California Heat Illness Prevention Study (CHIPS) in Immigrant Latino Farm Workers

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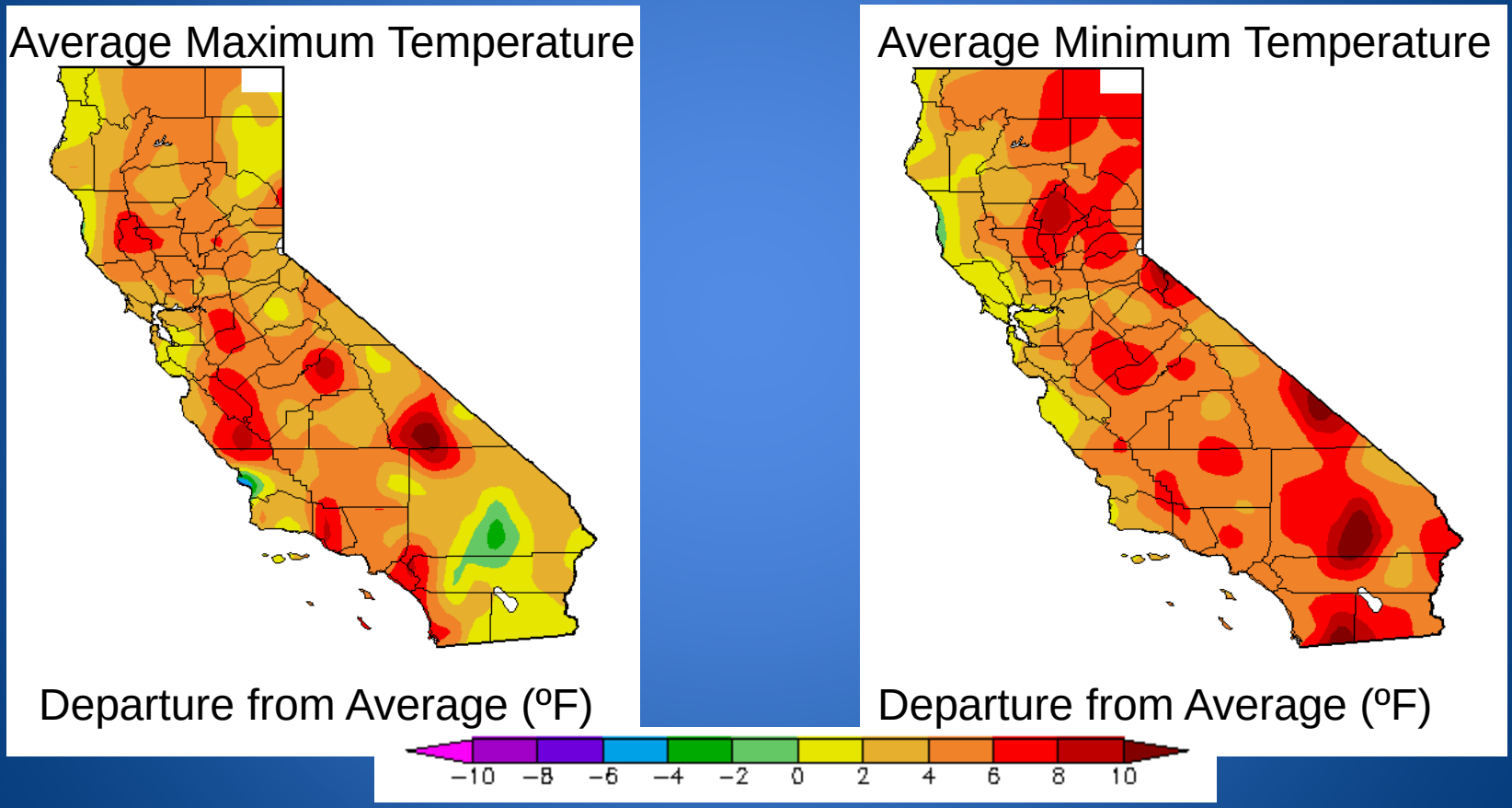
Marc Schenker, M.D.
Western Center for Agricultural Health & Safety
University of California at Davis

Heat Related Illness (HRI) : Significance

- Avg. of 688 U.S. deaths/year (1999-2003)
- Increasing over last decade (global warming)
- Agriculture - a high risk occupation for HRI
  - 6+ fatalities of farm workers in CA per year
  - Over 200 HRI claims annually in CA
- Preventable

Departures from Average Maximum and Minimum Temperatures, California, July 2006

Public Health Impacts of Climate Change in California: Community Vulnerability Assessments and Adaptation Strategies . CDPH and PHI, 2007



Source: Generated 8/1/2006 at the Western Regional Climate Center : NOAA

Heat Related Illness: increased susceptibility in farm workers

- Work pressure – Motivations to work beyond endurance, not take breaks, etc.
- Extended period of working in direct sun with high temperatures and humidity.
- Dehydration (restricted ability to drink water, rest in shade).
- Lack of knowledge of symptoms and response needed.
- Cultural beliefs (e.g. hot-cold syndrome)
- Poor nutritional habits, poverty and stress.

Current Aims

1] Quantify heat stress risk : monitor Ag workers in CA Central Valley. Assess hydration, core body temps, heart rate (surrogate for internal work load) and environmental conditions for different crop and tasks.

2] Investigate personal risk factors for heat illness using questionnaire data gathered from the MICASA cohort follow-up 2 (2011-12).

