Coming of Contraceptive Age: An Interdiciplinary Analysis of Hormonal Contraceptives and Mental Health

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An Interdisciplinary Analysis of Hormonal Contraceptives and Mental Health

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LUND
UNIVERSITY

DOCTORAL DISSERTATION

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Abstract: This thesis emanates from the discursive gap between a medical discourse and experience-driven knowledges in mental health aspects of hormonal contraceptives. The tensions and fractures between a medical discourse focusing on contraceptive effectiveness and largely refuting any significant adverse outcomes, and experience-based narratives of commonplace detrimental, or at least unwelcome and unpleasant, mental health effects, is apparent. Although hormonal contraceptives are widely used and side effects on mood and mental health are often reported, little is known about the link between hormonal contraceptives and mental health effects and, what is more, the discourses, narratives, and experiences such a link is inescapably and importantly enmeshed in.

Against this backdrop of increasing awareness of possible mental health side effects of hormonal contraceptives, an interdisciplinary approach with four studies utilizing different approaches to explore mental health aspects of hormonal contraceptives was conducted. Two nationwide prospective cohort studies were carried out, the second utilizing an intersectional multilevel approach, where significant associations between hormonal contraceptive use and subsequent use of psychotropic or antidepressant drugs was found. Two qualitative studies, one critical discourse analysis of contraceptive information directed at the public, and one in-depth interview with women using, or having used, hormonal contraceptives explored discourses of contraception and reproduction that are being drawn upon and reproduced in Sweden, along with experience-based narratives and knowledges. The studies in this thesis show that 1) depressive and other mental health side effects are likely more common than previously acknowledged, particularly among young women; 2) these mental health effects are affected by interacting power dimensions of oppression; 3) women are expected to choose and change (hormonal) contraceptive methods for years and plan pregnancies perfectly; together with 4) navigating often conflicting discourses on hormonal methods as either a simple and effective solution to all reproductive issues, or exogenous hormones as unnatural poison, obliging constant negotiation and self-surveillance.

Using reproductive justice as a jumping off point, this thesis argue that hormonal contraceptive use is a form of modern fertility work dependent on biomedicalization, and that mental health is at the core of this effort. I also show how hormonal contraceptives and discourses thereof are not value-neutral, but act as normative regulators of reproduction in a broader sense. Finally, I argue that hormonal contraceptive effects can be conceptualized as neither purely biochemical nor purely cultural, but rather as a contextual and interconnected result of different power-imbued processes. While availability of hormonal contraceptives is one important part of reproductive autonomy, it becomes clear that the medical discourse on hormonal contraception often obscures the arduous and fundamentally gendered fertility work, entrenched in a unequal society, that hormonal contraceptive use is. A more explorative approach by the medical community, in patient contact and in research on psychological side effects of hormonal contraceptives, could possibly start bridging the divide created by the unfeasibility of reducing complex human emotion, experience, and knowledge, to dichotomous variables.

Key words: Social Epidemiology, Social Medicine, Hormonal Contraceptives, Interdisciplinarity, Gender.

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The development of hormonal contraception forever changed human dynamics related to reproduction.

Donna J Drucker, 2020

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Abbreviations

ART	Artificial reproductive techniques
ATC	Anatomical Therapeutical Codes
AUC	Area under the (receiver operating) curve
DA	Discriminatory accuracy
GABA	Gamma aminobutyric acid
FSH	Follicle stimulating hormone
GnRH	Gonadotropin releasing hormone
HC	Hormonal contraceptive
IUD	Intrauterine device
LARC	Long acting reversible contraceptive
LH	Luteinizing hormone
LISA	Longitudinal Integration Database for Health Insurance and Labour Market Studies
OR	Odds ratio
PCV	Proportional change of the variance
PMDD	Premenstrual dysphoric disorder
PMS	Premenstrual syndrome
ROC	Receiver operator characteristic curve
RFSU	Riksförbundet för Sexuell Upplysning (The Swedish Association for Sexuality Education)
SARC	Short acting reversible contraceptive
SFOG	Svensk Förening för Gynekologi och Obstretik (The Swedish Specialty Association for Gynecologists and Obstetricians)
SPDR	Swedish Prescribed Drug Register
TPR	Total Population Register
WHO	World Health Organization

List of Papers

This thesis is based upon the following papers, referred to as study I-IV:

I. **'Association Between Hormonal Contraception and Psychotropic Drug Use in Adolescent Girls: A Study of 800,000 Swedish Women'**
Zettermark S, Perez Vincente R, Merlo J
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II. **'Hormonal Contraception and Anti-depressant Use in Sweden: An Intersectional Multilevel Analysis of Individual Heterogeneity and Discriminatory Accuracy (MAIHDA)'**
Zettermark S, Khalaf K, Perez-Vicente R, Leckie G, Mulinari D, Merlo J
BMJ Open. 2021; Oct 1:11(10):e049553.
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III. **'Invisible, Responsible Women in Sweden – Planning Pregnancies, Choosing Contraceptives'**
Zettermark S
NORA - Nordic Journal of Feminist and Gender Research. 2023; May 29.
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IV. **'They all of a sudden became new people: Using Reproductive Justice to Explore Narratives of Hormonal Contraceptive Experience in Sweden'**
Zettermark S
Manuscript (submitted)

Abstract

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The right to have a child, the right to not have a child and the right to raise your children. Everyone should have that. It's not that hard to explain — it's just hard as hell to achieve.

Loretta Ross, 2017

Introduction

The Pill. Imagine a drug so significant, so epoch-making, it's been nicknamed just 'the pill'. The hormonal contraceptive pill and its successors has been hailed as 'one of the seven wonders of the world' (The Economist, 1993), offering women bodily and societal autonomy through control over their reproduction (May, 2010), while also harshly criticized for making women sick (Gomez et al., 2018; Tone, 2002). Why is 'the pill' so important? Perhaps because it touches upon the very fundamentals of human life: upon bodily autonomy, pregnancy and birth, getting to decide when to have, or not to have, a child. Upon tangible corporal experiences of bleeding or mood changes, upon medicalization of reproduction and the rights of women. The development and use of the pill can be read as a challenge of patriarchal control over women's bodies, inherently protective of reproductive autonomy (Espey, 2015) or, in light of unrecognized side effects, social injustice, and an eugenic history, as a biomedical intervention reinforcing patriarchal and unjust systems of power (Dehlendorf et al., 2010; Geampana, 2019; Gomez et al., 2014).

Hormonal contraceptives cut through the tiniest biological components all the way up to the organization of human societies. These external steroid hormones mediate effects, through cell-level messaging in the lining of the uterus and ovaries, that have very real effects on the body: hindrance of fertilization and cessation of menstruation (Hawkins & Matzuk, 2008). Moreover, a number of studies show that hormonal contraceptives frequently cause side effects, ranging from mild headaches to blood clots and depression (Mu & Kulkarni, 2022; Simmons et al., 2019; Sitruk-Ware, 2016), but their effects do not stop there. Hormonal contraception creates a very concrete effect on women's imaginable life trajectories, including educational, financial, and relational aspects (Bellizzi et al., 2020; Drucker, 2020; James-Hawkins & Sennott, 2015) through their effectiveness in preventing pregnancy, both when it is unwanted – and wanted. Feminist scholars argue that these drugs create shared experiences, stories that develop into societal macro-stories or discourses, which in turn affect possible conceptualizations of contraception and personal reproductive journeys (Berndt & Bell, 2021; Downey et al., 2017; Lowe, 2005). Norms surrounding family size, and timing and spacing of children, become possible to enforce and, consequently, in some contexts, almost mandatory – both on a personal

and, more ominously, on a governmental level (Drucker, 2020). Birth control, including hormonal methods, is also a constant battleground for conservative forces, interested mainly in controlling and reducing women to procreators (Geiringer, 2016). Finally, the first contraceptive pill and its diverse successors are a result of, as well as a contributor to, the medicalization of reproduction that is still ongoing today (Burfoot & Güngör, 2022b). Taking all these aspects into account, it becomes apparent not only that hormonal contraception is uniquely important to study, but also that biology, story, and society are inextricably linked, and that understanding hormonal contraceptive experience entails, by necessity, understanding how it's enmeshed in structural power dynamics of control.

Women repeatedly describe 'going crazy' when using hormonal contraceptives (Hill, 2020), and often feel disregarded when voicing these issues.

> Among women who believe that the birth control pill has had a deleterious effect on their physical or mental health, there's a palpable sense that the medical establishment has behaved irresponsibly, foisting powerful pharmaceuticals on them while dismissing their doubts as nonsense. (Rosenfield, 2023)

While some clinical guidelines admit possible psychological side effects (Sundström Poromaa & Skalkidou, 2014), little is known of the magnitude, possible mechanisms, and diversity of mental health effects (Robakis et al., 2019). There is an ostensible tension between a medical discourse of effectiveness, of simply rationally choosing the best pregnancy protection (Bertotti et al., 2021; Takeshita, 2012), and an experience-driven, often more critical discourse among women having used hormonal contraceptives (Berndt & Bell, 2021; Geampana, 2019). This divide is even more poignant when it comes to inherently subjective mental health effects – it's even been branded 'the hormone war' in the Swedish press (Arpi, 2021). I therefore wanted to investigate possible mental health effects of hormonal contraceptives, conceptualized as a complex interplay of biology and society, grounded in the power-imbued cultural and political contexts, discourses, and stories shaping contraceptive experiences in Sweden today. This conceptualization of hormonal effects as irrevocably linked natural-cultural forces, meaning that 'real' effects from hormones cannot be reduced to biochemical effects, but that the cultural meaning attributed to them also affects emotions, behaviour, and norms, and thus are equally 'real' (Irni, 2013), is foundational to the thesis. This conceptualization obliterates the gulf between possible biochemical and contextual (emotional, relational, social, or cultural) effects, as neither exclusionary nor hierarchical, but equally real and imperative to understand.

This thesis is the result of being located as a feminist, a physician, and a contraceptive user at the crossroads that contraceptive practices and knowledges constitutes – the crossroads of reproductive norms and autonomy, of biomedical technology and neoliberal self-sufficiency, of politically-regulated population health and deeply personal stories of suffering, relief, questioning and living with hormonal contraceptives. The thesis explores different aspects of this field through an interdisciplinary approach, aiming to circumvent another and unidirectional truth claim, and instead capturing the complexity of contemporary hormonal contraceptive experience and mental health. In this process, it becomes clear how contraceptive experiences are written into our life stories – how coming of age as a girl in Sweden, is almost unavoidably, coming of contraceptive age.

Organization of the thesis

The thesis is organized as follows. First, this introductory chapter continues with a discussion of previous scholarship within the arena of hormonal contraceptives and mental health, together with the persisting knowledge gaps. The aims and purposes are then presented, before a more general background is given, to provide context and coherence for the reader. The background covers a short history of hormonal contraceptives, and the Swedish reproductive and contraceptive landscape including clinical guidelines, and it finishes with a deep dive into the biochemical compounds of current hormonal contraceptive methods and prevalent hypotheses of their mood effects.

After the background, the theoretical frameworks and their relevance for the included studies are presented along with definitions of important concepts. The Methodology and Methods section then outlines the ontological and epistemological point of departure before the methods of each study are considered. The main results for each included study are thereafter presented separately. An individual discussion of each study in relationship to previous scholarship is engaged in, before a more wide-ranging discussion of meanings of hormonal contraceptive use in contemporary Sweden. Strengths and limitations are debated before reaching the conclusions. Lastly, concluding remarks on moving toward reproductive justice and possibly bridging the divide outlined above, as well as future directions, are presented.

Previous research on hormonal contraceptive experience and mental health

Clinicians observe higher rates of mood and libido disturbances from hormonal contraceptives than the very low incidences quoted in product monographs (1%), and often more than those found by medical studies (Weibe, 2013; Wiebe et al., 2012). Experiencing side effects is the main reason for discontinuation of hormonal contraceptives, and mood effects are the most frequently quoted (Hoggart et al., 2013; Sanders et al., 2001; Simmons et al., 2019). Discontinuation rates of any chosen method are generally high, often about 50-60% within six months (Bellizzi et al., 2020; Westhoff et al., 2007). In Sweden, hormonal contraceptive use is dwindling (Hellström et al., 2019), and discontinuation of oral contraception due to mental health side effects has increased over time (Lindh et al., 2009). A majority of women suffer from depression and anxiety symptoms during their lifetime, while only a minority of men experience them, with the discrepancy starting in early puberty (Kessler et al., 2005; Kessler et al., 2006). A majority of Swedish women also use hormonal contraceptives during puberty and young adulthood (Kopp Kallner et al., 2015), and worries about side effects are common (The Public Health Agency of Sweden, 2017). Yet, little is still known about the magnitude of, causes and risk factors for, and contextual conditions predisposing for and contributing to mental health effects of different hormonal methods.

Do hormonal contraceptives cause depression?

In recent years, medical interest has increased in investigating the link between hormonal contraception and mental health. This section presents the current state of knowledge within medicine.

Most studies focus on depression or depressive symptoms, but investigations into well-being and sexual side effects have also been conducted (Robakis et al., 2019). Few randomized controlled trials exist, mainly since designing a study where one group is given a placebo pill without contraceptive effect provides a serious ethical dilemma, since unintended pregnancies can occur (Poromaa, 2013). Rather few of these studies have therefore been conducted, and almost none among teenagers (Worly et al., 2018). Graham et al (1995) found a small but noticeable effect on mood in a subset of women in their double blind, randomized trial on 150 adult women. A randomized Australian study of teenage girls using a combined pill found a similar number of side effects and depressive symptoms in the treatment and

placebo group (O'Connell et al., 2007). A Swedish research group at Karolinska Institutet established a link between combined pills and lower libido (Zethraeus et al., 2016) as well as reduced general well-being (Zethraeus et al., 2017) in adult women.

Population level observational studies, such the first two studies in this thesis, point toward a link between hormonal methods and subsequent depression. A nationwide Danish prospective register study showed a significant association between hormonal contraceptive use and subsequent depression, anti-depressant use, and even suicide in 2016, more pronounced in younger women (Skovlund, Morch, et al., 2016). The link with hormonal contraceptive use and subsequent mental health issues has been confirmed in a number of studies utilizing survey data (Anderl et al., 2020; de Wit et al., 2020; Morssinkhof et al., 2021). Johansson et al (2023), who used prospective survey data from 260,000 women in the UK, and performed sibling analysis to strengthen a possible causal inference, found that the risk of a depression diagnosis and depressive symptoms was highest during the first two years of using combined hormonal contraception, but that a persistently higher lifetime risk also existed. This result is in line with the results from Anderl et al (2022), who showed oral contraceptive use as a teenager could significantly predict major depressive disorder as a young adult.

