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# "The menopause transition and the gender gap in entrepreneurship"

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# Motivation

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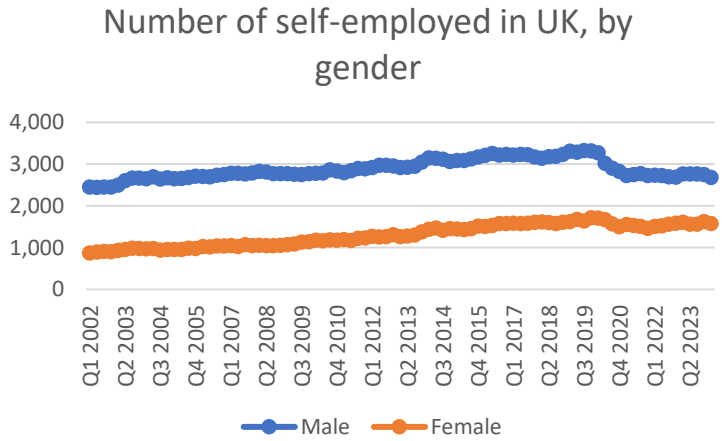
- Gender employment/pay gap has declined in recent decades[1] – Gender gap in entrepreneurship/self-employment persists[2]

- Scholars have investigated a range of channels through which gender influences entrepreneurial performance

- Particular focus on household / family formation and childcare (as part of view across the 'life course')



Source: Labour Market Stats., ONS

- Impact of gendered ageing has rarely been studied[3] – notable gap in literature around gender differences in 'mid-life'

1: Goldin, 2014; 2: Zanberg, 2021; Kiefer, 2022 3: Cheraghi, 2018

# Motivation

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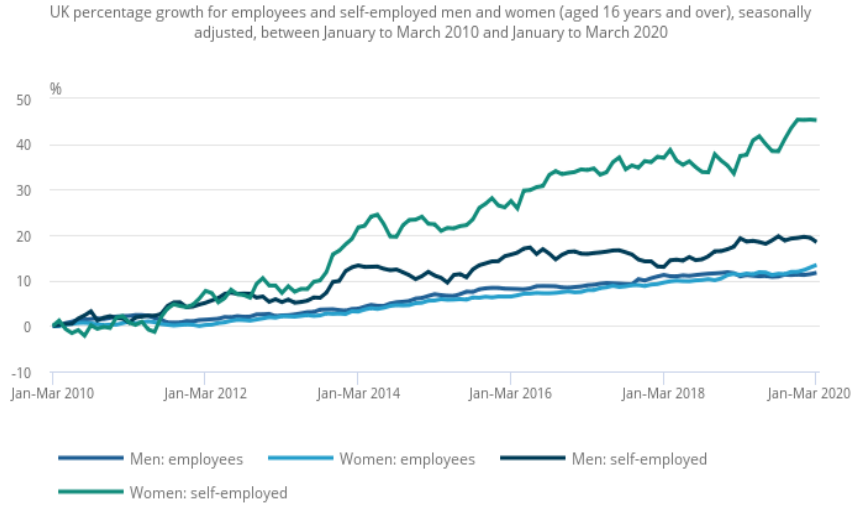
## What We Know:

- UK Self-employment among women increased at fast rate than any other category (driven by mid-life women)

Figure 3: The number of self-employed women has increased by 45.3% over the last 10 years; this is more than double the percentage increase for men




- Research on the association between mid-life health (menopause) and work is still relatively scarce
  *(Verdonk & Bendien, 2022)*
- Strong association between 'bothersome' menopause symptoms and work ability
  - Employed women change job, reduce hours or quit
  - Psychological / psychosocial most strongly associated
    *(e.g. Geukes et al, 2012; Bazeley et al, 2022; Bryson et al, 2022; D'Angelo et al, 2022)*

- Hormone Replacement Therapy (HRT) is found to be the most effective treatment for symptoms; use was negatively impacted in early 2000s by studies (erroneously) suggesting risks outweigh benefits for all
  *(e.g. Menon et al, 2007; Pines, 2018; Crawford et al, 2018)*

# Research Question

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- **What We Don't Know**:
  - No research compares mid-life women to mid-life men, when considering how menopause is related to employment (Brewis et al, 2017)
  - No research considers women who are self-employed/business owners
    - Either ignored or expressly excluded (e.g. Bryson et al, 2022)
    - Is nature of relationship between menopause and work similar to that of employed women?
    - Fundamental differences in flexibility, control and support

