

HAWAII WRESTLING WEIGHT MONITORING PROGRAM

Hawaii Interscholastic Athletic Directors Association

and

Hawaii High School Athletic Association

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Prepared by

Hawaii Athletic Trainers' Association

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HAWAII WRESTLING WEIGHT MONITORING PROGRAM

I. PROGRAM INTRODUCTION

The primary purpose for this program is to insure the future and safety of scholastic wrestling programs in the State of Hawaii. It has been developed in response to the concern for guidance of young wrestlers as they make decisions about diet, nutrition, and weight control. Research shows that wrestlers often attempt to lose weight rapidly to gain a perceived advantage over their opponent. The program is designed to assist in avoiding potentially harmful rapid weight reduction practices utilized to achieve specific weight class participation. In the interest of fairness, once the testing cycle has begun, no changes in the Weight Monitoring Program rules or procedures will be permitted until the state championships are completed.

II. COMPONENTS OF WEIGHT CONTROL PROGRAM

- A. National Federation of High Schools Ruling
- B. Nutrition Education Program
- C. Wrestling Weight Control Program
- D. Program Implementation Procedures
- E. Training of Skinfold Assessors

III. NATIONAL FEDERATION WRESTLING RULING 2000-2001 NFHS WRESTLING RULES BOOK

Section 3 - Weight Control Program

Art 1: Each individual high school association shall develop and utilize a specified weight-control program which will discourage severe weight reduction and/or wide variations in weight, because this may be harmful to the competitor. Such a program should be planned to involve the wrestler, his parents, his physician and his coach in establishing the minimum certified weight. An ideal program would be one where a medical professional would assist in establishing a minimum weight through the use of checking body fat and hydration. The recommended minimum body fat should not be lower than 7 percent.

Art 2: For health and safety reasons the state's weight control program shall.

- a. Require each wrestler to establish a certified minimum weight sometime prior to January 15 and prohibit recertification at a lower weight during the season. After certification, a wrestler may not weigh-in more than one weight class above the weight of certification without recertifying at a higher weight and;
- b. Each wrestler is required to have at least one-half of his weigh-ins during the season at the minimum weight he will wrestle during the state tournament series.

Section 4 Weight Classifications

Art 3: A contestant shall not wrestle more than one weight class above that class for which his actual stripped weight, at the time of weigh-in, qualifies him.

Art 4: At anytime the use of sweat boxes; hot showers; whirlpools; rubber, vinyl and plastic type suits; or similar artificial heating devices; diuretics; or other methods for quick weight reduction purposes is prohibited and shall disqualify an individual from competition. (note: Interpretation in January, 1999 NFHS newsletter defines competition for that day only)

Art 5: A 2-pound growth allowance may be added to each weight class on or after January 15.

Rule changes for 2001-2002

Rules 4-5-1 and 4-5-3, concerning weigh-in procedures for dual meets and tournaments.

These rule changes were implemented to eliminate the detrimental practices associated with dehydration that are considered to have a negative impact on a wrestler's well-being. In both dual meets and tournaments, wrestlers will be required to remain in the weigh-in area and not participate in any dehydration activities.

Weight Recommendation for female wrestlers.

The National Federation has not established a minimum body fat for women. The American College of Sports Medicine has recommended at least 12-12% for female wrestlers. Based on research data regarding eating disorders in women and concerns about low bone density and the subsequent risk of osteoporosis, Hawaii has set the minimum standard of 12% body fat for women. (Changed to 12%, June 2005)

NUTRITION EDUCATION PROGRAM

A. TRAINING THE COACH

1. All high school wrestling coaches will be required to participate in a nutrition education program designed and scheduled by the Hawaii High School Athletic Association in their first year and every three years thereafter.
2. The Nutrition Education program will be a minimum two hour program which will address weight reduction procedures which are scientifically based.
3. Identify both safe and dangerous methods of weight loss.
4. Diet maintenance and development will be a required component of the coaches training.
5. A Coach's Education video and fact sheet will be developed and sent out at least two weeks prior to the initial assessment date as determined by the HHSAA. The Coaches

Education component will take place before the Athlete Education presentation. National deadline is January 15.

