



# Violence: A Non-Chemical Stressor and How it Impacts Human Health

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## Objectives of this presentation

- Define non-chemical stressors and provide overview of non-chemical stressors in a child's social environment
- Summarize existing research on exposure to violence as a non-chemical stressor for children under 18 years of age
- Show that exposure to violence (a non-chemical stressor) may modify the biological response to chemical exposures

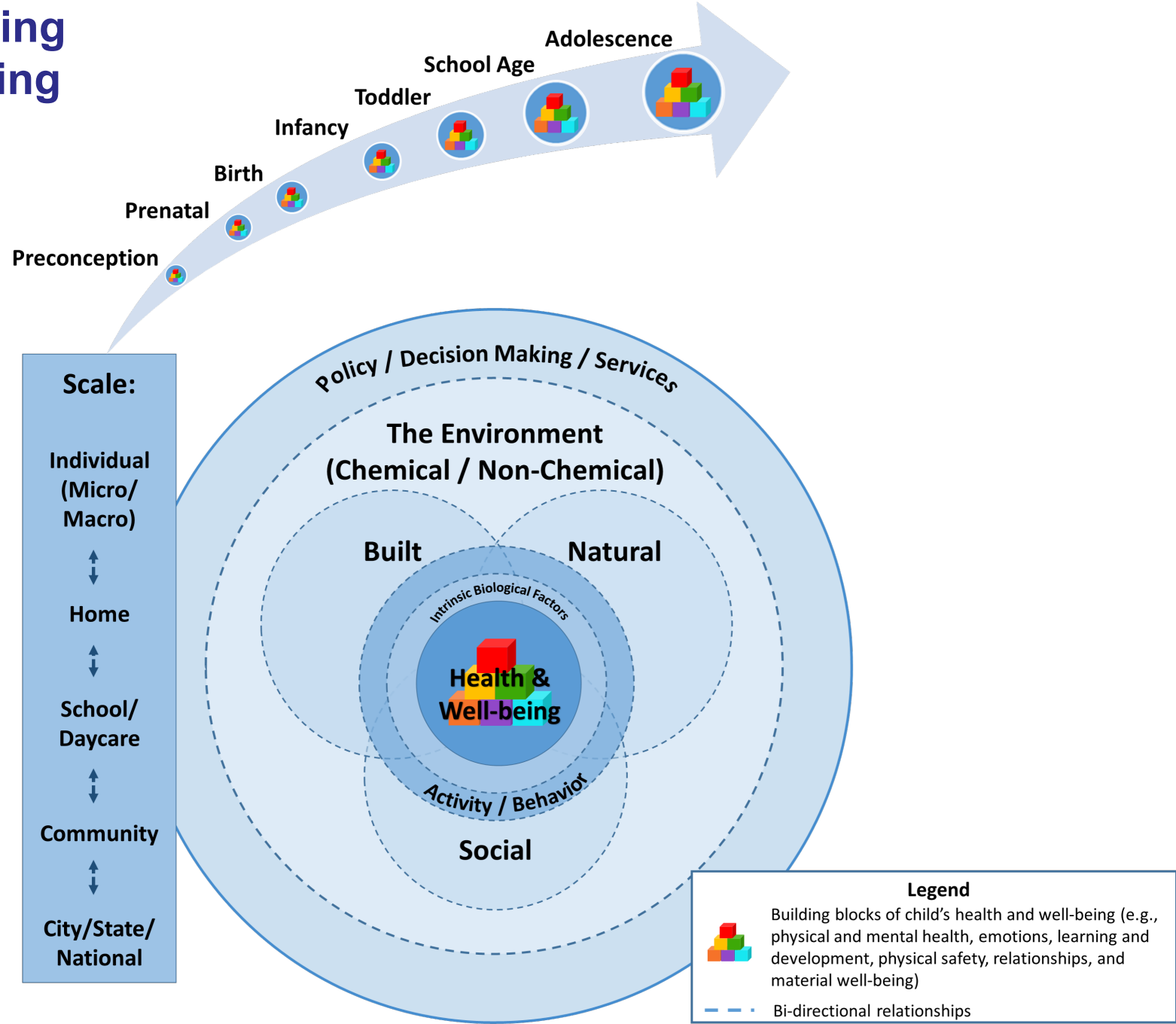
# What are Non-Chemical Stressors?

