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## **Longitudinal analysis of patterns and correlates of physical activity and sedentary behaviour in women from preconception to postpartum: The Singapore Preconception Study of Long-Term Maternal and Child Outcomes Cohort**

Anne H.Y. Chu<sup>1,2</sup>, Natarajan Padmapriya<sup>1,3</sup>, Shuen Lin Tan<sup>2</sup>, Claire Marie J.L. Goh<sup>1</sup>, Yap-Seng Chong<sup>2,3</sup>, Lynette P. Shek<sup>2,4</sup>, Kok Hian Tan<sup>5</sup>, Peter D. Gluckman<sup>2,6</sup>, Fabian K.P. Yap<sup>7,8,9</sup>, Yung Seng Lee<sup>2,4</sup>, See Ling Loy<sup>7,10</sup>, Jerry K.Y. Chan<sup>7,10</sup>, Keith M. Godfrey<sup>11</sup>, Johan G. Eriksson<sup>2,3,12,13</sup>, Shiao-Yng Chan<sup>2,3</sup>, Jonathan Y. Bernard<sup>14</sup>, Falk Müller-Riemenschneider<sup>1,15</sup>

<sup>1</sup> Saw Swee Hock School of Public Health, National University of Singapore, Singapore

<sup>2</sup> Singapore Institute for Clinical Sciences (SICS), Agency for Science, Technology and Research (A\*STAR), Singapore

<sup>3</sup> Department of Obstetrics & Gynaecology, Yong Loo Lin School of Medicine, National University of Singapore, Singapore

<sup>4</sup> Department of Paediatrics, Yong Loo Lin School of Medicine, National University of Singapore, Singapore

<sup>5</sup> Department of Maternal Fetal Medicine, KK Women's and Children's Hospital, Singapore

<sup>6</sup> Liggins Institute, University of Auckland, Auckland, New Zealand

<sup>7</sup> Duke-NUS Medical School, Singapore

<sup>8</sup> Department of Pediatrics, KK Women's and Children's Hospital, Singapore

<sup>9</sup> Lee Kong Chian School of Medicine, Nanyang Technological University, Singapore

<sup>10</sup> Department of Reproductive Medicine, KK Women's and Children's Hospital, Singapore

<sup>11</sup> MRC Lifecourse Epidemiology Centre and NIHR Southampton Biomedical Research Centre, University of Southampton and University Hospital Southampton NHS Foundation Trust, Southampton, UK

<sup>12</sup> Department of General Practice and Primary Health Care, University of Helsinki, Helsinki, Finland

<sup>13</sup> Folkhälsan Research Center, Helsinki, Finland

<sup>14</sup> Université Paris Cité, Inserm, INRAE, Centre for Research in Epidemiology and Statistics, Paris, France

<sup>15</sup> Berlin Institute of Health, Charite University Medical Centre, Berlin, Germany

**Corresponding author:** Anne H.Y. Chu; anne.chu@u.nus.edu, Saw Swee Hock School of Public Health, Tahir Foundation Building, National University of Singapore, 12 Science Drive 2, Singapore 117549

## ABSTRACT

Objective: Longitudinal changes in physical activity (PA) and sedentary behaviour patterns from preconception to postpartum are not fully characterised. We examined changes and baseline sociodemographic/clinical correlates of physical activity (PA) and sedentary behaviour in women from preconception to postpartum.

Methods: The S-PRESTO cohort recruited 1032 women planning pregnancy. Participants completed questionnaires at preconception, 34-36 weeks gestation and 12 months postpartum. Repeated-measures linear regression models were used to analyse changes in walking, moderate-to-vigorous PA (MVPA), screen time, and total sedentary time, and to identify sociodemographic/clinical correlates associated with these changes.

Results: Of the 373 women who delivered singleton live births, 281 provided questionnaires for all timepoints. Walking time increased from preconception to late-pregnancy but decreased postpartum (adjusted means [95% CI]: 454 [333–575], 542 [433–651] and 434 [320–547] min/week, respectively). Vigorous-intensity PA (VPA) and MVPA decreased from preconception to late-pregnancy but increased postpartum (VPA: 44 [11–76], 1 [-3–5] and 11 [4–19] min/week, MVPA: 273 [174–372], 165 [95–234] and 226 [126–325] min/week, respectively). Screen time and total sedentary time remained consistent from preconception to pregnancy but decreased postpartum (screen: 238 [199–277], 244 [211–277] and 162 [136–189] min/day, total: 552 [506–598], 555 [514–596] and 454 [410–498] min/day, respectively). Individual characteristics of ethnicity, body mass index, employment, parity, and self-rated general health significantly influenced women's activity patterns.

Conclusion:

During late pregnancy, walking time increased, while MVPA declined significantly, and partially returned to preconception levels postpartum. Sedentary time remained stable during pregnancy, but decreased postpartum. The identified set of sociodemographic/clinical correlates underscores need for targeted strategies.

Keywords: longitudinal study; physical activity behavior; pregnancy; sedentary lifestyle; women's health

## Introduction

Physical activity (PA) and sedentary behaviour are crucial lifestyle factors that affect physical and mental health.<sup>1</sup> Regular PA, whether of low-, moderate- or vigorous-intensity, has been linked to several health benefits, including a decreased risk of all-cause mortality and favorable cardiometabolic profiles.<sup>2</sup> However, with the advent of electronic technology, sedentary behaviours such as using electronic devices while sitting, reclining or lying down have become increasingly common. In women, regular PA during preconception was associated with a range of benefits, including improved assisted reproductive therapy outcomes, prevention of weight gain, and improved mental health. Moreover, it has been identified as a strong correlate of continued PA during pregnancy.<sup>3,4</sup> Beyond preconception, moderate-intensity PA during pregnancy and postpartum have also been linked to reduced risks of gestational diabetes, excessive gestational weight gain, medical intervention during labour, and postpartum depression.<sup>5</sup> Additionally, women who remain active during pregnancy have a lower risk of gestational weight gain, which in turn reduces the risk of postpartum overweight, macrosomia, future obesity, and type 2 diabetes for both the mother and child.<sup>4,6</sup> High levels of sedentary behaviour during pregnancy, on the other hand, have been associated with higher levels of C-reactive protein and LDL cholesterol in pregnancy, greater neonatal abdominal circumference, and larger babies.<sup>7</sup> Thus, it is important to maintain an active lifestyle before, during and after pregnancy.