Systematic reviews of the field and meta-analyses come to somewhat different conclusions, but most find no manifest adverse effect on mood (Fruzzetti & Fidecicchi, 2020; Oinonen & Mazmanian, 2002; Robakis et al., 2019; Schaffir et al., 2016). One recent review found that third and fourth generation progestins seem to have more negative mood effects, a finding that could explain discrepancies between older and newer studies (Hampson, 2023). De Wit et al conducted a meta-analysis of 12 studies including 5,000 adult women, and concluded that no worsening of depressive symptoms could be noted (2021), while the same team showed a significant association with higher depressive scores in teenagers (de Wit et al., 2019). Worly et al found no relationship with depression in their systematic review of progestin-only contraception (2018), while Mu and Kulkarni found more adverse effects with progestin-only methods in their review (2022). Non-oral progestin-only methods, such as IUDs, have been shown to have a more negative effect on mood symptoms (Elsayed et al., 2022). Two reviews investigating combined oral contraceptives found a beneficial effect on mood, especially with less androgenic progestins and a monophasic dosage (Oinonen & Mazmanian, 2002; Schaffir et al., 2016). The same studies both highlight that certain subgroups of women seem to react negatively.

Effort has been put into trying to pin-point the subgroups of women using hormonal contraception that are vulnerable to negative effects on mental health. Previous and ongoing mental disorders, varying from major depressive disorder to anxiety, have been identified as a key risk factor (Bengtsdotter et al., 2018; Lewis et al., 2019; Schaffir et al., 2016; Segebladh et al., 2009). Personality traits falling on the neurotic side, scoring high on anxiety, stress, and mistrust parameters, also seem to predispose for experiencing more mental side effects (Borgström et al., 2008). Being younger is a consistent risk factor (de Wit et al., 2019; Ott et al., 2008), but so also is being highly educated (Wiebe et al., 2011). In Sweden, being a teenager, having previous mental health problems and ADHD (attention deficit hyperactivity disorder) have been shown to increase susceptibility to negative mood changes and depression while on hormonal contraception (Lundin et al., 2021; Lundin et al., 2023). Suffering from PMS/PMDD and post-partum depression also predispose for negative mood effects of hormonal methods, rendering a hypothesis of certain women being more sensitive to hormonal fluctuations (Elsayed et al., 2022; Kurshan & Epperson, 2006; Larsen et al., 2023; Segebladh et al., 2009). However, many women with PMDD are also successfully treated with hormonal contraceptives, and the biochemical background for these conflicting effects is yet to be understood (Robakis et al., 2019).

Apart from agreeing that some women seem vulnerable to altered mental health when using hormonal contraceptives, there is thus a lack of medical consensus within this field. It is nevertheless noteworthy that in a northern European context, the critical, large-scale, quantitative research on possible mental health side effects of hormonal contraceptives is almost exclusively published and located within psychiatry or epidemiology (de Wit et al., 2020; Johansson et al., 2023; Larsen et al., 2023; Morssinkhof et al., 2021; Skovlund, Mørch, et al., 2016; Zettermark et al., 2021; Zettermark et al., 2018), as opposed to the research presenting no link or a positive effect, which is situated within gynaecology and reproductive health fields (Hellström et al., 2019; Lundin et al., 2022; Marr et al., 2011; Poromaa & Segebladh, 2012; Schaffir et al., 2016; Worly et al., 2018). As will be outlined below, reproductive planning and a higher utilization of effective contraceptive methods are encouraged within gynaecology as a means for improved reproductive health (Bertotti et al., 2021; Espey, 2015; Stern et al., 2016; Tydén, 2016). Medicine is not void of ideology or normative elements but operates within, and cocreates, fields of dominance and power (Burfoot & Güngör, 2022b; Clarke et al., 2010; Zola, 1972). It is possible that a hidden publication bias exists, both as a result of, and contributing to, the ideological story of hormonal contraceptives as effective regulators of risky female bodies and (less) suitable motherhood (Grzanka & Schuch,

2020; Gunson, 2010, 2016; Hawkes, 1995; Martin, 1987), which is considered below and developed in detail in the discussion.

Hormonal contraceptives as contextual practice and experience

Much qualitative scholarship has been devoted to (hormonal) contraceptive use, placing itself within diverse research traditions. The most relevant to the thesis is described here, with a focus on feminist scholarship.

Within a biomedical discourse on contraceptives, almost all emphasis is put on effectiveness, both in contraceptive information (Carson, 2018; Rivano Eckerdahl, 2011), and in contraceptive counselling meetings (Dehlendorf et al., 2016; Gomez et al., 2014). Quantifiable, biological knowledge is seen as objective and true, and should lead to rational, effective contraceptive choices void of emotional, relational, and embodied considerations (Berndt & Bell, 2021; Bertotti et al., 2021). Within this medical discourse, compliance with hormonal methods is seen as key to reducing reproductive risk, as not only unwanted, but also unplanned and mistimed pregnancies, particularly teenage pregnancies and abortions, are problematized as risky (Berndt & Bell, 2021; Stern et al., 2016).

Studies placed within this tradition aim at increasing compliance with contraceptive use, often specifically among teenagers, both internationally (Brown et al., 2007; Brown, 2015; Kabagenyi et al., 2016; Lessard et al., 2012; Peremans et al., 2000), and in Sweden (Ekstrand et al., 2005; Falk et al., 2010; Svahn et al., 2021). They often emphasize individual-level barriers such as 'lack of knowledge', or 'fear or hormones' (Asker et al., 2006; Bharadwaj et al., 2012; Hellström et al., 2019; Inoue et al., 2015; Robakis et al., 2019; Svahn et al., 2021). For example, Falk (2010) and Ekstrand (2008) both adopt a risk-taking framework, problematizing the 'sexual risk taking' of Swedish teenagers in regard to non-use of effective hormonal contraceptives. Side effects was a common reason for having discontinued hormonal contraceptives before an abortion (Falk et al., 2010), and they were regarded with scepticism because of possible negative effects during puberty (Ekstrand et al., 2005). Both Falk and Ekstrand also found that the girls interviewed worried about not being taken seriously when voicing issues with hormonal methods at the youth health center prescribing contraceptives.

Feminist scholars have challenged the medical efficacy paradigm by exploring contraceptive choice and experience as a contextual process, affected by personal and structural conditions. Scholarship has highlighted that embodied experiences of side effects, and the risk thereof, are highly relevant to the experience of hormonal

contraceptive use (Geampana, 2019; Hoggart & Newton, 2013; Hoggart et al., 2013; Littlejohn, 2013; Littlejohn & Kimport, 2017), and that effectiveness in pregnancy prevention is far from the only relevant factor in contraceptive choices (Berndt & Bell, 2021; Bertotti et al., 2021; Stevens, 2018). Romantic relationships have been found to be relevant in contraceptive choice (Brown, 2015; Downey et al., 2017), as well as the attitudes of health care providers, where a narrow focus on efficacy can become a barrier to reproductive autonomy (Berndt & Bell, 2021; Dehlendorf et al., 2013; Gomez et al., 2018; Littlejohn & Kimport, 2017; Lowe, 2005).

Recent scholarship emanating from a reproductive justice standpoint has underscored the importance of not only investigating contextual and societal factors, but also placing them within a context of power-dynamics and 'upstream' elements such as values, implicit standards and norms that regulate thoughts and behaviours regarding reproduction (Carvajal & Zambrana, 2020; Morison, 2023). Upstream factors such as reproductive norms of respectable women and motherhood (Alspaugh et al., 2020; James-Hawkins & Sennott, 2015), along with intersecting vulnerabilities stemming from racism and ageism (Alexander, 2022; Gomez et al., 2014; Price, 2011; Senderowicz, 2019), are paramount to understanding contraceptive practices and knowledges. These factors are tied to the femininization of reproductive responsibility, where women are constructed as responsible for the emotional and practical aspects of all family health work, aside from the physical burden of using contraceptives (Brown, 2015; Fennell, 2011; Kimport, 2018; Wigginton et al., 2015).

Not only is contraceptive use a contextual process, but so is discontinuation, changing and evaluating contraceptive methods (Downey et al., 2017). One systematic review by Le Guen et al, using reproductive justice as a point of departure, found that women's reasons to discontinue are complex, multifactorial, and seldom driven by irrational fears (Le Guen et al., 2021). The same study identified both 'altered mental health' and delegitimization of side effects from health care professionals as important reasons for rejecting hormonal methods. A recent Swedish compilation thesis focusing on sexual side effects of hormonal methods showed them to be insignificant at a population level, but through interviewing women it became obvious that individual women could still experience serious adverse effects (Malmborg, 2019). Adverse sexual effects were found to be a strong factor in reconsidering contraceptive method, but side effects on mood was an even stronger factor (Malmborg et al., 2020). Yet, resistance to hormonal methods is often branded as irrational 'hormonophobia' within a medical discourse (Inoue et al., 2015; Le Guen et al., 2021; Littlejohn & Kimport, 2017). This reduction of complex motifs

and situated, embodied decisions based on pluralist knowledge to simple and non-informative categories of contraceptive discontinuation is critiqued by feminist scholars (Bertotti et al., 2021; Fulcher et al., 2021; Inoue et al., 2015; Littlejohn & Kimport, 2017). The complex current state of knowledge is summarized below in Panel 1.

Panel 1. Current state of knowledge of hormonal contraceptive effects on mental health.

- The magnitude and causes of mental health side effects is still under debate.
- Few high-quality, randomized controlled studies proving causation have been done.
- Mental health side effects cause very real suffering and discontinuation.
- Vulnerable subgroups of women react negatively to hormonal contraception.
- Hormonal contraceptive effect on mental health is affected by individual, structural, and contextual factors.
- Women experience more psychological side effects in everyday life than medical studies seem to capture.
- A lack of both quantitative and qualitative scholarship is present.

Exploring the knowledge gap

A lack of scholarship investigating contraceptive information and experiences from a feminist standpoint has been underscored (Carson, 2018), particularly from a reproductive justice standpoint, taking dynamic contextual and structural factors of intersecting power dynamics into account (Morison, 2021; Morison, 2023). Many studies focusing on upstream factors such as political incentives, institutional barriers to, or social disparities in contraceptive use still treat these as static individual or structural traits rather than as unfixed locations of power, possible to change (Carvajal & Zambrana, 2020; Morison, 2023). In Sweden, few investigations of hormonal contraceptive experiences and side effects beyond a risk-reduction narrative exist (Rivano Eckerdahl, 2011) and, to my knowledge, none apply a reproductive justice perspective. Furthermore, because of the focus on medical risk reduction, a one-sided focus on teenagers has been identified (Carvajal & Zambrana, 2020; Morison, 2023).

Within medicine, no consensus exists concerning hormonal methods and mental health (Robakis et al., 2019). Several explanations for this have been provided by scholars, of which four will be presented here. First, designing randomized controlled clinical trials, where one group is provided with a placebo pill without contraceptive effect, provides a serious ethical dilemma, since unwanted pregnancies can occur (Poromaa, 2013). Rather few of these high-quality studies being able to prove causality have therefore been conducted, and almost none among teenagers (Worly et al., 2018).

Secondly, a 'healthy survivor effect', or a 'selective discontinuation bias' likely affects outcomes of both clinical trials and epidemiological studies. The 'healthy worker effect' or survivor bias was originally coined to capture the concept that those who stay in the work force are generally healthier than those who leave it (often because of illness), leading studies investigating only the workforce to become biased toward overestimating health (Arrighi & Hertz-Picciotto, 1994). The same process can be seen with pharmacological use within a population: those that continue taking a certain medication generally tolerate it well, while those with intolerable side effects will discontinue it (Ray, 2003). Measuring side effects only in long-time active users will consequently skew the results in a, for the medication, favourable direction. This effect, which in the case of hormonal contraception is not so much a healthy survivor effect as a selective discontinuation bias, has been discussed as having a large impact on studies of hormonal contraceptives (de Wit et al., 2021; Johansson et al., 2023), arguably since a drug not taken to treat a disease is easier to discontinue (Bancroft & Sartorius, 1990). Yet clinical studies recruiting women to evaluate side effects of

hormonal methods are also less likely to get participants with previous experiences of negative side effects (Poromaa, 2013). Taken together, it is possible that many studies underestimate side effects of hormonal contraception.

The third issue is that of measurability. In medical sciences, 'hard' end points, outcomes of a study that are considered objective and easily measurable (for example, a blood pressure level, or a diagnosis of venous thromboembolism), are generally favoured over 'soft' or 'subjective' endpoints that require interpretation (such as well-being or mood symptoms) (Asmar & Hosseini, 2009). The rationale behind this is related to the underlying positivist epistemology, aiming to reduce risk of bias and increase objectivity. Focusing on hard endpoints is cumbersome when mental health inquiries are on the table, since human experience and mental state are by definition subjective. The result is a lack of studies, a focus on, if not 'hard' then 'harder', end points, such as a depression diagnosis or a score on a depression scale, as well as very incongruent definitions and data collection of mental health side effects (Böttcher et al., 2012; Inoue et al., 2015; Poromaa, 2013). Women are, for example, more likely to report mood effects of hormonal contraception if asked directly about them (Talwar & Berger, 1979).

Fourthly and finally, larger systemic incentives for exploring side effects further might be lacking. Incentives for investigating side effects that could possibly dampen sales within the pharmaceutical industry are generally low (Fernandez & Klinge, 2020). The well-known gender bias in medicine (Hamberg, 2008; Risberg et al., 2006), where women's health is consistently underfinanced and understudied, could also be contributing to the lack of research in this area.

Taken together, too little is known about the crossroads of mental health and hormonal contraceptive use. A research approach that explores hormonal contraceptive knowledges and practices from a reproductive justice standpoint, utilizes observational data when intervention is unethical, confronts a healthy survivor effect, and accounts for the fallacies of hard end points is greatly needed in hormonal contraceptive research.

There is no thing as a single-issue struggle, because we do not live single-issue lives.

Audre Lorde, 1982

Aims and purpose of this thesis

This thesis is written against the backdrop of an increasing awareness of possible mental health side effects of hormonal contraceptives, and the tension between different dominant discourses: the medical narrative largely denying any significant adverse outcomes, and the experience-based narratives of commonplace detrimental or, at least unwelcome and unpleasant, mental health effects.

The general aim is to explore the field of hormonal contraceptives and mental health further, more precisely the discursive tensions and fractures between the medical understanding and the diversity of the experience-driven practices and knowledges of hormonal contraceptive use.

This aim entails capturing the complexity of contemporary hormonal contraceptive experience and mental health through a reproductive justice perspective. By studying different central aspects of this field, such as possible psychological side effects of hormonal contraceptives and reproductive discourses, using diverse methodological approaches, I aim to contribute to a deeper and broader understanding of the current Swedish contraceptive and reproductive landscape, with each study building on the former as well as looking in a new direction.