B. EDUCATING THE STUDENT/ATHLETE AND PARENT

1. Annually, wrestlers will be provided a minimum of one hour of nutrition education created by the HHSAA Minimum Weight Program and prior to completion of the testing procedure.
2. The education unit will be presented by each school's assigned certified athletic trainer. The educational presentation may be presented by other HHSAA approved providers using the HHSAA educational materials.

The Nutrition program will consist of:

- a. VIDEO - resented at the individual school's preseason team meeting.
 - i. Importance of maintaining a weight control program
 - a. Consequences of rapid weight loss.
 - b. Consequences of dehydration.
 - ii. Importance of maintaining a healthy body composition.
 - a. Body Fat - definition, physiological importance, consequences if too low
 - b. Lean Body Mass - definition
 - iii. Nutritional Guidelines to maintain or lose weight. (HHSAA weight monitoring program)
 - iv. Body Composition Testing Protocol
 - a. Specific Gravity Test - How test is performed, why, criteria to pass
 - b. Body Fat Measures - How test is performed, why, criteria to pass
 - c. Body Weight - How test is performed.
 - v. How results will determine weight classification
 - vi. Retest Process
- b. Student-Athlete Wrestling Handbook - received on testing date
 - i. Review of video
 - ii. Rule Section 4 - Article 4
 - iii. Nutritional guidelines to maintain weight
 - iv. Nutritional guidelines for reducing weight safely. (HHSAA weight monitoring program.)
 - v. Retest process
 - vi. Personal record data sheet
- c. Instructions - Question and Answer Session

C. WEIGHT LOSS PLAN

It is recommended that athletes lose 2-3 pounds per week in order to discourage rapid weight loss or a “Yo-yo diet”. Loss of more than 2-3 lbs per week will not result in permanent weight loss and may prove to be unhealthy. A proposed weight loss plan supported by the Michigan High School Athletic Association (Appendix G) using 3% loss of body weight per week can be used to assist in determining a safe weekly weight loss allowance for a 17 week period adequate time.

V. WRESTLING WEIGHT CONTROL PROGRAM

A. ESTABLISHING MINIMUM WEIGHTS

1. A specific gravity test must be administered at the time of establishment of the Minimum Wrestling Weight (MWW) to determine if each wrestler is adequately hydrated. Failure of this component of the test will result in the removal of the wrestler from the day’s weight determination process until the next test date as determined by the individual league. Adequate hydration is essential to the safe determination of the MWW.
2. Skinfold measurements will be utilized to determine each wrestler's body fat percentage. Only measurements taken by HHSAA registered Skinfold Assessors (Certified Athletic Trainer) who have successfully completed the HHSAA Standardized Skinfold Measurement Workshop will be accepted. Site Directors will have a list of approved skinfold testers. No wrestler may compete until the wrestler’s minimum wrestling weight is determined.
3. The lowest weight class a male wrestler may compete at will be determined as follows:
 - a. If the predicted weight, at 7% body fat, is exactly that of one of the weight classes, that weight shall be the wrestler's minimum weight class.
 - b. If the predicted weight falls between two weight classes he must wrestle at the higher weight class.
 - c. The wrestler will not be permitted to wrestle down more than one weight class provided the recorded minimal weight permits the wrestler to lose enough weight to wrestle down one class. The lowest weight class for a 128 lb. wrestler is the 130 lb. or 125 lb. class depending upon the optimal weight. If the optimal weight is 126 lbs., the lowest weight class is 130 lb. class. If the minimal weight is 114 lbs, the lowest weight class is 119 lbs. The determined minimal and optimal weight may not be the same.
 - d. Wrestlers will be allowed a 1 pound error variance when determining minimum weight. (ie. a wrestler at 113 pounds will be allowed to wrestle at 112; A wrestler at 113.1 will be required to wrestle at 119.)
4. The lowest weight class a female wrestler may compete at will be determined based on 12% (12%, 2005) body fat. Other guidelines will follow those indicated in section 3, a.b.c.d.