Similar to the general population, the latest World Health Organization (WHO) guidelines on PA recommend that pregnant women without contraindications should perform at least 150 min/week of moderate-intensity PA during pregnancy (and postpartum), while minimizing sedentary behaviour.<sup>1</sup> Yet, despite this recommendation, a majority of pregnant women are

sedentary for over 12 hours/day,<sup>7</sup> exceeding the median sedentary time of 4.7 hours/day for the general adult population.<sup>8</sup>

There is a scarcity of prospective research that examines changes in PA and sedentary behaviour during the transition from preconception to postpartum. Prior studies have reported changes in PA related to pregnancy, but these studies have limitations such as retrospective assessments of preconception PA,<sup>9-11</sup> cross-sectional assessments of pregnancy PA at a single timepoint,<sup>12</sup> or repeated measurements only during pregnancy.<sup>13,14</sup> Although a recent study compared PA patterns during pregnancy and up to 8 months postpartum to those during preconception,<sup>15</sup> PA data from preconception to 2 months postpartum were collected retrospectively, raising concerns of recall bias. Also, the PA information was not collected using validated questionnaires,<sup>15</sup> which complicates comparison of findings with other studies. Furthermore, most previous studies were conducted in Western populations, while some studies in Asia reported low PA levels during pregnancy that declined over time.<sup>16</sup> Cultural differences might influence attitudes and participation in PA.<sup>17</sup> Therefore, to inform the development of evidence-based strategies for promoting better maternal and child health, it is important to understand how PA and sedentary behaviour change over time across different populations during complex and challenging life stages.

Gaining insight into the correlates of PA and sedentary behaviour lays the groundwork for effective interventions to encourage active lifestyles.<sup>18</sup> Non-modifiable factors (correlates) can help identify groups that need targeted interventions, while modifiable factors can determine how to improve health and well-being.<sup>19</sup> Previous reviews have identified certain correlates of pregnancy PA,<sup>20,21</sup> such as higher education and income, as well as pregnancy-related correlates including fewer previous pregnancies and less discomfort during pregnancy, which

were positively associated with pregnancy PA. Another review reported correlates linked to reduced sedentary behaviour during pregnancy, such as higher education, nulliparity, and adherence to PA guidelines.<sup>7</sup> Nonetheless, the correlates influencing long-term changes in PA and sedentary behaviour from preconception to postpartum, which may ultimately affect health, remain unclear. This is important because individuals may respond differently to pregnancy, **resulting in varying levels of** risk for persistent changes in PA or sedentary behaviour. **In this study, we** aimed to examine changes and correlates of walking time, moderate-to-vigorous intensity PA (MVPA), screen time, and total sedentary time in Asian women from preconception through pregnancy and postpartum.

## **Methods**

### *Study cohort*

The Singapore PREconception Study of long-Term maternal and child Outcomes (S-PRESTO) study (ClinicalTrials.gov, NCT03531658) is a prospective preconception cohort study that is currently ongoing.<sup>22</sup> It involves the recruitment of women from Singapore's largest public maternity unit, KK Women's and Children's Hospital, making it a unique resource for studying the longitudinal changes in PA and sedentary behaviour. The S-PRESTO cohort is designed to study the long-term impact of women's health on the health outcomes of their pregnancy and offspring.<sup>22-24</sup> Between 2015 and 2017, a total of 1032 non-pregnant women aged 18–45 years were recruited with the following eligibility criteria: actively trying to conceive within one year of recruitment and being off-contraception in the previous month; of Chinese, Malay or Indian ethnicity (or a combination thereof); and intending to reside in Singapore for the next five years after enrolment. Exclusion criteria were known type 1 or type 2 diabetes and use of systemic steroids, anticonvulsants, HIV, or hepatitis B or C medications within the past month. The

SingHealth Centralized Institutional Review Board granted ethical approval (reference 2014/692/D), and written informed consent was obtained from all study participants.

*PA and sedentary behaviour assessment*

The validated short-form International Physical Activity Questionnaire (IPAQ)<sup>25</sup> and a sedentary behaviour questionnaire<sup>26</sup> were administered through **interviews** by qualified personnel during preconception, pregnancy (34-36 weeks of gestation) and postpartum (12 months after delivery). **The IPAQ, which is reliable and validated for use in pregnant women,<sup>16</sup> collects information about the duration and frequency of walking, moderate-intensity PA, and vigorous-intensity PA (VPA) over the past seven days.** The moderate-intensity PA and VPA responses were summed as MVPA.

Sedentary behaviour questions included daily time spent sitting or lying down over the past seven days in the following contexts:

- at work—"Occupational";
- watching television for leisure—"TV viewing";
- viewing other electronic devices for leisure (excluding TV time)—"Electronic devices";
- when eating, driving/travelling, reading or other sedentary activity (other than viewing TV/electronic devices)—"Other".

Sedentary time was subsequently analysed as:

- sum of TV and other electronic devices time—"Screen time";
- sum of all sedentary behaviours—"Total sedentary time".



### *Correlates*

We identified potential correlates of PA/sedentary time *a priori* from the literature.<sup>27,28</sup> During the first preconception clinic visit for eligibility screening, baseline sociodemographic and clinical characteristics were obtained from the enrolment questionnaire. This included age, ethnicity, education level, employment status, parity (number of previous pregnancies) at recruitment, and self-rated general health, which was measured by asking a single question, “How is your health in general?” with response options: 1. very good, 2. good, 3. fair, 4. bad, and 5. very bad. Height was measured with a SECA 213 portable rangefinder (Hamburg, Germany) to the nearest 0.1 cm, and weight with a SECA 803 weighing machine (Hamburg, Germany) to the nearest 0.1 kg. Body mass index (BMI) was computed by dividing weight in kilograms by the square of height in meters.

### *Statistical analysis*

Among women who had a singleton live birth and received postpartum follow-up, differences in baseline characteristics between women included in the analysis and those not included due to missing PA/sedentary time data were assessed using unpaired t-tests for continuous variables and chi-square tests for categorical variables. We then analysed the changes of PA/sedentary time variables (representing changes across time points for each intensity/domain-specific behaviour), and the associations between baseline sociodemographic/clinical correlates and PA/sedentary time (each intensity/domain-specific behaviours) using generalised estimating equations (GEE), i.e. PA/sedentary time at preconception, pregnancy and postpartum were treated as repeated measures in multivariable linear models. The three timepoints were treated as an ordinal variable (0, 1, 2), with an unstructured working correlation matrix. To examine whether the associations between sociodemographic/clinical correlates and PA/sedentary time differed by time points, we included interaction terms between each correlate and the timepoint

variable in a single model. We reported adjusted means and 95% confidence intervals (CIs) of the outcome variables, and the adjusted mean differences for the correlates. This paper presents the baseline sociodemographic and clinical correlates of four main outcome measures: walking, MVPA, screen time, and total sedentary time. Other individual PA/sedentary time components are additionally examined and described in the supplementary material. The statistical analysis was conducted using Stata Statistical Software version 14 (StataCorp LP, College Station, TX, USA).

