

Understanding and addressing risks for reduced kidney function in seasonal sugarcane workers in Guatemala

Jaime Butler-Dawson, PhD, MPH

Lyndsay Krisher, MPH

Center for Health, Work & Environment

Colorado School of Public Health, CU Anschutz Medical Campus

Overview

Background

Research

Conclusions

Research to Practice





Work in Guatemala

- Population 16.3 million (2015)
- Largest economic inequality in LA
 - ↑ poverty among indigenous populations
- 70% work in the informal economy
 - No access to benefits/social security
- Temp/Seasonal work in agribusiness
 - Coffee
 - Banana/plantain
 - African palm oil
 - Rubber
 - **Sugarcane**
- World's 4th largest sugar exporter



Center for Health, Work & Environment + Pantaleon Collaboration

Pantaleon – major sugarcane producer
in Central America

**Goal - Apply Total Worker Health®
principles to assess and improve
health, safety, and well-being of its
sugarcane workers in Guatemala**

Independent analysis and authority to
publish findings



Sugarcane Field Work

6-month season

4,000 hired annually

- Local / Highland workers
- Cane / Production workers

Cane Cutters

- Heavy exertion, long work hours
- Intense sunlight and heat
- Manually use machetes
- Paid by amount of cane cut (6 tons/day)



Field Practices

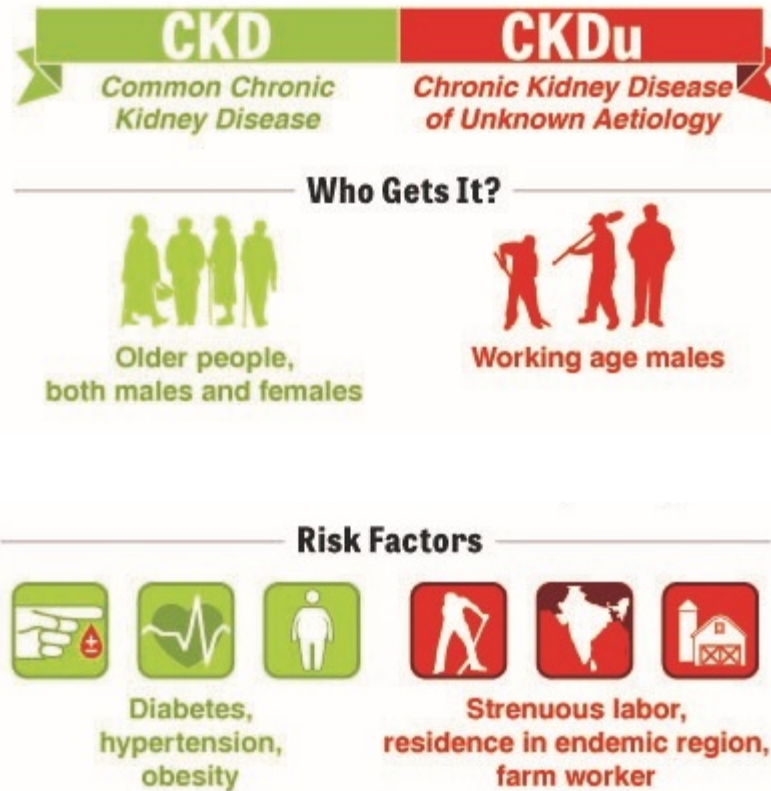
- Pre-employment health screenings
 - Physical exam
 - Hiring cut-off: ≥ 60 eGFR (kidney function)
- Water, rest and shade guidelines
 - ≥ 2.5 L electrolyte solution
 - ≥ 16 L water
 - Breaks: 3 x 20 min and 1 x 60 min
- Field nurse aides and physicians
- PPE
 - Goggles, hat, gloves, wrist / shin guards, boots



Chronic Kidney Disease of Unknown Origin (CKDu)

