Is there an optimal daily movement pattern for heart health?
A study of Canadian workers' activity tracker data

Avi Biswas

Institute for Work & Health Speaker Series

June 14, 2022

Institute for Work & Health | Research Excellence
Safe Work
Healthy Workers

Acknowledgements

Research Team

Avi Biswas (Co-PI)

Cameron Mustard (Co-PI)

Cynthia Chen

Peter Smith

Stephanie Prince Ware
(Public Health Agency of Canada)

Funding Source:

Institute
for Work &
Health

2

Open-access publication

Key findings

- Canadian workers had 6 distinct daily physical activity (PA) patterns

- Workers with moderate or high PA through the day or during evenings had lower heart disease risk compared to least active workers

- Workers with high daytime activity were not different in their heart disease risk to the least active

➢ **Promoting PA outside work hours may be the optimal strategy for heart health benefits in working populations**

Institute
for Work &
Health

Physical activity and heart health

Move More. Reduce Sedentary Time. Sleep Well.

Source: Canadian Society for Exercise Physiology

- Being physically inactive contributes to:
  - Unhealthy weight gain and obesity
  - High cholesterol
  - Elevated blood pressure and blood glucose levels

  - All heighten the risk of developing cardiometabolic diseases

"Adults accumulate a weekly average of 150 to 300 minutes of moderate intensity or ≥75 minutes of vigorous physical activity (PA), or an equivalent combination."

https://www.who.int/publications/i/item/9789240015128

Institute for Work & Health

How working lives influence physical activity

Work stress	**Long work hours**	**Multiple jobs**	**Shift work / Night work**	**Physical work**
Home stress	**Time availability**	**Home responsibilities**	**Low motivation**	**Tiredness**

Institute for Work & Health

Poll #1

Which of these make it hard for you to be physically active? Check all that apply.

1) Your workplace / the nature of your job

2) I don't have much time or energy after work

3) I'm not motivated right now

4) Other

Limitations of the Physical Activity guidelines

- Guidelines are agnostic to the settings in which PA occurs

Watch slidecast

Download presentation

The health paradox of physically demanding work: What is it and should we be concerned? (902.39 KB)

https://www.iwh.on.ca/events/speaker-series/2021-may-11

- Evidence from population-based studies mostly based on self-reported PA

Are there alternative PA strategies that are also heart healthy?

Institute for Work & Health

Objectives

1. Describe the distinct physical activity patterns of workers

2. Identify which physical activity patterns are associated with a lower future risk of heart disease over a 10-year period
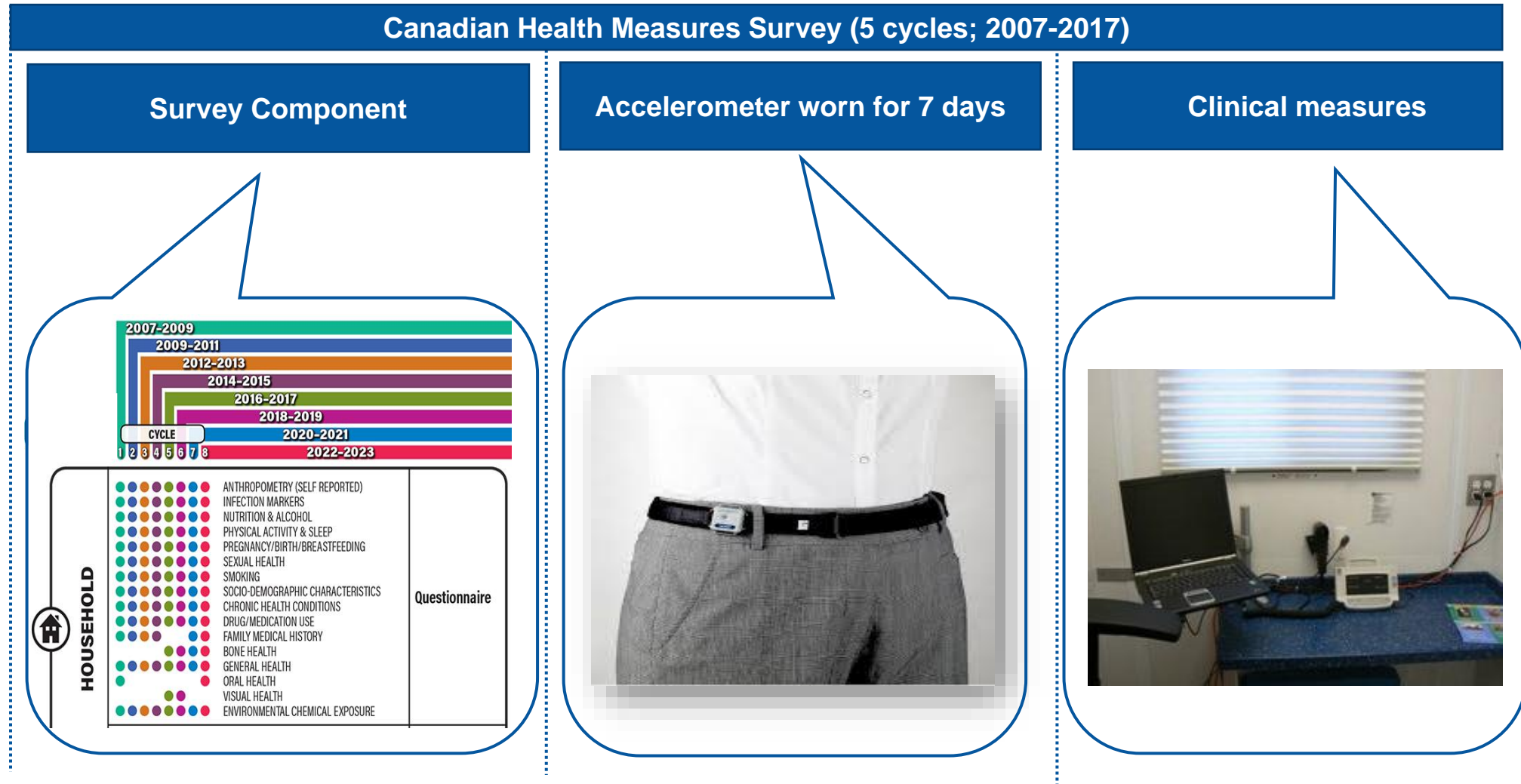
Institute
for Work &
Health

Data collection

Canadian Health Measures Survey (5 cycles; 2007-2017)

| Survey Component | Accelerometer worn for 7 days | Clinical measures |

Institute for Work & Health

Data processing

| Canadian Health Measures Survey (5 cycles; 2007-2017)		
Survey Component	**Accelerometer worn for 7 days**	**Clinical measures**

