

# Brown Bag Lunch:

## The Development Origin of Health and Disease: A Sex and Gender Perspective

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# Objectives

- Pubertal timing and women's health
- Prenatal stress, metabolic functions and girls' pubertal timing
- Results from a study conducted through the *Ice Storm Project*
- Early puberty in girls as gendered stressor
- Ongoing and future research
- International Society for Gender Medicine

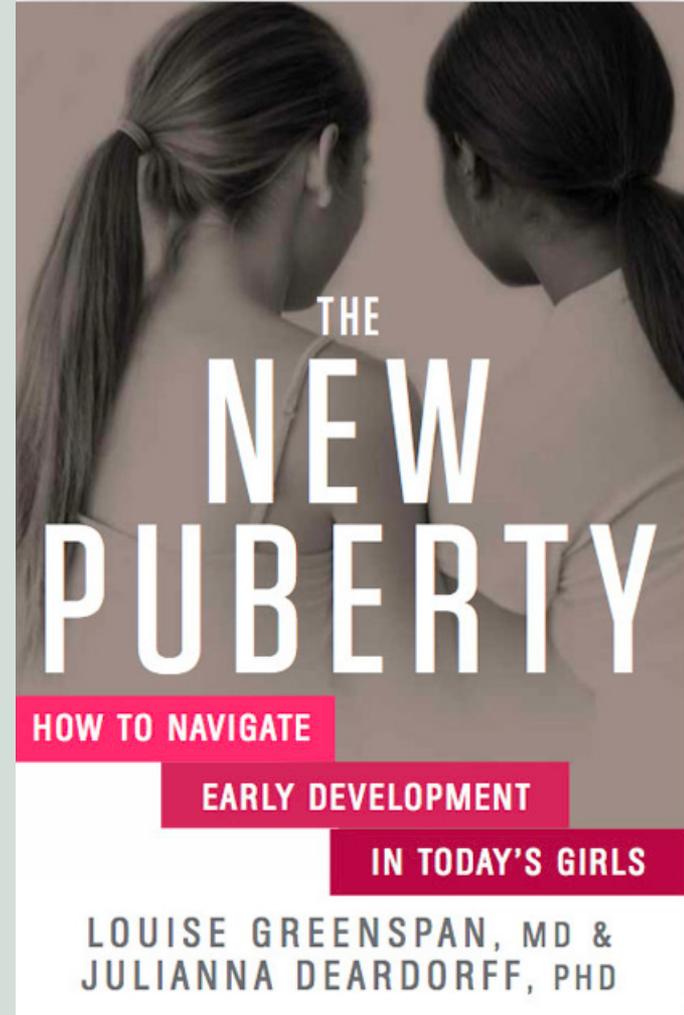
# TIME

Is it hormones?  
Is it fat? Is it something  
in the water?  
How parents and  
kids are coping

