

Does increased frequency of meal skipping lead to poorer bone health in college women attending a northeast university?

Nicole Yeomans, BS and Jesse Stabile Morrell, Ph.D.
Department of Agriculture, Nutrition, and Food Systems



Introduction:

Osteoporosis occurs when the body cannot make sufficient bone or loses too much bone mass, increasing fracture risk. **Approximately 10 million Americans have osteoporosis and another 44 million have low bone density, or osteopenia**, making osteoporosis the most common bone disease in the United States.¹

Peak bone mass (PBM), defined as the amount of bone tissue accumulated at the time of skeletal maturation,² is the most impactful factor related to proper bone health and is made in the first two decades of life in females, making this time the most critical for optimal bone health and reduced osteoporotic risk.

The young-adult female population experiences the highest rates of meal skipping compared to any other age group,³⁻⁴ with an estimated prevalence from a variety of studies ranging from 24-87%. Meal-skipping, accompanied by lower intakes of total energy and inadequate vitamin and mineral consumption as been shown to impact bone health.⁵ Yet, there is a lack of research that investigates the frequency of skipping any meal throughout the day in relation to bone health in the young adult population.

Inadequate vitamin and mineral consumption related to meal-skipping can **decrease levels of calcium and vitamin D concentrations**, minerals essential to proper bone growth/health, thus depleting bone mineral density (BMD) and **increasing one's risk for developing osteoporosis later in life.**^{5,6}

Objective: To determine if increasing frequency of meal skipping is associated with poorer bone health in college women (18-24y) attending a northeast university.

Methods:

Data were collected between 2005-2021 from the College Health and Nutrition Assessment Survey (CHANAS), an ongoing cross-sectional study done at the University of New Hampshire (UNH IRB #5524).

Subjects: Female students (n=7383) 18-24 enrolled in the introductory nutrition course were recruited and provided informed consent.

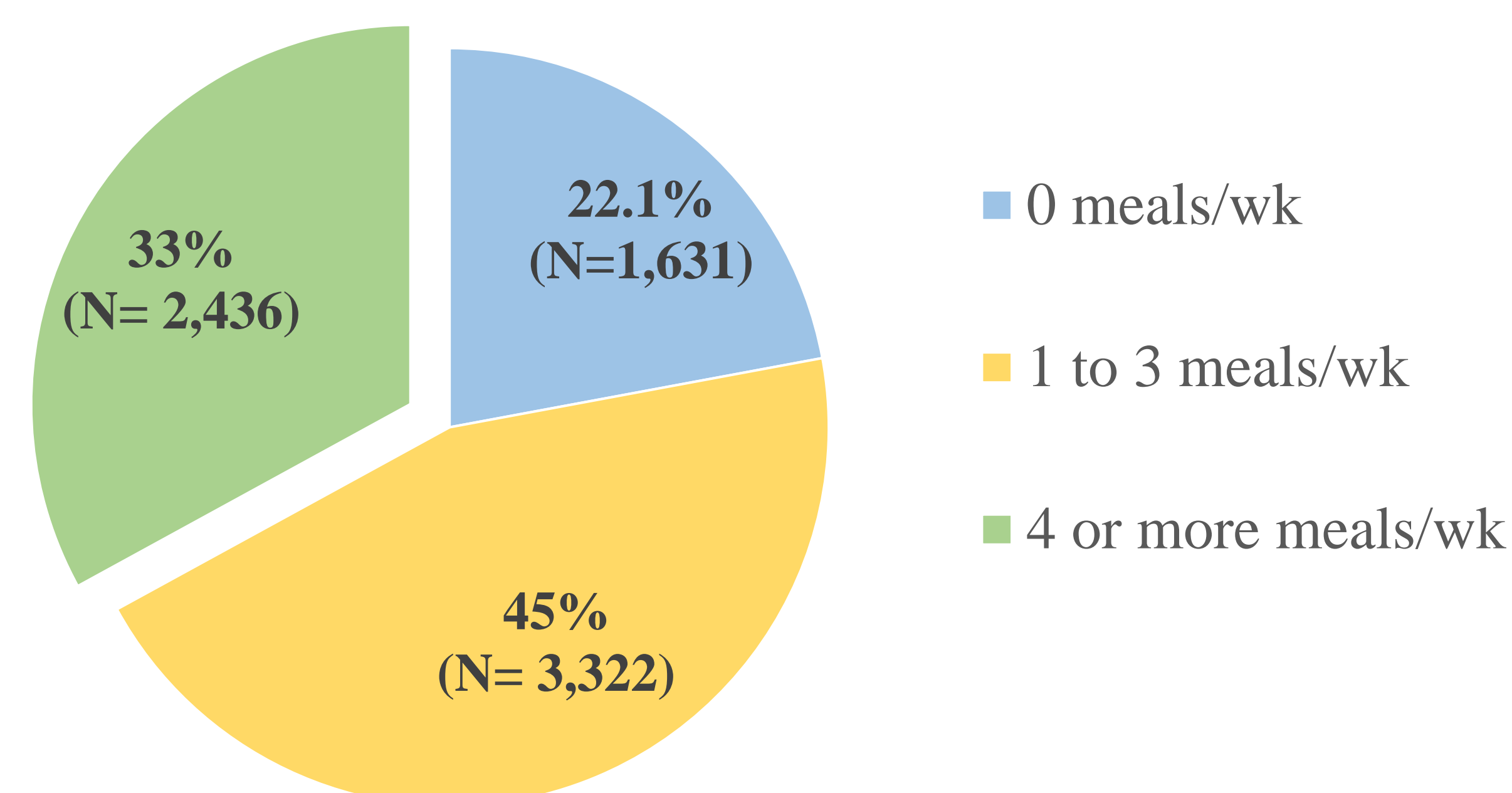
Data Collection:

- Participants **broadband ultrasound attenuation (BUA) Z-scores** from bilateral calcaneus bone were used to assess osteoporosis risk.
- Osteoporosis risk was categorized into 3 groups: low risk (≥ -1); medium risk or low bone density (between -1 and -2.5); and high risk (≤ -2.5).
- Meal-skipping habits (# meals skipped/wk) was self-reported via online survey.
- Meal-skipping was categorized into 3 groups: none, 1-3, and ≥ 4 or more meals skipped per week.

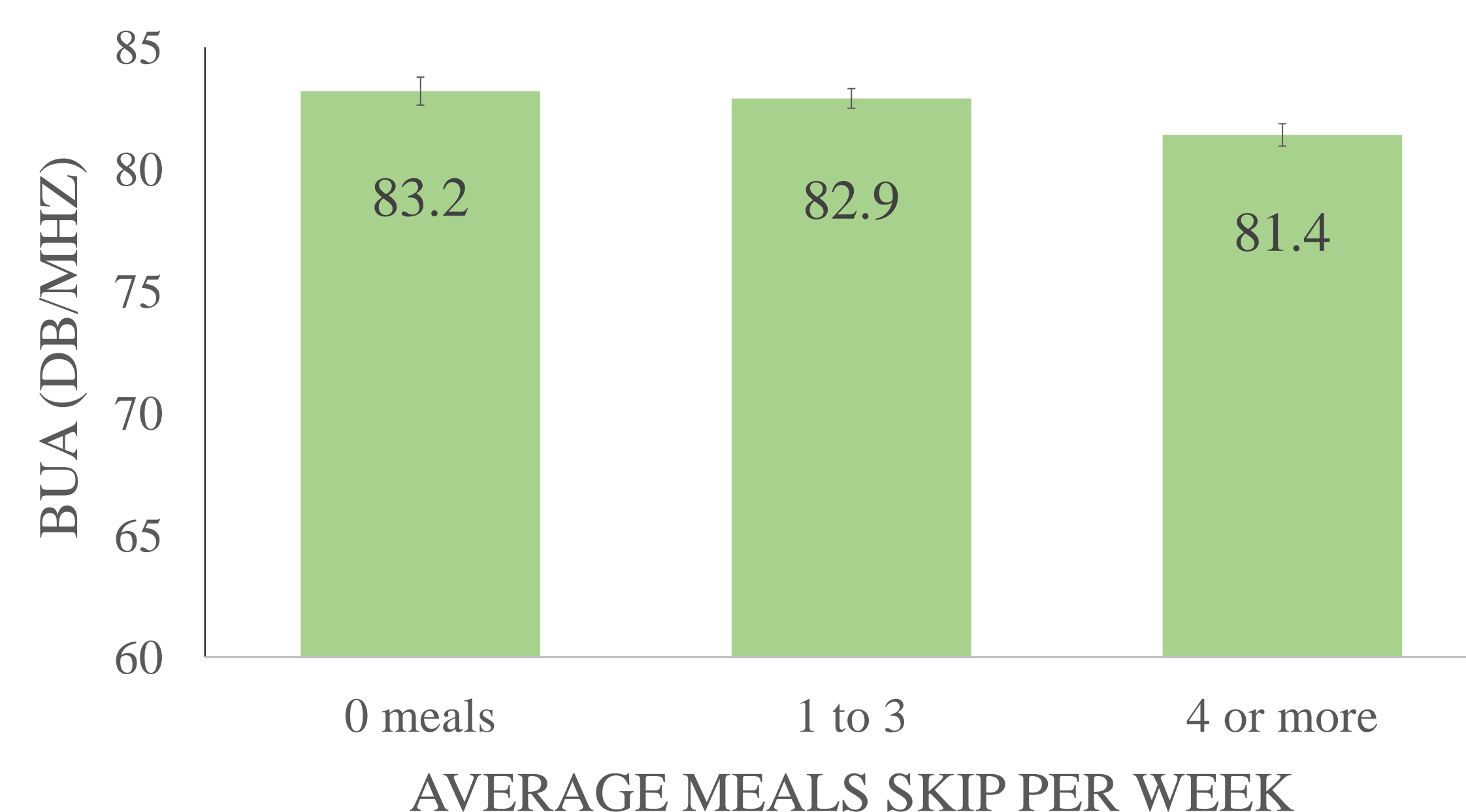
Statistical Analysis: After excluding participants with missing data, differences between meal-skipping groups were analyzed via ANCOVA, using age, BMI, alcohol intake, smoking status, and daily step count as covariates. Significance was set at $p < 0.05$.

Study Population Demographics	
	Females (n=7383) Mean \pm SD or n(%)
Age (y)	18.8 \pm 1.04
Daily step count (steps/day)	12,626 \pm 6257
BMI (kg/m²):	
- Underweight (<18.5)	286 (4%)
- Normal Weight (18.5-24.9)	5208 (73.3%)
- Overweight (25-29.9)	1285 (18.1%)
- Obese (≥ 30)	329 (4.6%)
Alcohol intake (past 30 days):	
- Yes	4053 (74.8%)
- No	1223 (22.6%)
Smoking status:	
- No	5113 (94.5%)
- Yes	296 (5.5%)