B. TIME PERIOD FOR MEASUREMENTS

1. No wrestler may compete in league competition until he has participated in the Weigh-in and his/her name and data are included on the school/league Master form.
2. Skinfold assessment may begin on the Monday following the last regular season football game and must be completed by January 15 in compliance with National Federation rules.
3. Individual leagues shall determine a maximum of three (3) test dates due to the peculiarities of each league. All tests must be completed by January 15.
4. Each wrestler may test on each league specified date.
5. Results of measurements should be distributed to the coaches on the day of the test and sent to the HHSAA Office within seven (7) days of the test date.
6. Unusual situations must be arranged with the HHSAA in writing before deadline or due dates.

C. LEAGUE RESPONSIBILITIES FOR THE MEASUREMENT PROCESS

1. It is the leagues responsibility to coordinate dates and personnel for skinfold assessment.
2. The league executive director or appointee will designate the site director.
3. The league will provide the materials to conduct the urine specific gravity test.
 - a. Refractometer
 - b. collection cups
 - c. plastic stir straws
 - d. distilled water
 - e. latex gloves
 - f. gauze
4. The league will provide the materials to conduct the skinfold assessment.
 - a. Lange or Harpenden Skinfold Calipers
5. The league must have available at the time of the measurement:
 - a. A certified scale (certified after the start of school in the fall and before October 31)
 - b. Skinfold data forms
 - c. Two league referees or designated personnel (coach, teacher, etc.) who will:
 - i. Assist with obtaining the weight of each wrestler.
 - ii. Assist with the recording of data.
6. It is the site director's responsibility to send, within one working day, the weight monitoring data forms to the participating schools and to the HHSAA office.

D. WRESTLER'S BELOW MINIMUM BODY FAT

1. Any male wrestler whose body fat percentage at the time of measurement is below 7% must obtain, in writing, a licensed physician's (MD or DO) clearance stating that the athlete is naturally at this sub-7% body fat level.

2. Any female wrestler whose body fat percentage at the time of measurement is below 12% (12%, 2005) must obtain, in writing, a licensed physician's (MD or DO) clearance stating that the athlete is naturally at this sub-12% (12%, 2005) body fat level.
3. A physician's clearance is for one season duration and expires April 1 of each year.
4. A parental permission form may not be used to affect the determination of minimal wrestling weight.

E. PHYSICIAN'S NOTE

A physician's note will not affect the determination of the minimal wrestling weight.

F. GROWTH ALLOWANCE

The Hawaii Weight Monitoring Program does not include growth allowance except as provided by National Federation Wrestling Rule 4-4-5.

G. RETEST PROCEDURES

1. Any wrestler may retest his/her initial measurement at the next league specified test date before January 15. The HHSAA will record/accept the determined weight class most advantageous to the wrestler. The steps for the retest process are:
 - a. The specific gravity assessment must be administered and passed prior to each skinfold reassessment.
 - b. The wrestler shall be reweighed.
 - c. The skinfold measurements will be remeasured.
2. The Bod Pod will not be used as a measurement for determining percent body fat. (June, 2005)

H. MATERIAL COSTS

1. Refractometer \$350
2. Skinfold Calipers
 - a. Lange Skinfold Calipers \$217.95
 - b. Harpenden Skinfold Calipers \$220.00 approx.

3. BOD POD assessment.

The BOD POD test must be arranged with an independent agency. The cost of the test will be determined by the agency.

VI. PROGRAM IMPLEMENTATION PROCEDURES

A. Body Composition Testing Goals and Procedures

1. Site Director - (Unbiased party)
 - a. Responsible for obtaining and organizing all materials needed for testing.
 - b. Obtaining, organizing and assigning all testers for the testing.
 - c. Resolve any problems which arise during the test.

2. Materials required for testing protocols (Quantity may vary depending on site requirements)
 - a. Registration forms (HHSAA Data form)
 - b. Refractometer
 - c. Plastic stir straws
 - d. Latex gloves
 - e. Distilled water
 - g. Cups - plastic 3 oz
 - h. Skinfold Calipers
 - i. Clipboards
 - j. Pens
 - h. Scales - Digital

B. Testing Protocols

1. Registration Station
 - a. List of all athletes to be tested is requested two weeks in advance.
 - b. Registration forms should be prepared prior to test date.
 - c. Athletes will be allowed to register on the day of the test.
 - d. Computer data should be prepared prior to the test date.

