Article: Sugarcane Workweek Study: Risk Factors for Daily Changes in Creatinine

Supplementary Material

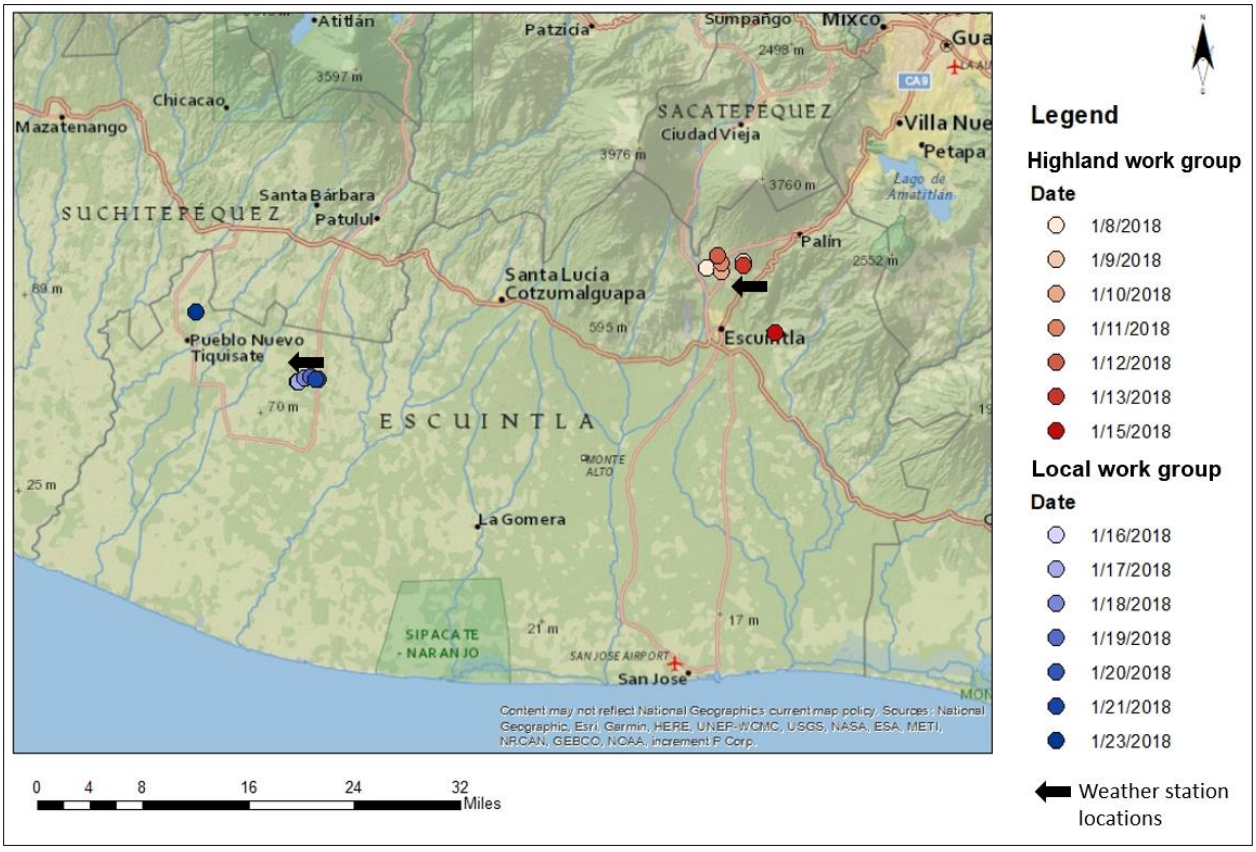

Figure S1: Map of study field locations by work group and date and location of weather stations.

Table S1: Distribution of markers of kidney function and daily risk factors. Mean (SD) or n (%).