- Factors found in the built, natural or social environments that impact health and well-being either alone or in combination with chemical stressors
  - E.g.: urbanization, stress, heat, noise, fast-food density
- Part of a complex system of social environment that includes places where children live, learn, play (everywhere)
- Can affect the biological response to chemical exposures; impacting children's health.

## Why are non-chemical stressors a concern for children?

- Current research suggests that non-chemical stressors can modify the response to chemical exposures
- Impact can be greater on children compared to adults due to:
  - Developmental stage
    - Different metabolic rates
    - Higher dermal and internal absorption rates
    - Larger surface area to body weight ratios
  - Activities/Behaviors: (the way they interact with the environment)
    - Crawling
    - Playing close to the ground
    - Mouthing behavior

# Conceptual Framework Depicting Children's Health and Well-Being





Can exposure to chemicals affect one's health?

Can exposure to a non-chemical stressor affect one's health?

Can exposure to non-chemical stressors affect the **BIOLOGICAL RESPONSE** to a chemical exposure?

- 1.) What has been studied so far?
- 2.) Where are the gaps in knowledge?

# Methods: General Literature Review

- ❖ Non-chemical stressors found in a child's social environment
- ❖ Children age 0 – 18 years old at time of exposure to non-chemical stressor
- ❖ Research published from 2000 – 2017
- ❖ From industrialized countries
- ❖ Databases: PubMed and PsycINFO

**Step 1:** Primary and secondary searches

**Step 2:** Initial screening of title & abstract

**Step 3:** Secondary screening of full-text

**Step 4:** Addition of manuscripts identified

Records identified through general & specific searching  
( $n = 7432$ )

Excluded:  
(Title/abstract review)  
( $n = 6941$ )

