Hard work in heat and health in a changing climate

230316

Kristina Jakobsson
Felipe Pacheco Zenteno

Occupational and Environmental Medicine,
School of Public Health and Community Medicine, Sahlgrenska Academy, Gothenburg

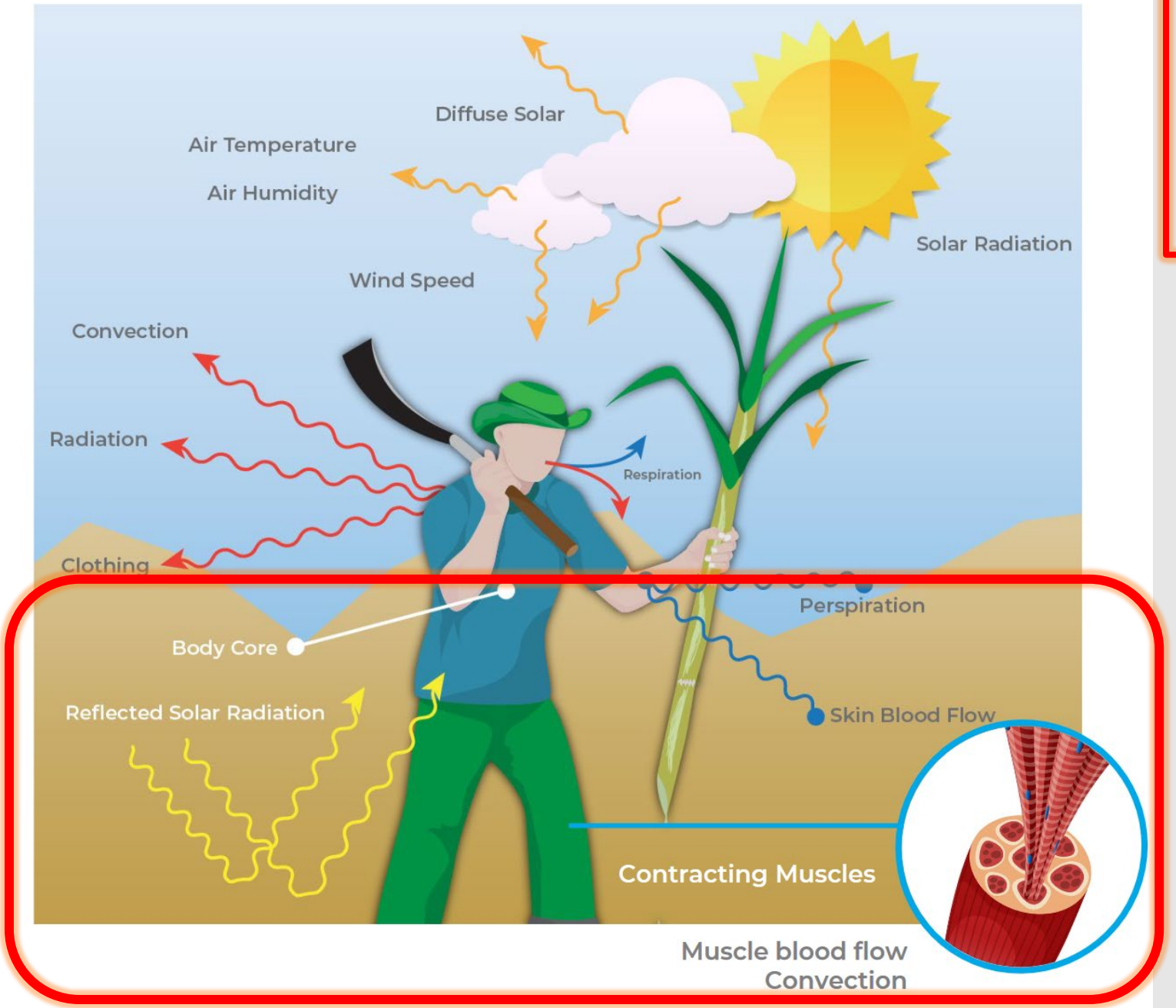
La Isla Network (LIN) www laislanetwork.org

Disposition

- Crash course in heat physiology
- CKD nT epidemics – is heat stress a risk factor?
- A timeline from a sugar mill in Nicaragua
- A Rest, Shade and Water workplace intervention

- What does it take to achieve and maintain a sustainable intervention?

- What are the driving forces for change?