## **Results**

### *Participants*

Of the 1032 women enrolled, 475 became pregnant within 12 months, 373 delivered singleton live births; and 342 were followed through postpartum (Fig. 1). In the analysis, 281 women who provided PA and sedentary time data at all three time points (preconception, 34-36 weeks gestation and 12 months postpartum) were included. Most of the women were  $\leq 30$  years old, underweight or normal weight, Chinese, university-educated, employed, nulliparous and reported very good/good health at recruitment (Table 1). Among all women who had singleton live births and underwent postpartum follow-up, there were more Chinese women included in the analysis compared to those who were not included due to missing PA/sedentary time data.

### *Changes in PA*

Walking time increased during pregnancy compared to preconception, but returned to nearly preconception levels at postpartum (Fig. 2A). Conversely, VPA decreased to nearly zero during pregnancy and slightly increased at postpartum, while MVPA also declined during pregnancy and partially recovered at postpartum.

### *Changes in sedentary time*

Occupational sedentary time was steady across all three timepoints (Fig. 2B). Both screen time and total sedentary time remained consistent from preconception to pregnancy, but decreased at postpartum. Other sedentary behaviours decreased gradually from preconception to postpartum.

### *Correlates of change in PA*

Compared to those who were unemployed at baseline, being employed was associated with higher overall walking time (Fig. 3; [Supplementary Table 1](#)). A significant interaction was found between employment status and timepoint for the outcome of walking time, such that employed women had higher walking time, particularly at preconception, than unemployed women. Based on single timepoint comparisons, non-Chinese women were associated with more walking [during](#) pregnancy than Chinese women. Notably, the association between [worse](#) self-reported general health and lower overall walking time [approached](#) statistical significance.

Compared to Chinese women, non-Chinese women consistently reported higher overall MVPA. A significant interaction of ethnicity or age with timepoints on MVPA was found, (Fig. 4; [Supplementary Table 2](#)). From single timepoint comparisons, no difference in MVPA was reported between older and younger women at preconception, however, older women reported lower MVPA during pregnancy and postpartum compared to younger women. Primi/multiparous women had with higher MVPA at postpartum than nulliparous women.

Compared to nulliparous women, primi/multiparous women had lower overall VPA, with a significant interaction indicating that primi/multiparous women had lower VPA, particularly

at preconception (Supplementary Table 3). The analysis of the interaction revealed that worse self-rated general health at baseline (compared to very good/good) was linked to lower overall VPA, particularly at preconception and postpartum.

#### *Correlates of change in sedentary behaviour*

Compared to those who were under/normal weight, higher BMI at baseline was associated with higher overall screen time (Fig. 5; Supplementary Table 4). A significant interaction term suggested that the association between BMI and screen time varied by time. Women who were overweight had higher screen time especially at postpartum, while those who were obese had higher screen time at preconception and pregnancy. In terms of parity, primi/multiparous women had shorter screen time compared to nulliparous women, and this was consistent across all three time points as indicated by the significant interaction term. Employment status was also associated with screen time, with employed women reporting lower overall screen time especially at preconception compared to unemployed women. From single timepoint comparisons, having an undergraduate education was associated with less screen time during pregnancy and postpartum compared to having a post-secondary education or below. Those with a postgraduate education had with less screen time during pregnancy compared to those with a post-secondary education or below.

Compared to women with under/normal weight, those with higher BMI had higher overall total sedentary time, with a significant interaction suggesting that being obese was associated with higher total sedentary time especially at preconception (Fig. 6; Supplementary Table 5). Employment status was associated with higher overall total sedentary time, with employed women having higher sedentary time than unemployed women at all timepoints. Primiparous/multiparous women had lower overall change in total sedentary time than

nulliparous women, especially at preconception and pregnancy. Self-reported fair/bad/very bad general health (versus very good/good) was associated with higher overall total sedentary time. From single timepoint comparisons, women of older age had higher total sedentary time during pregnancy than younger women. Having an undergraduate education was associated with lower total sedentary time at all timepoints compared to having a post-secondary education or below.

## Discussion

This study is the first to provide a prospective examination of PA and sedentary behaviour during the preconception, pregnancy and postpartum periods. In this multi-ethnic longitudinal cohort of Asian women, we found that MVPA decreased from preconception to pregnancy and only partially recovered at 12 months postpartum, particularly because VPA remained very low, and this continued until postpartum. While walking was the only activity that increased from preconception during pregnancy, it returned to slightly lower than preconception levels after delivery. Screen time and total sedentary time remained stable during preconception and pregnancy but decreased postpartum. Furthermore, different correlates were linked to PA and sedentary behaviour at distinct life stages. Women with higher overall walking time were employed, those with higher overall MVPA were non-Chinese; and those with lower overall VPA were primi/multiparous and had worse self-rated general health. For sedentary behaviour, women with higher overall screen time had a higher BMI, those with lower overall screen time were employed and primi/multiparous. Overall total sedentary time was higher in women who had a higher BMI, were employed and had worse self-rated general health, whereas overall total sedentary time was lower in women who were primi/multiparous.

Prior research using self-reported PA data showed an increase in walking time from preconception to pregnancy, which is in line with our findings.<sup>15,29</sup> Conversely, while we observed a decline in MVPA during pregnancy, a previous study reported no significant changes in women's overall PA levels from preconception to postpartum.<sup>15</sup> Although postpartum MVPA did not fully return to preconception levels, a partial rebound was observed; whereas a US cohort study of low-income, predominantly black women showed a decrease in accelerometry-measured MVPA from pregnancy to postpartum.<sup>30</sup> These discrepancies may be attributed to different PA measuring methods and social-ecological factors. In agreement with general population studies, moderate-intensity PA, rather than VPA, contributed mostly to overall MVPA levels. In our study, VPA levels were very low during pregnancy and remained low postpartum. This may be due to the safety and health benefits of VPA not being as well documented as with low-to-moderate intensity activities, and some healthcare providers may advise against VPA.<sup>5</sup> Additionally, women may prefer low-impact activities such as walking and resulting in reduced levels of MVPA, which could explain why walking activity increases during pregnancy. It should be noted that our findings on decreased levels of MVPA and VPA during pregnancy and postpartum are not consistent with the current WHO PA guidelines,<sup>1</sup> which recommend consistent levels of PA and do not discourage VPA per se, particularly for women who regularly performed VPA or were physically active before pregnancy.<sup>1</sup>

Our study's results align with a previous systematic review, indicating that employed and primi/multiparous women have higher levels of PA.<sup>20</sup> Walking may be part of working women's daily commutes to and from work. Women who had lower self-rated health reported engaging in less VPA. This could hinder PA, especially for VPA that demands more energy. Our observation of higher levels of MVPA among non-Chinese individuals is a unique finding. This could be because traditional pregnancy customs, known as "antenatal taboos", which

advocate reducing or avoiding PA to protect the foetus, are still culturally relevant among Chinese populations,<sup>31</sup> despite modern pregnancy-related programs generally recommend regular PA.