Variables	Day 1 (n=98)	Day 2 (n=97)	Day 3 (n=98)	Day 4 (n=94)	Day 5 (n=94)	Day 6 (n=98)	Day 8 (n=94)
Kidney function							
Pre-shift creatinine (mg/dL)	0.66 (0.15)	0.76 (0.15)	0.75 (0.19)	0.71 (0.20)	0.74 (0.21)	0.74 (0.22)	0.70 (0.19)
Change in creatinine (%)	38% (29%)	15% (23%)	17% (26%)	23% (25%)	14% (32%)	16% (35%)	11% (23%)
Acute Kidney Injury*, n (%)	34 (35%)	12 (12%)	13 (14%)	16 (17%)	13 (14%)	23 (24%)	6 (6%)
Hydration and fluid intake							
Weight change across shift (%)	0.05% (2.08%)	0.92% (2.78%)	0.61% (1.87%)	1.26% (2.19%)	0.64% (2.32%)	0.53% (1.82%)	-0.68% (2.28%)
Pre-shift urine specific gravity	1.012 (0.007)	1.011 (0.007)	1.010 (0.006)	1.009 (0.006)	1.009 (0.005)	1.009 (0.005)	1.010 (0.006)
Post-shift urine specific gravity	1.007 (0.007)	1.008 (0.007)	1.006 (0.006)	1.006 (0.007)	1.006 (0.006)	1.005 (0.006)	1.006 (0.006)
Number of electrolyte packets	1.29 (0.54)	1.36 (0.53)	1.40 (0.59)	1.37 (0.59)	1.39 (0.59)	1.44 (0.68)	1.44 (0.73)
Amount of electrolyte solution (L)	5.17 (2.31)	5.45 (3.67)	5.46 (2.26)	5.36 (2.51)	5.41 (2.72)	5.56 (2.93)	5.41 (3.14)
Number of sugar-sweetened beverages	1.67 (1.34)	2.62 (2.33)	2.35 (2.26)	2.80 (2.97)	1.80 (2.06)	2.32 (2.17)	2.77 (3.77)
Water intake, number of 5-L containers (L), n (%)							
Less than 2 containers (< 10 L)	1 (1%)	3 (3%)	2 (2%)	1 (1%)	4 (4%)	2 (2%)	2 (2%)
2-3 containers (10-14 L)	17 (18%)	16 (17%)	7 (8%)	21 (24%)	3 (3%)	5 (5%)	6 (7%)
3-4 containers (15-19 L)	40 (43%)	67 (71%)	64 (70%)	61 (69%)	69 (74%)	69 (72%)	65 (71%)
4 containers or greater (≥20 L)	36 (38%)	9 (9%)	19 (21%)	6 (7%)	17 (18%)	20 (21%)	18 (20%)
Work intensity and heat exposure							
Number of rest breaks	3.48 (0.63)	3.70 (0.69)	3.80 (0.73)	3.44 (0.52)	3.84 (0.43)	3.84 (0.42)	3.86 (0.46)
Work hours	10.46 (0.85)	10.05 (1.02)	10.93 (0.51)	9.33 (1.10)	11.00 (1.10)	10.88 (0.82)	11.29 (0.69)
Worked the prior day, n (%)	2 (2%)	97 (100%)	96 (100%)	93 (100%)	90 (97%)	96 (100%)	15 (16%)
Amount of sugarcane harvested (tons)	7.12 (3.23)	6.49 (1.57)	7.56 (3.10)	3.92 (1.90)	6.00 (1.86)	6.78 (2.71)	5.87 (2.11)
Standardized amount of sugarcane harvested	0.28 (0.88)	0.23 (0.82)	0.45 (0.90)	-0.63 (0.87)	0.05 (0.76)	0.21 (0.78)	-0.05 (0.73)
Average WBGT (C°)	22.4 (1.4)	22.9 (1.8)	22.7 (2.0)	22.6 (1.9)	23.1 (1.3)	22.7 (2.4)	21.3 (3.0)
Maximum WBGT (C°)	25.2 (1.9)	25.5 (2.4)	25.4 (2.3)	25.3 (2.5)	25.6 (1.7)	26.5 (1.8)	23.9 (3.7)
Lifestyle factors and water source							
Number of cigarettes smoked	0.06 (0.53)	0.02 (0.21)	0.00 (0.00)	0.00 (0.00)	0.01 (0.10)	0.00 (0.00)	0.01 (0.10)
NSAID use, n (%)	2 (2%)	3 (3%)	6 (7%)	5 (6%)	12 (13%)	3 (3%)	7 (8%)
Drinking water source, n (%)							
Well	10 (11%)	11 (12%)	12 (13%)	10 (11%)	12 (13%)	9 (10%)	12 (13%)
Municipal	31 (35%)	35 (37%)	32 (35%)	31 (35%)	28 (30%)	33 (35%)	31 (34%)
Dormitory tanks	48 (54%)	49 (52%)	48 (52%)	48 (54%)	53 (57%)	53 (56%)	49 (53%)