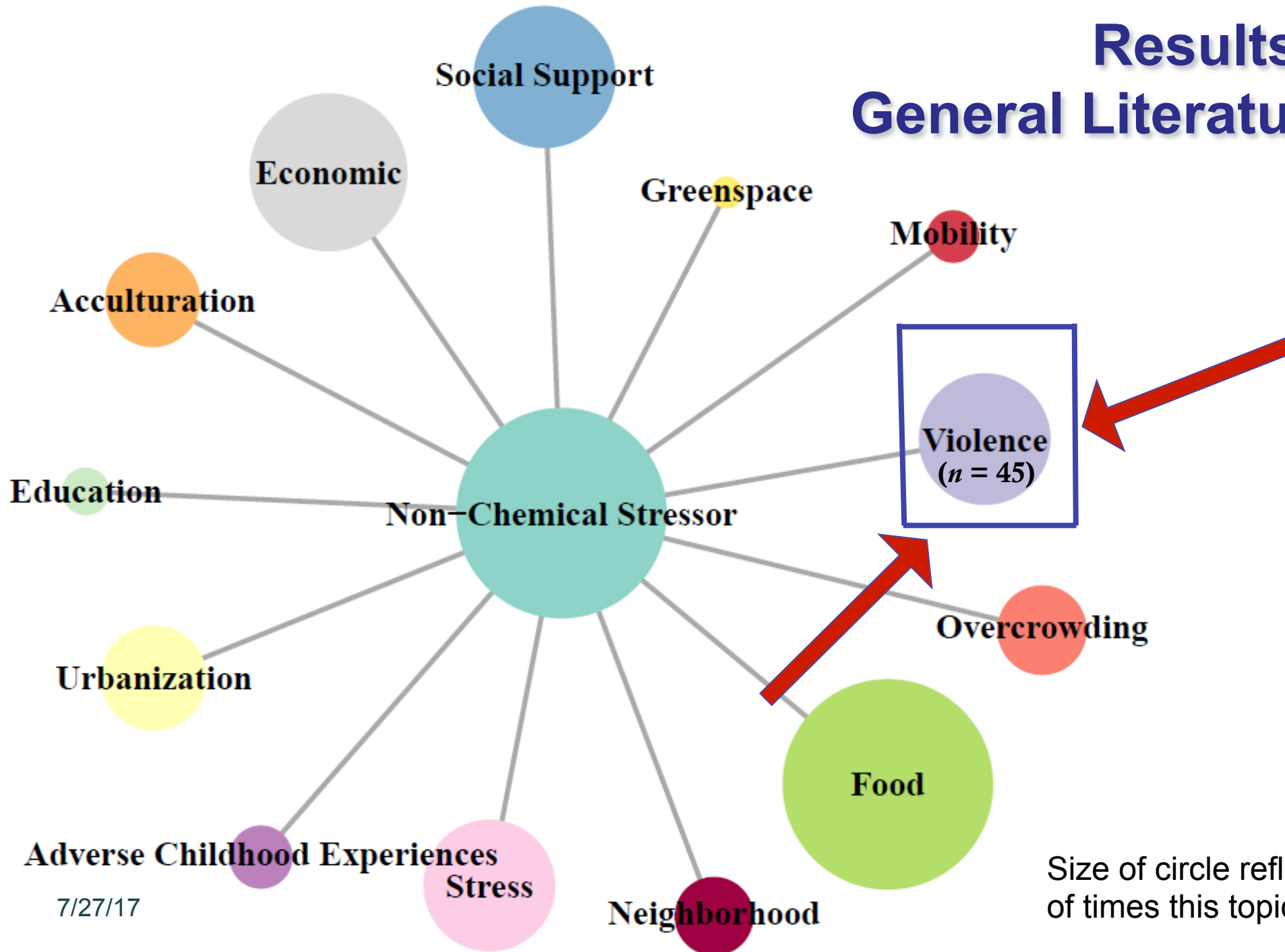
Included:  
(Based on title/abstract review)  
( $n = 491$ )

Excluded:  
(After full-text review)  
( $n = 171$ )

Included:  
Additional publications  
( $n = 52$ )

Articles Included in review:  
(Review and criteria met)  
( $n = 372$ )

# Results: General Literature Review



Size of circle reflects frequency  
of times this topic is studied. 7



# Violence

One of the non-chemical stressors that a child may encounter in their social environment