Traditional CKD vs. CKDu

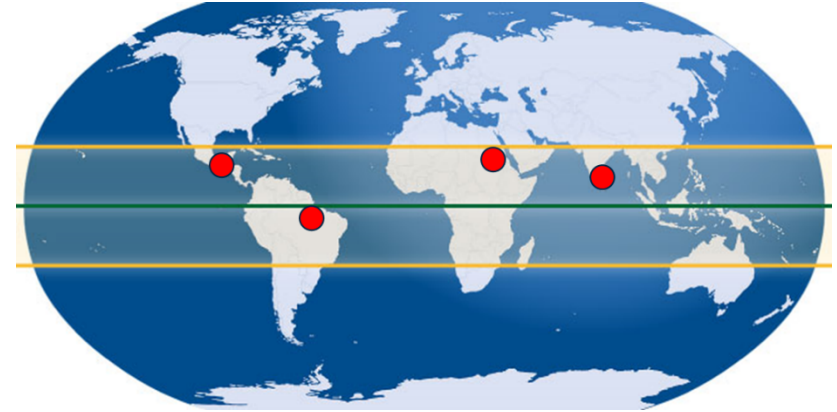
What's the Difference?



<https://www.publicintegrity.org/2012/09/17/10855/kidney-disease-kills-thousands-across-continent-scientists-scramble-answers>

Epidemiology of CKDu

- Past 2 decades
- Poor agricultural communities
- Male agricultural workers
- Aged 30 to 60 years
- Causes are not clear, appears multifactorial



• CKDu in Central America

- Rates are 13-15 times higher than in U.S. (O'Donnell, 2011)
- Leading hypotheses
 - Heat stress with repeat dehydration
 - Environmental nephrotoxin exposures