1 **Identify movements**

Working adults ≥18 years of age. Sample: ~10,582 adults	Sedentary behaviour Light-intensity physical activity Moderate-intensity physical activity Vigorous-intensity physical activity	Height and weight Waist circumference Blood pressure Cholesterol Blood sugar
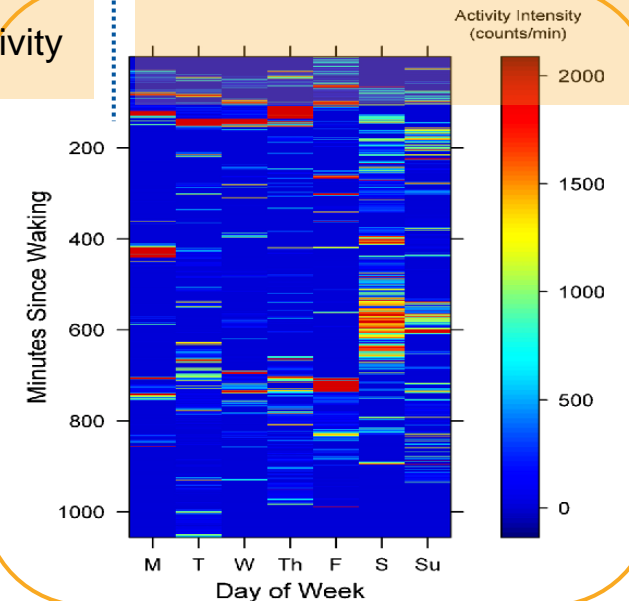
Identifying similar physical activity patterns

Hierarchical Cluster Analysis

Outcome: Predicted 10-year risk of first heart disease event

- Defined as fatal or nonfatal heart attack or coronary heart disease, or stroke over a 10-year period among people free from heart disease at the time of study participation

A high risk corresponds to the upper risk threshold for prescribing low-to-moderate dose statins to reduce heart disease risk
(US Preventive Services Task Force)

*Goff et al. ACC/AHA guideline on the assessment of cardiovascular risk. Circulation. 2014.

Outcome: Predicted 10-year risk of first heart disease event

https://tools.acc.org/ldl/ascvd_risk_estimator/index.html#!/calulate/estimator/

Final models

All results were statistically adjusted for the following characteristics:

Measurement
- Accelerometer wear time
- Seasonality

Sociodemographics & Lifestyle
- Age
- Education
- Household income
- Marital status
- Cohabitating with dependent child
- BMI
- Alcohol consumption

Work
- Hours worked per week
- Work stress
- Employed or self-employed status
- Physical demands of work
- Stationary or dynamic work?

IWH Institute for Work & Health
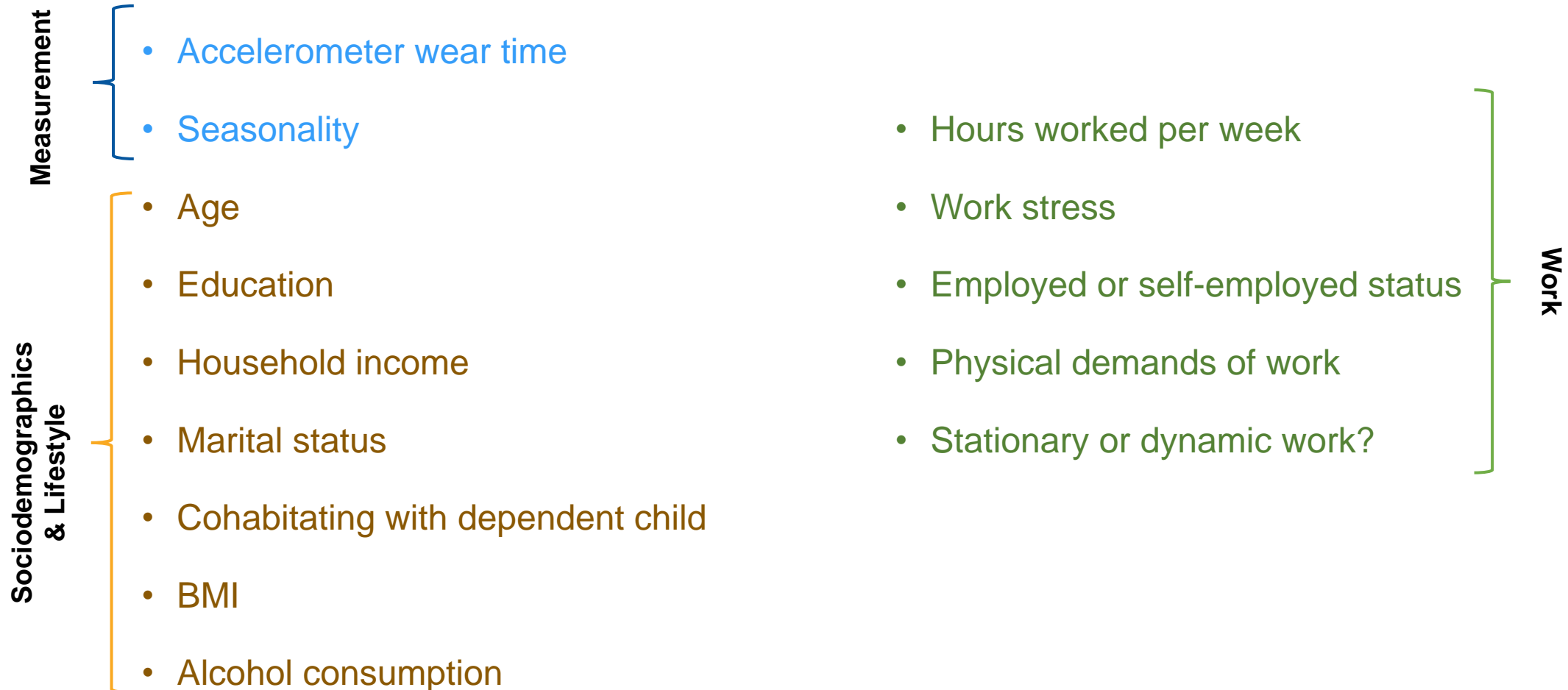
Study sample – 8,909 workers