# What is Violence?

- **Types of exposure to violence:**

- Indirect

- Witness violence
      - Seeing the violence
      - Hearing the violence

- Direct

- Victim of violence

- **Types of violence**

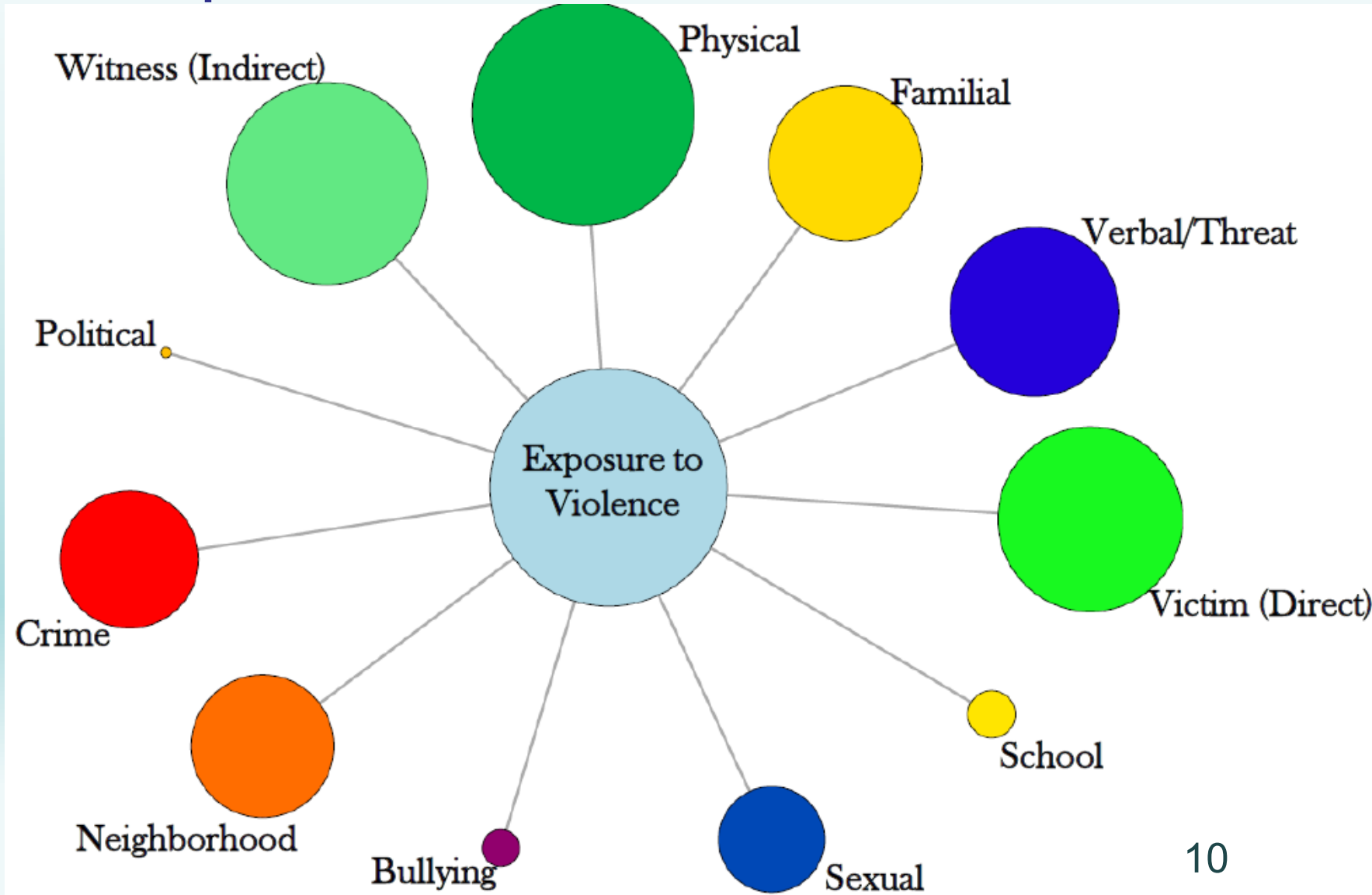
- Physical
  - Sexual
  - Verbal/threat
  - Crime
  - Bullying