We also ascertained correlates of changes in PA during each preconception, pregnancy and postpartum phase. While a review by Garland et al.<sup>20</sup> reported a positive association between education levels and PA during pregnancy, our findings contrast with this. This disparity may be due to the predominantly Caucasian participants in the studies reviewed and the complex interplay of various socio-ecological factors.<sup>20</sup> Continuous evaluation of factors that promote PA, including cultural expectations and knowledge about PA during pregnancy, would be valuable.

In our study, total sedentary time remained consistent at around 9.2 h/day before and during pregnancy. However, some other studies have reported an increase in sedentary time from preconception to pregnancy.<sup>7,32</sup> Our results are similar to a previous study that found a decrease in accelerometry-measured total sedentary time from pregnancy to postpartum.<sup>30</sup> As prolonged sedentary time can have negative effects on maternal health, reducing sedentary behaviour could be an important daily habit to target in future interventions.

Although there is a paucity of studies investigating the correlates of sedentary time in women around the pregnancy period, the 2003–2006 National Health and Nutrition Examination Survey (NHANES) found no significant associations between accelerometry-measured sedentary time and a range of correlates (e.g. age, gestational age, ethnicity, education, household income, marital status) in 359 pregnant women.<sup>33</sup> Our findings on the association between primi/multiparous women and lower overall screen time/total sedentary time align

with those of a systematic review of studies in the general adult population<sup>34</sup> and a cross-sectional study of adults in Singapore.<sup>35</sup> This may be due to the fact that women with no children tend to engage in more screen time and other sedentary behaviours during leisure time.<sup>36</sup> In this study, worse self-rated health was a correlate of higher sedentary time from preconception to postpartum; likewise, a cross-sectional study of Canadian women reported stress as a correlate of sedentary time during pregnancy.<sup>37</sup> The physical discomfort experienced during pregnancy may lead to a decrease in PA, which could worsen mental health. Therefore, it is important to evaluate self-perceived health and mental well-being to develop effective strategies promoting PA and reducing sedentary time from preconception to postpartum.

This study's findings indicate that there is a correlation between different levels of education and sedentary behaviour at various points in time. Exploring factors such as profession and knowledge of PA can aid healthcare providers in comprehending obstacles and encouraging women to embrace a healthy lifestyle. In addition, older age was associated with higher total sedentary time in pregnancy. These results demonstrate the potential for interventions targeted at decreasing screen time and overall sedentary time during significant life transitions. Regarding correlates of changes in sedentary time, the results of this study suggest that different levels of education are associated with sedentary lifestyles at individual timepoint.

Collectively, our results highlight groups of women at risk who can be targeted for interventions aimed at walking, MVPA and reducing screen time/total sedentary time. Walking is a practical activity that can easily be incorporated into the daily routine of unemployed women. A meta-analysis has shown that engaging in VPA up to the third trimester is safe for most healthy pregnancies and can lead to small beneficial effects such as increased gestational age at delivery and reduced risk of preterm delivery.<sup>38</sup> Nonetheless, it should be noted that women



who engage in VPA and/or choose to participate in exercise studies may have lower pregnancy risk and better health overall.<sup>38</sup> The differential effects of various correlates of PA/sedentary time suggest that interventions should be tailored to specific life stages.

### *Strengths and limitations*

The prospective design of our study helped to reduce recall bias, which is a common limitation of previous studies that rely on retrospective data collection. Furthermore, we gathered information on different types, intensities, and domains of PA and sedentary time, instead of relying on a single estimate. This approach is particularly crucial because our results highlighted diverse patterns of activity. However, our study has several limitations. Firstly, PA and sedentary time were self-reported, which is common practice but may still be subject to a degree of recall bias even with prospective data collection. Nevertheless, it allowed us to collect information on specific domains that accelerometers may not easily distinguish. Secondly, while the sedentary behaviour questionnaire was validated among non-pregnant adults in Singapore,<sup>26</sup> its validity and reliability in pregnant women were not evaluated. Thirdly, data collection at different timepoints does not allow direct comparisons of our results with previous studies. Additionally, assessments of sedentary time were heterogeneous across studies (e.g., single item vs. summary responses from various domains). Finally, because PA may affect fertility rates,<sup>39</sup> and women who did not conceive were not included in the analysis, the generalizability/external validity of our results, particularly during the preconception phase, to other study populations is limited.

### **Conclusions**

In this prospective cohort study, walking time was the only activity that increased from preconception to pregnancy, but postpartum decreased to a level close to preconception. MVPA and VPA, however, decreased during pregnancy and even after delivery did not return to their preconception levels. Hence, postpartum PA interventions are also crucial to

address this persistent reduction in PA. This study also identified high levels of screen time and total sedentary time before pregnancy and persisted throughout pregnancy; highlighting the importance of counselling to reduce sedentary behaviour, starting as early as the preconception period. Understanding the characteristics that influence healthy behaviours in mothers during different life stages is essential for policymakers and health professionals to develop targeted interventions.

**Abbreviations:**

Body mass index (BMI), confidence intervals (CIs), generalised estimating equations (GEE), moderate-to-vigorous physical activity (MVPA), physical activity (PA), Singapore PREconception Study of long-Term maternal and child Outcomes (S-PRESTO), vigorous-intensity physical activity (VPA)

**Declarations:**

Ethics approval and consent to participate

The SingHealth Centralized Institutional Review Board granted ethical approval (reference 2014/692/D), and written informed consent was obtained from the study participants.

Consent for publication

Not applicable.

Availability of data and materials

Restrictions apply to the availability of some or all data generated or analysed during this study, to preserve patient confidentiality or because they were used under licence. The corresponding author will on request detail the restrictions and any conditions under which access to some data may be provided.

Competing interests

K.M.G. has received reimbursement to speak at conferences sponsored by companies selling nutritional products. K.M.G. and S.Y.C. are part of an academic consortium who have received research funding from Nestle S.A. Other authors report no conflict of interest.

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Authors' contributions

AHYC conducted literature review, performed data analysis and wrote the manuscript. AHYC, NP, JYB and FMR contributed to the design of research, interpretation of data and revision of the manuscript. YSC, LPS, KHT, PDG, FKPY, YSL, JKYC, KMG, and SYC designed and led the S-PRESTO cohort study. NP, SLT, CMJLG, and JYB contributed to data acquisition.

CMJLG, KHT, YSL, SLL, KMG, JGE, and SYC critically reviewed the manuscript. All authors read and approved the final manuscript.