47% women; 53% men

Average age of 42 years

66% were married/in a common-law relationship

69% had attained postsecondary education

40% had children under 12 years living at home

63% in higher household income group

82% were in full-time work

Average work hours of 40 hrs/wk

66% perceived a bit or quite a bit of work stress
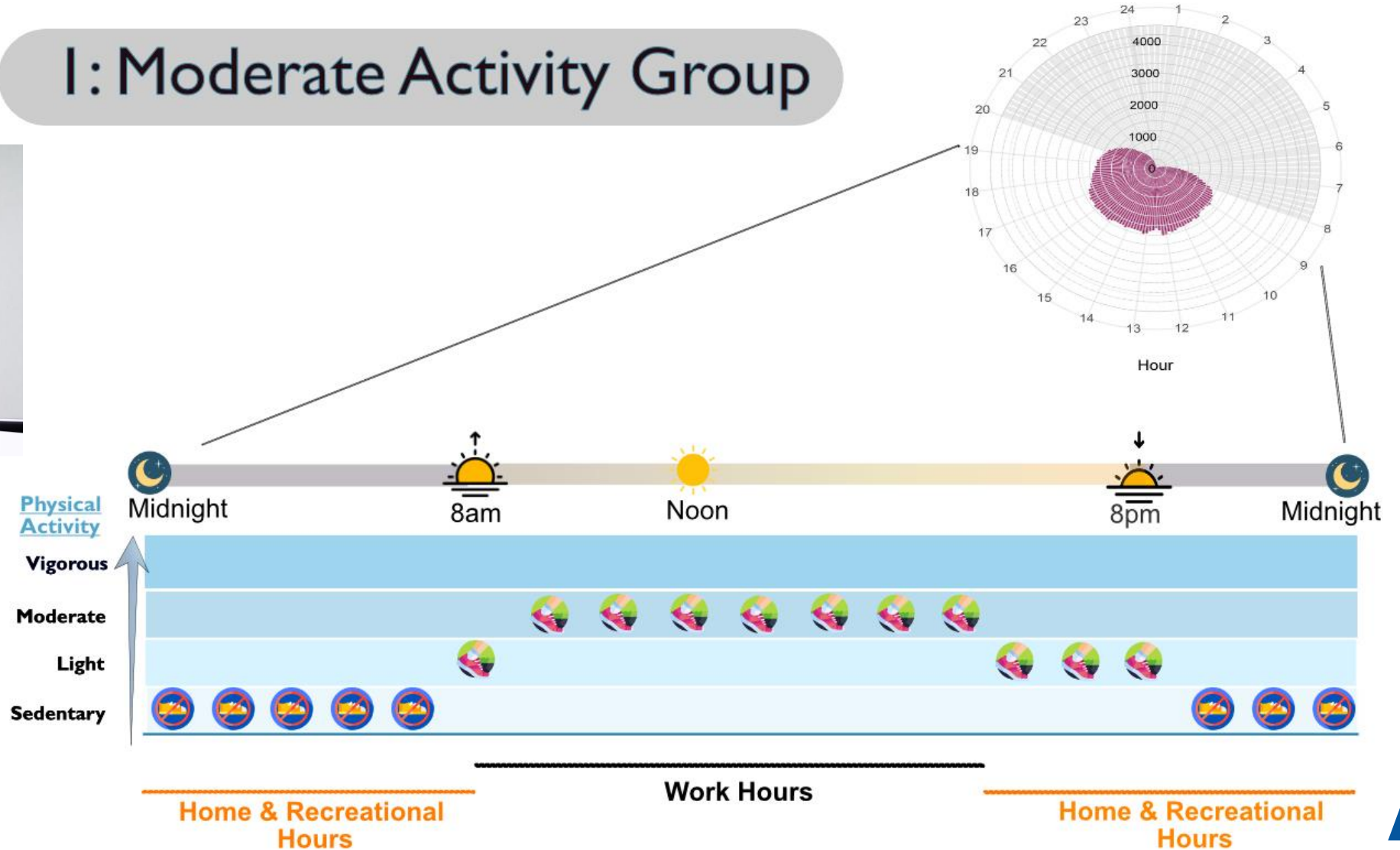
59% were overweight or obese

96% did not have pre-existing diabetes

Institute for Work & Health

Pattern 1 – 3,219 workers

Sales associate

I: Moderate Activity Group

Hour

Physical Activity

Vigorous

Moderate

Light

Sedentary

Midnight — 8am — Noon — 8pm — Midnight

Work Hours

Home & Recreational Hours — Home & Recreational Hours

Pattern 2 – 2,808 workers

Sedentary person

2: Lowest Activity

Hour

Physical Activity

Vigorous

Moderate

Light

Sedentary

Midnight | 8am | Noon | 8pm | Midnight

Work Hours

Home & Recreational Hours

Home & Recreational Hours
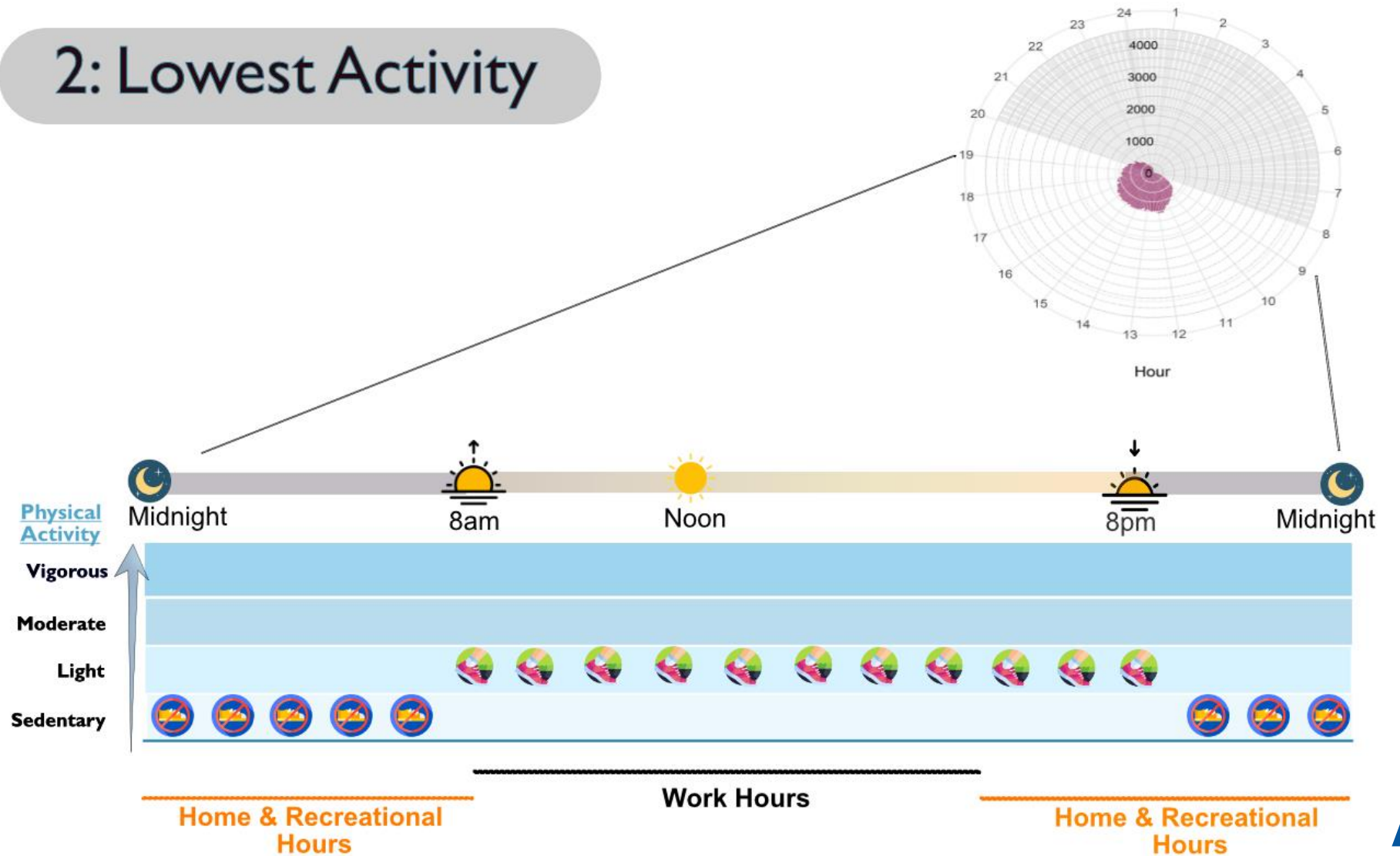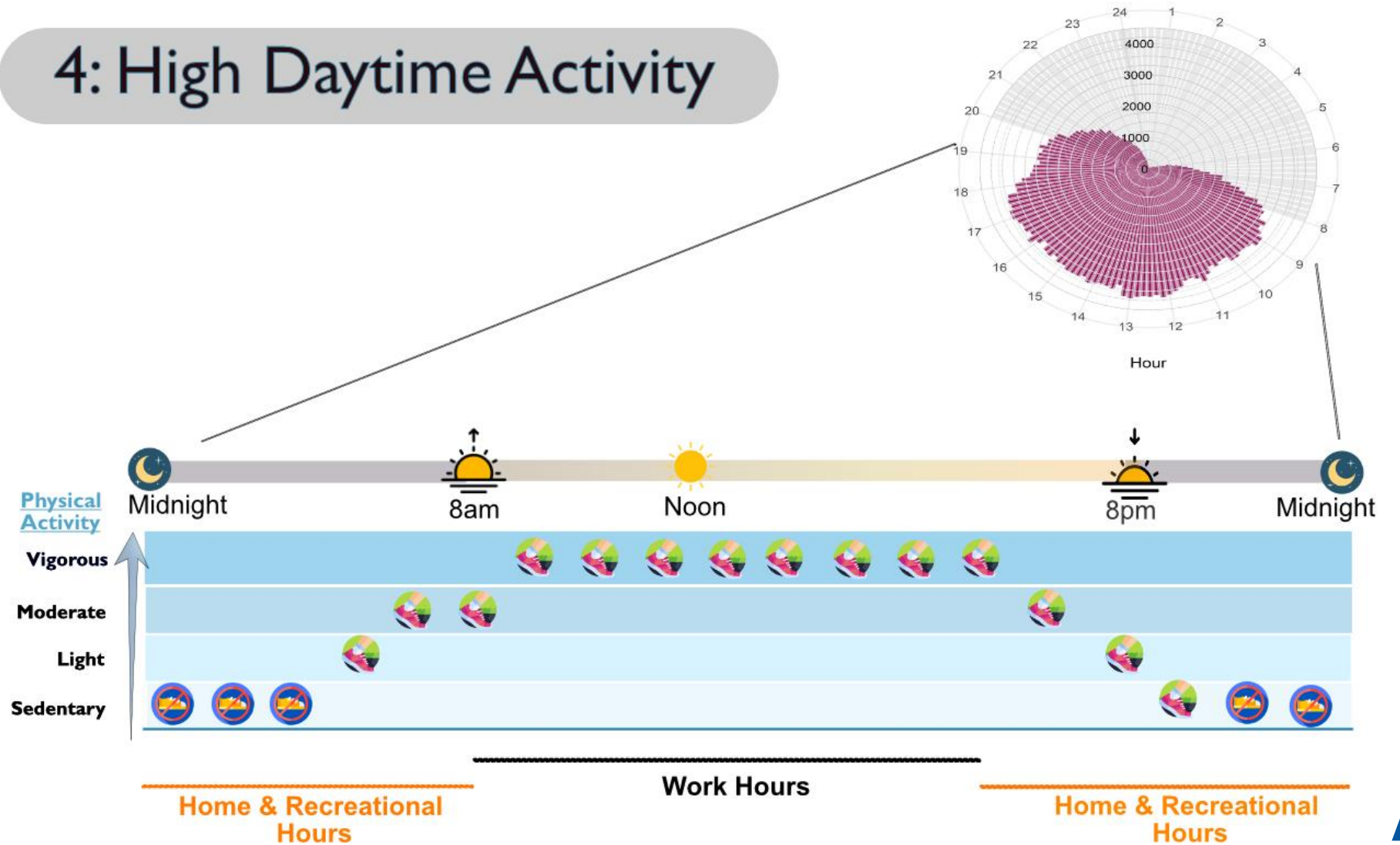
Pattern 3 – 1,194 workers