- **Scales of violence**

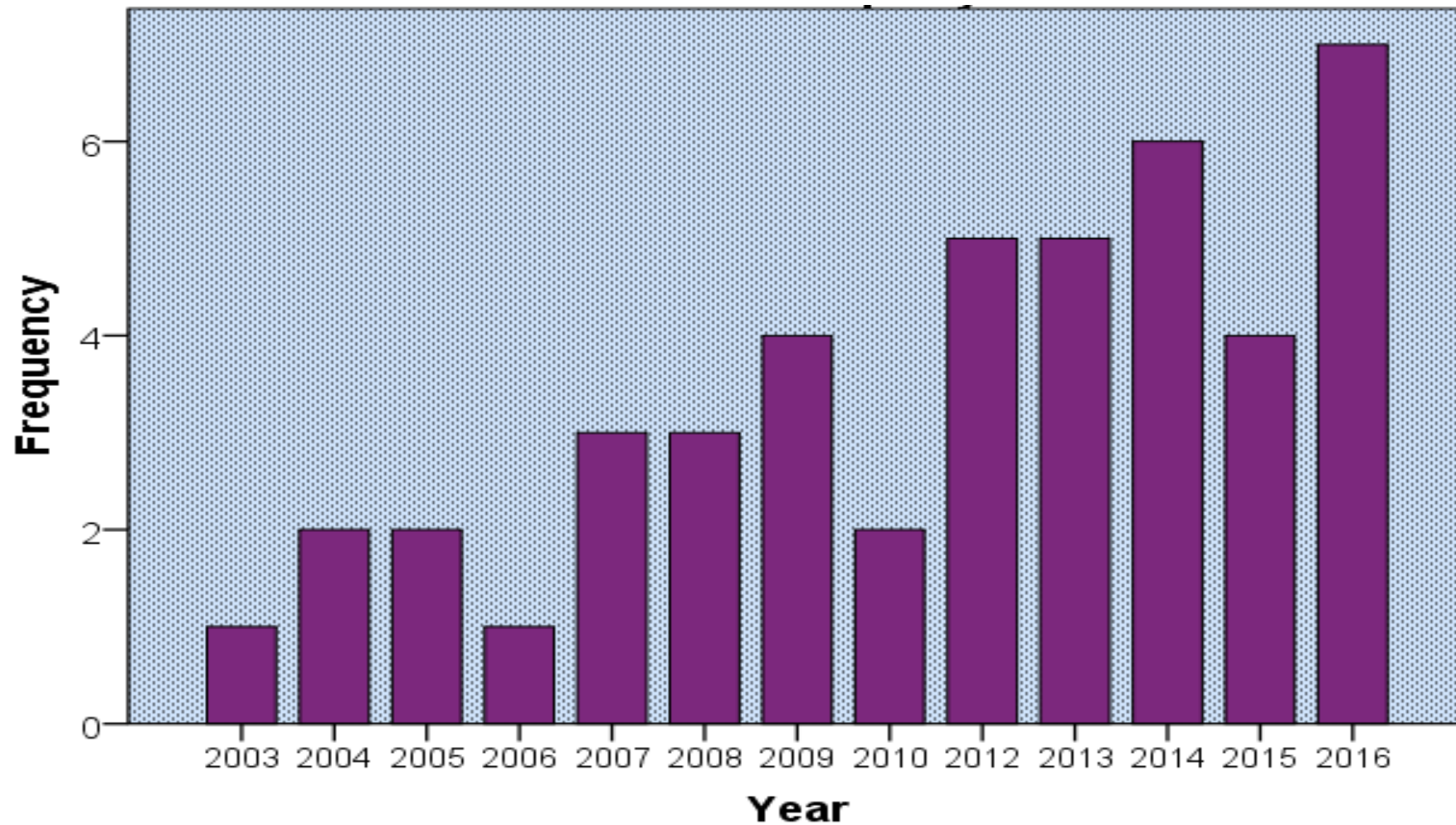
- Intrafamilial violence
  - School (bullying)
  - Neighborhood violence
  - Political/Terrorism/War