This is achieved by first epidemiologically investigating a disputed possible causal link between hormonal methods and subsequent mental ill health. Then building on these results, questioning the power structures at play within this field by studying population heterogeneity in depressive response to hormonal contraception based in structural injustice. Thereafter, to situate the knowledge within a broader reproductive conversation and make way for exploring the tension between medical and contraceptive user sensibilities, discourses in medical contraceptive information directed at the public are studied. Finally, drawing on knowledges gained from the previous three studies, the fourth study explores women's own narratives of navigating hormonal contraceptive communication, their choices and experience, partly centred on mental health through in-depth interviews. Figure 1 is a visual conceptualization of how the four studies are located within different contexts.

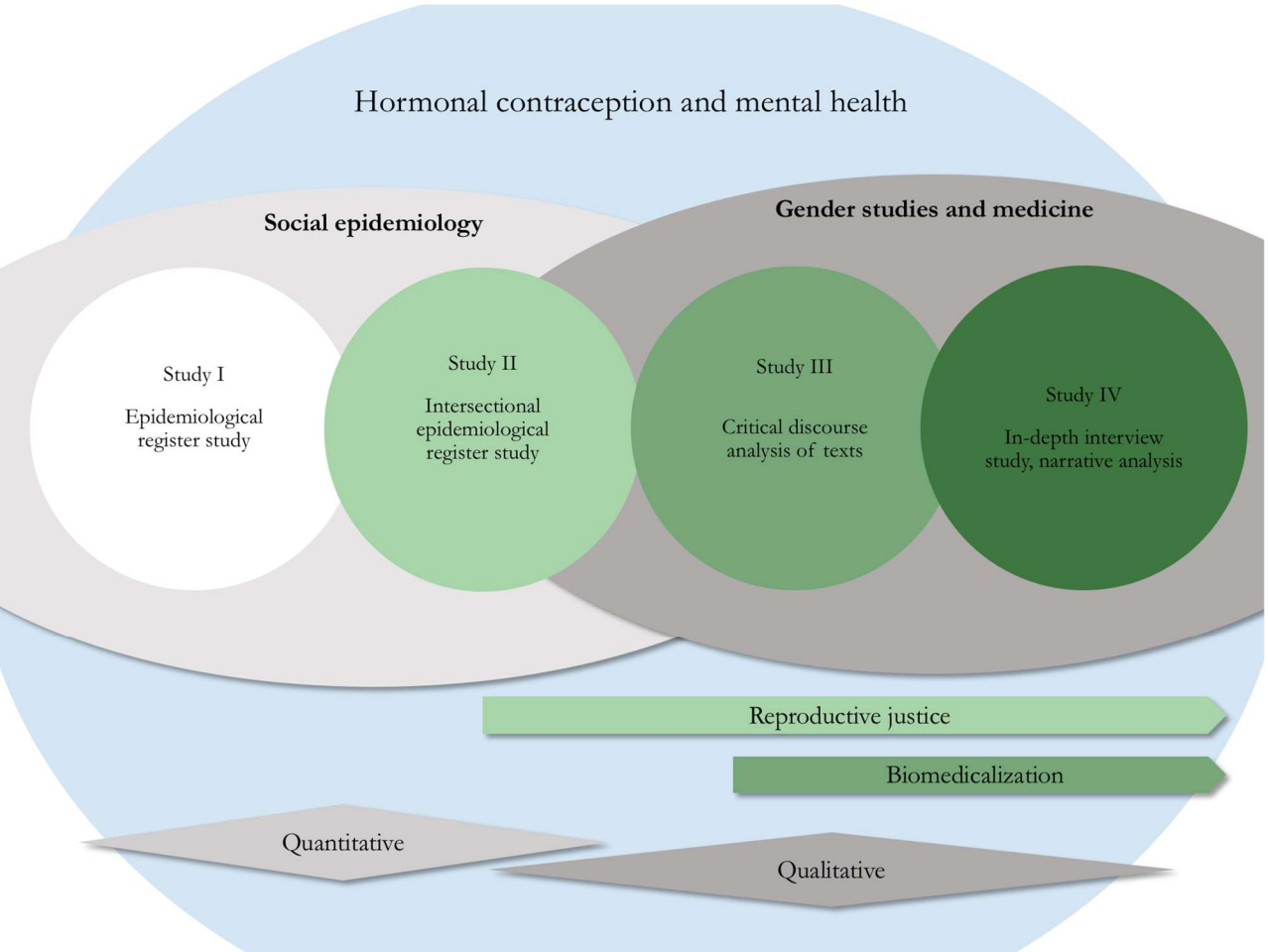


Figure 1. A visual conceptualization of the field of hormonal contraception and mental health. The four included studies can be seen as windows into particular parts of a broader field. The image extends beyond the limit of the page to illustrate that these field are vastly larger than shown here.

Knowledge gaps and research questions

Although hormonal contraceptives are widely used and side effects on mood and mental health are often reported, little is known of the link between hormonal contraceptives and adverse mental health effects and, what is more, the discourses, narratives, and experiences it is inescapably and importantly enmeshed in. Few and contradictory medical studies exist, particularly among teenage girls and marginalized groups, and no nationwide prospective cohort study in Sweden investigating this had been published prior to 2018. Qualitative enquiries exploring hormonal contraceptives and mental health, departing from a theory-driven social justice perspective, rather than from medically-framed risky behaviours, are also lacking.

Study I addresses this knowledge gap by investigating a possible adverse effect of hormonal contraceptives on mental health, through following a nationwide cohort of young women. We hypothesized that an association between hormonal contraception and psychotropic drugs would be stronger in adolescent girls, indicating a selective discontinuation bias.

> *Is there an association between hormonal contraceptives and subsequent use of psychotropic drugs? Is this association age-dependent, indicating a selective discontinuation bias?*

Study II responds to the lack of knowledge about marginalized groups and population heterogeneity in response to hormonal contraceptives, specifically how social contexts made up by intersecting dimensions of power can act in combination with hormonal contraceptives to predispose for depressive symptoms. We hypothesized that the association between hormonal contraceptives and anti-depressants would be more pronounced in more marginalized intersectional contexts.

> *What population heterogeneity in adverse mental health effects of hormonal contraceptives becomes visible through quantitative intersectional analysis? Does intersectional context, conceptualized through a MAIHDA-analysis, matter for the association between hormonal contraceptives and subsequent use of anti-depressants?*

Study III explores the discourses of contraception and reproduction that are being drawn upon and reproduced in Swedish official health care online sources, situated within a discursive tension between medical and experience-driven contraceptive sensibilities, to address the broader context in which understandings of hormonal contraceptives and mental health operate.

> *How are hormonal contraceptives and non-hormonal alternatives discussed? How is the ideal contemporary contraceptive user constructed? How and where are trust and responsibility allocated and what power relations are involved in contraceptive communications?*

Study IV adds to a richer understanding of women's narratives of using, questioning, and discontinuing hormonal contraceptives, and how these experiences are interwoven with biomedicalization and social injustice, aiming to diversify the knowledges of contraceptive experience and bridge knowledge gaps in understandings of current hormonal contraceptive landscapes.

> *How do Swedish women navigate the different dominant discourses on hormonal contraception? Which contraceptive stories are possible and which are not? What do these narratives tell us of the contemporary micro- and macro-political landscapes? How can notions of power within this field be understood from a reproductive justice perspective?*

The four studies in this thesis all look at the field of hormonal contraceptives and mental health from different angles. While the studies stem from different epistemologies, use different methodologies and produce different scientific comprehensions, the overarching interdisciplinary effort aim toward depicting rich and multifaceted knowledges of hormonal contraceptive use and mental health effects, and how these are written into our life stories.

To achieve this, reproductive justice, a framework not previously applied in a Swedish context to study contraceptive experiences, is used as a theoretical point of departure. My principal approach is, as mentioned, explorative. It is driven by a wish to understand how hormonal contraception affects us, our bodies, our relationships, and our society; the power structures behind and stories thereof; and how women navigate contraceptive choices, side effects, and reproductive narratives. This approach could be conceptualized in a metaphor of a painter, looking through different windows, as described in Panel 2.

Panel 2. Painting a thesis. A metaphor describing the interdisciplinary and explorative nature of this thesis.

I envision a painter trapped inside, about to paint a naturalistic scene, peering out through four different windows. She is confined by the same structures that also facilitate her work: the walls, windows, and colours available. All of the four windows have a distinctive shape and frame, and a somewhat different glass quality, at the same time allowing for a certain viewpoint, and limiting the same view. Each painting represents its own window-view, distinguishing a different part of the field outside, both distorted and made clear based on the confinements of the window. Simultaneously, as she's painting, she is creating a new field on the canvas, made out of a unique blending of perspectives and colours.

The walls represent the academic institutions, disciplinary traditions, and evaluating systems; the window frame the specific epistemologies and methods in each study; and the glass the lens through which the field is viewed: the theoretical frameworks. Each of the included studies explores a different part of the field of hormonal contraception and mental health, circumscribed by the restrictions of the window and room: the epistemology, empirics, methodology, and academic norms. Concurrently, as I'm writing this thesis, I'm creating a new field, on paper rather than canvas, composed of diverse knowledge production from my predecessors and myself. I'm using the same colours, my own language, throughout, to create coherence among differing viewpoints, aiming to paint a unique picture. That is, to advance the knowledges and understanding of the complexity of mental health and hormonal contraceptive experiences, and map out the discursive tensions and fractures between the medical understanding and the diversity of the experience-driven practices and knowledges.

Many young women feel worried about side effects of hormonal contraceptives. The worry can result in women choosing other contraceptives that, from a pregnancy perspective, are less safe.

Swedish Authority for Health Care Analysis, 2018

Background

To provide relevant context to the four included studies, this chapter is organized as follows. A historic overview of the development and spread of hormonal contraception is given first, focusing on the social implications. Thereafter the reproductive landscape in Sweden is outlined, focusing on hormonal contraceptive use and current clinical guidelines. The biology behind the drugs and type of hormonal contraceptives currently available is then described, before exploring the current hypotheses around biochemical effects of hormonal contraceptives on mood.

A short history of hormonal contraceptives

The development and spread of hormonal contraceptives is often described as a linear success saga (Carson, 2018; Tone, 2002); a sexual revolution, whereby women were for the first time free to choose when and whether to become pregnant (Espey, 2015). In this view, all we need to aim for today is increased access to effective methods, and perhaps fewer side effects, and equality will be ensured. A number of critical voices (Carvajal & Zambrana, 2020; Downey et al., 2017; Gomez et al., 2018; Gomez et al., 2014; Senderowicz, 2019) have posed the question: Is it really that simple?

The following section will provide an overview of the origin of, and controversies surrounding, the contraceptive pill, including a short rendezvous with some historic persons. The medical achievements, social consequences, and complex systems of oppression in place throughout the history of hormonal contraceptive development will help set the stage for understanding the current contraceptive scenery.

The first pill

The first hormonal contraceptive, a high-dose, combined pill called Enovid, was introduced to the public in the US in 1960, see Picture 1. However, it's history far predates that. A few visionaries such as the women's rights activists Margaret Sanger

and Kathrine McCormick, and biologist Gregory Pincus, are often credited with its development, and although often acclaimed as key figures with tireless commitment (Eig, 2014), it is perhaps more fruitful to view them as catalysts at a point in time when chemistry, post-war societal development, and women's rights converged to create conditions for a reversible, fertility-regulating drug (Drucker, 2020).

Picture 1. The first contraceptive containers. The first Enovid packaging looked like a cosmetic container, indicating the need to hide the medication inside. A more practical and user-friendly package with weekly rows was later developed. Image reprinted with kind permission from Museum of Obsolete Technology (MOOT).

Before the contraceptive pill, other methods were used to prevent pregnancy, most commonly the interrupted coitus or 'pull-out method' (Drucker, 2020). Douches, suppositories, sponges, and spermicides were also available, but rarely effective, and caused vaginal irritation, and although a step forward, the diaphragm needed fitting by a medical professional and could be incorrectly inserted, allowing sperm to get past (Drucker, 2020). Naturally occurring progesterone was known to modulate the menstrual cycle (inhibiting ovulation during pregnancy for example) but was useless as a medical compound because of the high doses needed. Spurred by Sanger and McCormick, Pincus and fellow physiologist researcher Chang recognized that a synthetic, slightly modified progesterone molecule effectively inhibited ovulation in rabbits (Eig, 2014). They also realized that the synthetic progesterone, the progestin, alone gave frequent breakthrough bleeds, and the combined oral contraceptive, incorporating oestrogen for bleeding control, was born (Eig, 2014). Pincus and Chang were not the first to come across this fact, but they were the first to obtain the infrastructure to move on to clinical trials, pinpointing how biochemical scientific progress is never only about chemical compounds (Djerassi, 2023).

The first clinical trial for the combined pill was carried out in Puerto Rico, which was not a coincidence. The rationale behind was threefold: birth control had a high

social acceptance, the lead gynaecologist John Rock had contacts on the islands, and the governing forces wanted to control a rising population boom (Briggs, 2002). The United States government also saw the trials as a novel way of trying out population control as a global policy (Briggs, 2002). Population control, focusing on the poor and those deemed as 'unfit' mothers, is thus inscribed in the very origin of hormonal contraception. The opinions on whether the key figures such as Sanger, Pincus, and Rock were active eugenics themselves, or just went along with doubtful narratives to get their invention on the market, differ, but scholars have argued that at least Sanger was driven by a genuine will to reduce the suffering of multiple and frequent pregnancies (Valenza, 1985).

The motifs are of less importance than reality, though, and the Puerto Rico trials were deeply unethical. The women included were actively sought out in the poorest neighbourhoods, never informed of possible side effects, only of the 'magic pill' that would prevent pregnancy (Briggs, 2002). The high-dose pill often had severe side effects, sometimes requiring hospitalization, but complaints were nonetheless disregarded. Three previously health women died. Parallel trials including more privileged women in the US could not be completed, due to high rates of drop-out (Drucker, 2020).

In an interview in *The Chicago Tribune* 2004, Delia Mestre, one of the last surviving participants of the Puerto Rico trials, was interviewed (Quintanilla, 2004). She elaborated on the lack of consent:

> Even now, it remains difficult to think of those days (…) The experiments were both good and bad. Why didn't anyone let us make some decisions for ourselves? I have difficulty explaining that time to my own grown children. I have very mixed feelings about the entire thing.

Mestre's words capture one of the inherent tensions, one that is seldom admitted in the mainstream hormonal contraceptive success saga: its ability not only to create, but also strip women of, bodily autonomy. A tension coined 'the contraceptive paradox' (Gomez et al., 2018). Rather than seeing these drugs as inherently good or evil, it is important to acknowledge that it is a technology that can be used for different purposes, depending on the economic, social, and cultural context, as well as interpersonal circumstances (Burfoot & Güngör, 2022b). Recognizing the systems of oppression, of racism, poverty and a deeply patriarchal medical science that made these and other unethical trials possible (Briggs, 2002; Corbie-Smith et al., 1999) and how these systems counteract autonomy, is fundamental to understanding the complexity of the contraceptive landscape of today.

