MUAC Z-Score Research and Related References

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MUAC Z-SCORE TAPE EVIDENCE TO DATE

Children's Mercy Hospital (Kansas City, Missouri, U.S.), with funding from private philanthropic donors and the New England Pediatric Device Consortium, developed a modified insertion tape (depicting z-score ranges) and an electronic z-score tape (calculating precise z-score values) for use in practice. Human-factors testing was performed for the insertion tape with 70 U.S.-based dietitians, and the device was iteratively refined (and retested) until the design and materials were favorably suited to use in a variety of clinical settings.[1]

Lambda, mu, sigma (LMS) values to inform the calculation of MUAC z-scores were estimated for every month of life, from 2 to 222 months, using Centers for Disease Control and Prevention (CDC)/National Health and Nutrition Examination Survey (NHANES) growth reference data (n = 28,995 children). These LMS values were validated using data from two independently conducted studies (n = 1,438 children combined).[2]

With support for larger-scale production of the MUAC z-score tape provided by Hallmark Cards, Inc., the device was rolled out institutionwide at a U.S. hospital in the Midwest. Over 10,000 patients being seen for care in both inpatient and outpatient settings were evaluated to compare the performance of MUAC z-values, age- and sex-standardized body mass index (BMI), and weight-for-height/length z-score (WLZ) values against dietitian-determined nutritional classifications.[3,4,5]

After testing MUAC z-score tape use (refer to Figure 2) with healthcare providers, testing began in the community setting by those without formal healthcare training. These activities included one study each in community health workers of Guatemala (n = 224 volunteers, n = 1,384 children 5 to 18 years)[6] and family members of India[7] (n = 125 parent-child dyads) caring for children at risk for moderate and severe acute malnutrition.

Both studies in Guatemala and India were conducted with a nongovernmental organization partner, Children International, which implemented the MUAC z-score tape organizationwide across 10 sites in eight countries. The MUAC z-score tape was evaluated for its impact and delivery with three different levels of support, in conjunction with deployment: home visits, telephone calls or SMS messaging (n = 1,882 children). Children International continues to use the MUAC z-score tape as part of its programming.[8]

Children's Mercy Hospital owns the rights to the MUAC z-score tape (U.S. Patent No. 10,238,317). It is currently licensed to Abbott, which manufactures and distributes the MUAC z-score tape at cost or through donation. In 2021, the MUAC z-score tape was recognized as a *Fast Company* World Changing Ideas finalist.

[1] Mallory K, Miller MA, Brahmachari R, Mitra N, Abdel-Rahman SM. Leveraging Lean Research Principles to Engage Caregivers to Improve Child Undernutrition: a Case Example in Kolkata, India. December 2020. doi:10.21203/rs.3.rs-130785/v1

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