# Number of Articles Reporting Specific Types of Violence and Exposure to Violence

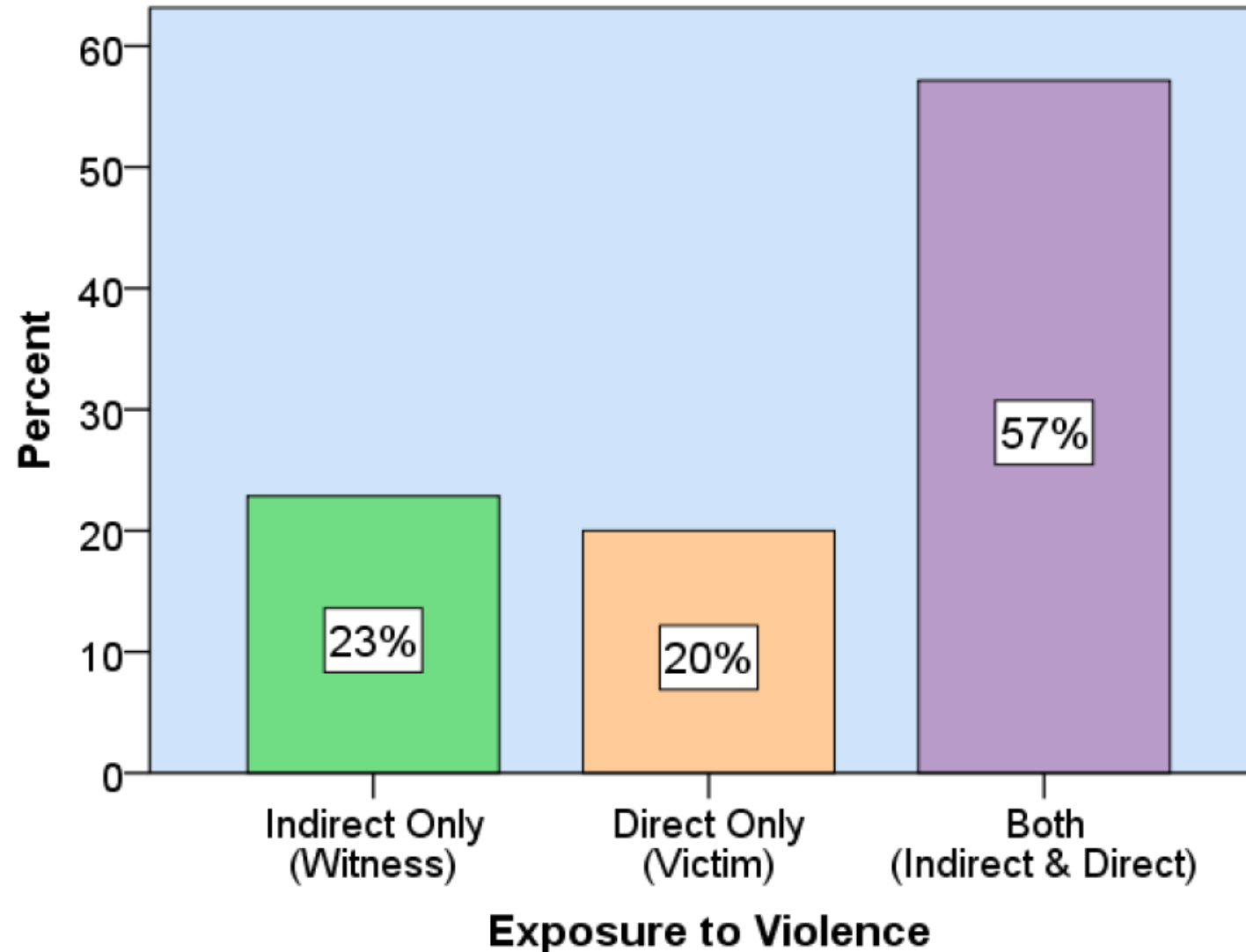
Category	Count	Percent
Physical	42	93%
Witness	38	84%
Victim	35	78%
Verbal/Threat	32	71%
Familial (home)	29	64%
Neighborhood	27	60%
Crime	26	58%
Sexual	20	44%
School	9	20%
Bullying	7	16%



