



Low Energy Availability Association with Food Insecurity Within High School Athletes in Underserved Communities in Los Angeles

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Abstract

Proper nutrition for sports and physical activity has been a focal point of athlete health. The term Female Athlete Triad helped describe physically active women who presented with disordered eating, amenorrhea, and osteoporosis. However, the term Relative Energy Deficiency in Sport (RED-S) is now used to capture wider health consequences secondary to low energy availability (LEA). Low Energy Availability in Females Questionnaire (LEAF-Q) has been used to assess LEA. Although the prevalence of disordered eating behavior can tend to be high among those who are screened using the questionnaire, inadequate food availability, including food insecurity (FI) may also contribute to low energy availability. In 2015, 30% of households living in Los Angeles County, reported to be food insecure.

The purpose of this observational study is to evaluate a possible association between food insecurity and low energy availability among high school female athletes within underserved Los Angeles communities. Our hypothesis is that there will be a statistically significant association between food insecurity and low energy availability, controlling for confounding variables. To our knowledge, there are no other studies that look directly into food insecurity as a contributing factor to low energy availability within high school athletes.

Eligibility Criteria

Inclusion

- Female participants ages 13-19;
- Currently participating in a high school sport;
- Read and speak in English;

Exclusion

- Inability to speak, read, or understand English;
- Females who are currently pregnant;
- Males;
- Not participating in a sport

Background

- The term Female Athlete Triad, was introduced in the early 1990's to describe a phenomenon occurring in physically active women who presented with disordered eating, amenorrhea and osteoporosis.[1] With the collection of more information and data, the Triad model was then revised to reflect a continuum along the interrelationship between energy balance, bone health, and hormonal health. Athletes could present on any point from normal to pathologic within these core domains.[2] This revision again heavily emphasized that the pathologic trigger stemmed from poor energy availability.[3]
- Initially, poor energy availability tended to be focused primarily on these physiological systems. However, emerging research began to show a much wider range of health consequences secondary to low energy availability. To reflect these broad effects, a new syndrome known as Relative Energy Deficiency in Sport (RED-S) had been defined by the International Olympic Committee.[4] It is now thought that low energy availability may pose serious consequences to various organ systems beyond those that were originally described within the Triad model.[1, 2, 5]
- The LEAF-Q was designed to focus on self-reported physiological symptoms linked to persistent energy deficiency, with or without disordered eating behavior/eating disorder (DE/ED).[9] Although the prevalence of DE/ED can tend to be high among those who are screened using the questionnaire, inadequate food availability, including food insecurity may also contribute risk low energy availability.[9, 10] According to the USDA, a household can be considered food insecure if it experiences either of the following: 1. A reduction in the quality, variety, or desirability of diet with little to no indication of reduced food intake or 2. Disrupted eating patterns and reduced food intake.[11, 12] The diets of food insecure families and individuals tend to be less expensive and of low nutritional value therefore subjecting them to poorer health outcomes.[13]
- Among those households living in Los Angeles County, in 2015 30% reported to be food insecure.[13] Data suggests that single parent Black or Hispanic households with young children and incomes below the federal poverty line are at increased risk for food insecurity.[14] Children within these households are at risk for developing long term poor health and developmental outcomes .[14] Traditionally, an 18-item US Household Food Security Scale (HFSS) was used by clinicians to help identify at risk children. However, its complex scoring system and time-consuming administration pushed for a more efficient method of screening.[15] In 2010, Drs. Erin Hager and Anna Quigg and the Children's HealthWatch team developed a validated 2-question food insecurity screening tool based on the HFSS known as the Hunger Vital Sign™, making the assessment more practical in the clinical setting.[15]

Methods

- The study will be conducted as a cross-sectional survey study with approximately enrolling 200-300 female athletes.
- Recruitment site: West Coast Sport Medicine Clinic
 - Non-profit organization
 - Provides high school athletes an opportunity to participate in interscholastic sports and have access to sports medicine care



- Study survey: 33-items via REDCap

Study Measures

- **Primary Outcome = LEA measured by LEAF-Q**
 - Sensitivity 78%, specificity 90%
 - Injury reporting: 2-item, Likert-type scale
 - Gastrointestinal function: 4-item, Likert-type scale
 - Menstrual function: 12-item, dichotomous and Likert-type scales
- Total score ≥ 8 is considered as an increased risk for LEA.
- **Predictor variable = Food insecurity, measured by Hunger Vital Sign**
 - Sensitivity 96.7% and specificity 86.2%
 - Food insecurity positive with 'often true' or 'sometimes true' answers to one or both questions

Within the past 12 months, we worried whether our food would run out before we got money to buy more.

- Often true
- Sometimes true
- Never true

Within the past 12 months, the food we bought just didn't last and we didn't have money to get more.

- Often true
- Sometimes true
- Never true

Confounding variables

- Self-reported subjective physical and mental health status
- Sleep hygiene
- Ethnicity
- Current sport participation type
- Training frequency and volume

Current Status and Beyond

- Clearance from full board IRB review obtained 1/29/2021
- Implement survey for data collection
- Data analysis
 - Linear and adjusted logistic regression models and report F, regression coefficient (B), R², adjusted Beta (B) for multivariable analysis.
 - 95% Confidence Intervals (CI), and p values equal or less than 0.05 as the level of significance.
 - Reporting

Conclusions

- No other studies look directly into food insecurity as a contributing factor to LEA within high school athletes
- Study data could help guide LEA screening among adolescent female athletes suffering from food insecurity

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