## EARLY PUBERTY

WHY GIRLS ARE  
GROWING UP FASTER

10/30/00  
\$3.50  
AOL Keyword: TIME



THE  
**NEW  
PUBERTY**

HOW TO NAVIGATE  
EARLY DEVELOPMENT  
IN TODAY'S GIRLS

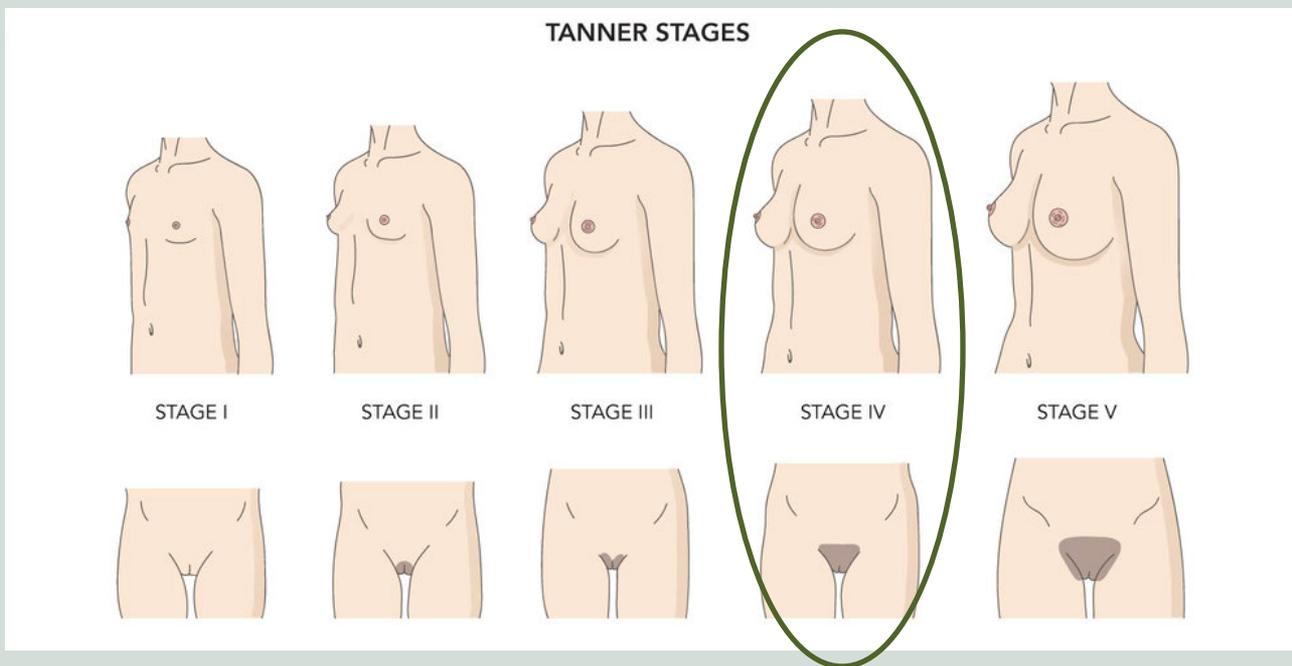
LOUISE GREENSPAN, MD &  
JULIANNA DEARDORFF, PHD

THE BLOG 08/27/2012 10:51 am ET | Updated Oct 27, 2012

## Is 7 the New 10? Why Do Some Girls Start Puberty So Early?



By Glenn D. Braunstein, M.D.



## Secular trend for the reduction in Age at Menarche

### ➤ United States

1960 to 1990: 13.5 to 12.5; 1990 to 2000: 12.5 to 12.3; 2007 no change

Cabera et al., 2014

### ➤ Canada

2000-2001 : Mean 12.72 years Median 12.67 years

14.6% < 11.53 years; 68 % between 11.53 and 13.91 years, 17.4 % > 14.1 years

Harris et al.,2008; Al-Sahab et al., 2010

Marshall and Tanner, 1969

# Pubertal timing and women's health

## Younger age at menarche (AAM)

### ➤ Vascular diseases

Canoy et al., 2015

### ➤ Type II diabetes

He et al., 2010

Janghorbani et al. 2014

### ➤ Breast & endometrial cancer

Berkey et al., 1999

Hsieh et al., 1990

Karageorgi et al., 2010

Gong et al., 2015

Rosner et al., 1994

### ➤ Depressive symptoms

Trepanier et al., 2013

Culpin et al., 2015

Gaysina et al., 2015

Tondo et al., 2017;