**"How is the menopause transition associated with self-employment likelihood, and performance, for midlife women?"**

# Methodology

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**Data from English Longitudinal Study of Ageing**

elsa English Longitudinal Study of Ageing

- Measure changes in health, economic and social circumstances
- 9 bi-annual survey 'Waves' (2002-2018)
- Restrict sample to those age 40-65, with at least one period of work (Emp or SEmp)
- Unbalanced panel (due to attrition; sample replacement; non-response)

| Survey Wave | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Total Panel |
|---|---|---|---|---|---|---|---|---|---|---|
| All IDs | 1572 | 1509 | 2598 | 3527 | 3479 | 3943 | 3509 | 2745 | 2012 | **24894** |
| Males | 716 | 690 | 1207 | 1652 | 1632 | 1833 | 1581 | 1198 | 855 | 11364 |
| Females | 856 | 819 | 1391 | 1875 | 1847 | 2110 | 1928 | 1547 | 1157 | 13530 |

- Variables of interest:
  - Dependent (Y) : Employment Type / Weekly Hours Worked / Av. Hourly Income
  - Explanatory (X): Menopause Status
  - Vector of controls e.g. individual characteristics

# Early Work – Correlation (at best!)

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$$Y_{i,t,a,r} = \alpha_t + \lambda_a + \Upsilon_r + \boldsymbol{\beta_1 Menopause\ Status} + \delta X_i + \epsilon_{i,t,a,r}$$

| | (1) Self-Empl | (2) Av Weekly Hours | | (2) Av Hourly Income | |
|---|---|---|---|---|---|
| | | Employed | S/Emp | Employed | S/Emp |
| Menopause Status | | | | | |
| Early/Prem | 0.107*** | -9.385*** | -7.992*** | -0.507*** | -2.426 |
| | (0.060) | (0.951) | (2.930) | (0.445) | (2.139) |
| Surgical | 0.095*** | -9.827*** | -11.254*** | -0.84*** | 6.055* |
| | (0.040) | (0.568) | (1.936) | (0.274) | (3.478) |
| Pre/Peri | 0.261*** | -9.803*** | -11.347*** | -1.083*** | -0.077 |
| | (0.0657) | (0.465) | (1.745) | (0.259) | (1.435) |
| Post | 0.191*** | -10.068*** | -11.630*** | -1.317*** | 1.637 |
| | (0.0267) | (0.345) | (1.191) | (0.174) | (1.107) |

- Model does not address endogeneity
- No causal interpretation
- Systematic differences between males & females not addressed

# Empirical Work

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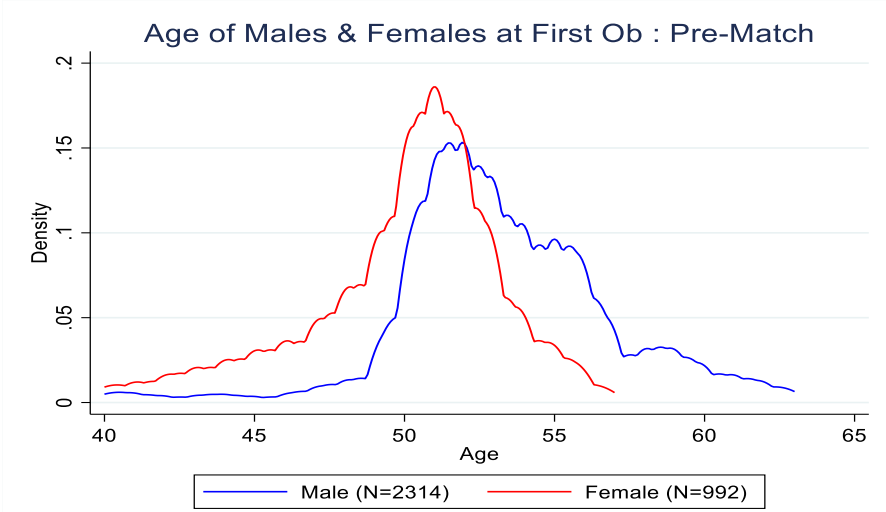
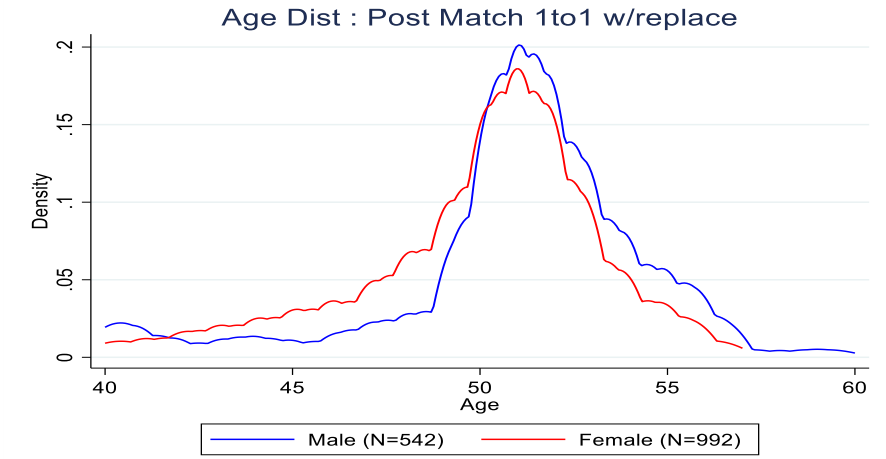
## Identification: Strategy 1

