Associations Between Environmental Indicators and Cortisol Levels in Minority Children Living in Los Angeles

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INTRODUCTION

❏ Biological stress responses may be altered by environmental factors, such as pollution burdens, hazardous waste sites, traffic congestion, and availability of green and blue spaces and have been shown to promote either positive or negative health effects.[1]

❏ Markers of biological and physiological stress include, but are not limited to, fluctuations in hormones such as cortisol.[2]

RESEARCH QUESTIONS & OBJECTIVES

❏ Are environmental factors associated with biological stress responses?

❏ Children who reside in greater environmental burden groups may have different cortisol levels and patterns than those who reside in the lower environmental burden groups.

METHODS

Sample:
❏ 124 participants of the Diabetes Risk due to Ectopic Adiposity in Minority Youth (DREAM) study; DREAM data was collected from 2009 to 2011.
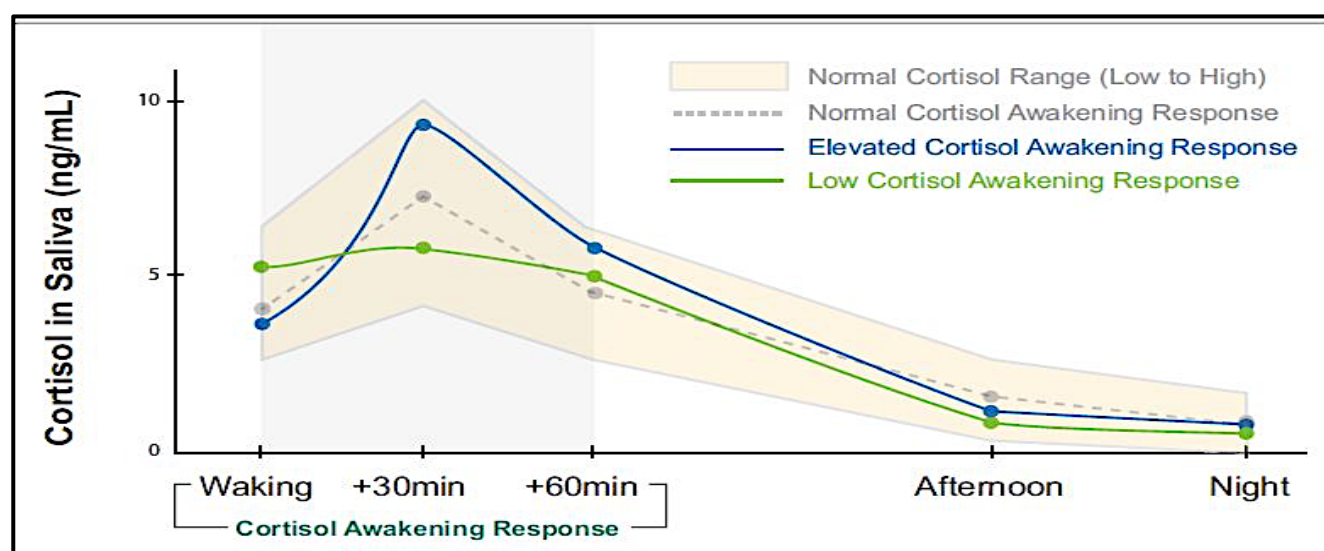
Cortisol:
❏ Salivary Cortisol at 5:30 AM, Salivary Cortisol at 6:00 AM, Fasting Serum Cortisol, Urinary Free Cortisol, Cortisol Awakening Response (CAR; the difference between the morning cortisol concentration and 30 minutes after).

CalEnviroScreen Version 3.0:
❏ Participants' address data to determine their home residence census of tract number.

❏ CES 3.0 percentile score (2015-2016 data) was used to categorize participants into those in the top 90th or greater percentile of pollution burden (n=62) and those below the 90th percentile of pollution burden (n=62).

❏ Eight categories compared: Ozone, Hazardous Waste, Drinking Water, Toxic Release, Traffic, Cleanup sites, Poverty, and Pollution Burden.