# Number of Publications per Year on Violence is Increasing

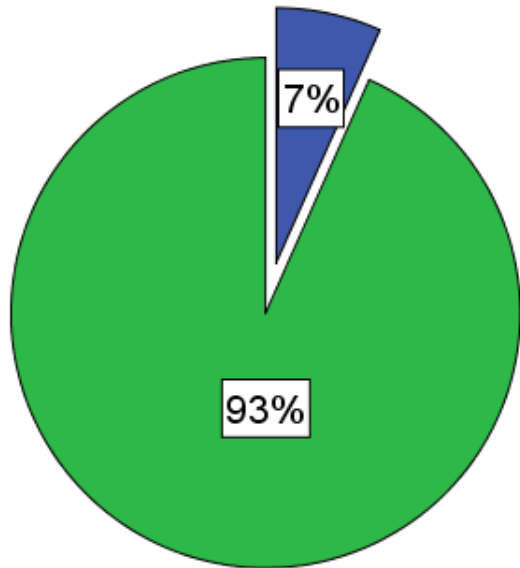


# Percentage of Articles on Indirect and Direct Exposure to Violence

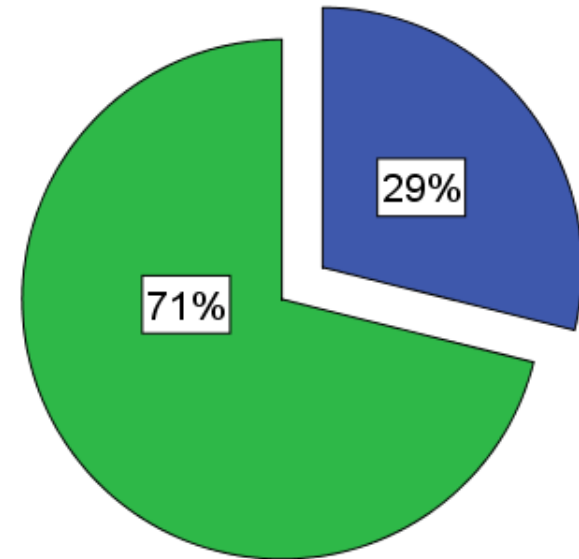


# Percentage of Articles on Specific Types of Violence

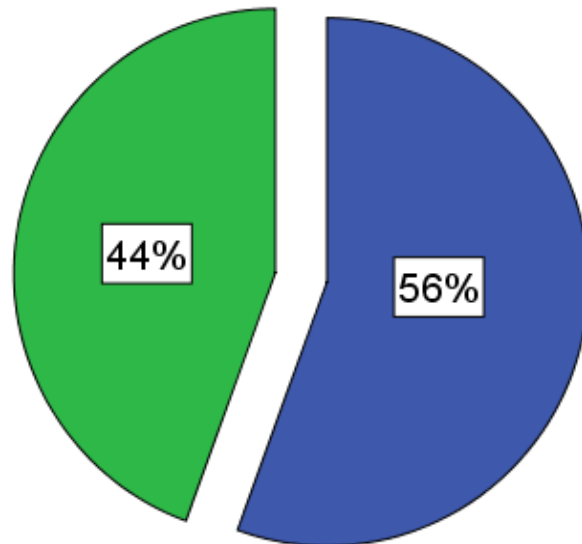
Physical



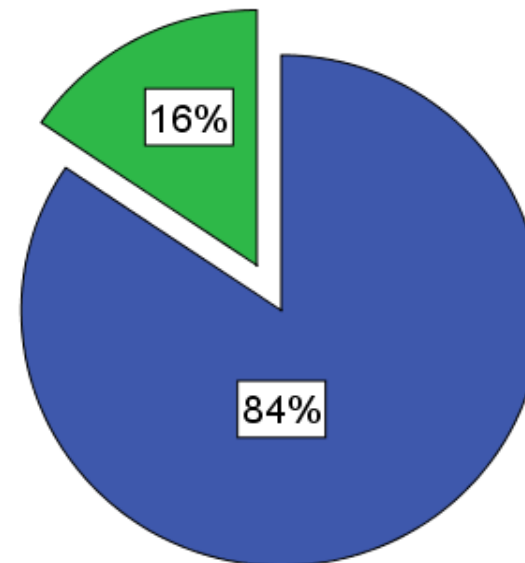
Verbal/Threat



Sexual



Bullying



no  
yes

# Links between Exposure to Violence and Health

- **Outcomes/Measures**

- Direct Physical Health

- General health
    - Chronic pain/conditions
    - Asthma & respiratory
    - Cardiac health