- Use subset of Panel which only includes women who we observe changing menopause status (N=992)
- *Selection Bias*: use Propensity Score Matching (list of individual characteristics) to also include a sample of men who are 'very similar'
- *Endogeneity*: consider menopause as an exogenous 'shock' and use DiD model to estimate causal impact

$$Y_{i,t} = \alpha_t + \beta_1 Female_i + \beta_2 PostMeno_t + \boldsymbol{\beta_3 Female_i \times PostMeno_t} + \delta X_i + \epsilon_{i,t}$$



# Empirical Work

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## Identification: Strategy 2

- *Exploit Quasi-Natural Experiment*: Women's Health Initiative study (2002)
  - Abruptly halted, concluding HRT increased risk of heart disease, cancer & stroke
  - Significant decline in HRT usage (women forgoing treatment to relieve symptoms)
- *Balanced panel:* (N=2,411 Women) from Life History Data (collected in Wave 3), observing menopause status in years before & after
- *Exogenous 'shock' to HRT use: e*stimate causal effects of increased/unremediated menopausal symptoms on self-employment propensity

$$SelfEmployed_{i,t,a,r} = \alpha_t + \gamma_a + \theta_r + \beta_1 Treated_i + \beta_2 PostWHI_t + \boldsymbol{\beta_3 Treated_i \times PostWHI_t} + \delta X_i + \epsilon_{i,t,a,r}$$

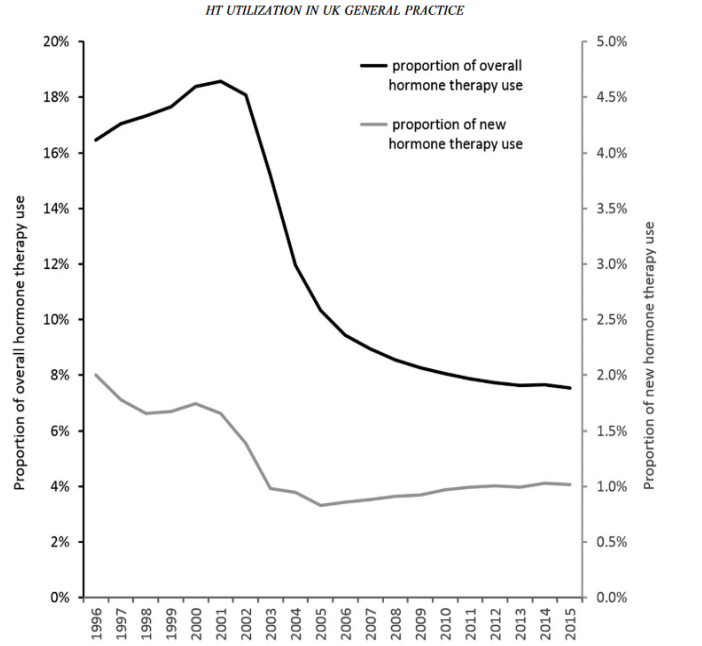


**FIG. 1.** Proportion of overall and new hormone therapy use in the general UK female population from 1996 to 2015. Numeric values corresponding to this figure can be found in Supplemental Digital Content 2, http://links.lww.com/MENO/A385.

# Reliable Causal Inference

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| DiD 1 | DiD 2 | Steps for Reliable Causal Inference (Atanasov & Black, 2016 & 2021) |
|---|---|---|
| ☑ | ☑ | Assess / Defend Shock Exogeneity |
| ☑ | ☑ | Construct Treated & Control Groups |
| ☑ | ☑ | Collect Covariates |
| ☑ | ☑ | Check Covariate Balance / Common Support |
| ☑ | ☑ | Confirm Shock Strength |
| ☑ | ☑ | Check for Pre-Treatment Parallel Trends |
| ☑ | ☑ | Defend "Only Through" Condition |
| ☑ | ☑ | Power Analysis |
| ? | ? | Model Estimation |

After WHI announcement, what is the best T&C grouping?