Spread and side effects

Complicating the historic and current landscape even further is, of course, the antagonist not yet made explicit: the conservative forces determined on controlling women, shaming sexuality, and forcing pregnancies (Geiringer, 2016). Birth control activists had always battled conservative forces, their arguments often stemming from the age-old patriarchal fear of unleashing a dangerous female sexuality, clad in a thin armour of morality, religion, or health concerns (May, 2010). The antagonism intensified as the contraceptive pill was developed, possibly because of its effectiveness and potential to be entirely controlled by women, as it was the first method decoupling birth control from the act of sexual intercourse itself (Geiringer, 2016). Rock originally designed the monthly intervals, a pill-free week resulting in a withdrawal bleeding, not because of any medical reason but to appeal to the Catholic church. The birth control activist's argument was that the cyclic dosage mimicked a monthly menstrual cycle, rendering the pill a 'natural' form of birth control that should be allowed. The effort was in vain. For a while the Catholic church was undecided, but cemented its position with the famous *Humane vitae*, establishing all artificial contraception as prohibited (Geiringer, 2016). The pill-free week lived on and, for half a century, women have had 'natural' withdrawal bleedings based on little more than a failed appeal to the pope (Edelman et al., 2006). In recent years, the medical community has changed direction and most prominent gynaecological organizations now recommend extended cycle regimens, a fact that is not uncontested and has been critiqued by feminist scholars as a means to streamline productive, non-bleeding bodies within a neoliberal logic of constant productivity (Gunson, 2010, 2016).

Despite resistance, use of Enovid increased rapidly after its first approval in 1960. Many women welcomed the ability to effectively regulate fertility, and both educational level and participation in the labour force for women increased (May, 2010). In Sweden, the pill was approved by the National Medical Board (Medicinalstyrelsen) in 1964 and spread quickly throughout the country (Andersson, 2003). A principal shift took place as prescription hormonal contraceptives, rather than barrier methods, became more common, moving control from the female midwives and activists previously distributing contraception, to the predominantly male medical profession. This was true in a Swedish setting as well, where birth control activists such as Elise Ottesen Jensen changed focus from distributing barrier methods to advocating for hormonal contraceptive availability (Linder, 1996). Many Swedish doctors had moral objections, but those working closely with women suffering the consequences of unsafe abortions or frequent childbearing became an important influence in shifting the medical and public

opinion (Andersson, 2003). Medicalization of women's bodies and reproduction had been a steady development throughout the 20th century, with increasing medical knowledge of hormones, the menstrual cycle, and pregnancy, paving the way for more precise diagnostic tools and medical intervention (Burfoot & Güngör, 2022b). It is important to remember that limiting and spacing of children is not dependent on hormonal methods but has been done throughout the world for centuries without these drugs. For example, the number of children per women in the West started to decline long before the introduction of hormonal methods (Freidenfelds, 2020). Nonetheless, with hormonal contraception, reproduction overnight became medicalized and gate-kept in new ways (Burfoot & Güngör, 2022b). For example, requiring a pelvic exam before prescription was common, and sometimes written agreement from the husband was needed (Drucker, 2020).

The first signals of widespread serious side effects from Enovid came early but were not picked up by the medical community (Liao & Dollin, 2012). Pharmaceutical companies were quick to realize what a lucrative market hormonal contraception was, and had no incentive to inform on disadvantages (Lackie & Fairchild, 2016). Journalist Barbara Seaman wrote *A Doctor's Case Against the Pill* in 1969, mapping out unknown, or at least unspoken of, life-altering side effects, such as blood clots, stroke, depression, and hypertension. She made a strong case against the pill, arguing mainly that women had a right to unbiased information of possible side effects, something not required at the time (Seaman, 1969). Seaman's book was a part of a larger women's movement throughout the 1970s, centring on the female body and a gendered, phenomenological approach to knowledge (Davis, 2007). Women's embodied experiences and stories were painted as juxtaposed to the paternalistic, sexist field of modern medicine, most famously recapitulated in the seminal work *Our Bodies, Ourselves* by the Boston Women's Health Book Collective, of which Seaman was a part (Davis, 2007). A parallel movement of advocating for increased access and gate-keeping, and protesting against putting women on unsafe drugs and monetary incentive can thus be seen - again displaying how women's autonomy was circumscribed by a patriarchal society and how the invention of 'the pill' was no simple route to liberation.

As the hormonal content was lowered during subsequent decades, fewer women suffered serious side effects and public debate shifted onto other issues. During the 1990s, debate erupted again, this time concentrating on blood clots (Lackie & Fairchild, 2016). Heightened media attention featuring personal stories of blood clots followed a press release in the *Lancet* in 1995 that reported a risk increase in venous thromboembolism with third generation combined pills. Sales of these pills dropped globally, and an increase in legal abortions could be seen in Norway

(Skjeldestad, 1997). This episode can be interpreted as both a cautionary tale of blowing scientific findings out of proportion, and of rational behavioural change in the light of new scientific findings. After all, third generation combined pills are not a recommended first-hand choice today, because of the higher risk of venous thromboembolism (Solymoss, 2011). In recent years, attention has been refocused on the possibility of both severe and unpleasant mental health side effects (Griksiene et al., 2022; Lundin et al., 2021). A period of intensified media coverage followed the publication of a nation-wide study by Skovlund et al (2016), showing significant associations between hormonal contraceptives and depression and suicide among young Danish women. The media coverage led to an increase in the reporting of adverse drug reactions, particularly mood-related, to medical authorities in the United Kingdom (Postma & Donyai, 2021). Even though the hormonal content dose has been reduced and changed many times since the 1960s, this short historic rendezvous goes to show how experience-driven scepticism of hormonal contraceptive and concerns about side effects are neither, as some like to argue (Le Guen et al., 2021), a new phenomenon, nor one possible to disentangle from political incentives, biomedical interventions, and structural injustices.

Swedish sexual politics: contraceptive and reproductive life plans

The following section will focus on some of the intertwined political and medical conditions specific to the reproductive arena of Sweden, first from a historical and then a contemporary viewpoint.

In Sweden today, an open and liberal view on sexual health is dominant, although undercurrents of other discourses are discernible (Rivano Eckerdahl, 2011). This openness was not always the case in Sweden. Contraceptive agents, as well as sharing information on them, were forbidden and punishable by fine or prison under the 'contraceptive law' (Preventivlagen or Lex Hinke) in Sweden during 1911-1937 and abortions were illegal until 1937 (Lennerhed, 2017). The state incentive behind this was the worrisome decline in nativity around the turn of the century, and moral reservations about frivolous living (Lennerhed, 2017). Many activists were against these laws, seeing the immense suffering that frequent births brought to many women and families (Andersson, 2003). Journalist and agitator Elise Ottesen Jensen was perhaps the most important figure in changing public opinion on contraceptives in Sweden (Linder, 1996). She was a stout feminist and socialist, believing in sexual and reproductive autonomy, not only through birth control, but through a broader sexual reform. She founded the sexual educational body RFSU (Riksförbundet för sexuell upplysning) in 1933, still actively advocating her ideals today (Linder, 1996). In part due to RFSU's work, the contraceptive laws were overturned in 1938, and sexual education became mandatory in schools as early as 1955 (Andersson, 2003). In hindsight, the worry about declining nativity should perhaps have driven policy change in the opposite direction – birth rates started to increase again only as the contraceptive law was overturned and abortions conditionally legalized in 1937 (Lennerhed, 2017).

The pill was approved in Sweden in 1964 (Andersson, 2003). Abortions were legalized under certain conditions in 1937, and the current law that allows for abortions without constraints up until the end of gestational week 18 was passed in 1975 (Lennerhed, 2017). The medical community was quick to adapt to the new hormonal method and, as in other countries, the control shifted toward male physicians when a prescription became necessary (Andersson, 2003). Contrary to the rest of Europe and the US, this new physician-centred contraceptive organization never really caught on in Sweden. Nurse midwives started to prescribe hormonal contraceptives as early as the 1970s, although they formally gained the right in 1996 (Vårdförbundet, 2019). With 30 hours of dedicated preparatory training in

contraceptive counselling, all nurse midwifes in Sweden have limited prescription rights, that is, prescribing hormonal contraceptives to healthy women for contraceptive purposes, since 1996 (SOSFS 1996:21). The vast majority, up to 90%, of all hormonal contraceptives are currently prescribed by nurse midwifes in Sweden (Lindh, 2014; Vårdförbundet, 2019).

Today, hormonal contraceptives are completely subsidized by the state for all youth age 20 or younger, and often heavily subsidized for women under 26 by the regional authorities, although rules and restrictions for this age group differ throughout the country (eHälsomyndigheten, 2022). After age 26, many hormonal methods are included in the national high-cost protection for prescription drugs, subsidizing medication so the yearly expense does not exceed a certain limit (2,600 sek in 2023, limit is subject to change) (eHälsomyndigheten, 2022). For adolescents and younger women, youth clinics providing free contraceptive counselling as well as a range of sexual and reproductive health services are available in every municipality, while older women often visit dedicated nurse midwife clinics. Sweden has an active gender equality agenda, where fathers' participation in childcare, and the mothers' in the labour market, is encouraged (Arousell et al., 2017). This becomes evident in both health care communication and by policy construction such as mandatory sexual education and the paid parental leave system, where three months of paid leave is earmarked for the father (Jungmarker et al., 2010; Lidbeck et al., 2018). The paid parental leave policy furthermore creates an incentive to have children close together, since the woman keeps her level of social security benefits at the same (higher) level as before the first child, if she becomes pregnant again within one year and nine months (Försäkringskassan, 2023). Maternity health care is free of charge, and childcare is heavily subsidized. Of relevance to the contemporary reproductive landscape is also that, despite the above outlined political efforts, the health care and the public sector in general have suffered substantial cutbacks in recent years, and 'women's health' is among the hardest hit areas (SKR, 2022; Vengberg, 2022). Seeing a health care provider often entails long waiting times and active effort (SKR, 2022).

An overt goal of Swedish authorities, communicated through policy documents and health care meetings, is to limit not only unwanted but also unplanned pregnancies and abortions (Sjöberg, 2018; Stern et al., 2016). Unplanned pregnancies carry higher medical risks, such as low birthweight, at a population level and are more often terminated; reasons used to motivate this stance (Stern et al., 2016). Contraceptives, foremost the effective long-acting hormonal methods, are seen as key to limiting unplanned pregnancies (Hellström et al., 2019; Lindh, 2014). A policy evaluation of the reform to subsidize hormonal contraceptive methods for

youth from the Authority for Health Care Analysis (Myndigheten för vård- och omsorgsanalys) concludes that was a successful intervention, but that barriers persist:

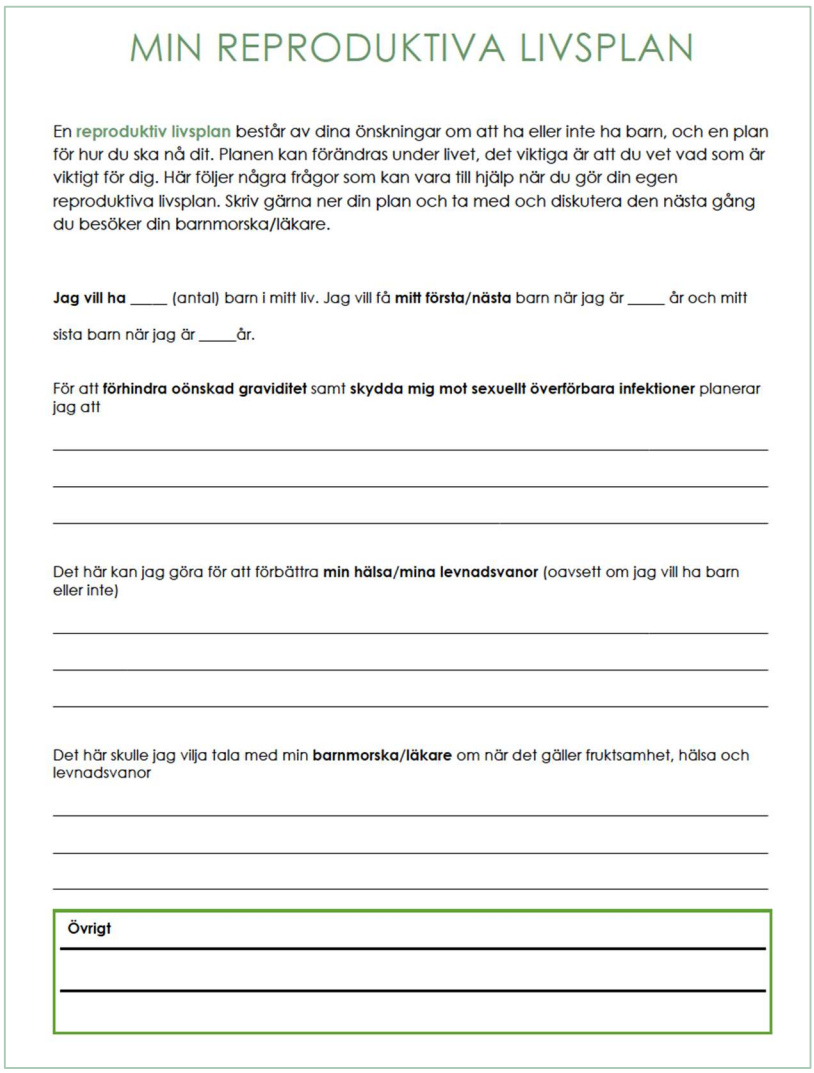
> Many young women feel worried about side effects of hormonal contraceptives. The worry can result in women choosing other contraceptives that, from a pregnancy perspective, are less safe. It is of vital importance that women are given objective and correct information on advantages, disadvantages, and possible side effects. When we compare Sweden to other countries, higher rates of abortions are apparent compared to the other Nordic countries. Taken together, we see a value in reducing unwanted pregnancies among young people, both from an individual and societal perspective (Sjöberg, 2018, p. 19).