Heat stress

Environmental heat

Clothing

Internal heat generation

Heat strain (in the body)

Physiological changes

Increased core body temperature

<38°C; 38-40°C; >40°C

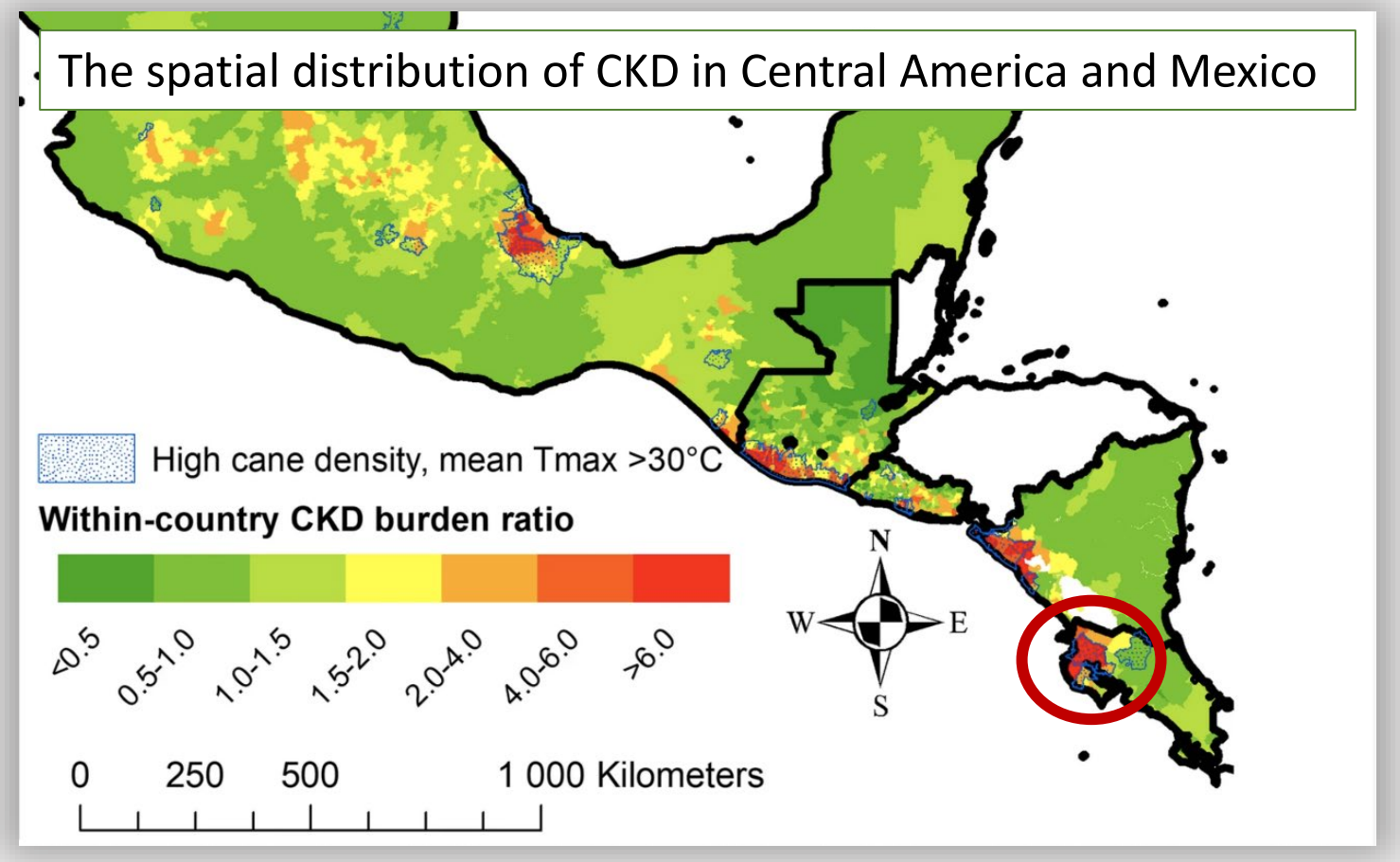
Heat stress and heat strain

- Reduced productivity
- Societal effects
- Health care system

- Acute heat related illness
  - headache
  - fatigue
  - nausea
  - dizziness
  - fainting
  - exhaustion
  - heat stroke
- Increased risk for accidents
- Long-term effects i.e. kidney disease
- Death

Chronic kidney disease of non-traditional origin, CKDnT

- found in young manual workers
- not related to diabetes, hypertension or other well-known risk factors



Risk factors

- Unknown?
  - Environmental toxins
  - Infections
  - Genetics
  -
- Heat stress?