Joinson et al., 2017

### ➤ Eating disorders

Posner, 2006

### ➤ Risky sexual behaviors

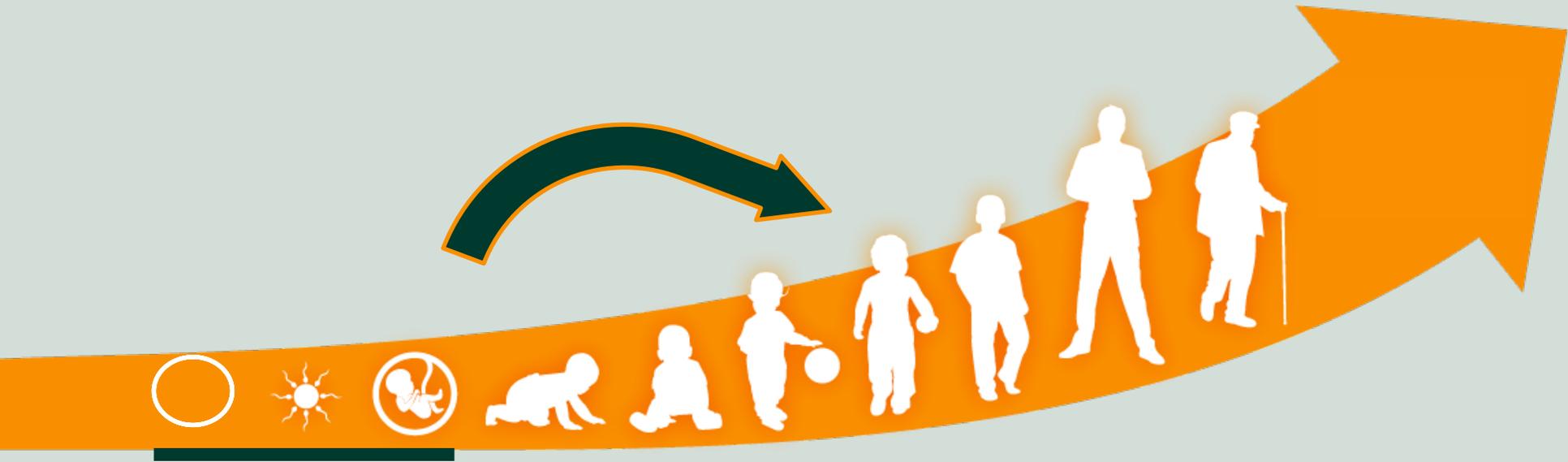
Baams et al., 2015

### ➤ Delinquent behaviors

Burt et al., 2006

Menarche under 11 year old carries the higher risks

# Development Origin of Health and Disease



# *Project Ice storm*



Dr Suzanne King,  
McGill University

## **Natural disaster induced prenatal stress**

- ✓ January 1998, freezing rainfall
- ✓ Over 3 million people left without power



## **Prenatal stress assessments**

- ✓ Objective : Loss, Scope, Change range [0-24]
- ✓ Subjective: Intrusion, Hyper arousal and Avoidance range [0-55]

## **Longitudinal outcomes**

- ✓ Psychological and physiological data collected at birth, 5.5, 8, 11, 13.5, 15.5, 18
- ✓ **Age at menarche** reported at 13.5 and/or 15.5 years of age.

# Adiposity, prenatal stress and pubertal timing

- ✓ Increased adiposity is associated with advanced pubertal timing. (reviewed in Juul et al., 2017).
- ✓ Prenatal stress predicts increase in metabolic functions (Dancause et al., 2012)