Society is here constructed as a stakeholder in the contraceptive practices of young women. Limiting unwanted pregnancies and the suffering they potentially cause is evidently a good thing. Yet, as has been mentioned and will be explicated later in the thesis, it is not the only important factor in reproductive autonomy. Availability and cost of hormonal methods are seldom limiting factors on contraceptive use in Sweden, but many girls and women still reject these methods (Hellström et al., 2019). This rejection, and the reproductive risk of an unwanted or unplanned pregnancy it carries, is often framed as the main problem in Swedish studies of non-use of contraception (Ekstrand, 2008; Ekstrand et al., 2005; Falk, 2010; Falk et al., 2010; Hellström et al., 2019; Lauszus et al., 2011). In Region Stockholm, the aim to limit the number of abortions and pregnancy planning through increased use of long-acting reversible contraceptives (LARCs), as well as through using a standardized tool called 'reproductive lifeplan', is made explicit in the official contraceptive counselling guidance:

> Women who use LARCs undergo fewer repeat abortions compared to those using short-acting reversible methods (SARCs). The goal is that contraceptive counselling at nurse midwife receptions shall lead to an increase in utilization of LARC. (…) Departing from a reproductive lifeplan (RLP) in the contraceptive counselling meeting. RLP aims to guide the woman or couple in their wishes for having or not having children and a plan for how the woman or couple should get there. (Mödrahälsovårdsenheten Region Stockholm, 2023a)

Yet, the early, unplanned, pregnancy is only one side of the reproductive risk discourse. The other is the risk of infertility or 'waiting too long'. The reproductive lifeplans are inspired by an American initiative and in a Swedish context they are mainly used to raise awareness of the age-dependent decrease in fertility and motivate women to plan their pregnancies before the decline is too steep (Tydén, 2016). One example of a reproductive lifeplan can be seen in Picture 2. The first line translated

to English reads 'I want ___ (number) of children in my life. I want to have my first/next child when I'm ___ years and my last child when I'm ___ years.' Evaluating reproductive lifeplans as a means to 'increase young people's knowledge about age and lifestyle factors effect on fertility' to encourage childbearing before 'female fertility has started to decline' is an ongoing research project at Uppsala university. One part is a website open to the public, where quizzes, information, and the reproductive lifeplans can be found (Uppsala University, 2023).



MIN REPRODUKTIVA LIVSPLAN

En **reproduktiv livsplan** består av dina önskningar om att ha eller inte ha barn, och en plan för hur du ska nå dit. Planen kan förändras under livet, det viktiga är att du vet vad som är viktigt för dig. Här följer några frågor som kan vara till hjälp när du gör din egen reproduktiva livsplan. Skriv gärna ner din plan och ta med och diskutera den nästa gång du besöker din barnmorska/läkare.

Jag vill ha ____ (antal) barn i mitt liv. Jag vill få **mitt första/nästa** barn när jag är ____ år och mitt sista barn när jag är ____år.

För att **förhindra oönskad graviditet** samt **skydda mig mot sexuellt överförbara infektioner** planerar jag att

Det här kan jag göra för att förbättra **min hälsa/mina levnadsvanor** (oavsett om jag vill ha barn eller inte)

Det här skulle jag vilja tala med min **barnmorska/läkare** om när det gäller fruktsamhet, hälsa och levnadsvanor

Övrigt

Picture 2. An example of a reproductive lifeplan from Uppsala university. Retrieved from: https://www.reproduktivlivsplan.se Reprinted with the kind permission of the project leader.

The reproductive lifeplans can also contain medical and life-style advice. In Region Stockholm, the woman who answers that she 'wants children, but not now' is prompted to take several measures to secure an aspired reproductive future:

> Increase your chances of having children in the future by:
>
> 1) Get to know your menstrual cycle and fertile window
> 2) Protect yourself against sexually transmitted diseases
> 3) Try to keep your BMI between 18.5 and 25
> 4) Take folic acid supplements every day
> 5) Don't wait too long
>
> When it's time: remember to improve your lifestyle habits before you try to become pregnant. (Mödrahälsovårdsenheten Region Stockholm, 2023b)

The rationale given is amicable, to help women have the children they want, when they want them. However, there is a definite undertone of a troublesome decline in nativity, not unlike at the beginning of the 20th century, but combined with a modern rhetoric of relying too heavily on artificial reproductive techniques, such as in vitro-fertilization (Waggoner, 2017). An emphasis on optimizing the female body for pregnancy through reproductive planning is also present. The latter trend has been coined 'the zero trimester', whereby coordinated public health initiatives aim to optimize every pregnancy before it is underway, critically described as reducing women to potential child bearers (Waggoner, 2017).

Taken together, the reproductive landscape in Sweden is imprinted by a long tradition of liberal sexual politics, a gender equality agenda, paid parental leave, excellent availability of contraceptive methods, and an emphasis on individual health, pregnancy planning, and female reproductive responsibility. In this particular landscape, with what seems to be very few barriers to making the 'right' reproductive choices, the tension between medical/governing authorities wanting women to use effective hormonal contraceptives, and the scepticism or rejection of these methods among women themselves, becomes extra poignant. To further elucidate the Swedish conditions, a part on current clinical guidelines and hormonal contraceptive use now follows.

Current clinical guidelines and contraceptive use in Sweden

> Contraceptive guidance aims to prevent unwanted pregnancy and preserve fertility until pregnancy is in question, as well as to promote sexual and reproductive health. The goal is that the woman becomes content with her method and uses it correctly and consistently. The woman's current life situation and previous experience of contraceptives should be considered, as should her expectations on the contraceptive method. (Swedish Medical Products Agency, 2014, p. 14)

The official recommendations from The Swedish Medical Products Agency are from 2014, while both the Swedish Specialty Association for Gynaecologists and Obstetricians (SFOG, Svensk förening för gynekologi och obstretik) and regional medical guidelines have more recent recommendations. Recommendations differ according to age, risk factors, and comorbidities. Combined methods are contraindicated for women with an increased risk of venous thromboembolism, and not recommended for women over 40 years. The first choice for new prescriptions of combined methods are combined pills containing levonorgestrel, norgestimate, or noretisterone, because of the lower rick of thrombosis (Swedish Medical Products Agency, 2014). As mentioned in the above section on Swedish sexual politics, an active effort to prescribe more LARCs is underway, and should be the first choice according to SFOG (SFOG, 2019).

It is clearly stated in the recommendations both from The Swedish Medical Products Agency and SFOG, that apart from medical contraindications, all methods can be prescribed to all women depending on their preference, but specific recommendations are still provided for different groups of women. For example, younger women are recommended to use LARCs, motivated by a perceived lack of ability to remember daily pills:

> Young women need highly effective methods, since fertility is high. They often have difficulty with methods dependent on a regular lifestyle and daily remembering, for example the pill, compared to older women. (Swedish Medical Products Agency, 2014, p. 21)

In Sweden, almost all hormonal contraceptive methods on the market are available, ranging from progestin-only IUDs, implants, and minipills to combined pills, patches, and vaginal rings. Specific hormonal content and route of administration are seen in Figure 2. Hormonal methods used for contraceptive purposes in healthy women are prescribed by midwives and subsidized for younger women. As a rule, hormonal contraceptive prescriptions are prescribed for one year at a time, to

minimize the risk of discontinuation. All other medications in Sweden can only be dispensed every third month.

Point prevalence of hormonal contraceptive use in Sweden is 40% when all women of 'reproductive age', about 15-45, are accounted for (Lindh et al., 2017), but varies considerably within this group. Almost 70% of teenagers and women ages 18-20 used a hormonal method during 2010 (Zettermark et al., 2018); see Figure 2. Overall contraceptive use is higher, around 70%, in ages 16-45 (Kopp Kallner et al., 2015).

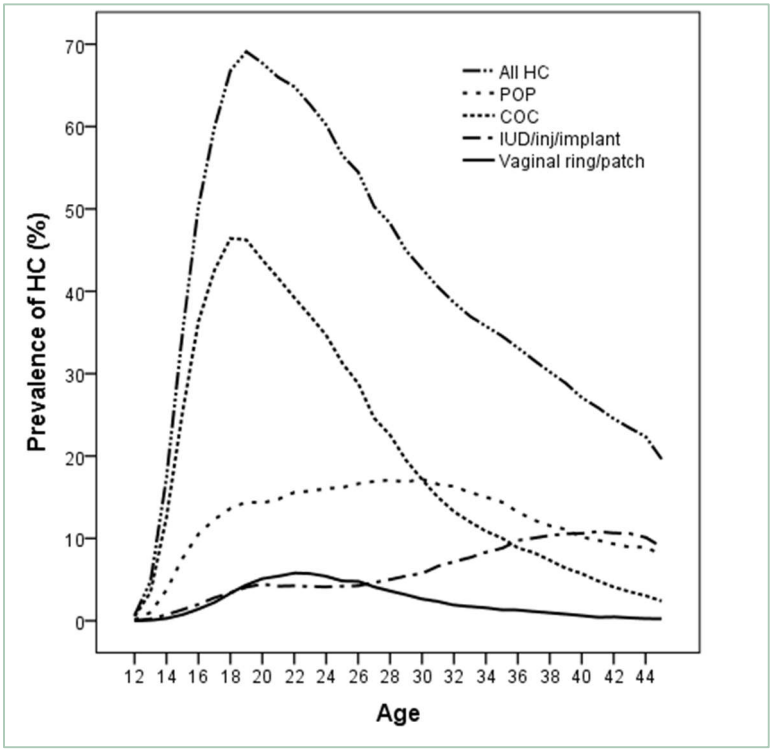


Figure 2. Hormonal contraceptive use in Sweden stratified for age. Point prevalence of different methods of hormonal contraception in Sweden 2010, stratified for age in years. HC: hormonal contraceptive (all methods), POP: progestin-only pill, COC: combined oral contraceptive, IUD: progestin intrauterine device, inj: progestin-only injection, implant: progestin-only implant, vaginal ring: combined vaginal ring, patch: combined transdermal patch.

In 2022, almost 1.5 million prescriptions for hormonal contraceptives were dispensed in Sweden (Statistics Sweden, 2023a). Since these are mostly yearly prescriptions, it is somewhat translatable to the number of women using a hormonal method. The monophasic combined pill is the most commonly dispensed hormonal method, followed by the progestin-only methods. The bi- and triphasic pills are uncommon in Sweden, while IUDs are becoming more common. The true utilization of LARCs is higher than indicated by the dispensing statistics, since the data only captures recently-dispensed prescriptions, and not a functioning IUD or implant already in place.

A more fine-grained view emerges when trends over time are taken into account, as can be seen in Figure 3. In 2010, 155 prescriptions were dispensed per 1,000 inhabitants, while this number had decreased to 143 per 1,000 inhabitants in 2022. However, the number of IUD dispenses, that are only renewed every three to eight years, had almost doubled, from 48,000 to 85,000, during the same period of time. The decreasing number of hormonal contraceptive prescriptions could thus reflect a shift from SARCs to LARCs, rather than an overall reduction in usage.

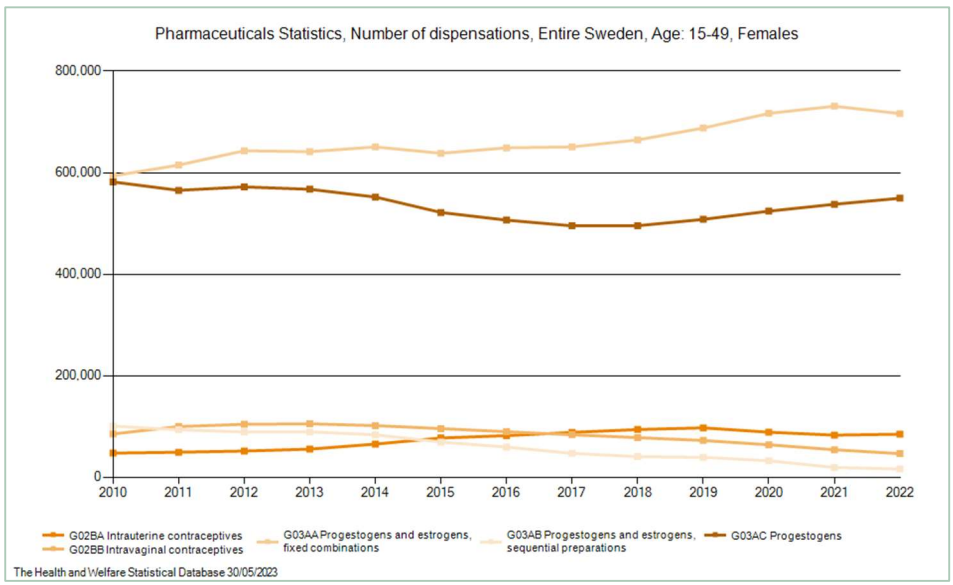


Figure 3. Trends in hormonal contraceptive use in Sweden. Number of dispensations of different hormonal methods per year, in all of Sweden, for women age 15-49. Graph collected from Statistical Database on Pharmaceuticals, Statistics Sweden (2023). The five position ATC (anatomical therapeutical code) codes represent IUDs (G02BA), vaginal ring (G02BB), monophasic combined pills (G03AA), bi- or triphasic combined pills (G03AB), and progestin-only methods, both pills and implants (G03AC).

Contraceptive use and reasons behind them were investigated in a national survey from The Public Health Agency of Sweden in 2017, including almost 8,000 teenagers and young adults ages 16-29 (The Public Health Agency of Sweden, 2017). The survey found that most young people wanted to use a condom (88%) as a contraceptive method, but the most commonly used method during the last intercourse was hormonal contraceptives (50%). Teenagers were more inclined to 'consider a hormonal method' (80%), compared to women over 25 (50%)(The Public Health Agency of Sweden, 2017, p. 64). One question was specifically posed regarding reasons for not using hormonal methods, where the most common answers were 'not required', worries about hormonal methods in general, or side effects.

> Girls who did not use hormonal contraceptives over the past 12 months stated the following reasons: not required (40 per cent), did not want to use hormonal methods (25 per cent), worried about side effects (23 per cent), use a condom instead (18 per cent), want to get pregnant (12 per cent), advised against use of hormonal contraceptives by medical care services (4 per cent), cannot afford them (3 per cent), did not have the time to collect the prescription (3 per cent). (…)
>
> Among 25–29-year-olds, the highest proportion (25 per cent) reported a fear of side effects or a dislike of hormones (30 per cent). A review of the survey's open answers revealed that the two most common reasons for not using hormonal contraceptives over the past 12 months was the experience of side effects (n= 60) or pregnancy or breastfeeding (n= 48). (The Public Health Agency of Sweden, 2017, p. 68)

Noteworthy is that scepticism toward hormonal methods increases with age, but also that side effects, be it the possibility of them or experience thereof, are important. Side effects are mentioned in the clinical guidelines, but rather synoptically and with no specific recommendations based on hormonal content and side effect profile.

> Many of the side effects that are seen with hormonal contraception are dose-dependent, mild, and often transient (…) Bleeding irregularities and mood effects are the most common reasons to discontinue treatment. Another hormonal preparation or contraceptive method can be considered if problems persist beyond 2-3 months of treatment (Swedish Medical Products Agency, 2014, p. 16).

The clinical guidelines are based on supplementary 'background material' that summarizes current medical literature and where more detail is given. Of special interest to this thesis is the chapter on effects on libido and mood, in which the authors conclude that although these side effects exist, too little evidence is available for exact directives.