How best to check parallel trends, with staggered 'Treatment'?

Reducing sample in steps above results in lower power – what to do?

# Next Steps

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- Methods to address ‘issues’ in steps to reliable causal inference

- For DiD1 (unbalanced panel)
  - Two Way Fixed Effects (TWFE) model
  - Compare to latest research on DiD with staggered treatment timing (Freedman et al, 2023)

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# THANK YOU

Questions & Feedback

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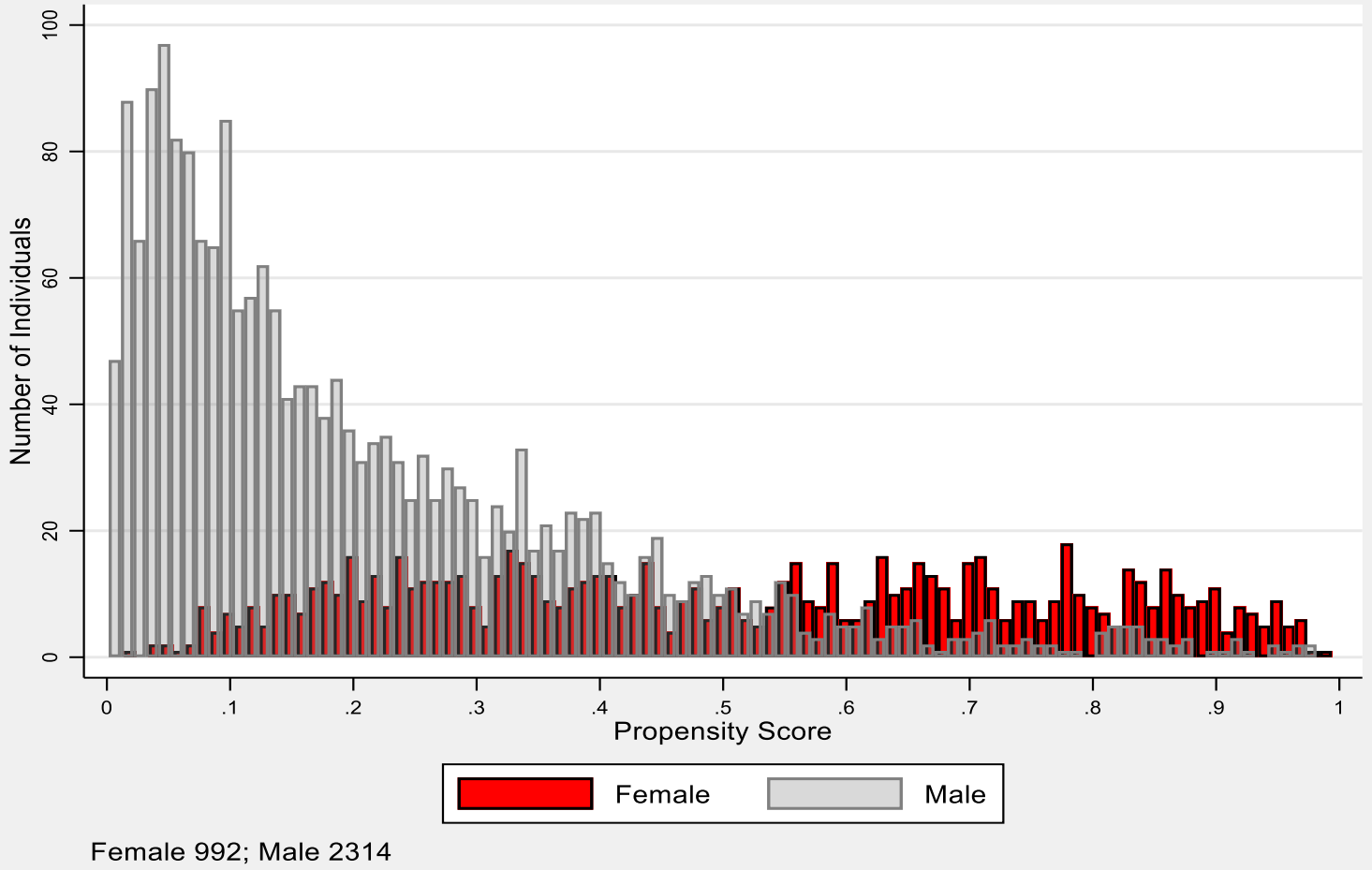
# Appendix: Propensity Score Matching




