Prevalence of abandoned homes in the neighborhood and thymic function

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Detroit Neighborhood Environment

During the recession, Detroit experienced one of the highest foreclosure rates in the country (Rooney, 2008)
Detroit Neighborhood Health Study

Population-based cohort study of predominantly African American adults living in Detroit, Michigan

5 study waves & 4 in-home blood draws (2008-2013)

Neighborhood assessment and phone survey: health status, social network, trauma, mental health, substance use, and socio-demographics

Thymic function assessed in wave 4
Study Rationale

More work needed to understand biological mechanisms between social context and disease distributions (Steptoe & Marmot, 2002)

Immune system is a significant biological factor on the pathway (Steptoe, 2012)

Neighborhood characteristics and immune function have not been examined in community-based cohorts
Conceptual Model

- Poor neighborhood quality
- Poor social cohesion
- Chronic stress
- Diminished immune function
- Negative health outcomes
Thymic Function

Employment Status

Neighborhood Prevalence of Abandoned Homes

Gender

Age

Thymic Function
Employment Status

Neighborhood Prevalence of Abandoned Homes

Social Cohesion

Thymic Function

Gender

Age
Thymic Function

Thymus is the main organ for *de novo* naïve T cell production. Thymic function plays essential role quality of immune response (Steptoe, 2012)
Thymic Function Sensitive to Stress

Stress may reduce thymic output of naïve T-cells, evidence largely limited to acute stressors animal studies (Gruver & Sempowski, 2008)

Stress-induced thymic atrophy compromises immune system
Study Measures – Thymic Function

Two measures of thymic output of naïve T-cells:

1. Number of signal joint T-cell receptor excision circles (sj-TREC)

2. Ratio of signal joint to beta T-cell receptor excision circles (sj/beta-TREC ratio)

(Ferrando-Martinez et al, 2010)
Study Measures – Abandoned Homes

Proliferation of abandoned homes has become an important source of stress in Detroit.

Trained raters assessed block group segments presence of abandoned homes.

Score was aggregated to a percentage in the neighborhood.
Study Measures – Social Cohesion

Respondents rated agreement with a series of statements on neighborhood cohesion (1=strongly agree, 5=strongly disagree)

Summed for composite score (high score indicates poor cohesion)
Analysis

1. Neighborhood prevalence of abandoned homes $\rightarrow$ thymic function

2. Neighborhood prevalence of abandoned homes $\rightarrow$ social cohesion $\rightarrow$ thymic function

Two-level linear regressions to estimate variance between and within neighborhoods on sj-TREC and sj/beta-TREC ratio values

Individual respondents nested within neighborhoods
Results – Descriptive

**N=277**

<table>
<thead>
<tr>
<th>Measure</th>
<th>Description</th>
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<tbody>
<tr>
<td>Age</td>
<td>Median: 56 (IQR: 47, 67)</td>
</tr>
<tr>
<td>Female</td>
<td>61%</td>
</tr>
<tr>
<td>Employed</td>
<td>35%</td>
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<tr>
<td>sj-TREC</td>
<td>Median: 3244.0 (IQR: 1454.7, 7180.2)</td>
</tr>
<tr>
<td>sj/beta-TREC</td>
<td>Median: 5.47 (IQR: 1.0, 18.8)</td>
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<tr>
<td>Neighborhood with abandoned homes</td>
<td>Median: 34 (IQR: 21, 44)</td>
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Results – Abandoned Homes

Presence of Abandoned Homes
- 4-19%
- 19.1-28%
- 28.1-39%
- 39.1-46%
- 46.1-61%
Neighborhood Characteristics and Log sjTREC

**p<0.05

Neighborhood prevalence of abandoned homes main effect
Social cohesion main effect**
Neighborhood prevalence of abandoned homes, adjusting for social cohesion
Neighborhood Characteristics and Log sj/beta-TREC

**p<0.05

- Neighborhood prevalence of abandoned homes main effect**
- Social cohesion main effect**
- Neighborhood prevalence of abandoned homes, adjusting for social cohesion
Discussion

Findings suggest increases in neighborhood vacancy may influence immune function at the population level.

Provide support for social cohesion mediating relationship.

sj/beta-TREC measure has been found to be associated with mortality in older adults (Ferrando-Martinez et al., 2013).

sjTREC associated with other markers of inflammation in DNHS.

Further studies needed examining potential stress mechanisms for this link.
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Questions?

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References


Appendix: More Information on Thymic Function

Thymic function must be measured indirectly, as direct measurements are invasive.

Signal joint T-cell receptor excision circles (sj-TREC) are DNA created in T-cells as they pass through the thymus (Douek et al, 1998).

Number of sj-TREC is a widely used quantification of thymic output (Dion et al, 2007).
   However, sj-TRECs are diluted by proliferation of naïve T cells in peripheral blood (can have a reduction in sjTRECs with no reduction of thymic function) (Dion et al, 2004).

Advantage of sj/beta-TREC measure is estimation of intrathymic proliferation of T-cells, independent of peripheral activity (Dion et al, 2004; Ferrando-Martinez et al, 2010).
Appendix: Results – sjTREC and sj/beta-TREC
Results – Main Regressions

<table>
<thead>
<tr>
<th></th>
<th>sjTREC</th>
<th>sj/beta-TREC</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>$\beta$ (95% CI)</td>
<td>$\beta$ (95% CI)</td>
</tr>
<tr>
<td><strong>Unadjusted</strong></td>
<td>-0.02 (-0.08, 0.1)</td>
<td>-0.1 (-0.3, 0.01)</td>
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<tr>
<td><strong>Adjusted for age, sex, employment status</strong></td>
<td>-0.1 (-0.9, 0.2)</td>
<td>-0.3 (-0.5, -0.09)</td>
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