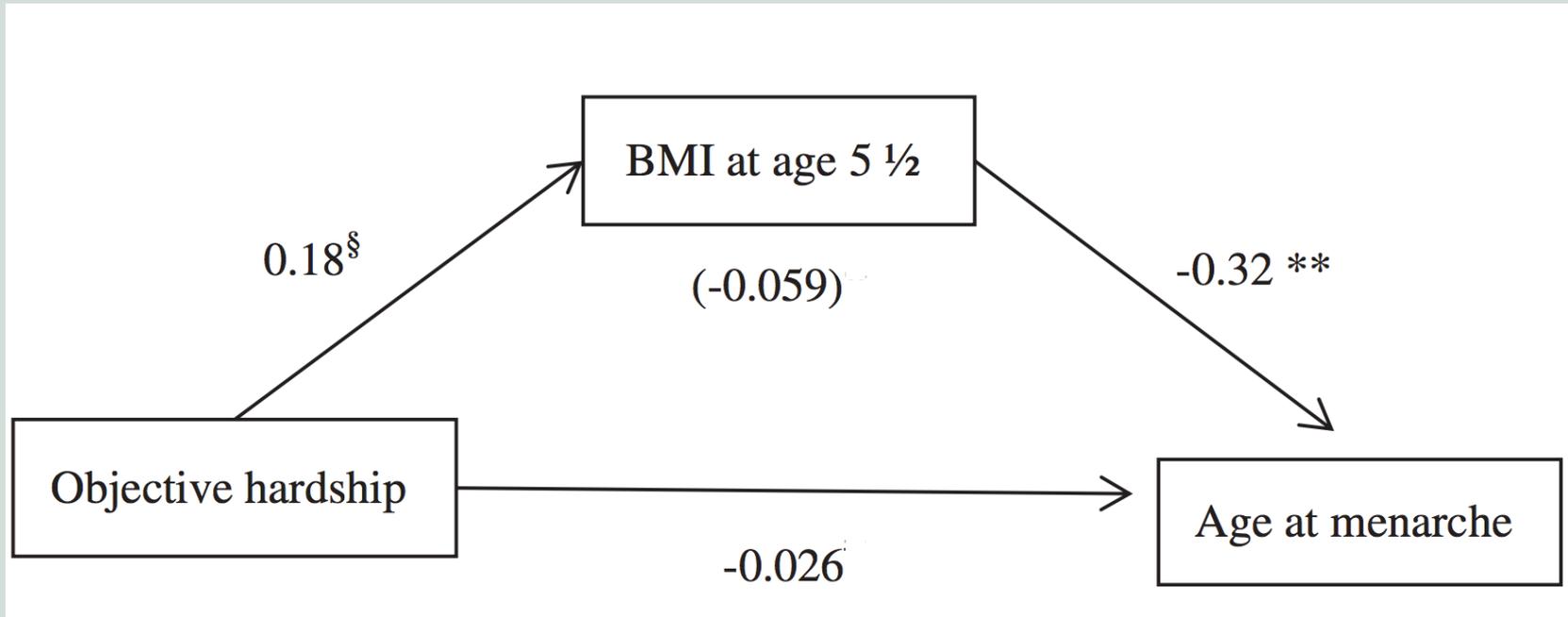
Could the relation between prenatal maternal stress and girls' pubertal timing be mediated by early changes in adiposity?

# Adiposity, prenatal stress and pubertal timing

Characteristics	Study sample ( $n = 30$ )
→ Age at menarche (years)	12.10 (0.84) [10.30–14.20]
Mother's age at birth of child	30.34 (3.89) [20.23–37.25]
→ Highest household SES (Hollingshead)	27.20 (9.84) [11–47] Upper class ( $n = 5$ , 16.7%) Upper middle class ( $n = 14$ , 46.7%) Middle class ( $n = 11$ , 36.7%)
Number (%) of mothers who smoked during pregnancy	6 (20.00)
Length of gestation (weeks)	39.53 (1.96) [32.86–41.71]
Birth weight (g)	3427.41 (604.21) [1850–4432]
Ponderal index	27.76 (3.57) [20.77–36.15]
Obstetric complications	4.29 (2.81) [0–12]
Major life events (6 months)	5.00 (2.74) [1–10]
Major life events (5.5 years)	4.04 (2.46) [0–12]
→ BMI at 5.5 years of age	15.60 (1.62) [12.92–20.02]
→ Objective hardship	9.77 (3.72) [3–18]
→ Subjective distress	11.06 (12.66) [0–55]

SES, socio-economic status; BMI, body mass index.

# Significant indirect effect



Significance of the model did not change after separately controlling for SES, gestational length, birth weight, obstetrical complications and major life events at birth and 5 years old.