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**Table 1. Comparison of baseline characteristics between included and not included women**

Baseline characteristics	Analysed (n=281)		Not included (n=61)		P-value*
	n (%)	Mean $\pm$ SD	n (%)	Mean $\pm$ SD	
Age (years)	281 (100.0)	29.9 $\pm$ 3.1	61 (100.0)	30.4 $\pm$ 3.5	0.260
Age (%)					0.079
$\leq$ 30 years	168 (59.8)		29 (47.5)		
>30 years	113 (40.2)		32 (52.5)		
Height (cm)	279 (99.3)	159.8 $\pm$ 5.5	61 (100.0)	159.9 $\pm$ 5.0	0.937
Weight (kg)	280 (99.6)	58.3 $\pm$ 11.1	61 (100)	60.5 $\pm$ 11.5	0.171
BMI (kg/m <sup>2</sup> )	279 (99.3)	22.8 $\pm$ 4.2	339 (99.1)	23.0 $\pm$ 4.3	0.559
BMI, Asian cut-offs (%)					0.192
Under & normal weight (<23 kg/m <sup>2</sup> )	181 (64.9)		32 (52.5)		
Overweight (23-27.4 kg/m <sup>2</sup> )	58 (20.8)		17 (27.9)		
Obese ( $\geq$ 27.5 kg/m <sup>2</sup> )	40 (14.3)		12 (19.6)		
Ethnicity (%)					0.029
Chinese	221 (78.6)		40 (65.6)		
Non-Chinese	60 (21.4)		21 (34.4)		
Education (%)					0.208
Post-secondary and below	75 (26.7)		19 (31.1)		
Undergraduate	170 (60.5)		30 (49.2)		
Postgraduate	36 (12.8)		12 (19.7)		
Employment status (%)					0.243
Unemployed	31 (11.0)		10 (16.4)		
Employed	250 (89.0)		51 (83.6)		
Parity (%)					0.915
Nulliparous	173 (61.6)		38 (62.3)		
Primiparous/Multiparous	108 (38.4)		23 (37.7)		
Self-rated general health					0.778
Very good/Good	207 (73.7)		46 (75.4)		
Fair/Bad/Very bad	74 (26.3)		15 (24.6)		

\*Among women with singleton live births and postpartum follow-up, t-tests (for continuous variables) and chi-square tests (for categorical variables) were used to assess the difference between women included in the analysis and those not included due to missing physical activity /sedentary time data. BMI; Body mass index

Figure legends:

**Fig. 1 Flowchart of the S-PRESTO women included in the analysis from preconception to postpartum.**

**Fig. 2 Adjusted mean change in A) physical activity and B) sedentary behaviour across timepoints for all intensity/domain-specific behaviours**

Data are means (95% CIs) adjusted for baseline characteristics: age, body mass index, ethnicity, education, employment status, parity, and self-rated general health. For occupational sedentary time, model was not adjusted for employment status.

P values relate to the overall change from preconception to postpartum.

MVPA; moderate-to-vigorous physical activity, PA; physical activity

**Fig. 3 Associations of correlates with walking time from preconception to pregnancy and postpartum in women**

Values are mean differences (95% CIs) from repeated-measures linear regression models. Overall P values relate to the overall association of exposure (correlates) on physical activity levels regardless of time. Interaction P values relate to the interaction term exposure\*time.

**Fig. 4 Associations of correlates with MVPA from preconception to pregnancy and postpartum in women**

Values are mean differences (95% CIs) from repeated-measures linear regression models. Overall P values relate to the overall association of exposure (correlates) on physical activity levels regardless of time.

Interaction P values relate to the interaction term exposure\*time.

MVPA; Moderate-to-vigorous physical activity

**Fig. 5 Associations of correlates with screen time from preconception to pregnancy and postpartum in women**

Screen time includes TV time and electronic device time.

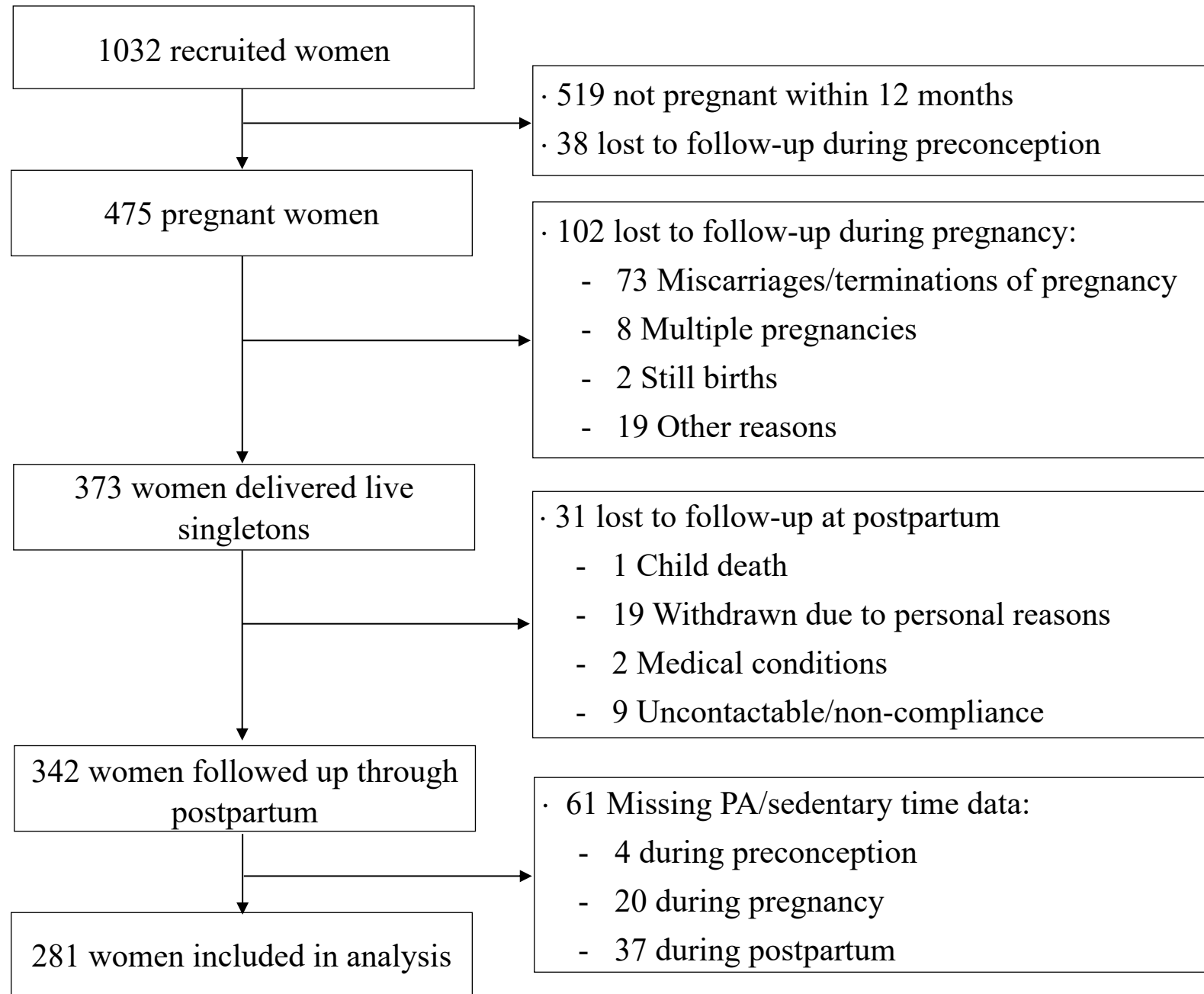
Values are mean differences (95% CIs) from repeated-measures linear regression models. Overall P values relate to the overall association of exposure (correlates) on sedentary behaviour levels regardless of time.