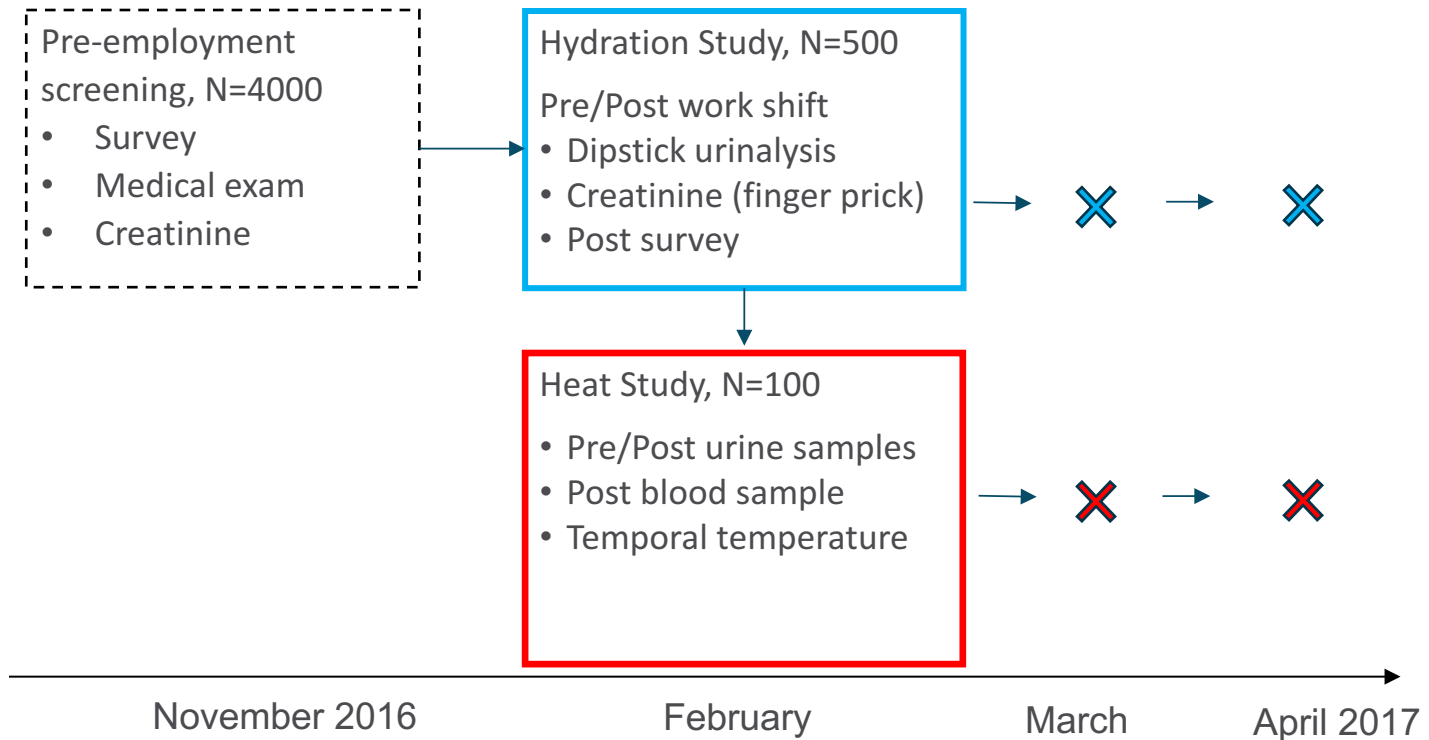


Research: Assess kidney damage and risk factors in sugarcane workers



All photos courtesy of Amanda Walker

Study Overview



Hydration Intervention

1. Increased education

¡Se pueden prevenir las enfermedades por calor!



✓ Agua
✓ Sombra y descansos
✓ Capacitación
✓ Plan de emergencia

CON AGUA UNO RINDE MAS.



¡Manténgase seguro y sano!

Bebe agua a menudo en lugar de esperar a sentirte sediento. Evita practicar de sus competencias.