2. Station #1 - Specific Gravity - Estimated time to complete test - 5 Minutes (There is no time limit to complete the test if athlete is having difficulty producing specimen) - Bath Room or Locker Room
 - a. One to two ATCs
 - b. Follow OSHA Standards
 - c. Student-athlete gives data form to ATC
 - d. ATC gives the athlete a cup.
 - e. Student collects urine sample and empties bladder.
 - f. Sample is placed on the refractometer using the plastic stir straw.
 - g. ATC reads refractometer. Specific gravity must be equal to or below 1.025 g/ml.
 - h. Student must empty and discard plastic cup.
 - i. If a pass is recorded, the data form is given to student-athlete and proceeds to Station #2.
 - j. All data must be entered in black or blue ink. All mistakes must be double initialed.
 - k. If a fail is recorded, the data form is retained by the ATC and the student-athlete is sent to Station #4

3. Station #2 - Weight Station - Estimated time to complete test - 3 minutes
 - a. Two league officials, coaches, ATC - A male and female required as determined by league.
 - b. Student-athlete gives data form to ATC or coach
 - c. Nude or undergarment weight is taken and recorded on individual's data form.

- d. All data must be entered in black or blue ink. All mistakes must be double initialed.
- e. Student-athlete goes to Station #3.

4. Station #3 - Skinfold measurements -Estimated time to complete test - 10 minutes See Appendix D for exact protocol

- a. A minimum of 3 ATCs - Optimal is 12 trained ATCs.
- b. One recorder for each ATC- may be students or coaches.
- c. One ATC to mark skinfold sites on each wrestler.
- d. ATC (A) will take 3 rotating skinfold readings at 3 sites. Recorder enters data on form.
- e. ATC (B) will take 3 rotating skinfold readings at 3 sites. Recorder enters data on form.
- f. ATC (C) will take 3 rotating skinfold readings at 3 sites. Recorder enters data on form.
- g. All data must be entered in black or blue ink. All mistakes must be double initialed.
- h. Data form collected at this station and sent to Data Analysis
- i. Student-athlete moves to Station #4.

4. Station #4 -Holding Area

Student-athlete reports to the holding area when testing is completed to await departure.

5. Data Analysis - Computer Room

- a. Minimum of One computer and printer - 1 computer literate person in charge.
- b. Data forms collected from Station #3.
- c. Preliminary information is prerecorded in the computer.
- d. Data inputed into computer.
- e. Results saved and reports (team and individual) printed out the same day if possible.
- f. Hardcopies given to HHSAA, League, Coach and School's ATC.
- g. Printout of results for entire team is given to HHSAA, League, Coach and School's ATC, including failed results.
- h. Print outs of all results will be distributed to all schools.

6. If the student-athlete fails the specific gravity test, instructions for retest will be included with report and the student-athlete will be instructed to review the handbook. Specific date for retest must be established by each league.

7. If the student-athlete or coach wishes to appeal the results, they must follow the procedures as noted in the handbook.

VII. TRAINING THE SKINFOLD ASSESSOR

A. Training the Assessor

1. Persons eligible to be trained as HHSAA approved assessors include Physicians (MD or DO), certified athletic trainer, registered nurses, licensed practical nurses, physical therapist, physician's assistant, nutritionist, health educator or an exercise physiologist.

2. To be eligible to become an HHSAA approved skinfold assessor, an individual must have demonstrated training and experience in skinfold measurement.
3. The assessor will participate in an initial training session and annual update education. The assessor will provide his/her own measuring device which meets the standard required by the HHSAA wrestling minimum weight program.
4. The assessor training will consist of both classroom education and practical training.
5. Training sessions will be conducted in conjunction with the Hawaii Athletic Trainer's Association and the University of Hawaii Department of Kinesiology under guidelines provided by HHSAA.

B. Recertification

1. Recertification will require a minimum of one hour training.
2. Recertification training will be conducted in several locations throughout the state annually.
3. Trainers and assessor trainers will conduct all recertification training programs.

C. Data Collection

1. The HHSAA will provide the forms for each school.
2. The assessor will conduct all body fat measurements.
3. The league will provide the supplies to conduct the specific gravity test.
4. The site director will be responsible for submitting the measurement results to the HHSAA within one working day after the testing date.