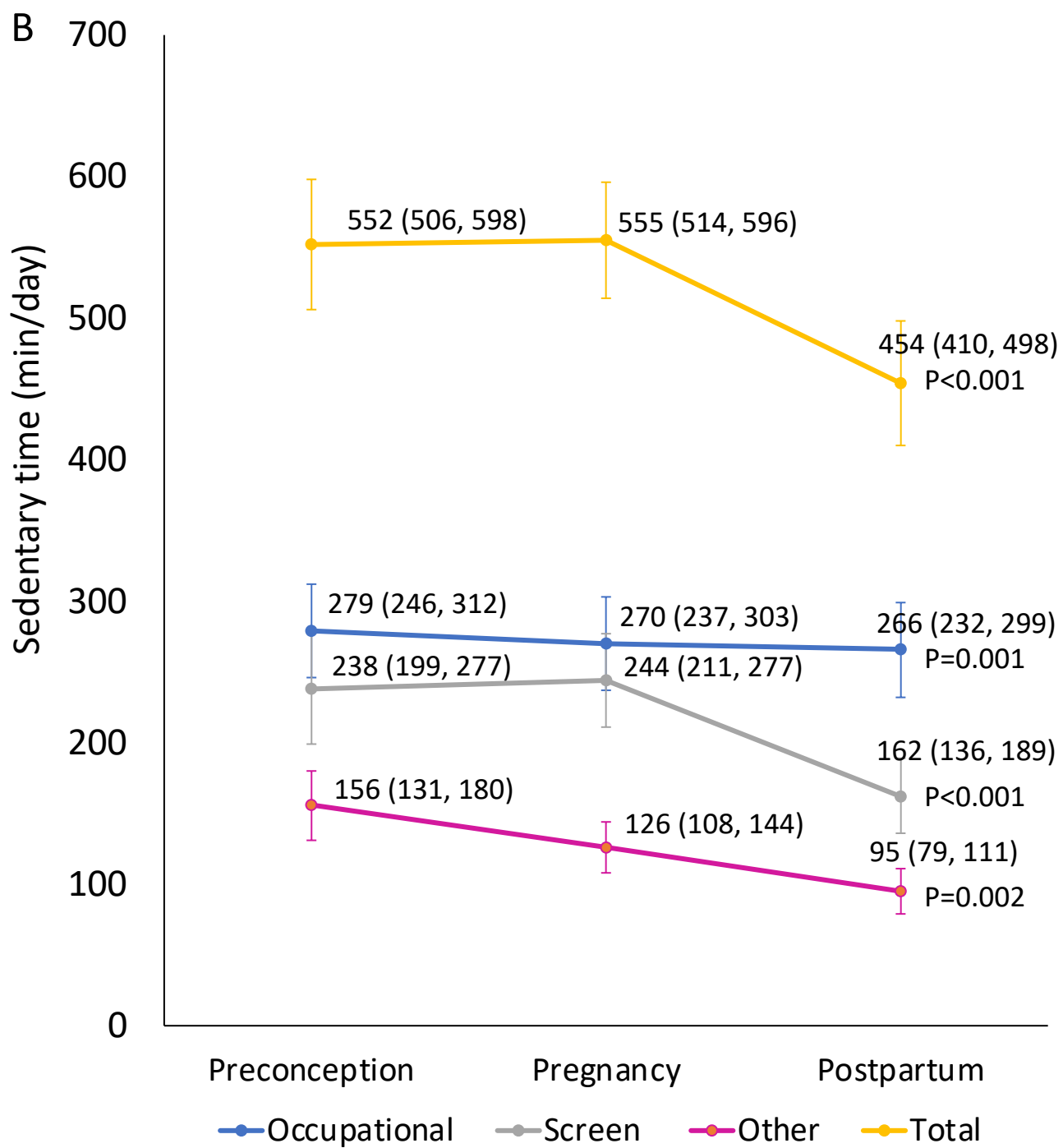
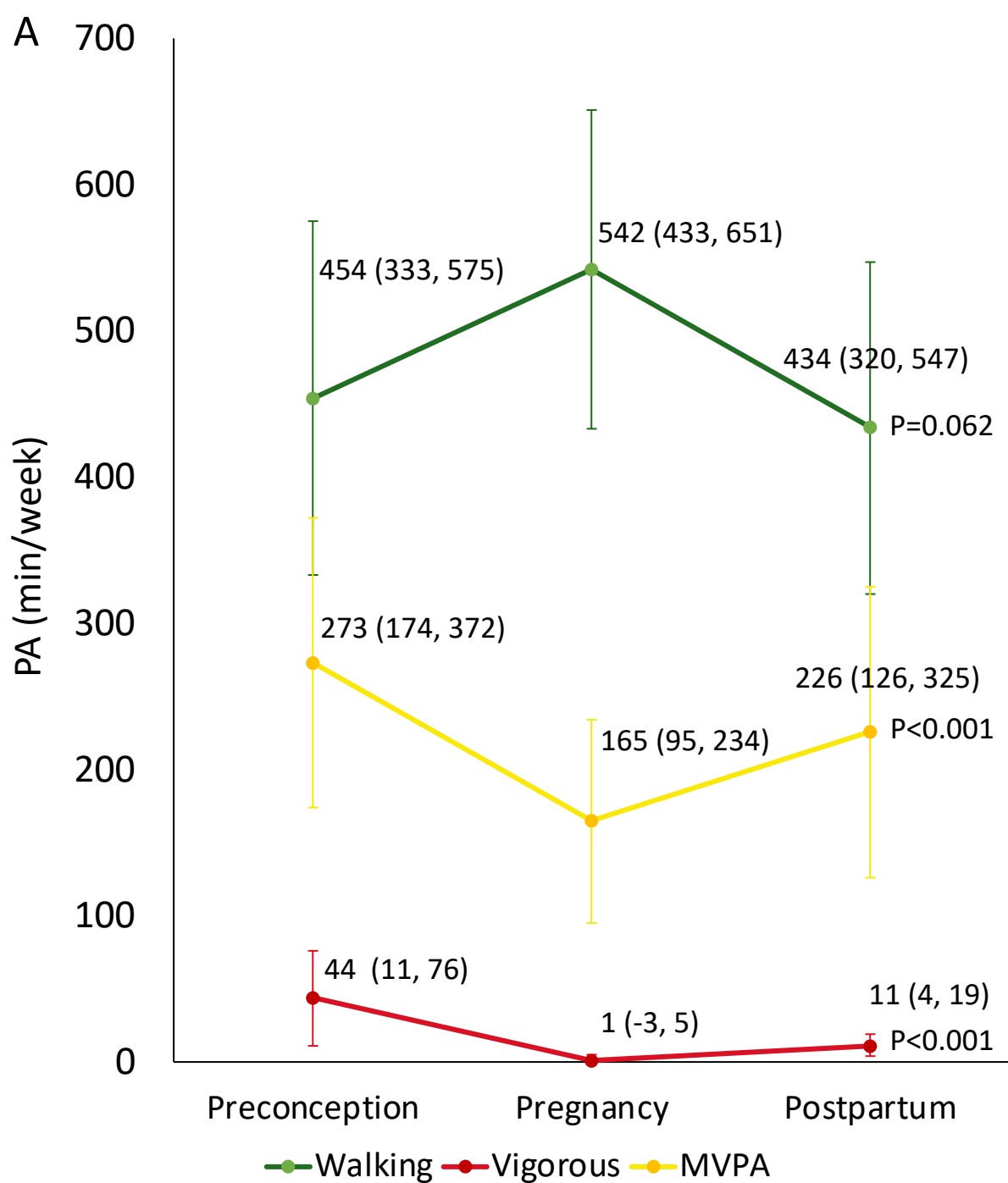
Interaction P values relate to the interaction term exposure\*time.