Early childhood educator
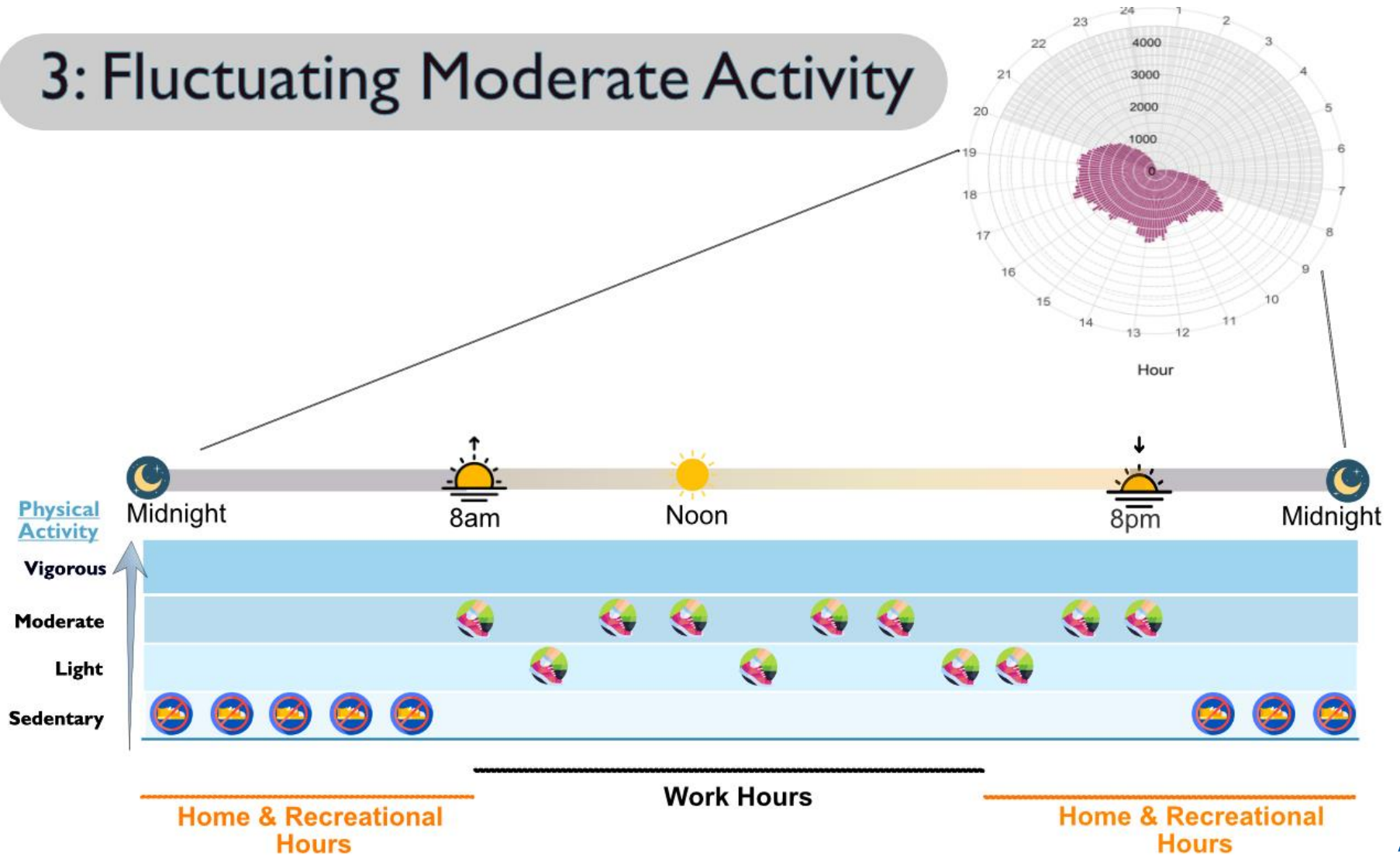
3: Fluctuating Moderate Activity

