance testing be recognized as a functional part of elementary and secondary school physical education programs in Belize.
2. That a national survey for secondary school girls be conducted in Belize.
3. That the results of physical fitness tests be considered in educational program development in Belize in order to locate weaknesses and to provide an awareness of the school's physical education effectiveness.

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APPENDICES

APPENDIX A

Report to the Minister

APPENDIX A

REPORT TO MINISTER

December 20, 1971

To: Hon. Louis Sylvester,
Minister of Local Government, Community
and Social Development

From: National Athletic Director

Subject: Job observation and future development.

Part 5 - section c.

"Physical Fitness Testing

Physical fitness testing is used in the United States to measure the physical standard of the nation's young, to locate weaknesses and to create an awareness of the schools' physical education effectiveness. The skills have a relation to performance in track and field. I feel the testing could be used effectively during the off season of track and field, to stimulate physical activity related to the sports (for all sports in general).

I would like to suggest that a national physical performance test be conducted possibly from September-December, 1972."

APPENDIX B

Co-operation Requests

APPENDIX B

CO-OPERATION REQUESTS

PHYSICAL PERFORMANCE TESTING

TO PRINCIPALS OF ALL SECONDARY SCHOOLS IN BRITISH HONDURAS.

Your co-operation is asked in assisting with the testing of all first and second form students in this Country.

The Physical Performance Testing is a battery of seven tests designed to give a measure of physical fitness for boys and girls from 10 to 18 years of age. The tests are the same as given by the American Association for Health, Physical Education and Recreation in the United States of America. They are selected to evaluate specific aspects of Physical status which, taken together, give an over-all picture of the young person's general fitness.

It is our wish to record accurate statistics so that a reliable appraisal of the level of fitness of our youths can be made. Testing will only involve 1st and 2nd form boys.

Objectives of the Testing:

1. Encourage Physical Education in the secondary schools.
2. To provide Physical Education teachers with a structured programme.
3. To measure and record National Norms for boys, 13 to 16 years of age.
4. To encourage students to do more physical activity.

APPENDIX C

Acceptance Letters

APPENDIX C

ACCEPTANCE LETTERS

MUFFLES COLLEGE

Orange Walk Town

British Honduras

November 15, 1972

Dear Mr. Cox:

Thank you for your letter of November 10 in which you included information the Physical Performance Testing and requested permission to conduct this test among our First and Second Form boys.

We are very much interested in the program and look forward to being included in it when you begin in January.

To date, our First and Second Form boys number 46 and 36 respectively, totalling 82 in all.

Sincerely,

Sister Leona M. Panton, R.S.M.

STANN CREEK HIGH SCHOOL

Principal:
J. K. Drepaul, B.A.

Stann Creek Town, B.H.

November 28, 1972

Ted W. Cox
Track and Field Director
Social Development Department
Belize City

Dear Mr. Cox:

I fully support your idea of administering tests to the male students of Forms One and Two.

Number of male students in form one = 36. Number of male students in form two = 31.

I remain,
Yours faithfully

J. K. Drepaul

Sacred Heart College

San Ignacio
Nov. 16, 1972.

Dear Ted,

In reply to your letter of Nov. 10 addressed to the venerable Headmaster, I am pleased to inform you that our doors are open for you at any time to administer your Physical Performance Testing. I or another member of the staff will be on hand to assist you.

Listed below is the required number of 1st and 2nd Form boys attending Sacred Heart College:

Form I A	=	22 Boys
Form I B	=	20 "
Form I C	=	19 "
Form II	=	27 "
Total	=	88 Boys.

Best wishes for a successful programme.

Sincerely,

Morris Garcia
Principal.

XAVIER COLLEGE

P.O. Box 63
Corozal Town
British Honduras

28th November, 1972.

Mr. Ted W. Cox,
Track and Field Director,
Social Development Department,
Belize City.

Dear Ted,

Greetings!

I would be happy to have you at Xavier College. I am interested in knowing more about your testing programme in Physical Education.

Please include us in your schedule for January. Classes commence here on January 8th.

I thank you.

Sincerely,

(W. J. Aguilar)
Principal

WJA/mt

The Methodist Church Honduras District

FLETCHER COLLEGE

16th November, 1972

P.O. Box 65

Corozal Town

British Honduras

Mr. Ted W. Cox
Track and Field Director
Social Development Department
P.O. Box 41
Belize City

Dear Ted,

In answer to your letter of November 10, we would be glad to have you come to Fletcher College to conduct the tests on Physical fitness. There are a total of 21 boys in Form I and 21 boys in Form II.

There will be at least one staff member available to assist you during these tests, so that in future years we will be able to conduct the tests without assistance.

Looking forward to your visit.