Fig: Hansson et al, BMC Publ Health 2021

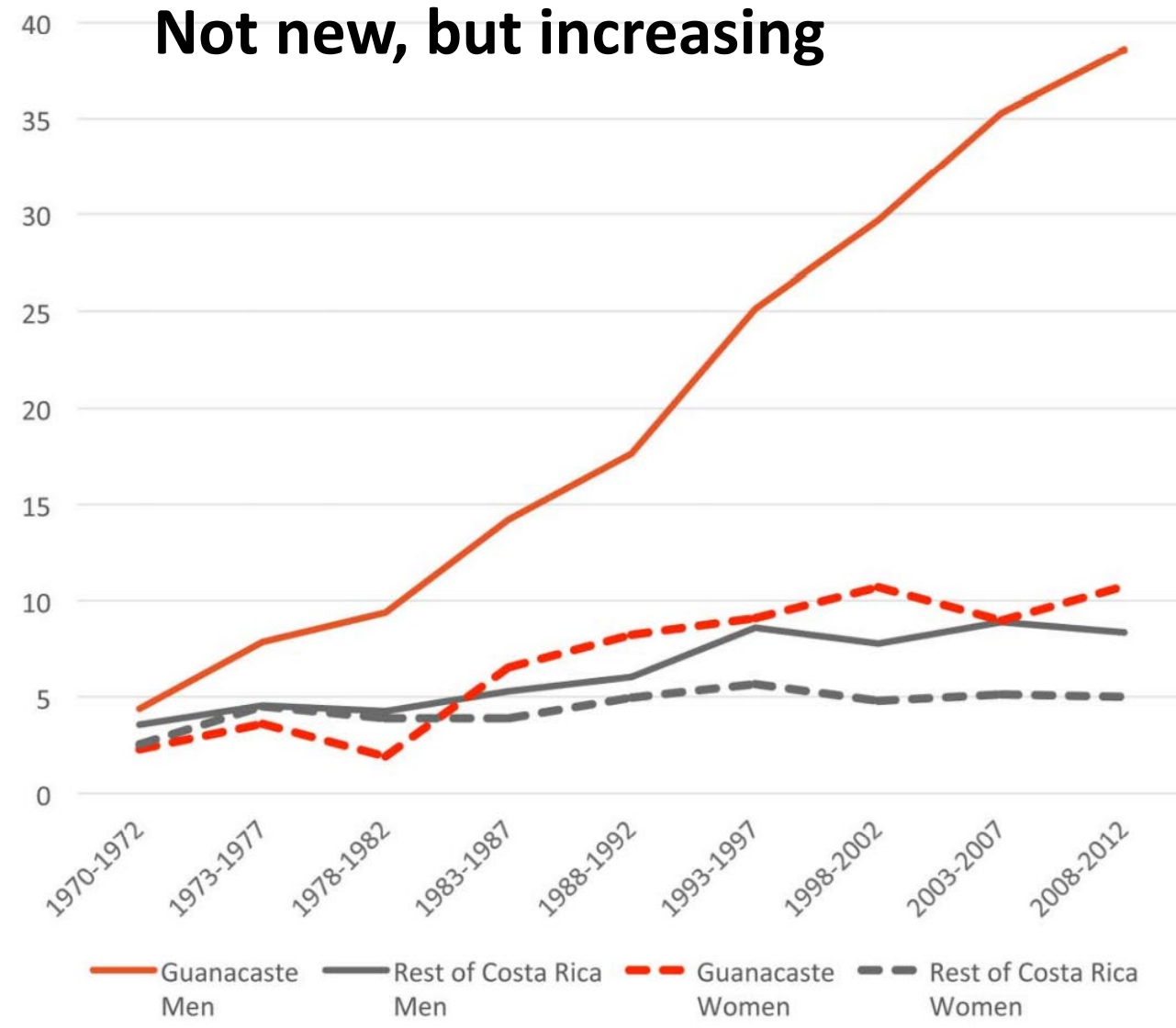


Figure 2 Age-adjusted chronic kidney disease (CKD) mortality rates per 100 000

Fig. Wesseling et al Occup Env Med 2015

Why now?

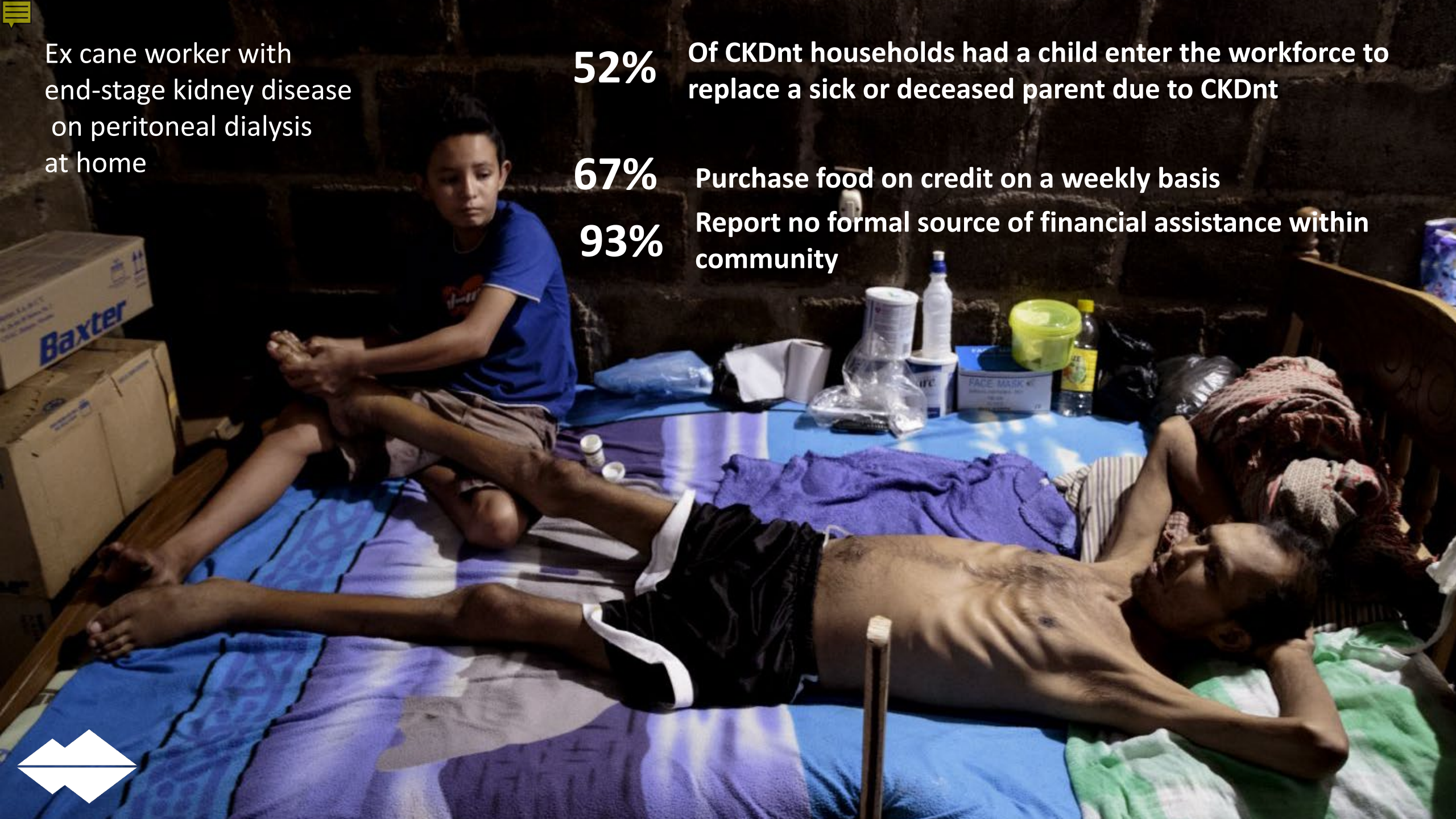
Industrialization of agriculture (rise of monoculture, i.e. sugarcane)