Construction worker

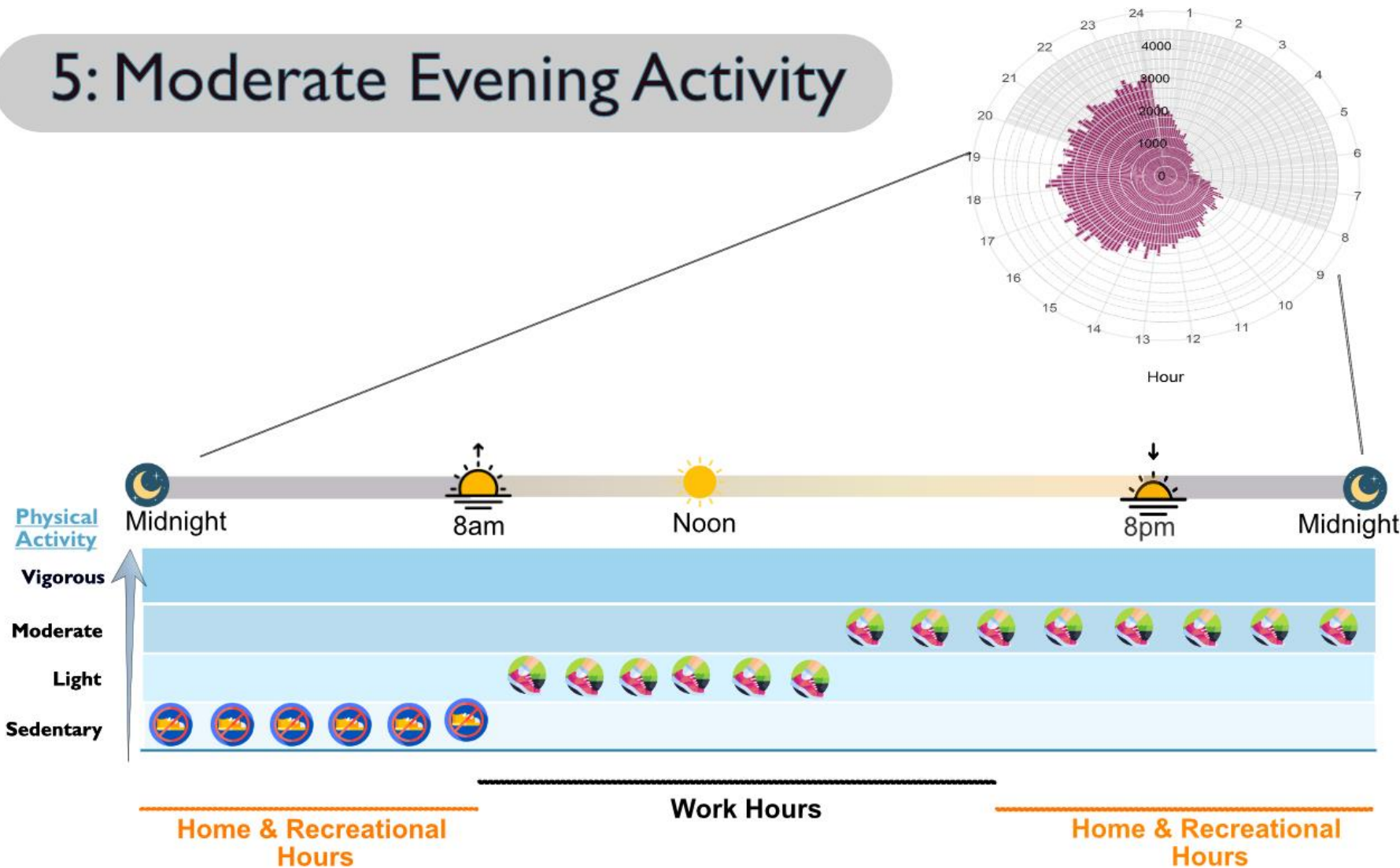# Pattern 5 – 225 workers

5: Moderate Evening Activity

Night shift workers

Pattern 6 – 750 workers

Active person

6: Highest Activity

Hour

Physical Activity

Vigorous

Moderate

Light

Sedentary

Midnight | 8am | Noon | 8pm | Midnight