# Result Summary

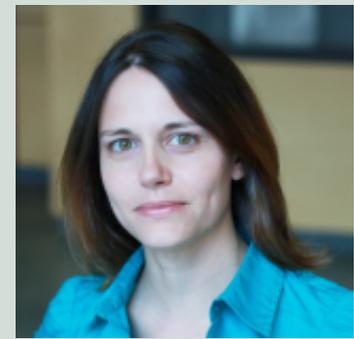
Prenatal maternal stress can lead to advanced puberty in girls through its effects on BMI at 5 ½ years old.

Effects only found for objective hardship.

Need to reproduce this finding in a larger more socio demographically diverse population.

Important to consider early life stress history when looking at the relation between pubertal timing and women' health.

# Ongoing project: Prenatal maternal stress, reproductive and sexual health



Dr Sherri lee Jones,  
McGill University

- Prenatal maternal stress:
  - Sexual functions (arousal, desire and inhibition)
  - Integrity of the hypothalamic pituitary gonadal axis:
    - Pelvic imaging in boys and girls (volume of prostate and testes in boys; volume of ovaries and antral follicle counts in girls )
    - Volume of the pituitary and hypothalamic nuclei.
    - Endocrine measurements

# Early puberty and women's health, a cause or consequence ?



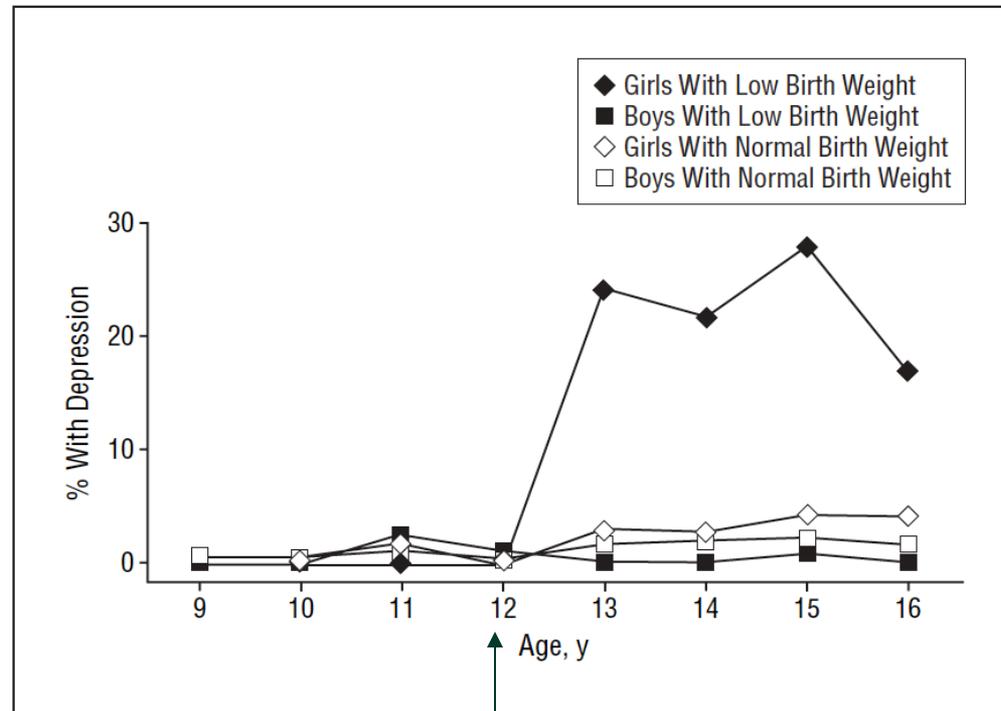
# Early puberty as a gendered stressor

## Advanced puberty in girls

- Increase risk of sexual assault (Vicary et al., 1995)
- Increase sexual harassment (Skoog and Ozdemir, 2016)
- Increase peer victimization\* (Hamlat et al., 2015)
- Increase sexual rumor \* (Reynold and Juvonen, 2011)
- Decrease in body esteem\* (Hamlat et al., 2015)

\* Mediated the association between advanced puberty and depressive symptoms.