Piece-work

Increased research and surveillance

Climate change

If it is heat stress at work
- how can it be prevented



Ex cane worker with end-stage kidney disease on peritoneal dialysis at home

52% **Of CKDnt households had a child enter the workforce to replace a sick or deceased parent due to CKDnt**

67% **Purchase food on credit on a weekly basis**

93% **Report no formal source of financial assistance within community**


unskilled workforce
low wages
over-exertion & dangerous working conditions
CKDu diagnosis
workers fired
sub-contracting
rapid acceleration of disease
early death
children leave school to work

Ingenio San Antonio, a sugar mill in Nicaragua

A time-line from a Nicaraguan sugar mill, Ingenio San Antonio, ISA

2000
- Awareness of kidney disease among workers by the company doctor
- Awareness by workers and in the local communities; ”La Isla de Viudas”
- Awareness at hospital clinics; large regional differences were reflected by health statistics

2006
- *Population-based studies in El Salvador and Nicaragua*

2010
- World Bank Loan for expansion of cane production at ISA
  - *Boston University investigations* ISA summary: not related to work
- Media awareness, filmmakers and investigative journalists
- Workplace ameliorations at the mill (end child labour, end subcontracting)

- *More research: heat strain emerging as a likely major driver of the disease – but also heavily disputed*

2014
- The first workplace *intervention study* in El Salvador by LIN researchers, funded by the Dutch Postcode lottery

2016
- German Development Bank loan for expansion and diversification at ISA
  - Mandated Rest, Shade and Water intervention&scientific evaluation by LIN

2023
- Interventions in El Salvador, Guatemala, Honduras (US DoL)

la isla network

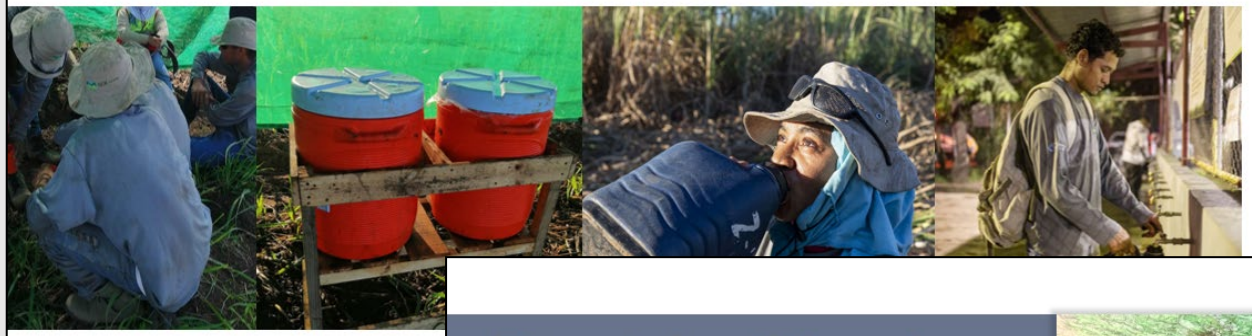
The task: implement, evaluate and disseminate a toolkit for reducing heat stress in manual outdoor work in hot climates