Work Hours

Home & Recreational Hours
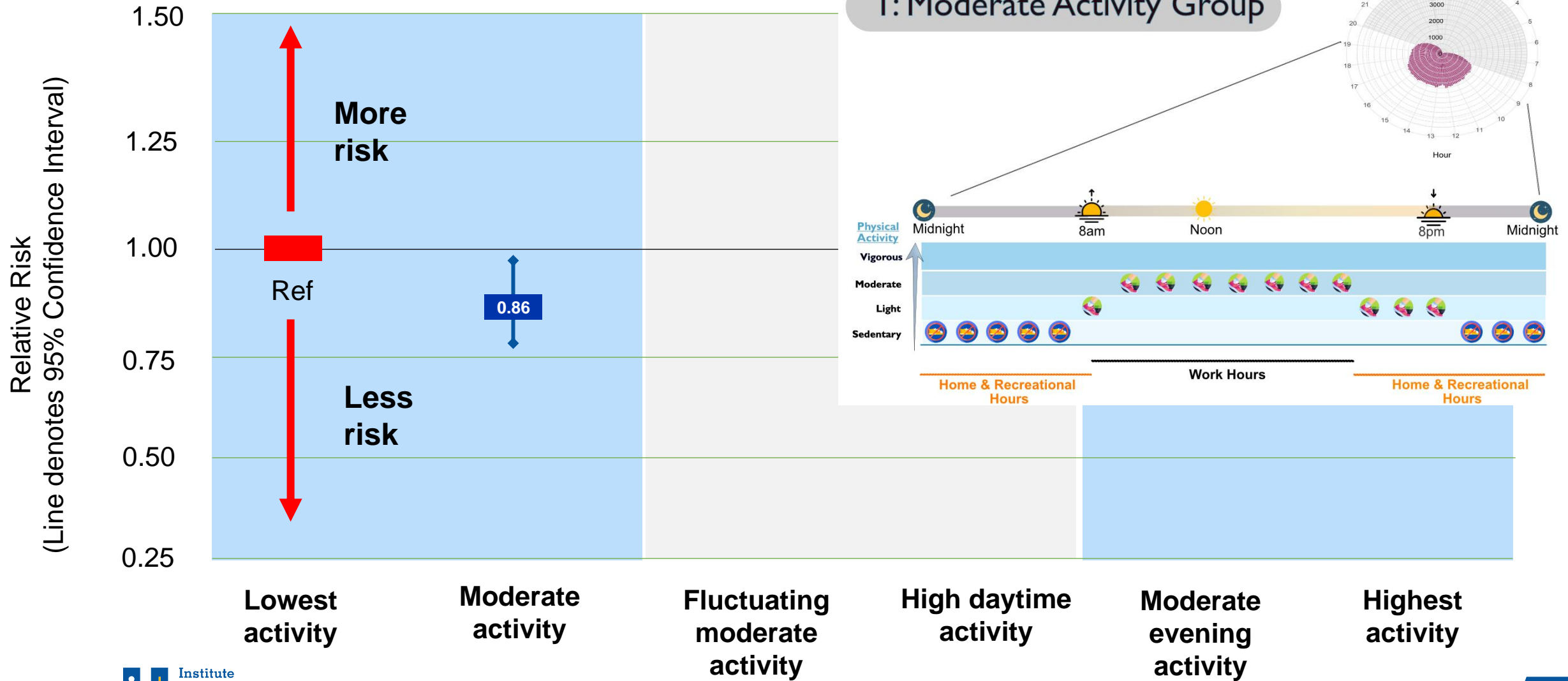
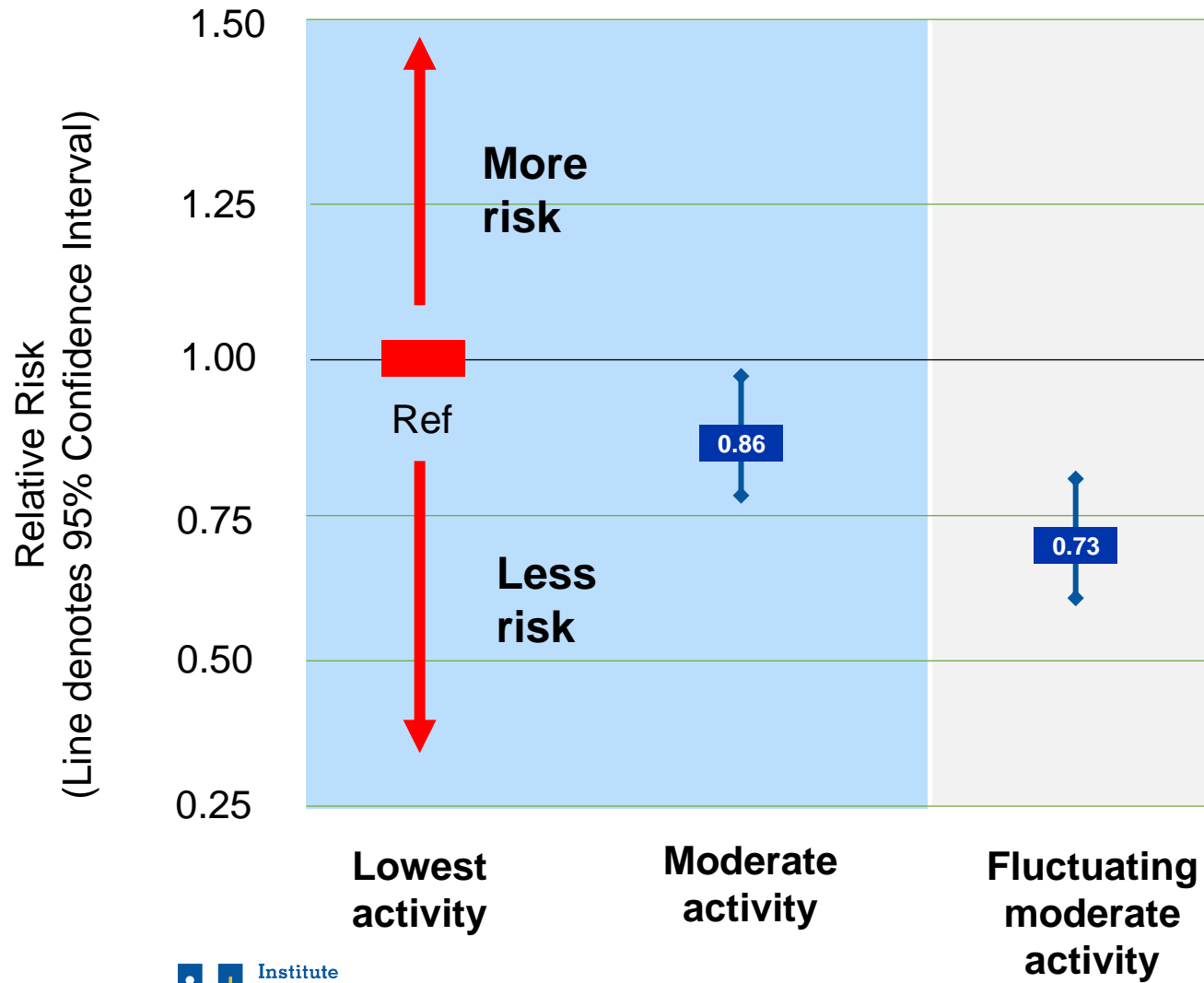Home & Recreational Hours

Institute for Work & Health
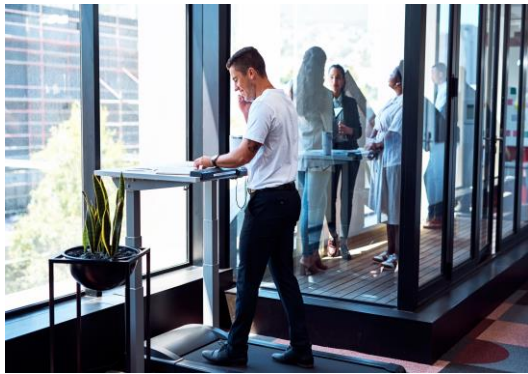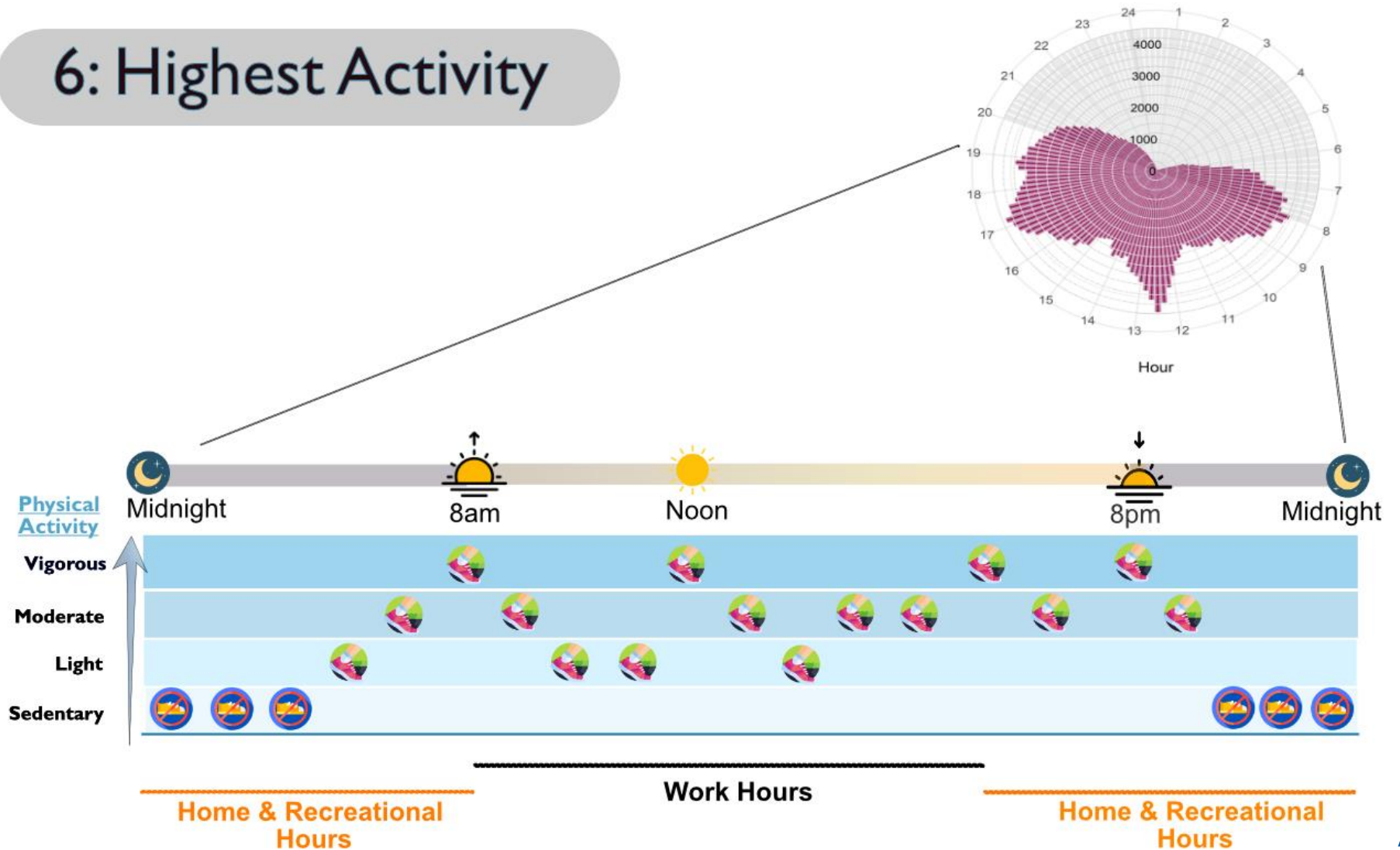
Poll #2