**Fig. 6 Associations of correlates with total sedentary time from preconception to pregnancy and postpartum in women**

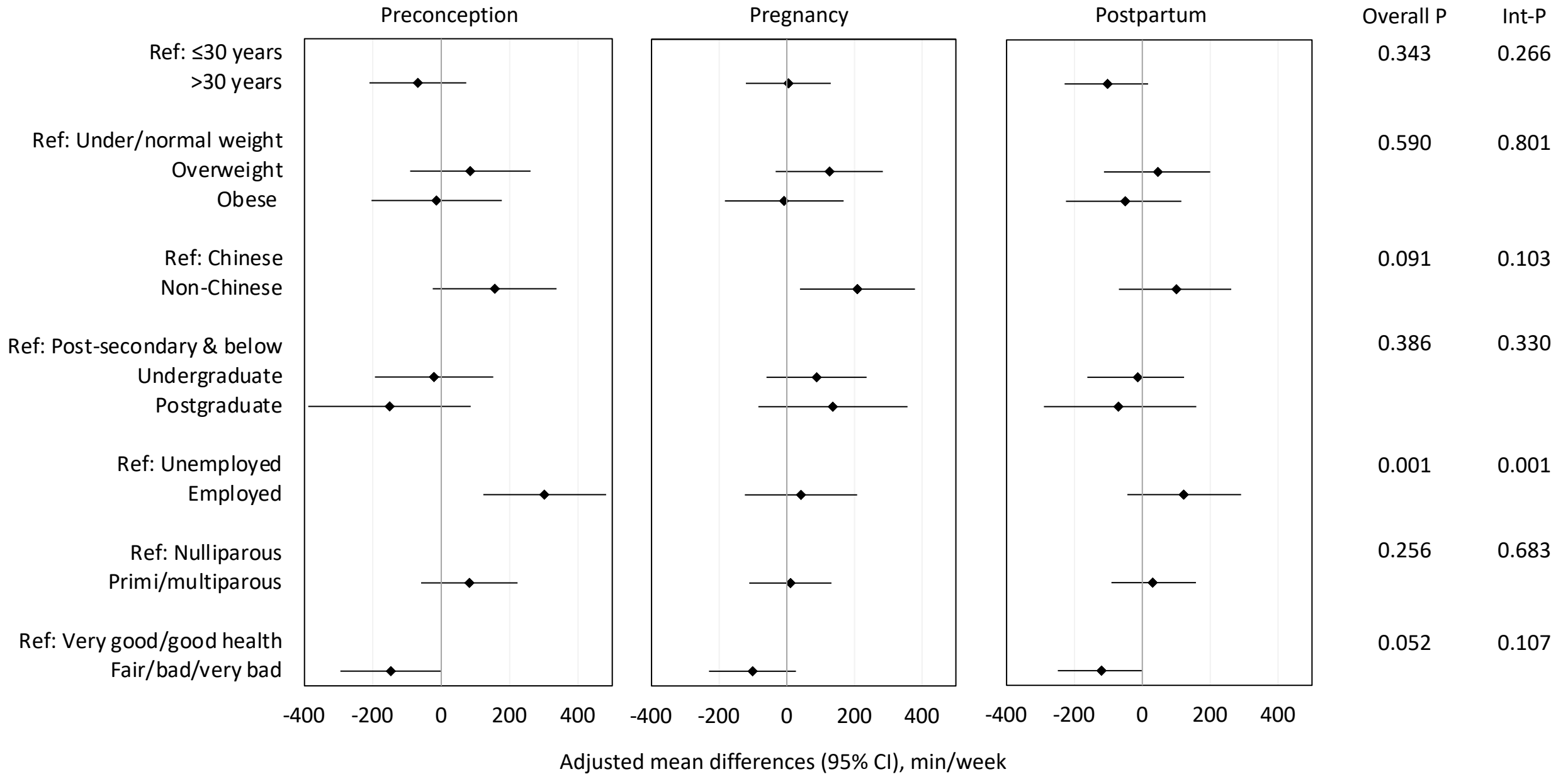
Values are mean differences (95% CIs) from repeated-measures linear regression models. Overall P values relate to the overall association of exposure (correlates) on sedentary behaviour levels regardless of time.

Interaction P values relate to the interaction term exposure\*time.