Water

Easy access to clean water

&

Electrolyte solution



Sanitation in the field

Rest in Shade

Incidence of Hospitalized Acute Kidney Injury (AKI) due to Heat illness

Data from the hospital at a large Nicaraguan sugar mill during three harvest seasons with gradually enhanced Rest-Shade-Water- interventions

Job	Estimated Workload	Operations as usual Harvest 1 2017-2018	Intervention Harvest 2 2018-2019	Improved intervention Harvest 3 2019-2020
		% of AKI	% of AKI	% of AKI
Cutters (burned cane and green cane seed)	High	9.4%	3.8%	0.6%
Drip Irrigation Repair + Field Support	Med/Low	3.9%	0.8%	0%

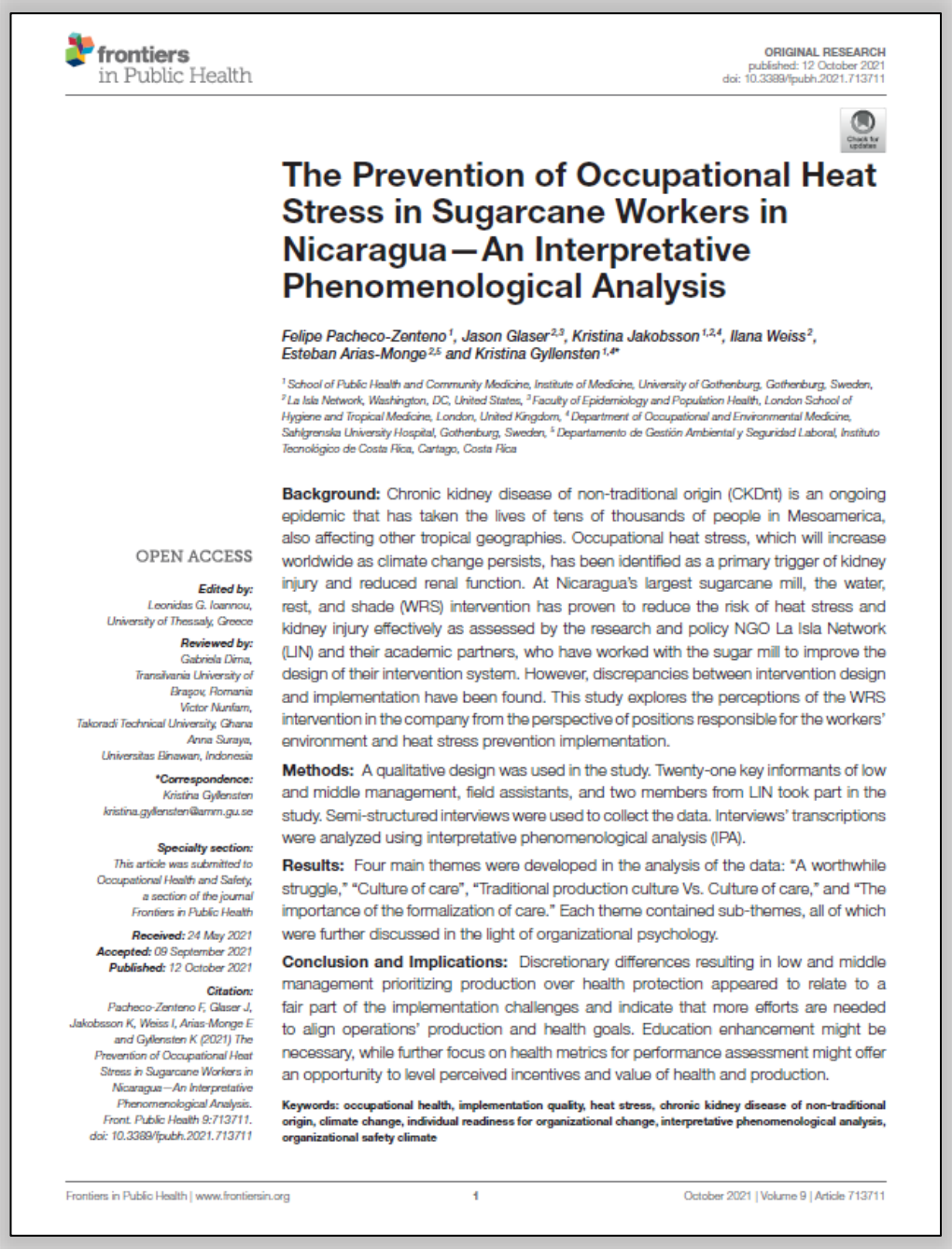
H1-H2: 63% reduction

H1-H3: 94% reduction

What does it take to achieve and maintain a sustainable RS&W intervention?