Which activity pattern fits closest to your own activity on an average day?

1) Lowest activity

2) High daytime activity

3) Fluctuating moderate activity or moderate activity
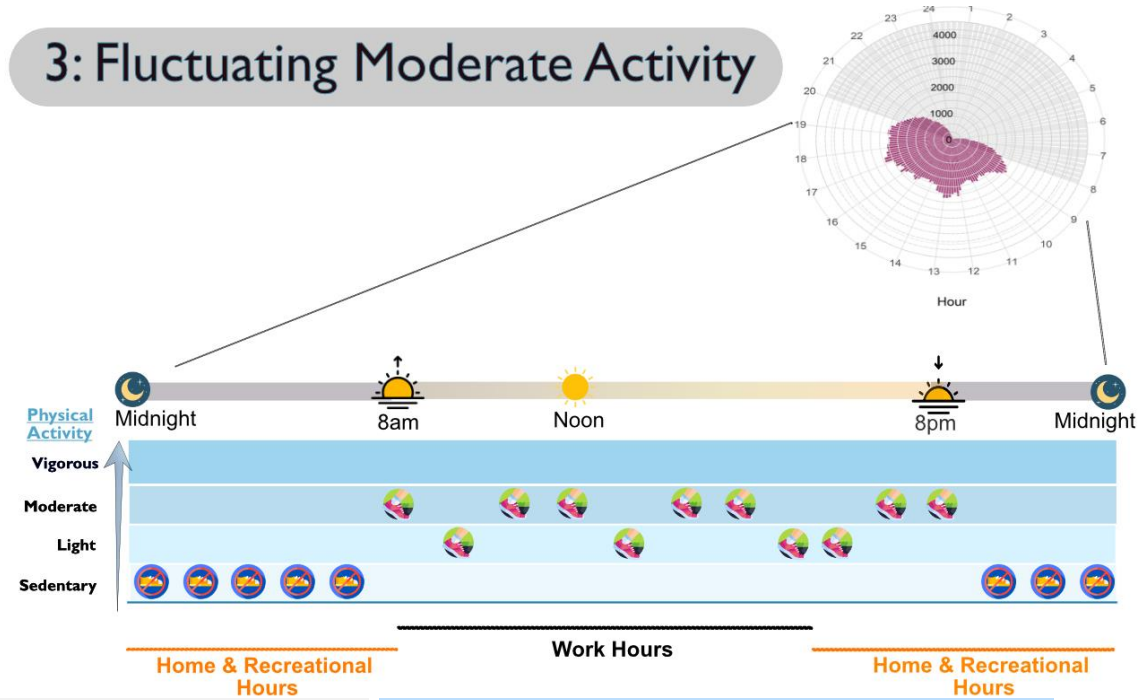
4) Moderate evening activity
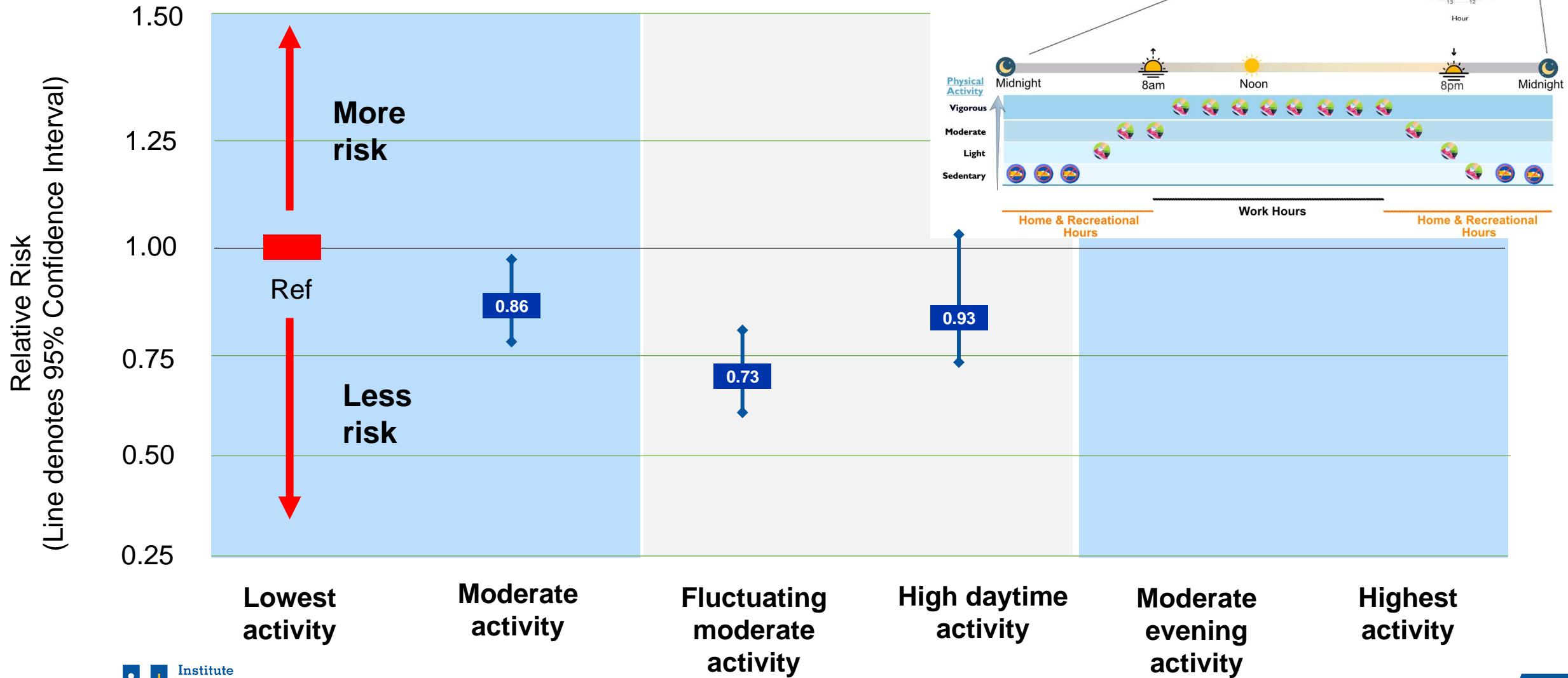
5) Highest activity