Aim 1: Physiological field study

- 100 field workers from 7 CA Central Valley farms assessed in summer 2012
- Assessments:

Personal measurements:

- Pre and Post-shift blood osmolalilty, body weight,
- Heart rate and core body temperature (thermometer pill)
- Personal ambient temperature and humidity
- Questionnaire data on water intake, practices and experiences

Field Environmental measurements:

- Central weather station
- Local (in field, mobile) weather station
- Crop, work rate, other conditions by study staff observations

Demographics of the Field Workers

Characteristic	%
Sex (male)	87.0
Ethnicity Latino	99.0
Immigrant to US	94.0
- If immigrated, from Mexico	100.0
Less than 6th grade education	48.0
Characteristic	Mean (SD)
Age	36.8 (11.7)
Years in US if immigrated	13.7 (10.7)
Years worked in farming	12.6 (10.5)

Mean Weight and Blood Osmolality Changes at Work

General linear models produced least square means by gender

Measure	Males	Females	P-val difference
Water consumed at work (oz)	94.7	56.8	0.12
Weight change (kg)	-0.61	-0.27	0.11
Change in mOsmolality	+ 4.17	+3.80	0.85

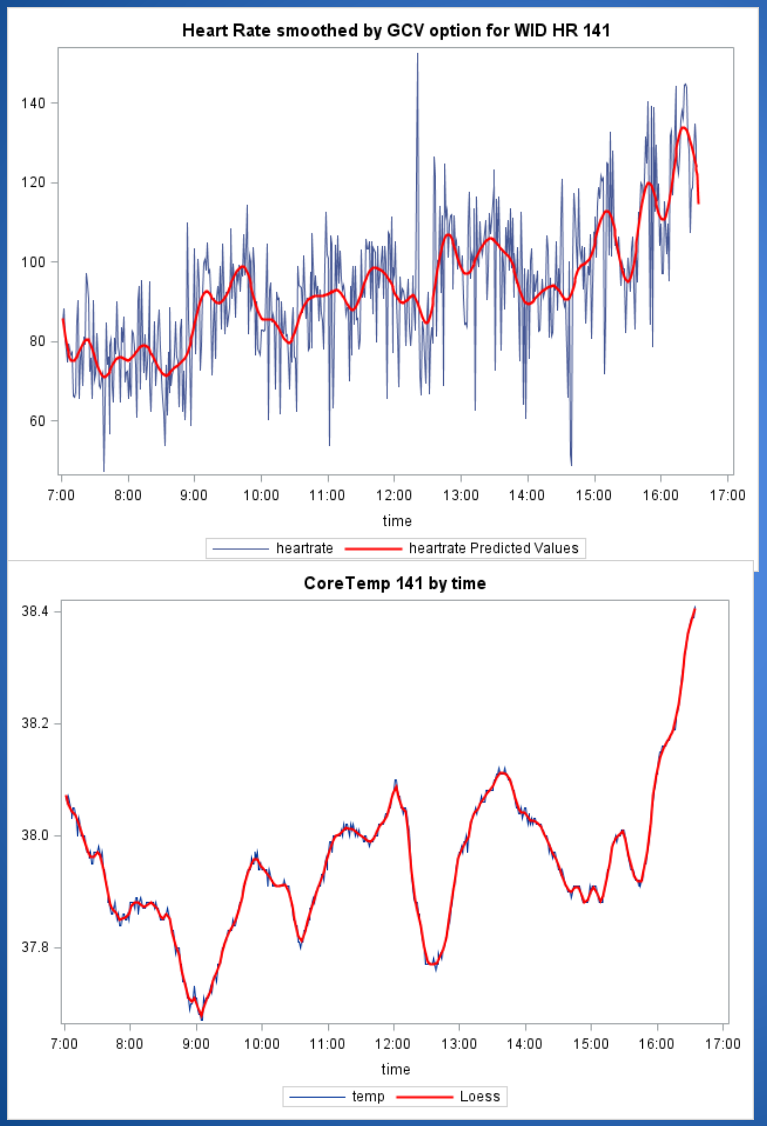
Workers exhibiting ≥ 3% increase in blood mOsm lost significantly more weight over the work shift

Measure	< 3% inc (95% CI)	≥ 3% inc (95% CI)	P-val difference
Weight change (kg)	-0.33 (-0.54 - -0.11)	-0.70 (-0.89 - -0.50)	0.0125

Physiological Aspects

- How does ag work contribute to core body temperature? How does ambient temp/humidity reflect body temperature of ag workers?
  - Contributors to overall core body temperature:
    - Environmental heat (conduction, radiation)
    - Metabolic heat (body's natural processes)
    - Exertional heat (muscle movement)
    - Evaporative compensation
- Increased risk dependent on activity level, physical condition, age, cardiovascular health, BMI, and acclimatization

Examples of Field Data Collected



Top graph records heart rate (blue) and smoothed heart rate (red).

We will be assessing associations between changes in heart rate and subsequent core temperature (bottom graph), taking into account environmental conditions of temperature (both personal and area), humidity, radiation, etc.

MICASA questionnaire information?


EXTECH
INSTRUMENTS
LAP SPLIT TIME ALARM
HEAT Watch
TEMPERATURE • HUMIDITY • HEAT INDEX • STOPWATCH
HW30

California Heat Illness Prevention Study (CHIPS)

Marc Schenker
James Jones
Gail Wadsworth
Dan Tancredi
Diane Mitchell
Jose Gutierrez
Alondra Vega