Research need

- Discrepancies between intervention design and implementation quality.
- How psychological and organizational factors affect heat stress prevention implementation?



frontiers in Public Health

ORIGINAL RESEARCH
published: 12 October 2021
doi: 10.3389/fpubh.2021.713711

The Prevention of Occupational Heat Stress in Sugarcane Workers in Nicaragua—An Interpretative Phenomenological Analysis

*Felipe Pacheco-Zenteno[1], Jason Glaser[2,3], Kristina Jakobsson[1,2,4], Ilana Weiss[2], Esteban Arias-Monge[2,5] and Kristina Gyllensten[1,4]**

[1] School of Public Health and Community Medicine, Institute of Medicine, University of Gothenburg, Gothenburg, Sweden, [2] La Isla Network, Washington, DC, United States, [3] Faculty of Epidemiology and Population Health, London School of Hygiene and Tropical Medicine, London, United Kingdom, [4] Department of Occupational and Environmental Medicine, Sahlgrenska University Hospital, Gothenburg, Sweden, [5] Departamento de Gestión Ambiental y Seguridad Laboral, Instituto Tecnológico de Costa Rica, Cartago, Costa Rica

Background: Chronic kidney disease of non-traditional origin (CKDnt) is an ongoing epidemic that has taken the lives of tens of thousands of people in Mesoamerica, also affecting other tropical geographies. Occupational heat stress, which will increase worldwide as climate change persists, has been identified as a primary trigger of kidney injury and reduced renal function. At Nicaragua's largest sugarcane mill, the water, rest, and shade (WRS) intervention has proven to reduce the risk of heat stress and kidney injury effectively as assessed by the research and policy NGO La Isla Network (LIN) and their academic partners, who have worked with the sugar mill to improve the design of their intervention system. However, discrepancies between intervention design and implementation have been found. This study explores the perceptions of the WRS intervention in the company from the perspective of positions responsible for the workers' environment and heat stress prevention implementation.

Methods: A qualitative design was used in the study. Twenty-one key informants of low and middle management, field assistants, and two members from LIN took part in the study. Semi-structured interviews were used to collect the data. Interviews' transcriptions were analyzed using interpretative phenomenological analysis (IPA).

Results: Four main themes were developed in the analysis of the data: "A worthwhile struggle," "Culture of care", "Traditional production culture Vs. Culture of care," and "The importance of the formalization of care." Each theme contained sub-themes, all of which were further discussed in the light of organizational psychology.

Conclusion and Implications: Discretionary differences resulting in low and middle management prioritizing production over health protection appeared to relate to a fair part of the implementation challenges and indicate that more efforts are needed to align operations' production and health goals. Education enhancement might be necessary, while further focus on health metrics for performance assessment might offer an opportunity to level perceived incentives and value of health and production.

Keywords: occupational health, implementation quality, heat stress, chronic kidney disease of non-traditional origin, climate change, individual readiness for organizational change, interpretative phenomenological analysis, organizational safety climate

OPEN ACCESS

Edited by:
Leonidas G. Ioannou, University of Thessaly, Greece

Reviewed by:
Gabriela Dima, Transilvania University of Brasov, Romania
Victor Nunfam, Takoradi Technical University, Ghana
Anna Suraya, Universitas Binawan, Indonesia

***Correspondence:**
Kristina Gyllensten
kristina.gyllensten@amm.gu.se

Specialty section:
This article was submitted to Occupational Health and Safety, a section of the journal Frontiers in Public Health

Received: *24 May 2021*
Accepted: *09 September 2021*
Published: *12 October 2021*

Citation:
Pacheco-Zenteno F, Glaser J, Jakobsson K, Weiss I, Arias-Monge E and Gyllensten K (2021) The Prevention of Occupational Heat Stress in Sugarcane Workers in Nicaragua—An Interpretative Phenomenological Analysis. Front. Public Health 9:713711. doi: 10.3389/fpubh.2021.713711

Study aim

- Explore the perceptions of the RS&W intervention and its implementation, from the perspectives of key informants of low and mid-level management and field assistants.