10-year heart disease risk
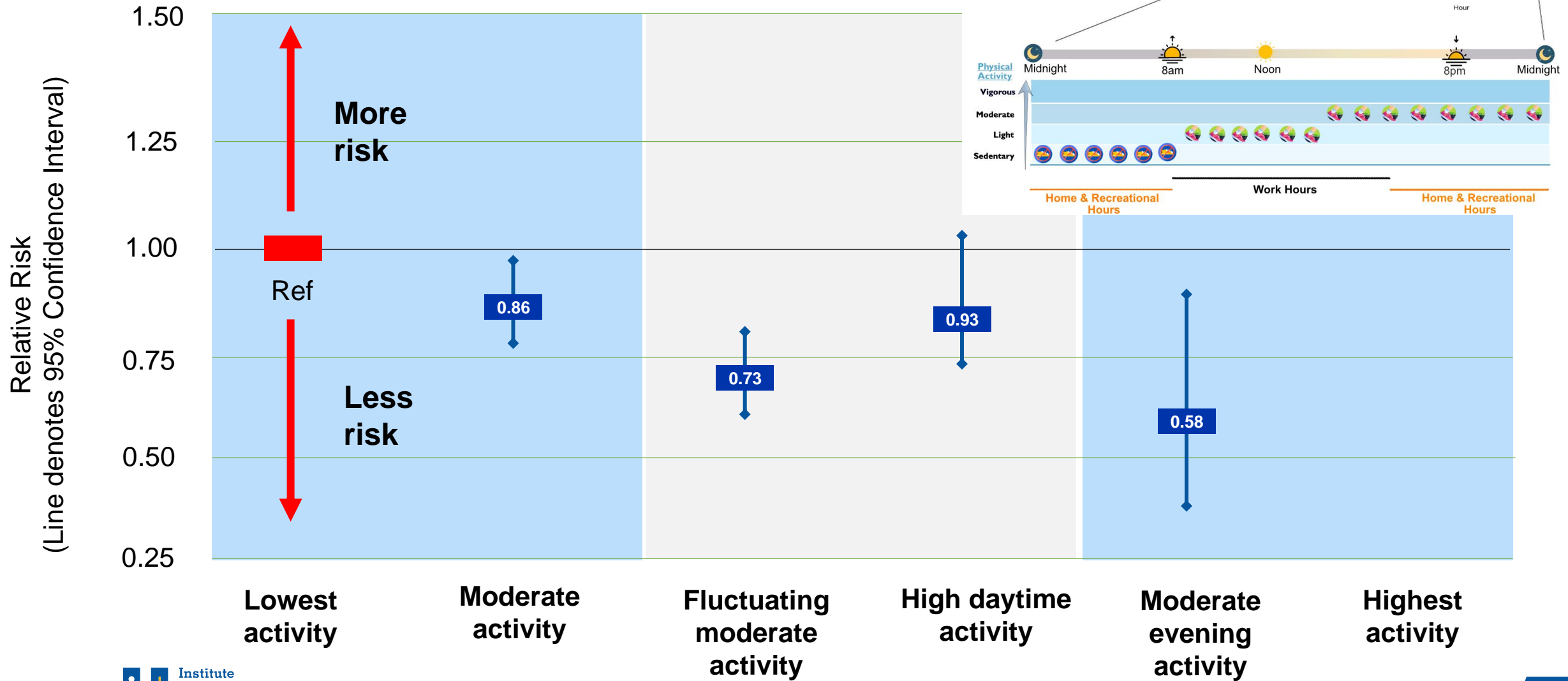
10-year heart disease risk

10-year heart disease risk

10-year heart disease risk

10-year heart disease risk

More risk

Less risk

Ref

0.86

0.73

0.93

0.67

0.58

Relative Risk
(Line denotes 95% Confidence Interval)

1.50

1.25

1.00

0.75

0.50

0.25

Lowest activity

Moderate activity

Fluctuating moderate activity

High daytime activity

Moderate evening activity

Highest activity

Institute for Work & Health

Worker characteristics in each activity pattern

	1: Moderate consistent activity	2: Lowest activity	3: Fluctuating moderate activity	4: High daytime activity	5: Moderate evening activity	6: Highest activity
High physically demanding job	**31%**	17%	12%	**27%**	**29%**	14%
Self-reported physical activity (PA)						
Total recreational PA / week (min)	81.1 (7.5)	87.0 (8.0)	**152.3 (17.7)**	**88.2 (33.1)**	**124.3 (15.9)**	**179.7 (17.7)**
Total active transportation / week (min)	**81.9 (20.1)**	47.4 (5.5)	**91.7 (11.0)**	**118.8 (24.0)**	41.6 (16.7)	76.6 (15.1)
Total other PA / week (min)	**278.6 (32.1)**	156.4 (22.7)	99.9 (19.2)	**190.7 (55.5**)	**443.3 (188.0)**	103.5 (25.1)

# Limitations and considerations

- Limitations of accelerometer devices

- Cross-sectional survey

- Limited work schedule information

Discussion

- Strategies promoting PA only in daytime work hours may be less effective than those promoting PA outside daytime work hours

- What roles do the PA paradox and recreational sitting play?

- A more feasible approach for people with socioeconomic and work-related barriers to PA

Institute
for Work &
Health

Implications
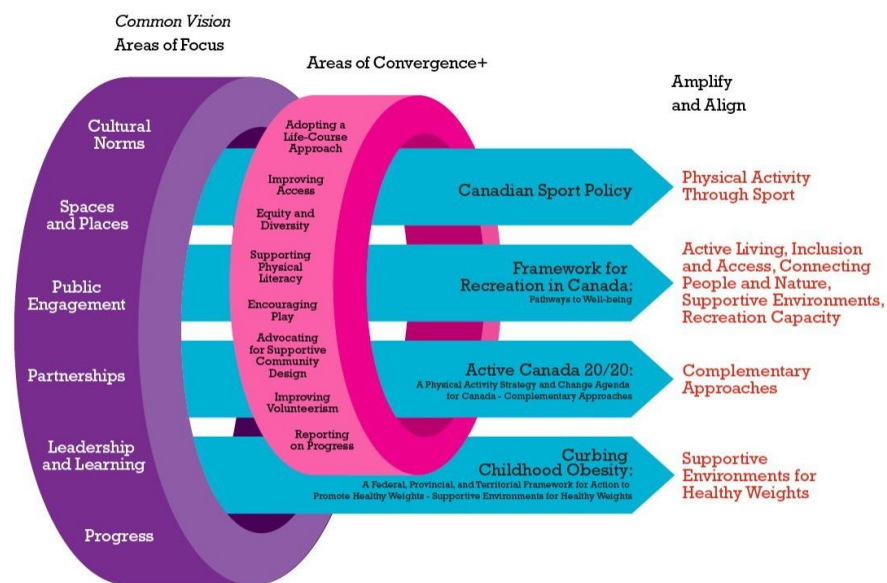
+ Federal, Provincial and Territorial Ministers Responsible for Sport, Physical Activity and Recreation.
Towards Alignment: A Collaborative Agenda for Recreation, Sport and Physical Activity in Canada, 2015.

https://www.canada.ca/en/public-health/services/publications/healthy-living/lets-get-moving.html

Thank you

Avi Biswas, PhD

Associate Scientist, Institute for Work & Health

✉ abiswas@iwh.on.ca

🐦 _avibiswas

Institute for Work & Health