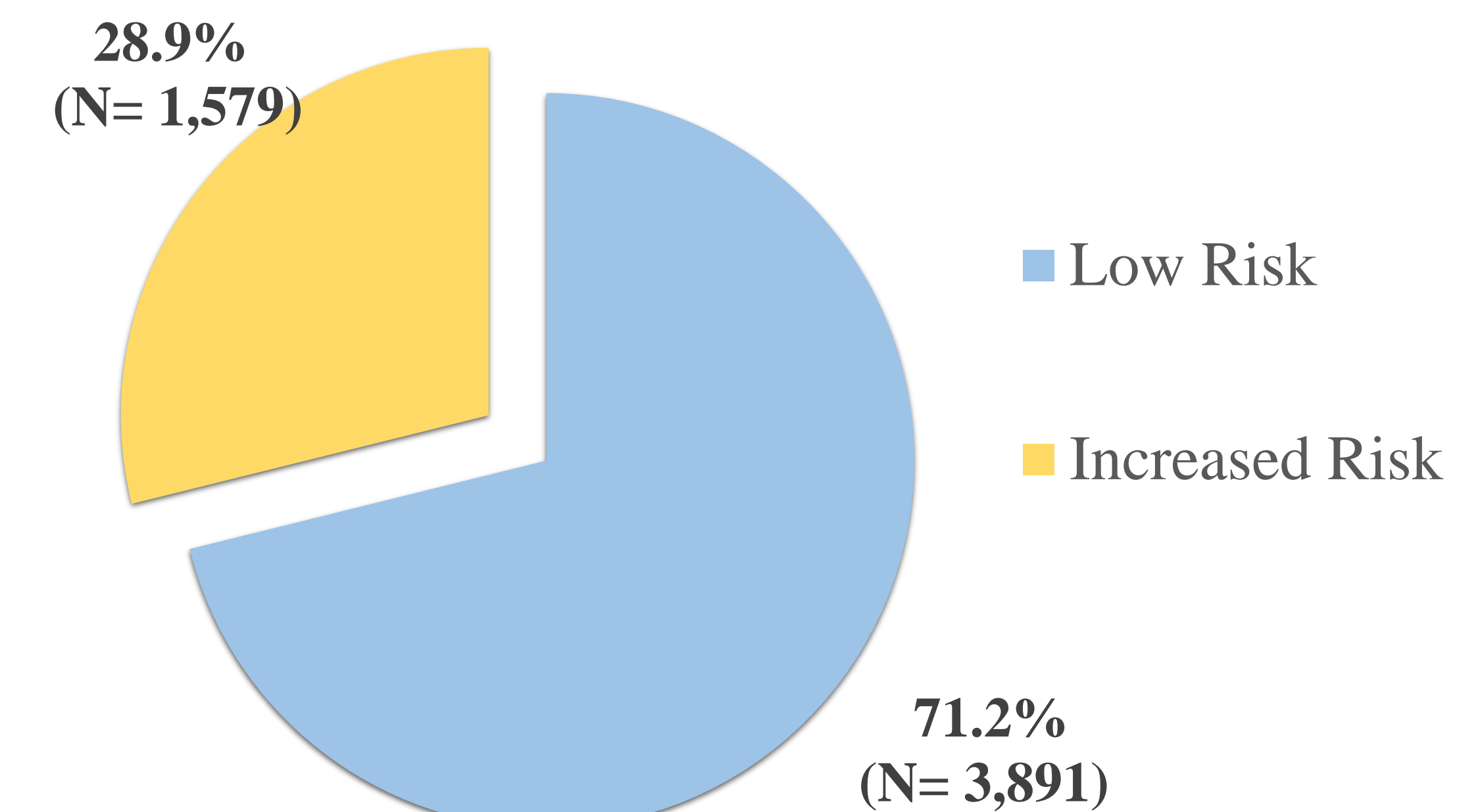
Prevalence of Meal Skipping



Meal Skipping and Bone Attenuation



Prevalence of Osteoporosis Risk



Key Findings:

- Most college females (**78%**) report meal skipping.
- Almost one-third (**29%**) of college females are **at risk for osteoporosis**.
- Female students who skipped ≥ 4 meals per week had the lowest **bone health** compared to those who skipped 0 or 1-3 meals per week.

Conclusions:

Females who frequently skip more meals per week have lower mean BUA scores compared to females who skip less meals. Future research should investigate the various lifestyle and dietary factors that impact bone health independent of meal-skipping behaviors. Given the high prevalence of meal-skipping patterns, college health administrators and dietitians should aim to tailor nutrition education to the female college population.

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References:

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