* Acute Kidney Injury (AKI) is defined as an increase in post-shift creatinine by ≥ 0.3 mg/dl or to ≥ 1.5 times pre-shift.

Table S2: Spearman correlation coefficients for urinary biomarkers of exposure [A] (Day 2 only).

	Cadmium (µg/g)	Nickel (µg/g)	Lead (µg/g)	Uranium (µg/g)	Glyphosate (ng/g)	Cotinine (ng/mL)
Arsenic (µg/g)	0.12	-0.11	0.36*	0.19	0.39*	0.14
Cadmium (µg/g)		-0.05	0.16	-0.02	-0.03	0.12
Nickel (µg/g)			-0.18	0.08	-0.02	-0.004
Lead (µg/g)				0.34*	0.52*	0.22**
Uranium (µg/g)					0.73*	-0.02
Glyphosate (ng/g)						0.09

[A] Metals and glyphosate are corrected for urine creatinine.
* p-value < 0.01, ** p-value < 0.05

Table S3: Urinary biomarkers of exposure distributions by reported water source for first 5-L water container fill-up.

Exposures [A], mean (SD)	Well (n = 10)	Municipal (n = 32)	Dormitory (n = 39)	p-value*
Cadmium (ug/g)	1.73 (0.74)	1.65 (0.72)	1.47 (0.56)	0.35
Arsenic (ug/g)	11.91 (4.03)	21.04 (18.77)	10.44 (5.00)	< 0.01
Nickel (ug/g)	3.83 (1.79)	2.49 (1.09)	3.26 (1.14)	< 0.01
Lead (ug/g)	12.09 (9.67)	10.26 (7.05)	3.19 (3.26)	< 0.01
Uranium (ug/g)	0.34 (0.24)	0.19 (0.18)	0.14 (0.21)	0.03
Glyphosate (ng/g)	3.49 (1.95)	3.56 (4.59)	0.81 (0.80)	< 0.01

[A] Exposures are corrected for urine creatinine.
*based on ANOVA.

Table S4: Baseline kidney function by reported drinking water source for first 5-L water container fill-up.

Water Source	Baseline eGFR, mean (SD)	p-value*
Well	106.89 (26.01)	0.03
Municipal	112.47 (13.76)	
Dormitory tanks	119.81 (13.31)	

eGFR: estimated glomerular filtration rate, ml/min/1.73m^2.
*based on ANOVA.

STROBE Statement—Checklist of items that should be included in reports of ***cohort studies***

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4-5
Objectives	3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	6
		(*b*) For matched studies, give matching criteria and number of exposed and unexposed	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7-9
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	7-9
Bias	9	Describe any efforts to address potential sources of bias	6
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7-9
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	
		(*b*) Describe any methods used to examine subgroups and interactions	
		(*c*) Explain how missing data were addressed	11-12
		(*d*) If applicable, explain how loss to follow-up was addressed	
		(*e*) Describe any sensitivity analyses	

Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed (b) Give reasons for non-participation at each stage (c) Consider use of a flow diagram	12
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders (b) Indicate number of participants with missing data for each variable of interest (c) Summarise follow-up time (eg, average and total amount)	12-13
Outcome data	15*	Report numbers of outcome events or summary measures over time	13

Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included (*b*) Report category boundaries when continuous variables were categorized (*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	13-14
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	14
Discussion			
Key results	18	Summarise key results with reference to study objectives	14-15
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	18
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	18
Generalisability	21	Discuss the generalisability (external validity) of the study results	18
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	19