RESEARCH & CREATIVE ACHIEVEMENT

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Comparison between OSHA-NIOSH Heat Safety Tool App and WBGT Monitor as Risk Assessment Methods for Heat Stress in Agriculture in Eastern North Carolina

Introduction

- · Heat is the leading cause of weather-related deaths with agriculture, ranking number 1 from 2000-2010 in average annual heat-related fatality rate
- · North Carolina (NC) ranked number 6 in the top 10 US states with the highest occupational heat-related deaths occurring in July.
- The Centers for Disease Control and Prevention (CDC) estimates that farmworkers' risk for heat-related death is nearly 20 times greater than other outdoor workers
- · Despite such risk, many agricultural workers do not fully understand how to prevent or treat heat-related illness (HRI)
- · It is important for workers to know the extent of their heat exposure and its associated health risk so they can take appropriate necessary preventive measures.



OSHA and NIOSH developed the OSHA-NIOSH Heat Safety Tool app for mobile devices that enables worker and supervisors to monitor HI at worksites.

· The main purpose of this study was to determine the reliability of the app in providing accurate heat stress risk information for agricultural workers in eastern NC.

Results Continued



Two agricultural sites, in Tarboro and Avden, in the rural parts of eastern NC within or near Pitt County were selected and recruited as monitoring sites



stress at these agricultural sites was assessed by deploying two heat stress monitors, one at each monitoring site on the same days.

Occupational exposure to heat

Monitoring was conducted for 44 days within the period of April 16 to August 9, 2019 to cover most of the summer The OSHA-NIOSH Heat Safety Tool app (version 3.1) was used to collect data on current hourly ambient temperature (°C), relative humidity (%), HI (°C), and associated risk

Two types of comparison were conducted between data obtained from heat stress monitoring and the app: 1) hourly mean WBGT vs. hourly HI, and 2) hourly WBGT-based risk vs hourly HI-based risk for heat stress





- Figure 2. Daily Mean and Maximum WBGT Index (°C) by Monitoring Day and Site
- Figure 2 demonstrates an increasing trend in WBGT indices from April to August at both monitoring sites.

- The OSHA-NIOSH Heat Safety Tool app was found to be most reliable in identifying minimal risk conditions, but its reliability decreased as the heat stress risk condition became more severe
 - The app was very inaccurate in assessing high and extreme risks at any type of workload (low to very heavy), with 0% of the WBGT-based high and extreme risks matching those identified by the app.
- Given the varying degree of reliability of the app depending on the risk conditions, the use of the app to assess occupational risk to heat stress in an agricultural setting is not recommended.
- The performance of the app in assessing risk was demonstrated to not be protective of the workers particularly for heavy and very heavy workloads, which are likely performed by agricultural workers.
- There is still a need for more readily accessible and reliable information on heat stress risk and HRI prevention measures that may be used by agricultural workers and other similar outdoor workers.
- A well-designed mobile app that provides WBGT-based risk information may fill this need

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Figure 4. Percentage of Hourly WBGT-Based Risk Level Assignments with the Same Hourly HI-Based Risk Level Assignments by Workload.

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- Results indicated excessive summer heat
- exposures in agricultural settings in Eastern NC. Findings demonstrated that the HI-based risk
- from the app did not correspond well with the WBGT-based risk derived from onsite heat stress measurements.
- There are several possible reasons for this finding:
- 1. Different parameters were used to calculate the HI and WBGT.
- 2. HI was originally designed for use by the general public and not for workers.
- 3 The local weather conditions at the agricultural sites may be different from those at the NOAA regional weather stations used by the app.
- · The app was most reliable in identifying minimal risk conditions
- The reliability of the app decreased as the heat stress risk condition became more severe.
- Unfortunately, the app being reliable for minimal risk conditions is not very useful since this risk level is not one of utmost concern
- This study also had several limitations including: 1. The study was limited to 2 agricultural sites.
- 2. Workers were not observed and assumptions were made about workload.
- 3. A relatively narrow range of WBGT indices were obtained.

levels from 8:00 AM to 6:00 PM.