Use sombreros y ropa ligera de colores claros. Si algo duele está trabajando por el momento. Llamar al 911.

Descansa en la sombra.



AGUA. SOMBRA. DESCANSOS.

Desarrollado por CAL/OSHA

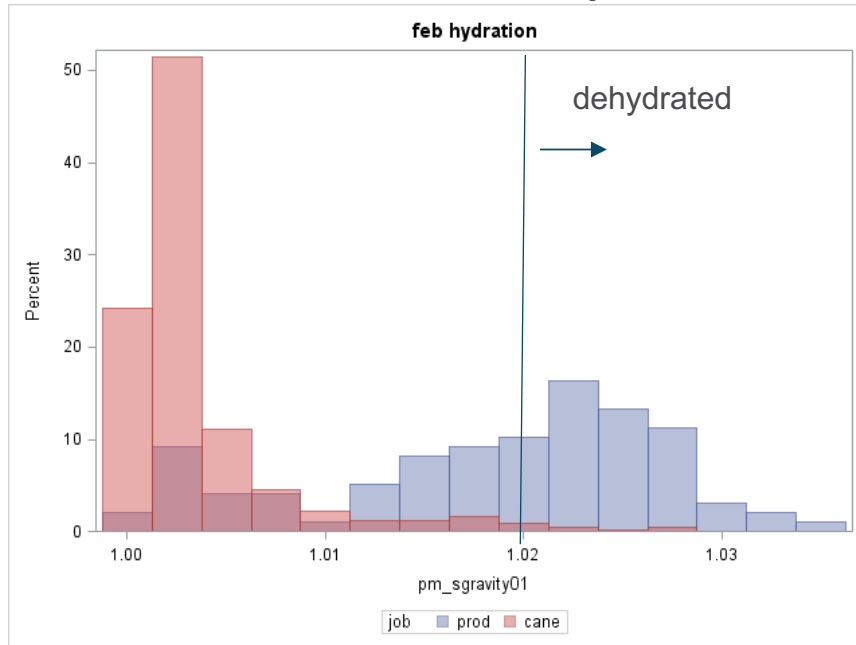
2. Incentive for hydration



- Token if AM USG < 1.02 (hydrated)
- Token if <1% body weight (hydrated)
- Prize raffle with tokens

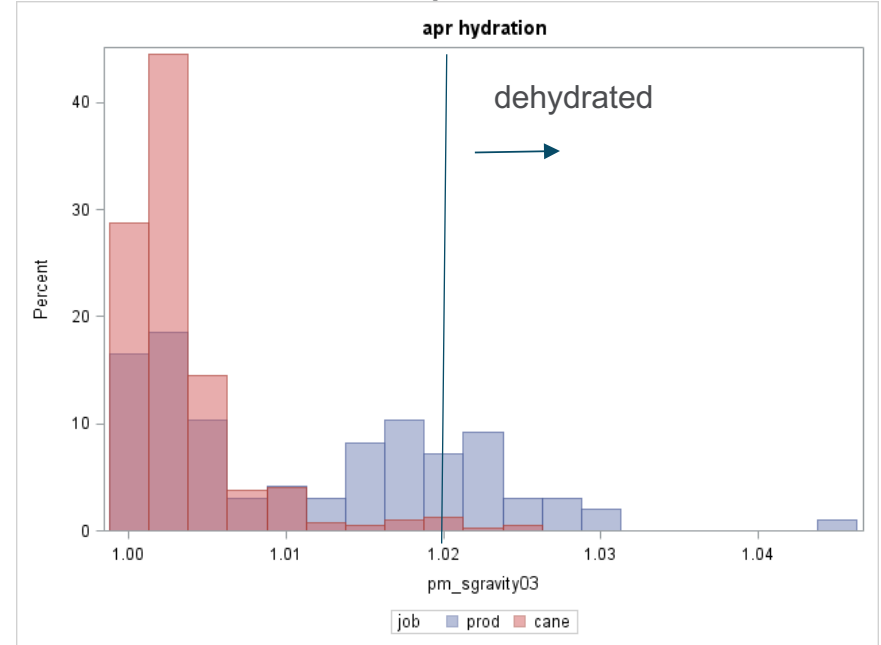
Results: Hydration improved across season