APPENDIX A

A. HYDRATION REQUIREMENT

Specific gravity assessment of the urine will determine whether a candidate may participate in the skinfold measurement process on any date. If the wrestler has a specific gravity above the predetermined level, they may NOT be assessed for body composition. A specific gravity level greater than 1.025 g/ml will result in failure.

Monitoring this process is a part of the Assessor's responsibility. Make certain that each wrestler is tested individually to prevent urine exchange (this is an area where the right to privacy must be respected). The wrestler must fill the cup with urine. A drop of urine will be placed on the refractometer to determine the specific gravity for the specimen. If the wrestler passes the specific gravity test he may continue for the body composition assessment. If the wrestler fails the specific gravity test he cannot be assessed for 48 hours and must meet the hydration requirement before the skinfold assessment takes place.

B. BODY COMPOSITION

The human body can be represented as composed of at least two components.

1. Lean Body Mass (LBM)= the muscle and bone mass predicted to be in the body.
2. Body Fat (BF)= essential and non-essential fat storage that is predicted to be in the body. To some, this is an over simplification. The actual composition of an individual's body is probably not truly known, nor can it actually be determined. All current methods of assessing body composition are indirect methods or predictions of the actual values. While underwater (hydrostatic) weighing has long been considered the "GOLD STANDARD" (the method to which all other methods of body composition determination have been related) it too has been critically reviewed as having the possibility for error. Population specificity, maturation, and sub-component validity have all been cited as having potential negative impact on hydrostatic body composition assessment. Current technology and its improvement will continue to lead researchers to develop new methods and refine those which currently exist. This will require that those of us assessing body composition through various field techniques must continue to update our knowledge and remain current relative to adjustments in assessment procedures.

C. PREDICTION OF BODY COMPOSITION

There are a number of field techniques available to attempt to assess body composition. Following is a brief description of some common techniques.

1. Bioelectric Impedance analysis (BIA). A fairly modern technique, still in the developmental stage. It utilizes electrode attachment to the extremities and a small (safe) electrical current to determine the conductivity of lean tissue versus fat tissue. It is programmed to calculate lean body mass and percent body fat. The instrument costs about \$3000 to \$6000, is subject to hydration level of each subject.

2. Skeletal Anthropometric Widths(SAW). This method was developed by Tipton et.al. specifically for the wrestling population in Iowa. It utilizes diameter assessment with two types of anthropometric calipers on the chest, hip, and ankle joint areas along with height and weight. A prediction equation includes these various measurements to calculate minimal wrestling weight.
3. Near Infra-Red technology (NIR): This is a method that was developed to determine the legal fat content of packaged meats for human consumption. It utilizes the theory of the passage of light waves through lean muscle tissue versus fat tissue. The cost of the units ranges from \$1000 to \$2000 and purport rapid and non-invasive assessment. Ultrasound technology has also been used in a similar manner to determine fat deposition.
4. Computed Tomography (CT): This is an example of new technology being adapted to the study of body composition. It was developed for the detection of normal versus pathological internal body components. Although few CT scan units are used strictly for determination of body composition, it may be the most valid potential assessment device currently available. As such it may define a new "GOLD STANDARD" for body composition assessment.
5. Hydrostatic Weighing (HSW). This is an ancient method (Archimedes' principle) adapted to the body composition assessment problem in recent times. It involves the submersion of an individual to determine the subject's under water weight which is used along with the weight on land to calculate the body density. It utilizes the concept that muscle mass and fat mass have specific know densities relative to water. The assessment of residual volume of the lungs is an important feature of this assessment. The availability of a proper space and equipment is a problem with this method, but it can be very accurate if all the conditions of assessment are met. Currently this method is not available in Hawaii at this time.
6. Skinfold Assessment (SFA): This is a current method which has gained popularity with the exercise and fitness community. It is based on the relationship between subcutaneous fat and total body fat and its inverse relationship to body density number of sites to determine the thickness of the skin. Skinfold thicknesses are used in a regression equation equations have been derived for specific populations. The cost of accurate calipers range from \$175 to \$ 250.
7. BOD POD: - an air-displacement plethysmograph for measuring human body composition, utilizes the inverse relationship between pressure and volume (Boyle's law) to measure body volumne directly. The BOD POD utilizes computerized sensors to determine the amount of air displaced by the person's body within a confined area (the BOD POD). The whole-body measurement principle is the same as underwater weighing and the overall body density can be used to determine the percentage of fat and lean tissue. Developed in conjunction with the US National Institutes of Health, the test can be completed in less than 5 minutes. A BOD POD is located at the Family Practice Center on Ward Ave in Honolulu and at the Waimea Hospital on the Big Island. Individuals must make arrangemente with the private vendors for testing.