Sincerely,

Antonio J. Correa,
Principal

APPENDIX D

Testing Schedule

APPENDIX D

Testing Schedule

Ministry of Local Gov't Community and Social Development

National Physical Performance Testing

January - March 1973

<u>Month</u>	<u>Date</u>	<u>Day</u>	<u>Place</u>	
Jan.	5	Friday	Belmopan	Arrangements
	6	Saturday	San Ignacio	Arrangements
	7	Sunday	San Ignacio	
	8	Monday	San Ignacio	Testing
	9	Tuesday	San Ignacio	Testing
	10	Wednesday	San Ignacio	Testing
	11	Thursday	San Ignacio	Testing
	12	Friday	Belmopan	Testing
	13	Saturday	Belize City	
	14	Sunday	Belize City	
	15	Monday	Belize City	
	16	Tuesday	San Ignacio	Testing
	17	Wednesday	San Ignacio	Testing
	18	Thursday	San Ignacio	Testing
	19	Friday	San Ignacio	Testing
	20	Saturday	Belmopan	
	21	Sunday	Belmopan	
	22	Monday	Belmopan	Testing
	23	Tuesday	Belmopan	Testing
	24	Wednesday	Belmopan	Testing
	25	Thursday	Belmopan	Testing
	26	Friday	Belmopan	Testing
	27	Saturday	Belize City	
	28	Sunday	Orange Walk	Arrangements
	29	Monday	Orange Walk	Testing

<u>Month</u>	<u>Date</u>	<u>Day</u>	<u>Place</u>	
Jan.	30	Tuesday	Orange Walk	Testing
	31	Wednesday	Orange Walk	Testing
Feb.	1	Thursday	Orange Walk	Testing
	2	Friday	Orange Walk	Testing
	3	Saturday	Corozal	Arrangements
	4	Sunday	Orange Walk	
	5	Monday	Orange Walk	Testing
	6	Tuesday	Orange Walk	Testing
	7	Wednesday	Corozal	Testing
	8	Thursday	Corozal	Testing
	9	Friday	Corozal	Testing
	10	Saturday	Corozal	
	11	Sunday	Corozal	
	12	Monday	Corozal	Testing
	13	Tuesday	Corozal	Testing
	14	Wednesday	Corozal	Testing
	15	Thursday	Corozal	Testing
	16	Friday	Corozal	Testing
	17	Saturday	Belize City	
	18	Sunday	Stann Creek	Arrangements
	19	Monday	Stann Creek	Testing
	20	Tuesday	Stann Creek	Testing
	21	Wednesday	Stann Creek	Testing
	22	Thursday	Stann Creek	Testing
	23	Friday	Stann Creek	Testing
	24	Saturday	Stann Creek	
	25	Sunday	Stann Creek	
	26	Monday	Stann Creek	Testing
	27	Tuesday	Stann Creek	Testing
	28	Wednesday	Stann Creek	Testing
March	1	Thursday	Punta Gorda	Arrangements
	2	Friday	Punta Gorda	Testing
	3	Saturday	Punta Gorda	
	4	Sunday	Punta Gorda	
	5	Monday	Punta Gorda	Testing

<u>Month</u>	<u>Date</u>	<u>Day</u>	<u>Place</u>	
March	6	Tuesday	Punta Gorda	Testing
	7	Wednesday	Punta Gorda	Testing
	8	Thursday	Punta Gorda	Testing
	9	Friday	Punta Gorda	Testing
	10	Saturday	Belize City	
	11	Sunday	Belize City	
	12	Monday	San Pedro	Arrangements
	13	Tuesday	San Pedro	Testing
	14	Wednesday	San Pedro	Testing
	15	Thursday	San Pedro	Testing
	16	Friday	San Pedro	Testing

APPENDIX E

Statistical Procedures

APPENDIX E

COMPARISONS OF MEANS

1. The standard error of each mean was first calculated.

U.S.A.

Only the standard
error is reported
in the literature (26)