- Indirect physical health

- Obesity/weight/BMI
    - Risk/Health behavior
    - PTSD

- Health Indicators

- Telomere length
    - Cortisol levels

- **Chemical/Biological (pathway)**

- Cortisol levels

- Aiyer, 2014
    - Peckins, 2012
    - Suglia, 2009

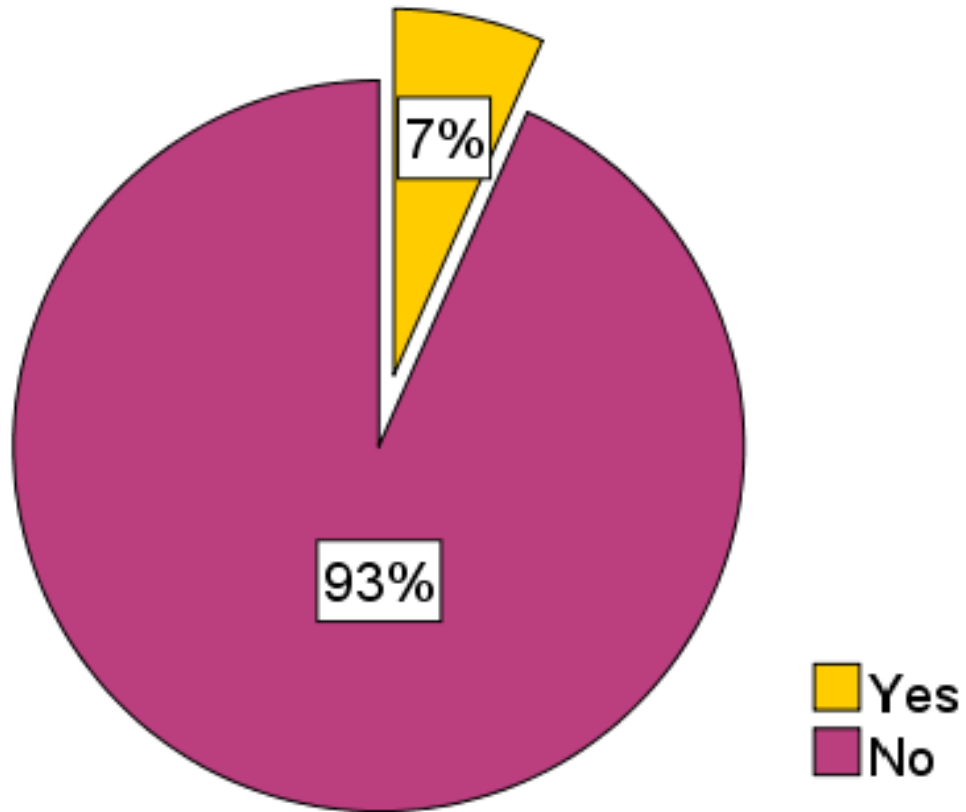
- Telomere

- Mitchell, 2014
    - Shalev, 2013

- MAOA – “Human Warier Gene”

- Oulette-Morin, 2016

# Percentage of Research on Exposure to BOTH a Chemical Stressor AND a Non-chemical Stressor



## Chemical Toxic: 3/45

Chiu, 2014

Clougherty, 2007

Shmool, 2014

# Example: Clougherty et al., 2007 (longitudinal)

## Synergistic effects of traffic related air pollution and exposure to violence on urban asthma etiology

### STUDY

- Working-class neighborhood in Boston
- 413 children 0 – 16 years old
- ETV (Chronic Stressor)
- Stressors
  - Violence (frequency of witnessing hitting, slapping, punching, shooting, stabbing, and hearing gunshots or domestic verbal abuse)
  - Air pollution (NO<sub>2</sub>)
- Asthma Diagnosis

### FINDINGS

- Significant for children with above average (Mdn) exposure to violence
- Effect of air pollution and violence was magnified among children in the same community over time
- Association b/w traffic related air pollution and asthma solely for children *exposed to violence*



# Preliminary Observations and Future Research Considerations

- Few studies on sexual abuse
- Dose-response reaction to type and amount of violence for heart disease (Dong, 2004; Riley, 2010)
  - Least is physical, Then sexual, then physical AND sexual
  - Number of adverse experiences
- Limited research on both chemical & non-chemical
- No chemical exposure research involving water – All have been air/inhalation exposure route

Future studies should consider study design that incorporates both chemical and non-chemical stressors from multiple source and routes.

# References

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# Thank You!