D. METHOD COMPARISON

The Program calls for the assessment of all the wrestlers in the State of Hawaii within a two week period prior to the beginning of the season. Given the methods reviewed above to accomplish this task the appropriate choice is skinfold assessment. There has been more work done to establish population specific methods, procedures, and calculations with the skinfold method than with any other method. The cost of the methods is a factor to consider in the selection of a program. Standardization of procedures is a major factor in the control of validity and reliability. This can be best accomplished to insure accurate reproducible and fair results in an economically controlled environment through the skinfold assessment procedures.

As hydrostatic weighing is currently unavailable in Hawaii, the BOD POD is a reliable and valid alternative to hydrostatic weighing which is recommended to be used for the appeal process. (The BOD POD is no longer an accepted measurement device as there is limited access. June, 2005)

APPENDIX B

SKINFOLD ASSESSMENT TERMINOLOGY

The use of skinfold assessment in the process of determination of body composition requires some standardization of terminology used in this field. The following is an attempt to accomplish this standardization:

1. Total Body Weight (TBW)=weight of the body on a certified, calibrated scale.
2. Body Density(BD)=the mass of the body per unit of volume. (The fat free component is assumed to have a density of 1.100 gm/cm³. The mass of fat is considered to be about .90 gm/cm³.)
3. Percent Body Fat(%BF)=the proportion of total body weight that is fat weight and expressed as a percentage. $\%BF = (TBW-LBM) / (TBW) \times 100$
4. Lean Body Mass(LBM)=the weight of the lean tissue of the body such as muscle, bone, and blood. The weight of the body without the fat weight. $LBM = TBW-FW$
5. Fat Weigh(FW)=the weight of the fat tissue of the body. Includes both essential and stored fat tissue. $FW = TBW \times \%BF$
6. Minimum Wrestling Weight (MWW)=the lowest weight at which a wrestler may compete, determined to be 7 % body fat for males and 12% (12% 2005) for females in the Hawaii Wrestling Monitoring Program
7. Ideal Body Weight=a body weight selected for a specific individual or group based on both empirical and scientific evidence that provides an optimum level of performance.
8. Minimum Weight = a body weight selected for a specific individual or group based on a specific percent body fat. A minimal, but not necessarily ideal or optimum, body weight.
9. Regression equations=equations which express the relationship (based on correlation) between the criterion measure (GOLD STANDARD) and the prediction measure. In skinfold assessment these are determined for specific combinations of sites, and specific populations.
10. Population Specificity=the attempt to make prediction calculation (equations) on representative subjects from specific groups of individuals, the results of which are intended to be applied to a similar, larger population. In skinfold assessment for body composition the important specific factors are sex, age, national origin, maturation and hydration.
11. Biological Variability =variation which will contribute to error due to such factors as hydration and deposition sites.

12. Technical Variability = variability which will contribute to error due to such factors as lack of standardization of procedures among assessors.

13. Reliability = reproducibility, the consistency and dependability of a measure, $>.9$ with experienced assessors. Increases with fewer sites and monitored practice.

14. Validity = degree to which an assessor obtains an accurate measure. How well the group being assessed matches the group from which the regression equation was obtained. Dependent upon: age, activity level, population specific, body composition status.

APPENDIX C

SKIN FOLD SITE SELECTION AND IDENTIFICATION

The sites and regression equation selected for the Program are those described by Lohman specifically for use with young wrestlers. The techniques for site identification are adopted from "Anthropometric Standardization Reference Manual", Lohman, Roche, and Martorell, Human Kinetics Books, Box 5076, Champaign, IL 61820, (800-DIAL-HKP).