**Common Support, based on**

- Age
- Ethnicity
- Education (highest level)
- Socio-Economic Status (NSSEC)
- Marital Status
- Children
- Overall Health (self-reported)
- Smoking Status
- Region

# Appendix: Menopause Definitions & Timeline

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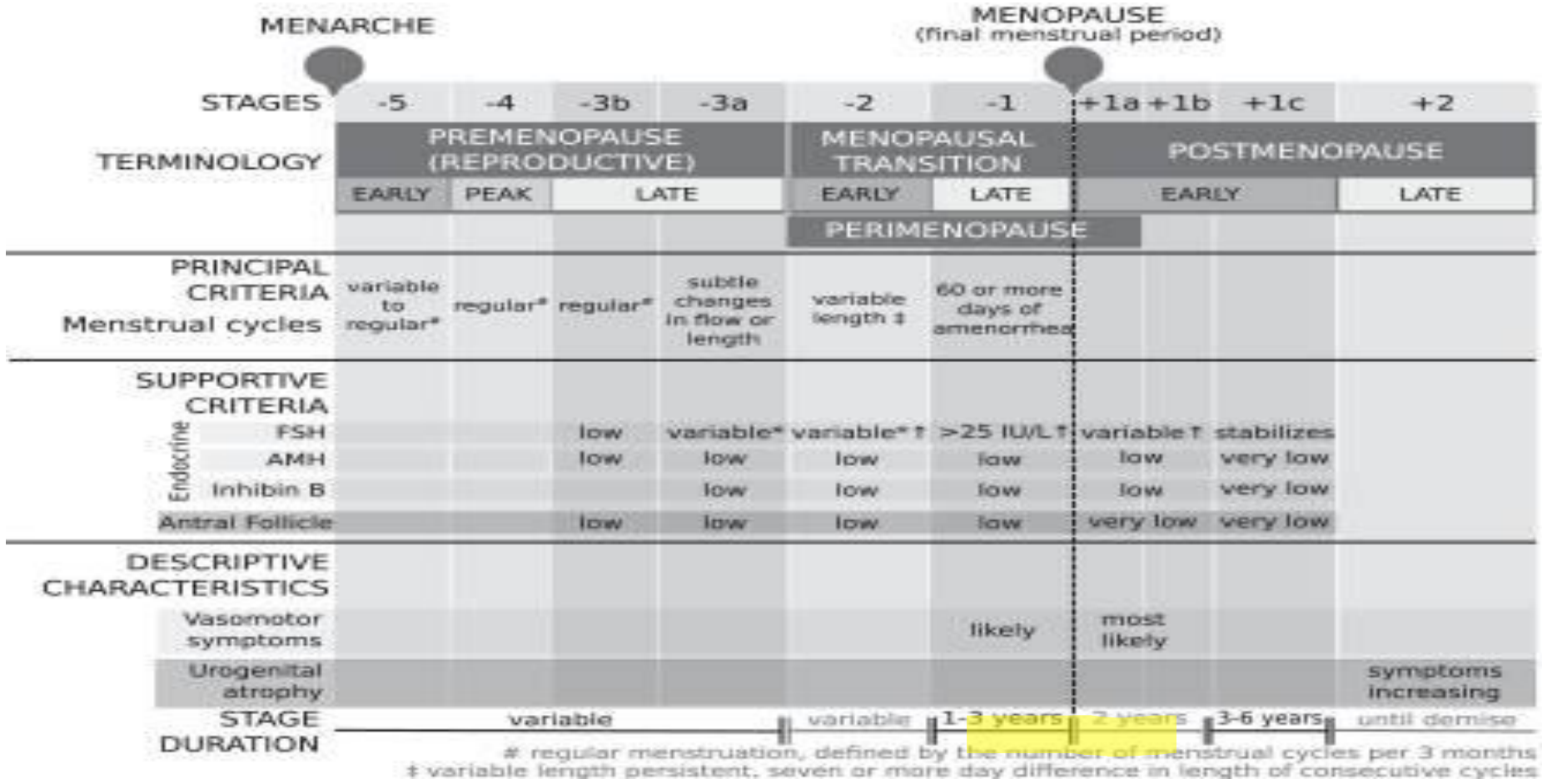


Source: Ambikairajah A, Walsh E, Cherbuin N. (2022)