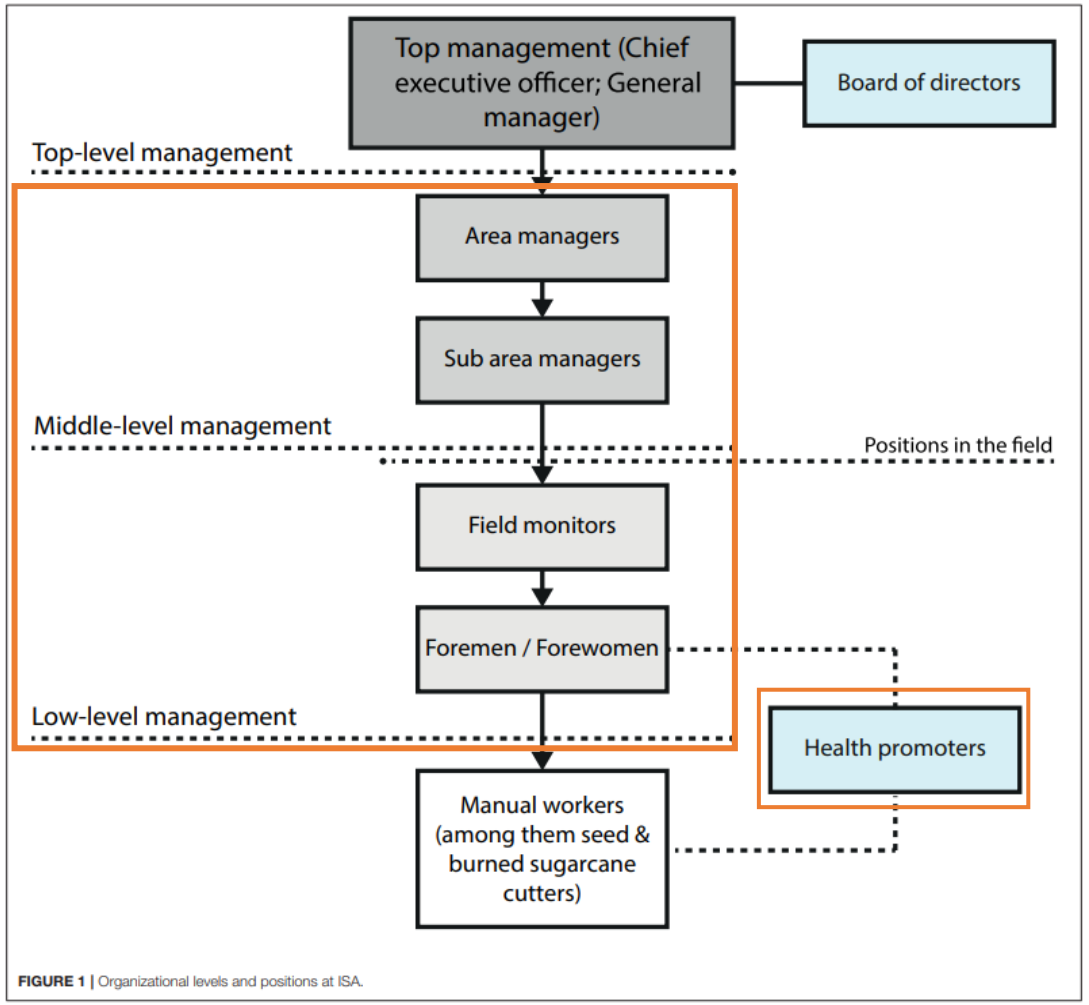


FIGURE 1 | Organizational levels and positions at ISA.

Research questions

a) What are the main enablers, obstacles, and opportunities for improvement to the implementation of the RS&W intervention?

b) How do low and mid-level management and field assistants perceive and experience the RS&W intervention, as well as their roles, and other organizational levels' role, in the implementation process?

Methodology

23 semi-structured interviews:

- 21 respondents from the mill.

  Responsible for the workers' environment and heat stress prevention implementation.

- 2 members from La Isla Network.

February 2020. Chichigalpa, western Nicaragua.

Analysis

Interpretative phenomenological analysis.
Smith JA, Jarman M, Osborn M. (1999)

→Explore in detail how participants **experience and make sense** of the topic under investigation.

→"Insider's perspective" while also offering an interpretative account from an "outsider's perspective."

*Software Atlas.ti

Individual readiness for organizational change

→ Extent to which an individual or individuals are cognitively and emotionally inclined to accept, embrace, and adopt a particular plan to purposefully alter the status quo

(a) Change-specific efficacy
(b) Appropriateness
(c) Management support
(d) Personal valence

Holt DT, Armenakis AA, Feild HS, Harris SG. (2007)

Organizational culture, climate and safety-climate

- Org culture → Shared values, beliefs, and attitudes.

- Org climate → Shared perceptions regarding the policies, procedures and practices that get rewarded and supported in relation to a specific strategic goal.

- **Org safety-climate** → Shared perceptions when this strategic goal involves practices that entail health risks for employees.

Schneider B. (1990)

Findings:

4 main themes with sub-themes were developed in the analysis.

TABLE 1 | Clustered themes and sub-themes.

Theme 1: A Worthwhile Struggle	1.1 Perception of being already used to/adapted to the implementation of the preventive measures
	1.2 Different beneficiaries of the WRS intervention
	1.3 Pride on being forerunners and the expectation to maintain and improve results
	1.4 Potential benefit of communicating and spreading information on the implementation within the company
Theme 2: "Culture of Care": The Importance of Education and Follow-Up	2.1 To need for the managers to become aware and to raise awareness in others
	2.2 The need for the cutters to become aware
	2.3 Follow-up in the field and controlling for compliance
	2.4 Foremen as key actors
Theme 3: Traditional Production Culture Vs. Culture of Care	3.1 Tension between two ways of producing
	3.2 Importance of not affecting the production goals adversely
	3.3 Task overload in the field
	3.4 The need for a greater involvement of low and middle management
Theme 4: The Importance of the Formalization of Care	4.1 Recording and monitoring health indicators, and measuring impact
	4.2 A committed top management
	4.3 The weight of guidelines and regulations
	4.4 An organizational structure that facilitates decision-making, supervision, and coordination on health protection
	4.5 The importance of having key performance indicators based on health outcomes

→ **Discussed in the light of organizational psychology:**

- Organizational safety-climate
- Individual readiness for organizational change

1. A worthwhile struggle

- Preventive measures as normality, after a difficult start (unprepared).
- Intervention's tangible benefits → positive emotions and motivation to continuing.