> Most women feel unaffected or better on hormonal contraceptives, but negative effects on mood and libido are not entirely uncommon side effects. About 15% report sexual side effects and 4-10% report worsening of anxiety or/and depressive symptoms. (Sundström Poromaa & Skalkidou, 2014, p. 60)

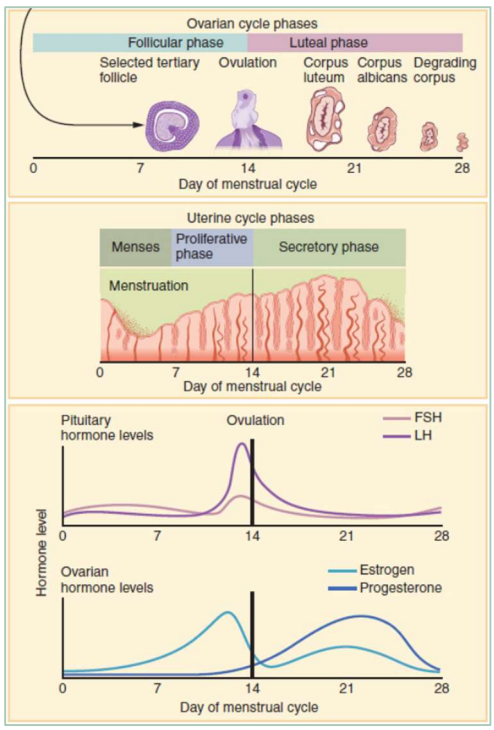
The general recommendations are that combined methods should be considered before progestin-only methods for women with previous psychological side effects, as well as less androgenic progestins. Extended cycle regimens are recommended for PMS/PMDD (Sundström Poromaa & Skalkidou, 2014). To better understand a possible biochemical background for mental health effects, an overview of the biology behind hormonal methods and possible mechanisms for mood effects will be presented in the following sections.

The biology behind

In this chapter, an outline of the biological mechanisms behind hormonal contraceptive effects is given, before the hormonal contraceptive methods available today are presented in detail. Finally, to better grasp the specific context of the studies in this thesis, an account is given of possible biochemical mechanisms for mental health effects.

Mechanisms of contraceptive action

The menstrual cycle consists of an interplay of hormonal signalling and local changes in the ovaries, uterus, cervix, and vagina. It is often divided into the follicular and luteal phase, as can be seen in Picture 3.



Picture 3. Ovarian, endometrial, and hormonal changes during a menstrual cycle. Illustration from Betts et al. (2013). CC BY 3.0.

In the follicular phase, an egg cell matures and is released through rising levels of oestrogen and pituitary hormones, while progesterone is the hormonal captain of the luteal phase, readying the uterus for a potential implantation of a fertilized egg (Hawkins & Matzuk, 2008). More detail is given in panel 3.

Panel 3. A closer look at the hormonal interaction of the menstrual cycle

During puberty, the release of gonadotropin-releasing hormone (GnRH) from the hypothalamus in the brain becomes pulsatile, which stimulates the nearby pituitary gland, in turn releasing follicle stimulating hormone (FSH) and luteinizing hormone (LH). The menstrual cycle starts when FSH stimulates ovarian follicles to develop. Typically, only one will continue to develop into a mature antral follicle, containing the ovum, egg cell. Specialized granulosa cells in the developing follicle will produce oestrogen, which stimulates GnRH to release LH. LH in turn stimulate other specialized cells, theca cells, to produce the androgen androstenedione, that is also converted to oestrogen.

A negative hormonal feedback loop is now followed by a positive feedback loop. The rising oestrogen levels inhibit FSH and LH in the pituitary gland, stalling development of further follicles. However, the dominant follicle will continue producing oestrogen, reaching a tipping point where the inhibitory signals instead become amplifying, inducing a surge in the levels of FSH and LH. The surge in LH causes ovulation when the dominant follicle releases its ovum. The ovum is swept into one of the fallopian tubes by its 'fingers', fimbriae, where it disintegrates within a day if unfertilized. If fertilization occurs, the zygote is transported to the uterus with a possibility of implantation after about three to five days. Throughout the follicular phase, rising oestrogen levels stimulate growth of the lining of the uterus, the endometrium, and prime endometrial cells to respond to rising levels of progesterone during the luteal phase, which make implantation and sustenance of an embryo possible. Oestrogen also changes the composition of cervical mucus and thickens the vaginal lining. Close to ovulation, cervical mucus will be see-through and slippery, coined 'fertile mucus', meaning it can sustain sperm.

During the luteal phase, FSH and LH will cause the now emptied dominant follicle to develop into a corpus luteum ('yellow body'). The corpus luteum secretes progesterone that inhibits GnRH, in turn decreasing LH and FSH, but is reliant on human chorionic gonadotropin (hCG) to persist, a hormone only secreted by implanted embryos. In the absence of implantation, the corpus luteum will atrophy into corpus albicans after 10-12 days, causing LH and FSH to rise again, and the endometrium to be shed through menstruation (Hawkins & Matzuk, 2008). The follicular phase then begins anew, a cycle that for most women, in the absence of pregnancies and hormonal contraception, is repeated monthly for three to five decades.

The basic mechanism of action for hormonal contraceptives in preventing pregnancy is twofold: preventing ovulation and making cervical mucus unfertile (Rivera et al., 1999). High levels of progesterone, and synthetic versions thereof, inhibit ovulation through negative feedback on the pulsatile release of GnRH, thereby inhibiting the rise in FSH and LH needed for ovarian follicles to mature. Without the positive feedback of oestrogen secreted from a dominant follicle, ovulation cannot take place (Hawkins & Matzuk, 2008). This mechanism of action was the first to be discovered, and oestrogen was originally added only for bleeding control (Eig, 2014). It was later discovered that exogenous oestrogen also decreases the release of FSH, again inhibiting follicular development. Secondly, progesterone changes the viscosity and reduces the amount of cervical mucus, effectively stopping sperm from passing. Other effects are thinning of the endometrium and slowing of tubal motility (Rivera et al., 1999).

Combined hormonal contraceptives, containing some form of both progestin and oestrogen, thus work by both inhibiting ovulation and making sperm penetration through the cervix difficult (Rivera et al., 1999). Progestin-only contraception always changes cervical mucus but has a dose-dependent relationship to inhibiting ovulation. The low-dose pill often permits ovulation, while the middle and high dose options inhibit ovulation through the processes mentioned above (Rivera et al., 1999). The different kinds of hormonal contraception, their chemical disposition, and side effects are discussed in more detail in the following sections.

The contraceptive methods of today

Access to contraceptives, hormonal and nonhormonal, varies around the globe, partly depending on approval from medical authorities, economic circumstances, and pharmaceutical production but also, and often foremost, depending on cultural context, traditions, national and local knowledge, and differing incentives to provide, force, or withhold certain contraceptive options (Wood et al., 2023). The following segments should thus be read as a way of comprehending the variety of (hormonal) contraceptives developed, rather than as an exposé of contraceptive options available to everyone.

Today, a plethora of hormonal contraceptives exist, varying in both hormonal content and route of delivery. Compared to the earliest contraceptive pills, modern hormonal contraceptives contain only a tenth of the progestin dose, and a fifth of the oestrogen dose (Rivera et al., 1999). The contraceptive pills alone are used by 150 million women worldwide. When adding injectables, implants, and intrauterine

devices (IUDs), the number of total users rise to over 250 million (United Nations, 2019).

Mostly outside the scope of this thesis, but important to mention, are of course the many non-hormonal contraceptive possibilities. These range from sterilization, to 'natural family planning', such as abstaining during the fertile window of the menstrual cycle, at least five days prior to and one day after ovulation. Barrier methods are still common, with the condom, and less known female condom or femidom, also protecting against sexually transmitted diseases. Worldwide, female sterilization and the male condom are the most commonly used methods. Taking all contraceptive methods into account, it is estimated that more than a billion women globally are using a contraceptive method (United Nations, 2019). See Figure 4.

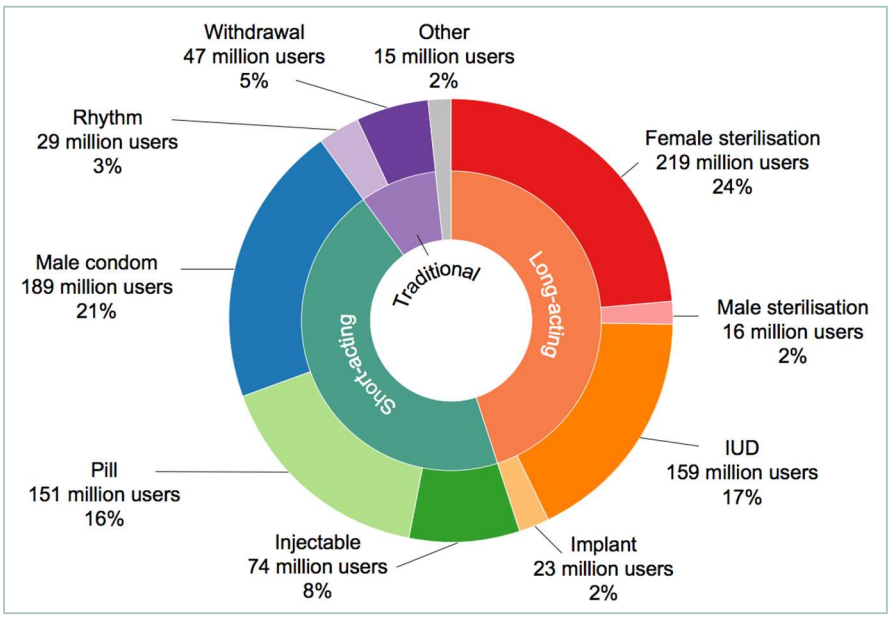


Figure 4. Contraceptive methods worldwide. Estimated numbers of women ages 15-49 using various contraceptive methods, worldwide, United Nations (2019). CC BY 3.0

Several different ways of classifying hormonal contraceptives exist. The most basic division, already touched upon, is the one between combined, comprising both oestrogen and progestin, and progestin-only preparations. Separating oral (pills), vaginal (ring), transdermal (patch), and internal (intrauterine devices, IUDs, injections, implants) is common in the lay press. Medical literature often takes frequency of consumption into account, drawing a line between short-acting preparations, to be taken/inserted daily or weekly (SARCs, short-acting reversible

contraceptives) and long-acting ones, to be injected/inserted at monthly to yearly intervals (LARCs, long-acting reversible contraceptives). Examples of SARCs and LARCs are provided in Table 1. Yet another common partition is historic and biochemical, naming 'generations' of hormonal contraceptives based on their progestin content, in order of discovery. This categorization, together with side effects associated with different generations, will be discussed further down. Finally, it is common to divide hormonal and non-hormonal contraceptives into categories based on their efficiency at preventing pregnancies.

Table 1. Overview of contraceptive methods by hormonal content and duration of effect.

	SARC	LARC	Permanent
Combined	Combined oral contraceptive pill Vaginal ring and patch		
Progestin only	Progestin-only pills: low and medium dose Emergency contraception	Progestin IUD Implant and injections	
Non-hormonal	Condoms Natural family planning methods	Copper IUD	Male and female sterilization

SARC: short acting reversible contraceptive, LARC: long acting reversible contraceptive, IUD: intrauterine device.

The Pearl Index was developed in 1934 and is used to calculate the number of pregnancies occurring per 100 woman-years while using a specific contraceptive method, often referred to as 'contraceptive failure rate' (Shelton & Taylor, 1981). This measure can easily be comprehended as the number of pregnancies occurring in 100 women, using the same method, during one year. It calculates the number of pregnancies occurring for a given birth control method per 100 woman-years of use, using the following formula: *Pearl Index = (Number of pregnancies x 12) x 100 / (Number of women in the study x Duration of study in months).* Other methods of contraceptive effectiveness exist, such as the life table pregnancy rate, but are harder to interpret and less commonly used (Shelton & Taylor, 1981).

The Pearl Index is often divided into perfect and typical use, since many methods are dependent on a certain mode of usage to prevent pregnancy (for example,

accurately placing a condom, remembering a pill every day, or calculating the timing of ovulation correctly) (Shelton & Taylor, 1981). The Pearl Index assumes regular sexual activity that could result in pregnancy. Contraceptive methods and their estimated Pearl Index are presented in Table 2.

Table 2. Contraceptive methods and associated Pearl Index with perfect and typical use. Numbers should be considered approximate. Adapted from WHO & Johns Hopkins Center for Communication Programs (2018).

Contraceptive method	Pearl Index, perfect use	Pearl Index, typical use
Combined oral contraceptives	0.3	7
Progestogen-only pills	0.3	7
Implants	0.1	0.1
Progestogen-only injectables	0.2	4
Combined contraceptive patch and vaginal ring	0.3	7
Progestin IUD	0.5	0.7
Copper IUD	0.6	0.8
Male condoms	2	13
Female condoms	5	21
Male sterilization (Vasectomy)	0.1	0.15
Female sterilization (Tubal ligation)	0.5	0.5
Lactational amenorrhea method	0.9 (in six months)	2 (in six months)
Standard days method	5	12
Basal body temperature method	No reliable data	No reliable data
Sympto-thermal method	<1	2
Calendar or rhythm method	No reliable data	15
Withdrawal (coitus interruptus)	4	20
Emergency contraception pills	1-2	No reliable data
No contraceptive method	85	85

Four generations of hormonal contraceptives

Combined hormonal contraceptives are just that: a combination of oestrogen and progestin. The most commonly used form of oestrogen in hormonal contraception is the modified oestrogen ethinyl oestradiol, but the naturally occurring oestradiol is also available (in combination with the progestin nomegestrol acetate) since 2014. Combined oral contraceptives contain <50 µg of ethinyl oestradiol either as a fixed daily dose (monophasic), or in dosages that vary according to the day of the month (bi- or triphasic). Oestrogen is not strictly needed for a contraceptive purpose, but aids inhibition of ovulation, and provides better bleeding control (Rivera et al., 1999). The main disadvantage of combined methods discussed in medical literature is the well documented risk of venous thrombosis. The risk increase is three- to fivefold, from a level of 1 per 1,000 in young healthy women (Brown et al., 2017; Solymoss, 2011). A higher dose of oestrogen, or combining it with a third or fourth generation progestin, increases the risk, and the combination pill with the second generation progestin levonorgestrel is consequently often a first choice (de Bastos et al., 2014).

Progestins are synthetic hormones that have been modified to have a progestional activity in the body. Progestins can be derived from different steroids and are classified according to the steroid hormones from which they derive, either from testosterone (estranes and gonanes) or from progesterone (pregnanes and norpregnanes). All progestins bind to the progesterone receptor but also, to a varying degree, to other steroid receptors such as androgen and glucocorticoid receptors throughout the body, with both agonistic and antagonistic effects (Sitruk-Ware, 2004; Sitruk-Ware & Nath, 2013). The side-effect profile of a certain hormonal contraceptive therefore varies depending on progestin content and dose, as well the oestrogen content (Davtyan, 2012). The first generations of progestins had a strong anti-gonadotropic effect, stifling ovulation, but were highly affinitive to androgenic and mineralocorticoid receptors, causing side effects such as acne and bloating. Later generations of progestins were developed with the goal of less androgenic effects (Davtyan, 2012). Each generation consist of several different progestins, most available today in different forms, as shown in Table 3.