# Prenatal adversity, depressive symptoms and sex differences:



**Figure 1.** Three-month prevalence of depressive disorder by sex and birth weight.

# Early puberty, hormones and gendered stress

- Early maturing girls tend to have higher levels of luteinizing hormone (LH), follicle-stimulating hormone (FSH) and estradiol (reviewed in Mendle, 2007)
- Cortisol stress response increases with pubertal development (van der Bos et al., 2014)
- **PRECLINICAL:** Stress exposure during pubertal development, estradiol and depressive-like behaviors (Ismail et al, 2012)

Pubertal development is a critical period for the development of the stress response and regulation

# Go Grrrls: A Randomized Controlled Trial of a Gender-Specific Intervention to Reduce Sexual Risk Factors in Middle School Females

**Table 1.** Program Components.

Developmental issues	Developmental process	Program implementation: Empowerment objectives
Gender role identification	At puberty, gender-intensification theory suggests gender-related expectations influence behavior.	Enhance positive messages about gender roles Promote a more positive sex-role self-image
Body image	Adolescent girls are at risk to develop a negative body image that leads to low self-esteem, depression, body image disturbance, and eating disorders.	Promote understanding of the changes that take place during puberty Promote positive body image and body acceptance
Self-acceptance	In early adolescence, girls have a drop in self-esteem, and this is accompanied by increased self-criticism, negative mood states, and for some girls, depression.	Promote a positive self-image in response to the biological, psychological, and social changes girls confront Reduce self-criticism and promote positive mood states
Sexuality	Girls' sexuality is a major issue because of the potential consequences associated with high-risk behaviors. As girls develop sexually they need information and skills to prevent unwanted sex, unwanted pregnancies, and STDs.	Promote awareness and understanding of sexuality issues Understanding risk factors for pregnancy Enhance responsible decision making and safe sex Broaden girls understanding of sex so it isn't seen only as intercourse
STI/HIV education	As a part of girls' sexuality, girls who engage in sexual activity need to possess the ability to protect themselves from STIs.	Address the special risks for younger girls Promote the use of condoms to prevent pregnancy and STIs Teach assertiveness skills in negotiating sexual behaviors including condom use
Responsible decision making (skills training)	Most adolescents in today's society will confront decisions that could have life-long, if not, lethal consequences. The cognitive development of young people has important implications for adolescent risk taking.	Promote responsible decision making by teaching assertiveness, resistance to peer pressure, and problem solving skills In conjunction with decision making encourage personal assertiveness and skills for reducing sexual risk taking
Planning for the future	Adolescent girls often experience a "crisis in confidence" that undermines their educational and career decisions for later life.	Enhance girls' achievement motivation Build their confidence for educational and vocational aspirations Teach a "mastery orientation" as opposed to a "learned helplessness" orientation

Note. STD = sexually transmitted disease; STI = sexually transmitted infection, HIV = human immunodeficiency virus.