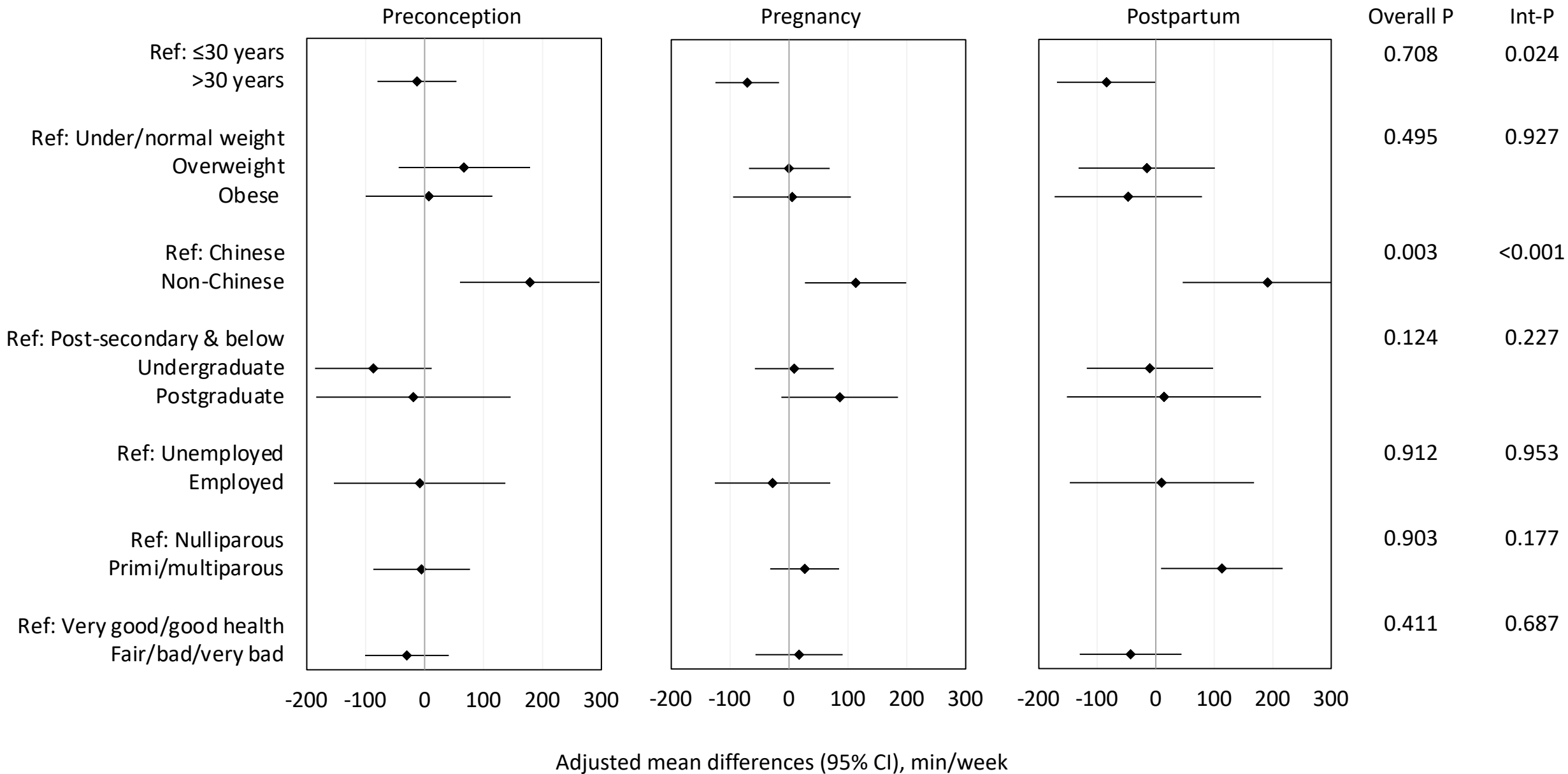




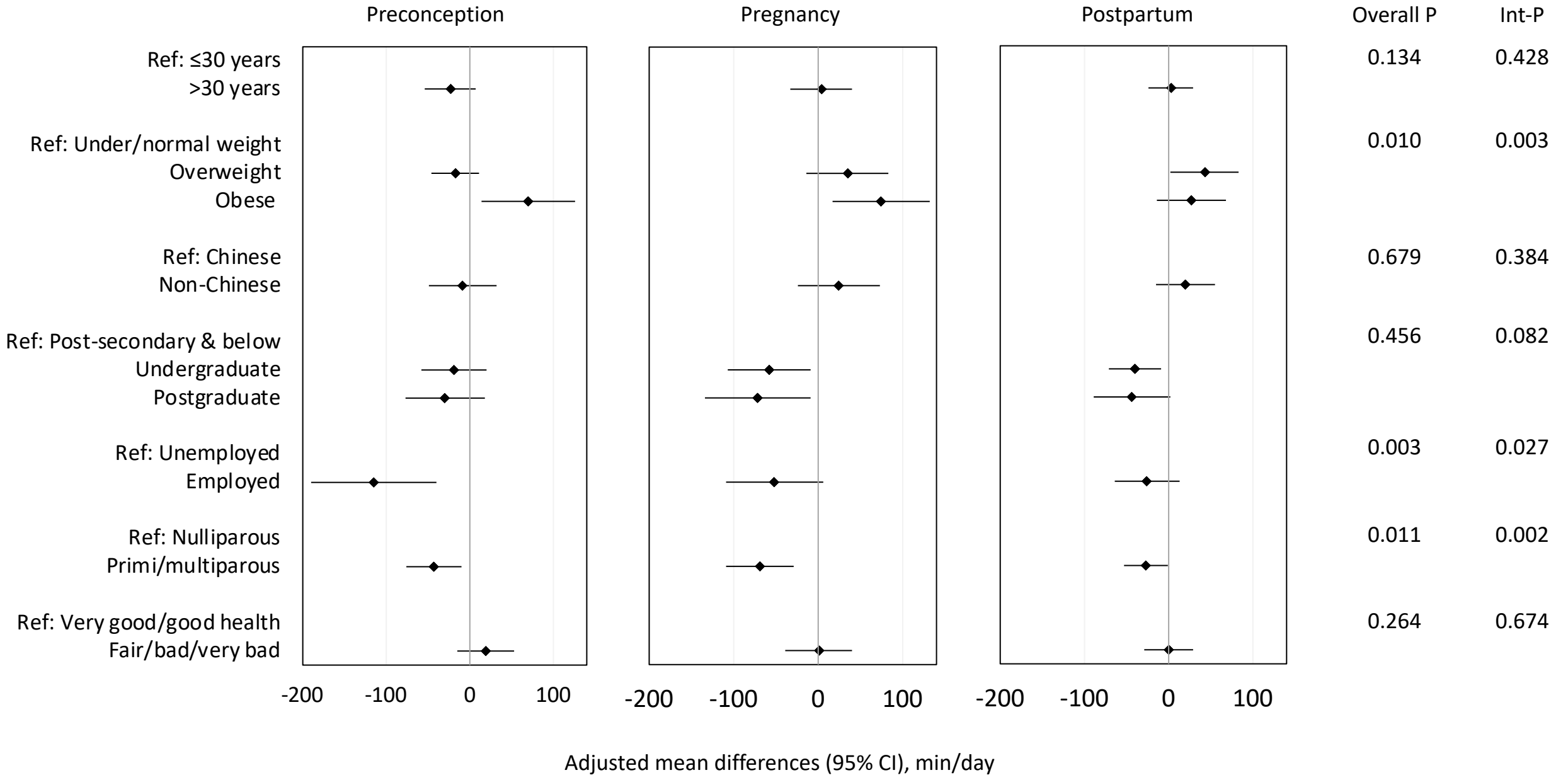
### Correlates of walking time



### Correlates of MVPA



# Correlates of screen time



# Correlates of total sedentary time