Table 3. Overview of the progestin content of four generations of hormonal contraceptives, and in what form they are available today.

Progestin	Available in	Specific use
First generation		
Estranes derived from testosterone		*More androgenic*
norethindrone/norestisterone	Combined pills Minipills, low dose progestin	
norethynodrel	-	(Progestin in first birth control pill, Enovid)
norethindrone acetate	Combined pills	
ethynodiol diacetate	Combined pills (not in Sweden)	Endometriosis
Pregnanes derived from 17-OH progesterone		
medroxyprogesterone acetate	Injection, high dose progestin	
chlormadinone acetate	Combined pills (not in Sweden)	
Second generation		
Gonanes derived from testosterone		*More androgenic*
levonorgestrel	Combined pills, IUDs Emergency contraception	First choice combined pills Most prescribed
lynestrenol	Minipills, low dose progestin	
Third generation		
Gonanes derived from testosterone (levonorgestrel derivatives)		*Less androgenic*
desogestrel	Combined pills Medium dose progestin pills	Acne, PMDD
gestodene	Combined pills	
norelgestromine	Patch	
norgestimate	Combined pills	Acne
etonorgestrel	Vaginal ring, implant	
Fourth generation		
Estranes (non ethylated) derived from testosterone/spironolactone		*Less androgenic*
dienogest	Combined pills	Menorrhagia, acne
drospirenone	Combined pills Minipills, low dose progestin	PMDD
Pregnanes (19-norprogesterones) derived from progesterone		
nestorone/segesterone acetate	-	(Ongoing clinical trial for male contraceptive gel)
nomegestrol acetate	Combined pills	

Although mainly prescribed for contraceptive purposes, hormonal contraception is also used for treating varying disorders such as endometriosis, dysmenorrhea or menorrhagia, premenstrual dysphoric disorder (PMDD), and acne (Bahamondes et al., 2015; Robakis et al., 2019). Non-contraceptive health benefits of combined hormonal contraception are a reduced incidence of endometrial, ovarian, and colorectal cancers (Hannaford et al., 2007; Vessey & Painter, 2006). Most hormonal contraceptives also decrease the amount of bleeding or stop it altogether, and therefore lower the risk of iron deficiency and anaemia, especially with an extended cycle regimen or IUDs (Bahamondes et al., 2015). The risk increase for venous thrombosis only applies to combined contraceptives, since the oestrogen component drives this risk (Abou-Ismail et al., 2020). A minor increase in breast and cervical cancer is also detectable while using combined methods, but the effect subsides gradually after discontinuation (Iversen et al., 2017). Taken together, effect on all-cause mortality of hormonal contraception is beneficial (Hannaford et al., 2010).

Subtler side effects of hormonal contraception are experienced and defined differently in different settings and studies, and exact rates are hard to pinpoint. Often quoted are breakthrough bleeding, nausea, breast tenderness, headache, hypertension, acne, weight gain, bloating, hirsutism, and mood effects such as irritability and depression (WHO & Johns Hopkins Center for Communication Programs, 2018). A short deep dive into the possible biochemical explanations for adverse mental health effects of hormonal contraception now follows.

The relevance of progesterone metabolites on mood effects

A body of work investigating possible biochemical and neurobiological explanations for hormonal contraceptive effects on mood is emerging, but significant knowledge gaps in fundamental pharmacodynamics, neurobiological changes, and subsequent mood effect still exist (Hampson, 2023). It is known that hormonal contraceptive use is associated with brain changes (Song et al., 2023). Emotional and cognitive processing in both cortical and subcortical regions of the brain is affected (Gurvich et al., 2022; Toffoletto et al., 2014). One study showed that women with previous emotional side effects from combined pills developed mood deterioration when exposed anew, alongside downregulated emotional brain reactivity (Gingnell et al., 2013). The observed higher correlation of mood effects with non-oral forms could be due to a higher bioavailability of hormones in these formulas (Van Den Heuvel et al., 2005).

Hypotheses as to how these effects are mediated include alterations in the serotonergic system, and modulation of GABA (gamma aminobutyric acid)-ergic

systems in the brain (Pletzer et al., 2023). GABA is a neurotransmitter which mainly has inhibitory functions in the adult mammalian nervous system, while it is excitatory in the developing brain (Li & Xu, 2008). Drugs, for example alcohol, benzodiazepines, and anaesthetics, stimulating the GABA-ergic system usually induce relaxation and have anxiolytic effects, but contradictory and adverse effects such as irritability and anxiety have also been found (Andréen et al., 2009). Receptors binding to the GABA messenger come in two versions, $GABA_A$ and $GABA_B$, which mediate different effects on a cellular level. For the purpose of mood effects, the $GABA_A$ system is of relevance. The mood effects of hormonal contraceptives are believed to be facilitated by the neuroactive metabolites of progesterone (and synthetic progestins), such as allopregnanolone and pregnanolone, which are positive regulators of the $GABA_A$ system. It is thought that the relationship is biphasic, with medium-low concentrations of allopregnanolone inducing an adverse, anxiogenic effect, while very low and high concentrations have less effect on mood (Andréen et al., 2009). The bimodal association can be visualized as an inverted U-shape; see Figure 5.

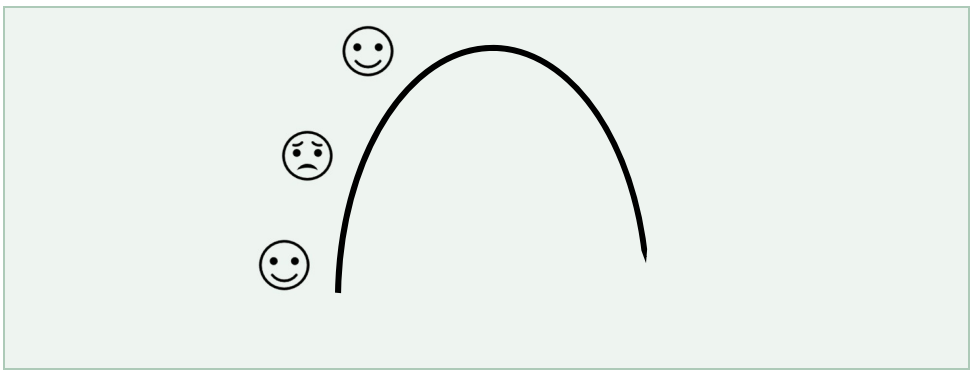


Figure 5. The bimodal association of allopregnanolone on mood. Medium-low concentrations of allopregnanolone induce an adverse, anxiogenic effect, while very low and high concentrations have less negative effect on mood.

Negative mood symptoms arise when the serum concentration of allopregnanolone is similar to luteal phase levels in an ordinary menstrual cycle, explaining some of the experiences of altered mood in PMS/PMDD, but not all women are sensitive to this paradoxical effect of progesterone metabolites (Andréen et al., 2009). In hormonal contraception, the type of progestin matters, with less androgenic progestins having less effect on mood (Griksiene et al., 2022; Pletzer et al., 2023). To make matters even more complicated, the dose of oestrogen also affects cognitive effects (Pletzer et al., 2023).

Puberty is another complicating factor. Teenagers are more sensitive to the GABA-ergic system-mediated mood effects of hormonal contraception (Fruzzetti & Fidecicchi, 2020). Animal models have shown that an upregulation of the GABA-ergic pathways during puberty can cause anxiety in young mice when exposed to allopregnanolone, while adult animals have an anxiolytic effect (Shen et al., 2007). These results should clearly be interpreted with care, but the possibility of an age-dependent differentiated neurobiological response to hormonal contraception should not be ruled out.

Good evidence – however vital – is not enough to change the world.

Nancy Krieger, 2015

Theoretical Frame

In this chapter, the main theoretical concepts shaping and framing the research will be discussed: interdisciplinarity and ecosocial medicine, intersectionality and the allied notion of reproductive justice, and finally the concept of biomedicalization. First, a short definition of central concepts is presented.

Defining depression, mental health, and gender

Central concepts within this thesis are depression, mental health, and gender. Depression is medically described as a multi-etiological disorder that disproportionately affects women, with a life-time prevalence of about 30% and a peak incidence during 15-45 years of age (Piccinelli & Wilkinson, 2000). In clinical practice, major depression disorder is a criterion-based diagnosis, following the definition posed in the globally acknowledged *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5). Five out of nine symptoms, including depressed mood and loss of interest/pleasure, must have persisted for at least two weeks and cause clinically significant distress or impairment (American Psychiatric Association, 2013). I follow the WHO definition for mental health, which admits mental health as existing on a continuum of distress, and not only as absence of mental disorders:

> Mental health is a state of mental well-being that enables people to cope with the stresses of life, realize their abilities, learn well and work well, and contribute to their community. It is an integral component of health and well-being that underpins our individual and collective abilities to make decisions, build relationships and shape the world we live in. Mental health is a basic human right. And it is crucial to personal, community and socio-economic development.
>
> Mental health is more than the absence of mental disorders. It exists on a complex continuum, which is experienced differently from one person to the next, with varying degrees of difficulty and distress and potentially very different social and clinical outcomes. (WHO, 2022, p. 2)

The individual and societal experience, diagnosis and treatment of depression, and mental ill health, are very much dependent on the belief in its aetiology, warranting careful consideration of the underlying belief systems(Brandis, 1998). Depression and mental health can more generally be understood through a variety of different theoretical lenses or approaches, of which only a very brief overview will be given here. During the beginning of the 20th century, Freud's psychoanalytical model of repressed childhood emotions creating symptoms in the adult was dominant (Furman & Bender, 2003). Freud's model was soon challenged by the functional school of thought, which rejected the idea of repressed emotions and held that the functioning adult ideally could accept and process emotions without reactivity. In parallel, as psychiatric drugs were developed, the biomedical model of pathological and measurable fluctuations of neurotransmitter levels won ground in understanding and defining depression (Furman & Bender, 2003). The preferred treatments thus shifted from psychotherapy to cognitive therapy to pharmaceutical interventions – all of which still persist in different forms.

The cognitive theory, alongside the biomedical model, are dominant today. Cognitive theories of depression postulate that the thoughts, interpretations, attitudes, and beliefs of an individual, as well as the way memories are recalled, modify the risk for development and relapse of depressive episodes. At the core of this approach is the vulnerability-stress hypotheses, meaning that an interaction of psychological vulnerability and a triggering stressor (for example, a negative life event), cause the onset of depression (Gotlib & Joormann, 2010). The reductionist interpretation of the biomedical model, that all depressive symptoms can be attributed to a certain level of a specific neurotransmitter (often serotonin), is generally rejected in clinical psychiatry and modern models of depression, but maybe most unequivocally so in social medicine:

> From a social medicine perspective, no form of medicine can ever be a pure biological science: there is always a mutual imbrication of biological and social concerns in any domain of medicine. (…) Social medicine engages social as well as biological determinants of health and disease (Alegria et al., 2018). Social medicine encourages health practitioners to develop a keen understanding of how social structures like poverty, racism, stigma, and economic marginalization shape patterns of illness in individuals and populations (Metzl and Hansen, 2014), and how healthcare providers can be more effective advocates for the health of their patients (Kirmayer et al., 2018). Psychiatry played an important role in the formation of the field of social medicine, but the insights from this field apply to somatic as well as mental health. (Lie & Greene, 2021, p. 333)

Social medicine thus acknowledges the interplay of society and biology for individual health, and the particular implications for mental health. Of special relevance to understanding mental health in its societal context is the theory of oppression. It postulates that members of an oppressed group become more vulnerable to stressors negatively affecting mental health through the process of internalizing the oppressors' prejudice and discrimination (Furman & Bender, 2003). When structures of oppression prevent the expression of rage or resistance outwards, these emotions are turned inwards, creating guilt, shame, and insecurity (Allport, 1954), predisposing for depression. Franz Fanon famously described this phenomenon in northern Africa, where he found that racism and colonialism predisposed for a number of mental health disorders. He theorized that oppression leads to estrangement or 'negation of the self', whereby incomprehension and despair follow (Fanon, 1963). Oppression theory is not unrelated to Marx's concept of alienation in capitalist societies, whereby the separation of meaningful work and labour as a means to capitalist production/profit leads to estrangement and existential desolation (Olman, 1971).

Poorer mental health in oppressed groups has been confirmed by numerous social epidemiological studies (Kern et al., 2020; Marmot, 2017; Sinkewicz et al., 2022), and many different explanations such as psychological factors, material standards, level of freedom, and social rank are given (Wetherall et al., 2019). A consistent finding is that women and marginalized groups are more prone to persistent depressive symptoms than men (Sinkewicz et al., 2022). Feminist scholars have highlighted the need to acknowledge how structural causes of depression and systems of power contribute to 'the ideological reproduction of oppressive social relations' (Neitzke, 2016, p. 59), arguing that purely biomedical models of explanation silence marginalized voices (MacKay & Rutherford, 2012). Societal power structures, privilege, and causes of oppression thus need to be examined and changed to achieve improved health in marginalized groups.

My aim in giving this background is to make my own constructivist position visible. My understanding of depression, mood disorders, and mental health depart from a feminist location within social medicine, admitting the relevance and interplay of biology, structural oppression, and gender relations in the aetiology of mental health symptoms. This position also encompasses an understanding of power structures of oppression and marginalized groups as dynamic. The intersection and fluidity of different marginalized positions will be discussed further in the section on intersectionality on page 70.

Constructing gender

Following feminist scholarship, I conceptualize gender and sex as constructed, that is, as lacking meaning before described by a language within a social and cultural context:

> All bodies are gendered from the beginning of their social existence (and there is no existence that is not social), which means that there is no 'natural body' that pre-exists its cultural inscription. This seems to point towards the conclusion that gender is not something one is, it is something one does, an act, or more precisely, a sequence of acts, a verb rather than a noun, a 'doing' rather than a 'being' (Salih, 2006, p. 55).

This does not mean that the gendered material corporeality is irrelevant, only that it is impossible to separate from cultural understandings of gender and sex, and find a 'pure' biological body. In feminist philosopher Butler's words: 'Gender is the repeated stylization of the body, a set of repeated acts within a highly rigid regulatory frame that congeal over time to produce the appearance of substance, of a natural sort of being' (Butler, 1999, p. 43). Sex and gender are neither one-dimensional, following any particular biological script, nor linear in subsequent expressions (Salih, 2006). However, gender continues to be an organizing principle in society, and gendered identities, expressions, and oppression are very real (Narayan, 2004). I use the word 'woman' throughout this thesis, not to essentialize this category but to recognize its political and cultural relevance in analyzing gendered systems of power related to reproduction. I acknowledge that people in need of contraceptives and those with hormonal contraceptive experience can be of any gender (Agénor et al., 2020; Karrington, 2021). Nonetheless, my empirical material consists of either pre-defined numerical binary gender categories, or interviews with cis-gender women. Using a gender-neutral language would, apart from obscuring the very power dimensions I want to explore, run the risk of extrapolating rather particular cis-gendered experiences, rather than admitting transgendered narratives merit their own depiction (Karrington, 2021).