February



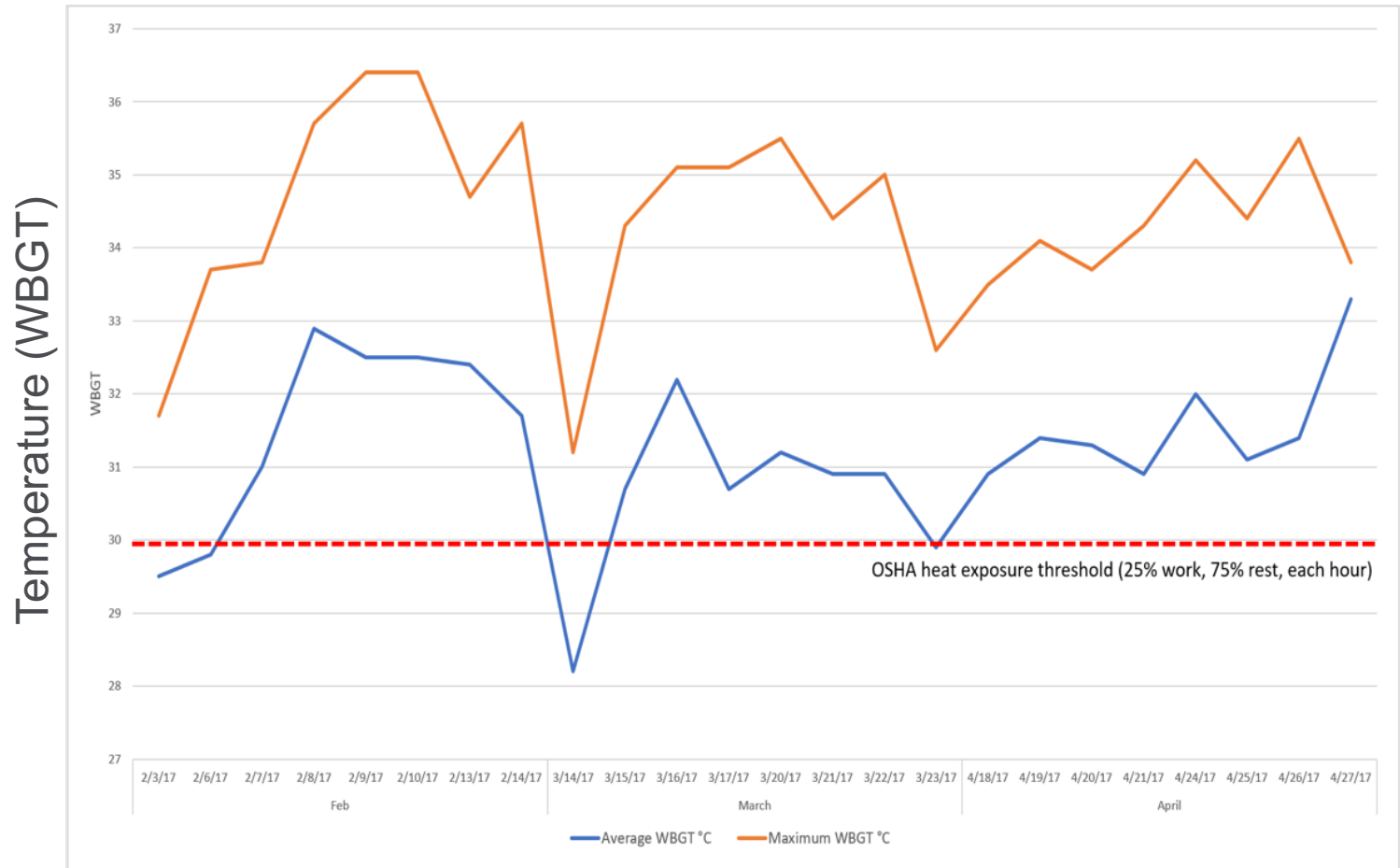
Specific Gravity

April



Specific Gravity

Results: Field temperatures



Study Days (Feb – April)

Results: Biomarkers

Kidney Function

- 14% cross-harvest decline
- 1% CKDu
 - < 60 eGFR at 2 time points >3 months
- 98% kidney injury
 - Albuminuria (>30) at 2 time points

Hydration and Electrolytes

- Small percentage are dehydrated
- Half have low K and Na levels

Heat + Exertion = Muscle breakdown

- Muscle breakdown is common
- Lactic acidosis is common



Addressable Risk Factors

Increased risk of reduced kidney function

- Lower kidney function at start of season
- Lower kidney function at start of work shift

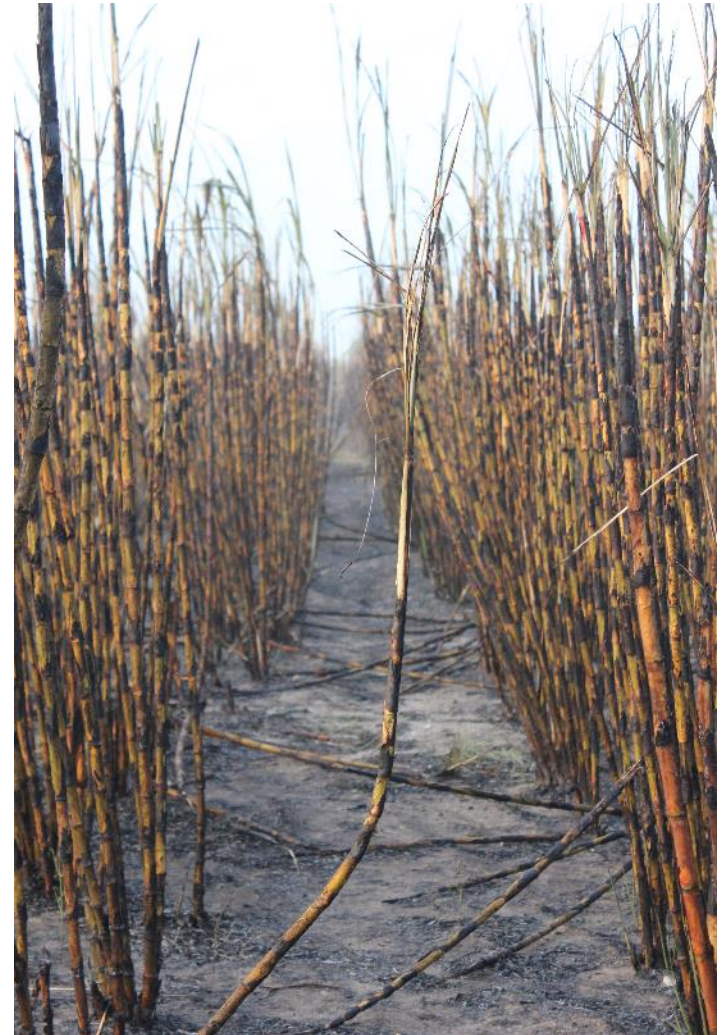
Protective factors of reduced kidney function

- Electrolyte solution
- Rest breaks
- Hydration

Conclusions

- Hydration is protective, but does not prevent all injury.
- Heat stress likely significant contributor, additional work and life risk factors exist.
- Physical exertion of field work is too much for the heat.
- Nephrotoxic heavy metals & agrochemicals analyses still pending.

What can be done?



Next Steps: 2017-18 Recommendations, Implementation & Evaluation

2 pilot studies

- Increase hydration through electrolyte replacement
- Change work schedule during high heat periods

More protective hiring cut-off

Increased surveillance: mid-harvest screening

Remove incentive to cut more cane



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