Figure 1: Diurnal Cortisol Curve

Legend:
- Normal Cortisol Range (Low to High)
- Normal Cortisol Awakening Response
- Elevated Cortisol Awakening Response
- Low Cortisol Awakening Response

Y-axis: Cortisol in Saliva (ng/mL)
X-axis: Waking, +30min, +60min, Afternoon, Night
Cortisol Awakening Response

RESULTS

Table 1A: Descriptive Table of Physical Characteristics

	CalEnviroScreen 3.0 < 90th Percentile Group — Frequency or Mean ± SE (n=62)	CalEnviroScreen 3.0 ≥ 90th Percentile Group — Frequency or Mean ± SE (n=62)
Physical characteristics		
Age (years)	14.3 ± 0.39	14.6 ± 0.38
Ethnicity		
African-American	31 (50%)	26 (42%)
Latino	31 (50%)	36 (58%)
Pubertal Stage		
Pre-puberty	13 (21%)	10 (16%)
Puberty	15 (24%)	18 (29%)
Post-puberty	34 (55%)	34 (55%)
Sex		
Male	34 (55%)	37 (60%)
Female	28 (45%)	25 (40%)
Height (cm)	158.5 ± 2.1	159.3 ± 1.7
Weight (kg)	78.6 ± 3.5	77.4 ± 3.5
BMI (kg/m^2)	30.2 ± 1.0	29.7 ± 1.02
BMI z-score	1.8 ± .08	1.7 ± .10

Table 1B: Descriptive Table of Environmental Factors and Stress Measures

	CalEnviroScreen 3.0 < 90th Percentile Group — Frequency or Mean ± SE (n=62)	CalEnviroScreen 3.0 ≥ 90th Percentile Group — Frequency or Mean ± SE (n=62)
Environmental factors		
CES 3.0 score	44.8 ± 0.9	57.7 ± 0.7*
Ozone	0.0479 ± 0.0005	0.0458 ± 0.0001*
Hazardous waste	0.1 ± .05	1.4 ± 0.5*
Drinking water	570.8 ± 21.1	592.6 ± 17.7
Toxic Release	4763.4. ± 422.3	7211.9 ± 768.7*
Traffic	1572.8 ± 155.1	1762.0 ± 132.5
Cleanup Sites	8.6 ± 1.7	16.5 ± 4.5
Poverty	57.5 ± 2.1	66.0 ± 1.7*
Pollution Burden	49.6 ± 0.8	57.9 ± 0.9*
Stress Measures		
Salivary Cortisol at 530am	0.8 ± 0.1	0.9 ± 0.1
Salivary Cortisol at 600am	1.8 ± 0.1	1.6 ± 0.1
Cortisol Awakening Response (CAR)	1.0 ± 0.1	0.7 ± 0.1*
Urinary Free Cortisol	5.0 ± 0.8	6.0 ± 1.1
Fasting Serum Cortisol	10.2 ± 0.4	10.1 ± 0.5