1. subject should be in standing anatomical position with the skin for potential skinfold sites exposed.
2. all measurements are taken on the right side of the body
3. identify the sites for Males = TRICEPS, SUB SCAPULAR, ABDOMEN
4. identify the sites for Females = TRICEPS, ABDOMEN, SUPRAILIAC, THIGH

ABDOMINAL=measured vertically, the site is located 3 centimeters lateral to the midpoint of the umbilicus and 1 cm inferior to the umbilicus. The subject must stand erect with weight on both feet, relax the abdominal wall musculature and breathe normally during the assessment procedure.

SUBSCAPULAR=measured on a diagonal axis, (left shoulder to right hip) one centimeter below the inferior angle of the scapula. The site is angled infero-laterally about 45 degrees in the natural cleavage line of the skin. It may be necessary to have the subject place their arm behind the back to make the anatomical features more prominent. The arm is returned to the relaxed anatomical position for the measurement procedure.

SUPRAILIAC=a diagonal fold above the crest of the ilium at the spot where an imaginary line would come down from the mid-axillary line. The person being measured should stand erect with feet together. The arms should hang by the sides, but can be moved slightly to improve access to the site. A diagonal fold should be grasped just to the rear of the midaxillary line, following the natural cleavage lines of the skin. The skinfold caliper jaws should be applied about one-half inch from the fingers.

THIGH=a vertical fold on the front of the thigh, midway between the hip (inguinal crease) and the nearest border of the patella or knee cap. The person being tested should first flex his hip to make it easier to locate the inguinal crease. Be sure to pick a spot on the hip crease that is exactly above the midpoint of the front of the thigh. The closest border of the knee cap should be located while the knee is extended. When measuring the thigh skinfold, the body weight should be shifted to the other foot, while the leg on the side of the measurement is relaxed with the knee slightly flexed and the foot flat on the floor.

TRICEPS=measured vertically in the midline of the posterior aspect of the upper arm, over the triceps muscle, midway between the lateral acromion process of the scapula and the inferior

margin of the olecranon process of the ulna. Elbow is flexed to identify the landmarks but extended and relaxed to elevate the skinfold.

STANDARDIZED ASSESSMENT PROCEDURE

In an attempt to insure valid and reliable assessment of skinfold widths the following general measurement techniques should be employed. These techniques are general in that they are applied to all skinfold site assessments. The subjects skin should be dry. Measurements should not be taken immediately after a workout or when the subject is overheated. This may be an ever present problem because some of the wrestlers may be attempting to take part in rapid weight reduction through exercise just prior to the assessment-this should not be allowed. In addition the process requires that each wrestler pass a urine specific gravity test to determine adequate hydration level for the skinfold assessment procedure.

There is no substitute for practice and experience as an assessor. Quality in-service participation, in-depth knowledge about the all aspects of the body composition assessment, careful site identification, and practice will assist in the accuracy and value of this Program.

1. palpate the site to familiarize both you and the subject with the area to be measured
2. elevate the double fold of skin and the subcutaneous fat with the thumb and index finger of the left hand 1 cm above or adjacent to the measurement site
3. become familiar with the width of the thumb and index finger as well as the perpendicular approach to site assessment prior to the elevation of each specific skinfold site.
4. the fold should be lifted in such a manner as to have two parallel sides.
5. the long axis should be parallel to the natural cleavage lines of the skin.
6. measure with caliper in right hand with scale in a position to avoid error due to parallax.
7. measure midway between the body surface and the bulbous crest of the skinfold.
8. caliper jaws are placed to measure the thickness of the skinfold perpendicular to its long axis.
9. caliper pad measurement surface should be in contact with the skinfold for 2 to 4 seconds.
10. record to the nearest .5 mm and obtain (through rotation of sites) three measures with no more than a .5 mm difference.