$$\sigma_M = .2$$

Belize

$$\sigma = 2.5$$

$$X_1 = 3.2$$

$$N = 2.35$$

$$\sigma_M = \frac{\sigma}{\sqrt{N}}$$

$$\sigma_M = \frac{2.5}{\sqrt{235}}$$

$$\sigma_M = .2$$

2. Next the standard error of the difference between the means was calculated.

$$\sigma_{\text{Diff}} = \sqrt{\sigma_{M_1}^2 + \sigma_{M_2}^2}$$

$$\sigma_{\text{Diff}} = \sqrt{.04 + .04}$$

$$\sigma_{\text{Diff}} = .3$$

3. The significance of the difference between the two means was the next procedure (37).

$$\underline{t} = \frac{M_1 - M_2}{\sigma_{\text{diff}}}$$

$$\underline{t} = \frac{3.2 - 2.8}{.3}$$

$$\underline{t} = 1.3$$

APPENDIX F

Statistical Data

APPENDIX F
STATISTICAL DATA
COMPARISON OF MEANS FOR U.S.A.-BELIZE

Test	Belize			U.S.A.			$\sigma_{\text{diff.}}$	$\bar{X}_1 - \bar{X}_2$	<u>t</u>	Significance
	\bar{X}_1	σ_{M_1}	N_1	\bar{X}_2	σ_{M_2}	N_2				
<u>Twelve-Year-Olds</u>										
Pull-ups	2.7	0.2	74	2.3	0.2	570	0.3	0.4	1.3	N/S
Sit-Ups	32.6	2.3	75	38.9	1.3	582	2.6	6.3	2.4	.05
Shuttle Run	11.2	0.1	62	11.6	0.1	562	0.1	0.4	4.0	.05
Standing Broad Jump	64.4	0.9	71	61.0	0.5	569	1.0	3.4	3.4	.05
50-Yard Dash	8.1	0.1	65	8.1	0.1	547	0.1	0.0	0.0	N/S
600-Yard Run-Walk	139.8	3.0	50	163.7	3.0	491	4.3	23.9	5.6	.05
Softball Throw	96.8	2.4	66	111.7	1.5	544	2.8	14.9	5.3	.05
<u>Thirteen-Year-Olds</u>										
Pull-ups	3.2	0.2	235	2.8	0.2	493	0.3	0.4	1.3	N/S
Sit-Ups	36.1	1.4	239	39.7	2.0	518	2.4	3.6	1.5	N/S
Shuttle Run	10.9	0.1	209	11.3	0.1	482	0.1	0.4	4.0	.05
Standing Broad Jump	66.3	0.6	230	64.5	0.6	537	0.9	1.8	2.0	.05
50-Yard Dash	8.0	0.0	217	7.9	0.1	503	0.1	0.1	1.0	N/S
600-Yard Run-Walk	134.4	1.6	160	156.8	4.0	447	4.3	22.4	5.2	.05
Softball Throw	103.5	1.4	217	122.9	2.5	502	2.9	19.4	6.7	.05
<u>Fourteen-Year-Olds</u>										
Pull-ups	4.3	0.2	296	3.5	0.2	628	0.3	0.8	2.7	.05
Sit-Ups	39.3	1.3	305	44.7	1.5	635	2.0	5.4	2.7	.05
Shuttle Run	10.7	0.0	273	10.8	0.1	611	0.1	0.1	1.0	N/S
Standing Broad Jump	69.5	0.6	293	70.1	0.7	615	0.9	0.6	0.7	N/S
50-Yard Dash	7.8	0.0	278	7.6	**	572	0.0	0.2	**	
600-Yard Run-Walk	126.5	1.1	227	150.0	3.1	555	3.3	23.5	7.1	.05
Softball Throw	113.7	1.4	273	139.9	2.1	568	2.5	26.2	10.5	.05

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APPENDIX F (Continued)

Test	Belize			U.S.A.			$\sigma_{diff.}$	$\bar{X}_1 \bar{X}_2$	<u>t</u>	Significance
	\bar{X}_1	σM_1	N_1	\bar{X}_2	σM_2	N_2				
<u>Fifteen-Year-Olds</u>										
Pull-ups	6.1	0.2	246	4.4	0.2	600	0.3	1.7	5.7	.05
Sit-Ups	40.6	1.5	238	46.6	2.1	601	2.6	6.0	2.3	.05
Shuttle Run	10.6	0.1	227	10.7	0.1	578	0.1	0.1	1.0	N/S
Standing Broad Jump	74.4	0.7	238	74.0	0.7	561	1.0	0.4	0.4	N/S
50-Yard Dash	7.5	0.0	215	7.2	0.1	563	0.1	0.3	3.0	.05
600-Yard Run-Walk	123.0	1.2	206	139.5	3.0	569	3.2	16.5	5.2	.05
Softball Throw	128.5	1.6	218	156.9	2.3	580	2.8	28.4	10.1	.05
<u>Sixteen-Year-Olds</u>										
Pull-ups	7.1	0.3	124	5.5	0.2	444	0.4	1.6	4.0	.05
Sit-Ups	44.5	2.2	125	50.7	2.3	447	3.2	6.2	1.9	N/S
Shuttle Run	10.3	0.1	120	10.4	0.1	431	0.1	0.1	1.0	N/S
Standing Broad Jump	79.1	0.8	119	79.0	0.8	418	1.1	0.1	0.1	N/S
50-Yard Dash	7.2	0.1	104	7.0	0.1	409	0.1	0.2	2.0	.05
600-Yard Run-Walk	114.9	1.1	110	132.2	2.6	402	2.8	17.3	6.2	.05
Softball Throw	139.1	2.1	114	165.2	3.2	407	3.8	26.1	6.9	.05
<u>Seventeen-Year-Olds</u>										
Pull-ups	6.5	0.6	39	6.3	0.3	429	0.7	0.2	0.3	N/S
Sit-Ups	40.8	3.8	36	48.3	2.6	431	4.6	7.5	1.6	N/S
Shuttle Run	10.1	0.1	37	10.4	0.2	426	0.2	0.3	1.5	N/S
Standing Broad Jump	80.7	1.8	36	82.5	0.9	393	2.0	1.8	0.9	N/S
50-Yard Dash	7.1	0.1	28	6.8	0.1	402	0.1	0.3	3.0	.05
600-Yard Run-Walk	112.9	2.4	37	132.5	3.4	402	4.2	19.6	4.6	.05
Softball Throw	143.0	4.1	36	177.0	3.0	404	5.1	34.0	6.7	.05

**
Less than .05