Figure 2: CalEnviroScreen 3.0 ≥ 90th Percentile Group Associated with Lower CAR

Y-axis: Cortisol Awakening Response (CAR)
X-axis: ≥90th Percentile CES 3.0 Score; <90th Percentile CES 3.0 Score
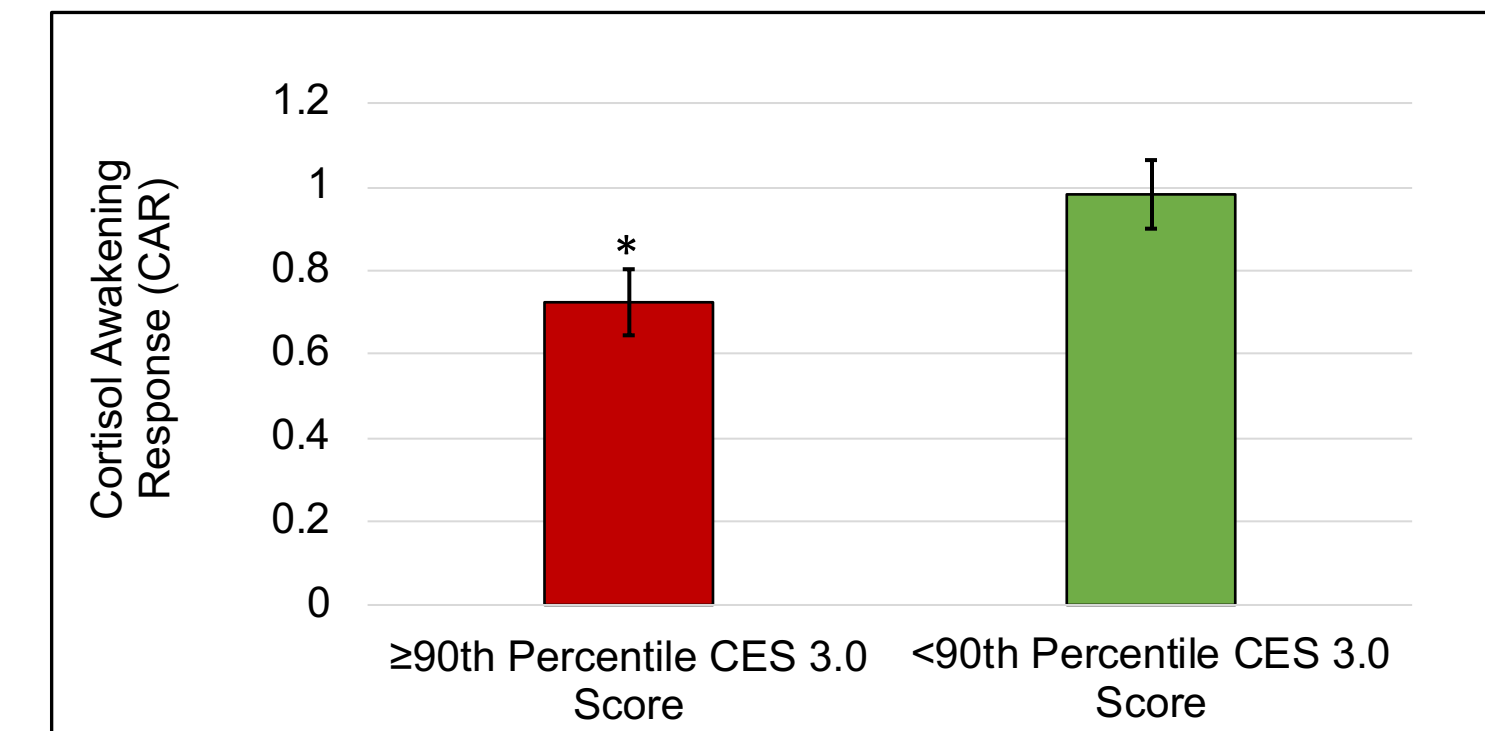
*p<0.05, ANCOVA analysis, adjusted for age, sex, and ethnicity.

STRENGTHS & LIMITATIONS

❏ This study is one of the first to incorporate a state-level indicator to investigate the role of environment on biological stress in Los Angeles area youth.

❏ An advantage of this study also lies in the fact that it is secondary; there has been several analysis and clean-ups of the original data set.

❏ The cross-sectional design is a limitation due to lack of tracking participants.

❏ Salivary cortisol was only collected in the morning therefore we are missing the overall diurnal curve.

❏ Generalizability is limited to African-American and Latino pediatric communities.

SUMMARY & CONCLUSIONS

❏ Our results show there may be an association between environmental factors and the biological stress responses, as measured by CAR.

❏ The study of indicators, such as the diurnal curve as well additional environmental factors, are needed to more deeply ascertain the relationship between stress and environment.

ACKNOWLEDGEMENTS

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