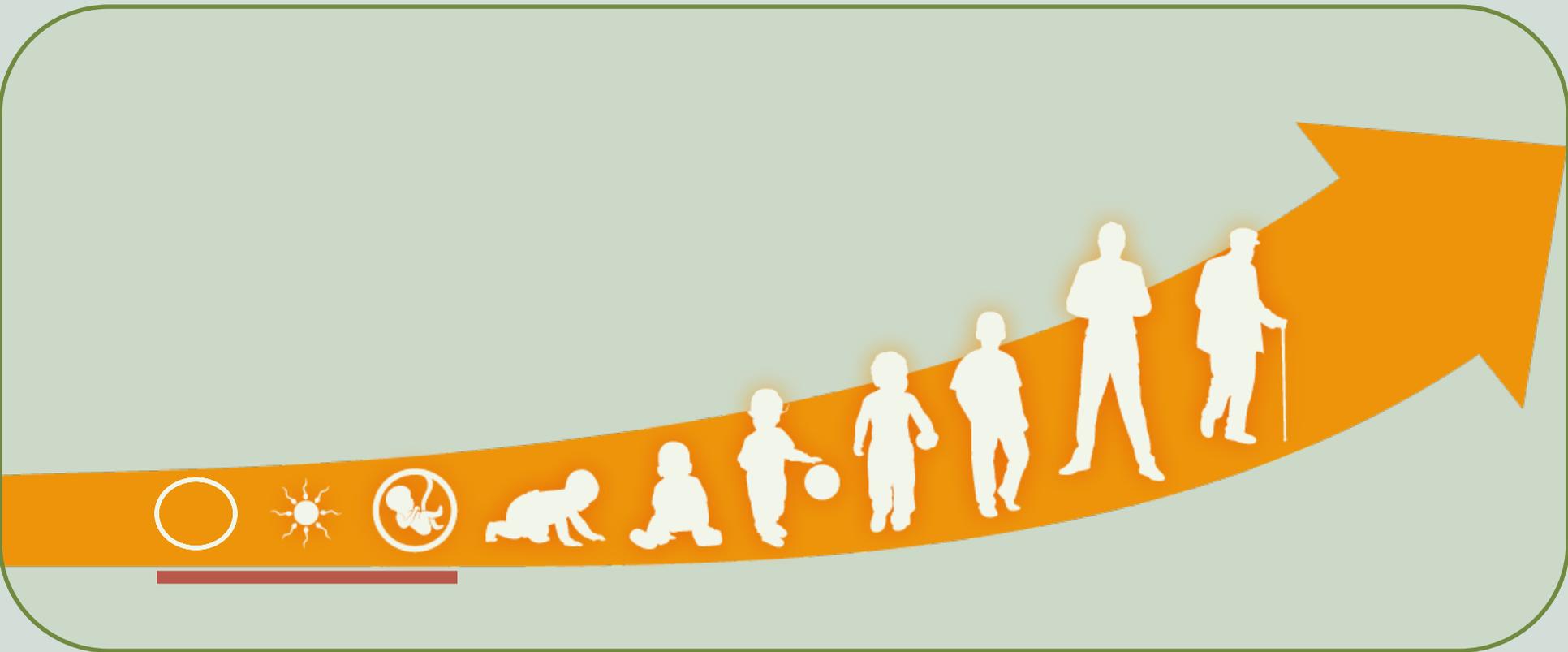
## Education, Empowerment and Support

# Ongoing and future projects



- ✓ Investigating the mediating role of pubertal timing as a gendered stressor in the the relation between prenatal adversities and depressive symptoms in adolescent girls. The National Longitudinal Survey of Children and Youth
- ✓ Neuroendocrine correlates of pubertal experiences.
- ✓ Gender perspectives on chronic stress.[Arija Birze, UofT]
- ✓ Empowerment and sense of community with incoming students UNBC through dance workshops. [Ashleigh Ritchie, Royal Academy of Dance].

# Sex and gender developmental perspectives on health



Attention to sex and gender perspectives should be integrated in the study of Early life experience in men and gender diverse individuals.

Inter

"An informative read for the general audience, health care providers, and students." –VIRGINIA M. MILLER, PH.D., PROFESSOR, SURGERY AND PHYSIOLOGY DIRECTOR, WOMEN'S HEALTH RESEARCH CENTER, MAYO CLINIC

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*The Groundbreaking New Science of Gender- and Sex-Related Diagnosis and Treatment*

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RESEARCH ARTICLE

The contribution and network Post-Trauma



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- Sherri Jones, PhD
- Larine Sluggett, MSc
- Arija Birze, PhD candidate
- Ashleigh Ritchie, PhD



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**Merci , Thank you !**