> *"Things are changing because the mill has benefited... We benefited a lot because we have the recognition of almost the entire industry and we have been awarded as a model mill in terms of sustainability, in good practices for production. And that also motivates the production engineers. ...people are changing, and they start owning this, and they get more and more involved."*

2. Culture of care ➡ Emerging safety-climate

- Change in the traditional way of working, focused exclusively on production indicators, toward an increasing consideration of health prevention.

(1) Continuous education → Break down the perceived cultural resistance to caring for health.
→ Awareness and engagement.

(2) Follow-up on the cutters → Continuous supervision/control and monitoring.

> *"There are two lines: one is to make people aware that it is for their good, and the other is the supervision part, which is that, well, when they* [the workers] *are losing the lines, then we align them."*

2. Culture of care

"*I think that the biggest obstacle that we as people, as cutters, as staff have is the education. With that basis, well, we are not aware of risks. ...Therefore, that* [lack of] *education is what we address with day-to-day training. ...when they* [cutters] *become aware* [of the risks], *then that obstacle starts to decrease. ...But basically, in my opinion, the first obstacle is that people must become aware of taking care of themselves.*"

3. Traditional production culture vs. Culture of Care

➢ Different priorities in different areas of the organization.

> *"There are still certain barriers in this regard, even though there is an order from above which is what must be followed. There is still a bit of pride among the engineers who do not want to understand that it is necessary to also take care of the health of the workers, and not only to produce."*

- Inconsistencies between **espoused and enacted prioritization** of health and safety (Zohar, 2010).

- **Discern of what behaviors were expected** from foremen and cutters.

3. Traditional production culture vs. Culture of Care

- Fact that production was not affected adversely by incorporating care of health.

> *"I believe that we no longer have fears, those fears have already been overcome and rather, I believe that what is coming and all the changes that might come we are going to assimilate them in a better way; because we have already managed to overcome the cultural obstacles that we had, those of production."*

4. The importance of the formalization of care

- The systematization of information, systematic monitoring of health indicators, and the regularity and organization of the WRS preventive measures following this monitoring.

- Specific guidelines on implementation (goals, procedures, and authority levels).

Conclusion

- Discretionary differences in low and mid management resulting in prioritizing production over health.
- Performance assessments on health metrics → level **perceived incentives** and value of health and production.
- Enhanced education and participation → **involvement**.

Implications

- Governments → Legislation that regulates workers' health protection
  → Incentives for companies' initial investing and evaluation of prevention programs.

- Ministries of labor and health → Employers' and workforce education on the need for such programs.

References

- Holt DT, Armenakis AA, Feild HS, Harris SG. Readiness for organizational change: the systematic development of a scale. J Appl Behav Sci. (2007) 43:232–55. doi: 10.1177/0021886306295295

- Schneider B. The climate for service: an application of the climate construct. In: Schneider B, editor. Organizational Climate and Culture. 4th ed. San Francisco, CA: Jossey-Bass (1990). p. 383–412

- Smith JA, Jarman M, Osborn M. Doing interpretative phenomenological analysis. In: Murray M, Chamberlain K, editors. Qualitative Health Psychology: Theories and Methods. London: Sage (1999). p. 218–40

- Zohar D. Thirty years of safety climate research: reflections and future directions. Accid Anal Prevent. (2010) 42:1517–22. doi: 10.1016/j.aap.2009.12.019

What are the driving forces for change?

BONSUCRO – a global sustainability platform and standard for sugarcane, one of the world's most important crops. The purpose is to collectively accelerate the sustainable production and uses of sugarcane.

Sugarcane for

Sugar
Molasses
Bioethanol
Bioplastics
Energy production

An unspecificed product at the bottom of a commodity chain

SPIRITS SCANDALS

Bars Toss Flor de Caña Rum Over Dire Worker Conditions

Entire communities are suffering from a chronic kidney disease.

by Caroline Pardilla | Dec 7, 2015, 2:00pm EST

Flor de Caña down the drain. | Bobby Heugel

A brand at stake…..

Flor de Caña,
ISAs premier rum
(and a national pride)
was boycotted by US
bartenders in 2015

Thank you for your attention!

la isla network

UNIVERSITY OF GOTHENBURG

UNIVERSITY OF LONDON

HARVARD UNIVERSITY

LUND UNIVERSITY

BON SUCRO
The global sugarcane platform

UNIVERSITY OF MICHIGAN

LONDON SCHOOL of HYGIENE &TROPICAL MEDICINE

TEC | Tecnológico de Costa Rica

UNIVERSITY OF BIRMINGHAM

Fair Trade USA™

TEXAS
The University of Texas at Austin

UNIVERSITY OF LIVERPOOL

UNA UNIVERSIDAD NACIONAL COSTA RICA

UNIVERSIDAD NACIONAL AUTÓNOMA DE NICARAGUA, LEÓN
UNAN - LEÓN

World Vision

NUS National University of Singapore
Yong Loo Lin School of Medicine

Karolinska Institutet

Universiteit Utrecht

SRI RAMACHANDRA
INSTITUTE OF HIGHER EDUCATION AND RESEARCH

www.laislanetwork.org