APPENDIX D

BODY COMPOSITION FORMULAS

MALES

LOHMAN EQUATION-CALCULATION OF BODY DENSITY

$$BD = [1.0973 - (\sum SF \times .000815)] + [(\sum SF)^2 \times .00000084]$$

sum of SF = Triceps SF + Subscapular SF + Abdominal SF

BROZEK EQUATION-CALCULATION OF % BODY FAT FROM BODY DENSITY

$$\% BF = (4.57/BD) - (4.142)$$

CALCULATION OF MINIMUM WEIGHT AT 7% BODY FAT

$$MWW = ([1 - \% BF] \times TBW) / .93$$

FEMALES

JACKSON-POLLOCK EQUATION FOR CALCULATION OF BODY DENSITY

$$D = 1.0961 - 0.000695 (\sum 4 SF) + 0.0000011 (\sum 4 SK)^2 - 0.0000714 (\text{age, years})$$

sum of SF = Triceps, Abdomen, Suprailiac, Thigh

BROZEK EQUATION-CALCULATION OF % BODY FAT FROM BODY DENSITY

$$\% BF = (4.57/BD) - (4.142)$$

CALCULATION OF MINIMUM WEIGHT AT 12% (12% 2005) BODY FAT

$$MWW = ([1 - \% BF] \times TBW) / .86 (.88, 2005)$$

APPENDIX E

HAWAII HIGH SCHOOL ATHLETIC ASSOCIATION WRESTLING BODY COMPOSITION TESTING PROGRAM TESTING PROTOCOL SHEET, 1998-99

It is important that wrestlers having their body composition tested follow the guidelines listed below. Certain factors can adversely affect the accuracy of body composition testing on any given day. In order to control as many of those factors as possible each wrestler to be tested should be provided with the following information.

1. Do not eat 4-5 hours before the test.
2. Avoid strenuous exercise for 10-12 hours before the test. Exercising immediately prior to the test will yield completely inaccurate results.
3. Avoid caffeinated beverages for 10-12 hours before the test.
4. Avoid any beverages or medications that may contain alcohol for 24 hours before the test.
5. Avoid the use of any diuretic drugs (fluid pills).
6. Consume water, juices, and non-caffeinated beverages as normal the 24 hours prior to the test.
7. DO NOT COME TO THE TEST DEHYDRATED.
8. Wear a t-shirt and shorts to the test.

ACCURATE RESULTS CANNOT BE OBTAINED IF THE TESTING IS PERFORMED IMMEDIATELY FOLLOWING A WORKOUT.

WEIGHTS MUST BE ACCURATELY OBTAINED IMMEDIATELY PRIOR TO THE TESTS BEING PERFORMED

APPENDIX F

Equipment requirements for Wrestling body fat testing (Estimated)

The equipment requirements for body fat testing must be determined on the estimated number of athletes participating in wrestling in each league. The following is an estimate only and is probably on the conservative side. Exact data from each league secretary will provide a more complete picture, but for preliminary planning purposes, we can use the following numbers

Estimated distribution of athletes

Big Island Interscholastic Federation (BIF) 200
Maui Interscholastic League (MIL) 200
Oahu Interscholastic Association (OIA) 700
Interscholastic League of Honolulu (ILH) 250

The HHSAA will need to provide the appropriate forms for collection of data. This will not only mean development of the forms, but printing and distribution to all sites.

A majority of the equipment required to conduct the testing can be provided by the league or schools at minimal or no cost. The Site Manager will be responsible for arranging with the host school for a majority of the equipment needed to conduct the test, but will need cooperation from other schools in order to have all of the required equipment. Quantity will depend on the number of athletes scheduled for the testing protocol.

Scales (Digital preferred)
Clip Boards
Pens
Paper Towels
Paper cups
Tables
Chairs

Computers - Lap top preferred
Printer

Equipment to be Purchased for testing (Estimate)

	Cost @	
Skin Fold Calipers	\$ 217.95	
Refractometer	\$ 350.00	
Production of Nutrition Video 5 copies	\$ 1000	
Form Production & Duplication	\$ 400	

APPENDIX G

WEIGHT LOSS ALLOWANCE

It is recommended that athletes lose 2-3 pounds per week in order to discourage rapid weight loss or a “Yo-yo diet”. Loss of more than 2-3 lbs per week will not result in permanent weight loss and may prove to be unhealthy. A proposed weight loss plan supported by the Michigan High School Athletic Association using 3% loss of body weight per week can be used to assist in determining a safe weekly weight loss allowance for a 17 week period adequate time.

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