Interdisciplinarity

Interdisciplinarity has its roots in the 1930s, when 'grand concepts', such as quantum mechanics, forced academic disciplines to work together, and its popularity has come and gone in waves. In the 1960-70s, a more politically and socially motivated push for interdisciplinarity formed, driven by a will to break down barriers within and surrounding academia, which laid the basis for the interdisciplinary university programmes and centres existing today (Chettiparamb, 2007). To understand interdisciplinarity, a few words must first be spent on disciplinarity. Aram (2004) describes academic disciplines as 'quasi-stable thought domains', made up by problems, theories, and methods of inquiry that are semi-integrated and semi-autonomous. However, disciplines are not purely intellectual spheres, but have material impact on the social and institutional organization within and outside academia. The reciprocal organizing of disciplines and society is emphasized by Huber: 'a discipline also functions as a vehicle for the reproduction of social structures while in turn having its social structures reproduced by them' (1992, p. 193).

A more straightforward definition is given by Squires (1992). According to Squires, disciplines are distinguished by; 1) what they are about, the object, 2) their stance towards that object in knowledge production: methods, techniques, and finally 3) their means of operating: in a normative, reflexive or philosophical mode. In a simplified example, the discipline of medicine would traditionally be: 1) about the human body, its function and illnesses, 2) investigated through quantifiable, physical measurements, 3) operating in a normative mode (not reflexive about its own nature to any significant extent). Even this simple example makes the constraints of disciplinarity apparent, since a plethora of medical studies and approaches transcend, redefine, and operate contrarily to these principles on a daily basis. Interdisciplinarity is therefore perhaps less of an ideal and more of a necessity, in a complex and ever-changing world.

Arguments for interdisciplinarity can be divided into normative arguments, striving to justify its existence, and phenomenological arguments, emanating from observations of practice. The normative arguments are usually posed as either filling disciplinary knowledge gaps, or transcendence of disciplinarity in a broader sense. The phenomenological argument mainly asserts that interdisciplinarity always has existed within disciplines, and its development is intertwined with the disciplinary advances (Chettiparamb, 2007). An early definition of 'interdisciplinary' is given in the landmark report by The Organization for Economic Cooperation and Development (OECD) from 1972:

> …an adjective describing the interaction among two or more different disciplines. This interaction may range from simple communication of ideas to the mutual integration of organising concepts, methodologies, procedures, epistemologies, terminologies, data leading to an organisation of research and education in a fairly large field. (OECD, 1972, p. 25)

The definitions and implications of interdisciplinarity are ever evolving. The influential interdisciplinarity scholar Julie Klein defines interdisciplinarity as 'neither a subject matter nor a body of content. It is a process for achieving an integrative synthesis, a process that usually begins with a problem, question, topic, or issue' (1990, p. 175). She further argues that theories and concepts are influential inspirations, and creations, of interdisciplinarity because of their robustness and ability to persevere in different fields, along with a certain plasticity allowing for adaptation (Klein, 2000).

Strathern (2005) visualizes three different aspects relevant to modern interdisciplinarity. First, she articulates how the everyday ability of drawing analogies and getting inspired by new methods is made explicit in interdisciplinary scientific training, creating 'a self-consciousness about the ability to mix knowledges'. Secondly, the cross-boundary problem-solving of interdisciplinarity and how it creates theoretical impetus is highlighted. Thirdly, she discusses how interdisciplinarity is nowadays seen as a goal in itself, as standing for certain values, such as a critique of normative scientific discourse. Questioning and critiquing existing organization of knowledge is often argued as being at the core of (worthwhile) interdisciplinarity, as opposed to the mere repackaging of disciplinary ideas. In Klein's words, 'when intellectuality is premised on rediscovery and rethinking, resocialisation and reintellectualisation, interdisciplinarity becomes not just a way of doing things but a new way of knowing' (Klein, 1996, p. 15).

One school of thought argues that reflexivity, sometimes in a post-modern or radically constructivist fashion, is inherent to interdisciplinarity, while others disagree. The post-modern school argues that difference and heterogeneity need to be respected, and that engagement in society is not a fallacy, but a requirement (Chettiparamb, 2007). Romm (1998), for example, articulates that interdisciplinarity can enhance 'democratisation of knowledge construction' through 'discursive accountability', making structures of power within knowledge construction visible. Nevertheless, the structures which any interdisciplinary venture operates within are still defined by traditional, disciplinary institutions, rules, and standards. In line with the above post-modern reflexivity is Kelly's (1996) definition of wide interdisciplinarity. Narrow interdisciplinarity is situated within a positivist research paradigm, while wide interdisciplinarity include the humanities, with

critical and constructionist perspectives explicitly confronting situated values and meaning.

Drawing on Klein, Strathern and Kelly, I aim to recognize a mix of knowledges, importance of theory, and critique of status quo, and locate myself within a reflexive or wide interdisciplinary tradition in this thesis. Even though the included studies stem from different disciplines, I understand all of them through a critical, or wide, lens.

Ecosocial medicine and (a cure for) risk factor epidemiology?

Social medicine is an inherently interdisciplinary arena. Its very birth is often attributed to a 19th century German pathologist, Rudolf Virchow, realizing social conditions were crucial for understanding the spread of typhus (Taylor & Rieger, 1985). The basis for social medicine is acknowledging that social and environmental factors affect and interact with individual health, while social epidemiology focuses on populations and the distribution of sickness and health related to social determinants of health (Honjo, 2004). Within the current biomedical paradigm of dividing the body, and knowledge about it, into ever smaller compounds and mechanisms of interest, sometimes completely obscuring the body it originated in and its interaction with a surrounding world, social epidemiology becomes a potentially radical juxtaposition, with the means, and a moral obligation, to advocate for social change (Krieger, 2015).

The social determinants of health are defined by WHO as 'the non-medical factors that influence health outcomes', such as income, education, discrimination, and political stability (WHO, 2023). These are intricately linked with inequality on a local, national, and global level:

> These inequities in health, avoidable health inequalities, arise because of the circumstances in which people grow, live, work, and age, and the systems put in place to deal with illness. The conditions in which people live and die are, in turn, shaped by political, social, and economic forces. (CSDH, 2008)

The social determinants of health are often ordered by proximity to the individual, with the first level being set as the individual herself, her physical makeup of hereditary risk factors and age, moving up through relational, meso- and macro determinants (Dahlgren & Whitehead, 1991, 2021). See Table 4 for examples of social determinants of health.

Table 4. Examples of social determinants of health.

Individual level	Mesolevel	Macrolevel
Lifestyle factors: diet, physical activity	Income	Social security systems
Social networks	Education	Structural/political conflict
	Working life conditions/unemployment	Social inclusion and non-discrimination
	Food and water availability/insecurity	Cultural factors
	Housing and basic amenities	Broad environmental factors: climate change
	Health services of decent quality	
	Community protection	
	Close environmental factors: toxins, mould, air pollution	

Adapted from Dahlgren & Whitehead (1991).

The clear-cut division into levels of social determinants, although comprehensible and useful in invoking social change (Dahlgren & Whitehead, 2021), also points to a possible fallacy of the model if not grounded in a theoretical basis. First of all, talking about lifestyle factors lends itself to a blaming-the-victim rhetoric of 'choosing' the 'right' lifestyle factors, or living with disease, which is both stigmatizing and reductionist (Crawford, 1977). Secondly, all levels bleed into and affect each other. Instead, I consider health as being created within a dynamic multi-way interaction between society and body, an interplay of genes, cells, individuals, networks, and a structural and politically ordered environment, placing this thesis and the included studies in the ecosocial tradition of social epidemiology (Krieger, 1994). Society changes bodily processes in direct and indirect ways, affecting biomarkers (Vineis et al., 2020), as well as individual experiences – just as individuals shape their surroundings. Nancy Krieger, who developed the ecosocial theory, uses the metaphor of a twisted and growing bush to explain these interactions, with society being 'an evolving bush of life intertwined at every scale, micro to macro, with the scaffolding of society that different core social groups daily reinforce or seek to alter' (Krieger, 2001, p. 371).

Remedies for real-world risk fatigue

Social epidemiology operates in a real-world setting. That is, controlled interventions are seldom carried out, but the world as it is, this 'evolving bush of life' (Krieger, 2001, p. 371), is observed through available data. As mentioned above, epidemiology

focuses on population health, and therefore often utilizes large-scale registers or surveys to investigate associations between certain diseases or health outcomes and possible causes at a population level. For example, to answer the question of how many women starting on hormonal contraceptives begin to use an anti-depressant within a year, a nationwide register of prescription dispensations could be used, as in Study I. This approach has strengths, since many health outcomes are neither ethical nor feasible to investigate in a controlled setting, and furthermore some health effects become visible only when whole populations are exposed. However, measuring associations between exposure (being exposed to, for example, pollution, poverty, or hormonal contraception) and outcome (for example, later developing asthma or depression) in a real-world setting, carries risks. The risk of bias, measuring the wrong thing, distorting results, have been discussed at length in the epidemiological community (Grimes, 2015), and I will touch upon it further in the discussion chapter. Another risk that has gained more attention in recent years is creating unnecessary risk.

The focus on creating ever-more fine-grained risk factors for any and every outcome, often reported to the public as simple truths rather than results of intricately-designed population studies with very little impact on individual health, has been coined 'risk factor epidemiology' (Merlo, 2014). This, in turn, is a part of a broader 'risk society' whereby societies organize in response to perceived risk, potentially creating stigma, anxiety, and dependence on redundant or even hazardous safety behaviours (Beck, 1992). Several remedies for this development have been suggested, two of which are applied in the studies of this thesis.

One way of more justly reporting risk factors is to not only focus on averages between groups, but also account for the discriminatory accuracy (DA), a quantitative way of operationalizing measurements of heterogeneity within a population (Merlo & Mulinari, 2015; Merlo et al., 2017). Discriminatory accuracy measures with what precision it is possible to predict an outcome for someone, based solely on their belonging to the exposed group. The mean value can differ between groups, but with a significant overlap between groups, that is, a greater heterogeneity within the group, prediction becomes less sensitive. Figure 6 illustrates the difference between two populations with the same difference in mean value for a continuous variable (same reported risk increase), but very different individual variation around this mean value. In population A, the groups are homogenous, and knowing the mean value can almost predict individual group belonging, while in scenario B, the population is heterogenous with significant overlap between groups, despite a difference in group averages. The DA takes this heterogeneity into account, meaning a more accurate report on risk can be made, as well as avoiding unnecessary stigma

to groups based on just group averages. This careful approach to risk factor production through utilizing DA is taken in both study I and II.

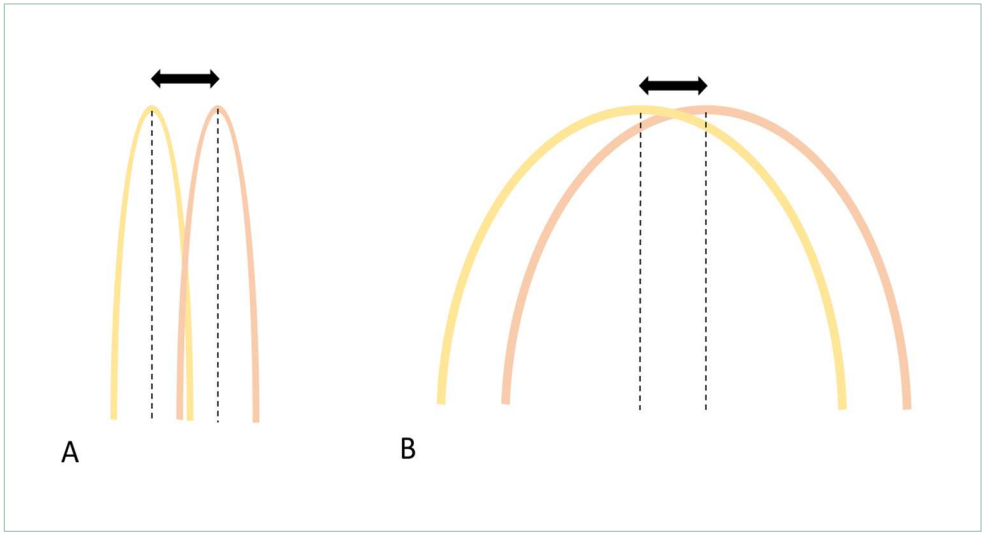


Figure 6. Visualizing Discriminatory Accuracy. An illustration of two populations with the same average difference between groups, within a population with small (A) and large (B) intra-group heterogeneity around the average.

Another important remedy for risk factor epidemiology, which has been called for by scholars within social epidemiology, is integrating social theory to a higher extent (Bauer, 2014; Evans et al., 2018; Lane-Fall, 2023; McCall, 2005; Merlo, 2018; Wemrell et al., 2017). Special attention has been given to the framework of intersectionality and its potential to confront 'the underlying power structures that produce inequalities (rather than inequalities simply resulting from the accumulation of independent risk factors)' (Green et al., 2017, p. 214).

Operationalizing social theories in a quantitative setting is challenging, but one fruitful way to conceptualize intersectionality and capture the underlying intersecting power dimensions of oppression is through multi-level analysis (Evans et al., 2018; Green et al., 2017; Merlo, 2003, 2018; Merlo et al., 2009; Merlo et al., 2018), as is done in study II.

The theoretical frameworks of intersectionality and reproductive justice are considered in the following section, before closing the theoretical chapter on the concept of biomedicalization. The different theoretical concepts discussed here may seem disparate, but there is important common ground, as Panel 4 illustrates.

Panel 4. Advocating social change. Common integral value of different research approaches within the thesis.

Intersectionality, reproductive justice, the critical branch of social epidemiology, and reflexive interdisciplinarity in itself, have an integral value in common: viewing research on injustice as a means for social change. Merely reporting experiences of oppression, or risk factors for disease based on social injustice, is not enough. Realizing the ecosocial and political context, shaped by structural power dynamics that these experiences and risk factors are formed within – and thus its potential for change in a positive direction – matters. This occurs by realizing, informing of, and advocating that change. In Krieger's words:

Good evidence—however vital—is not enough to change the world; history is vital, because we live our history, embodied. Our goal: a just and sustainable world in which we and every being on this planet may truly thrive. (Krieger, 2015, p. 587)

Intersectionality in activism, theory and social epidemiology

The theoretical basis of reproductive justice draws on intersectionality, as first described in the seminal paper by Crenshaw 30 years ago (1991). Intersectionality is a theoretical framework developed within the tradition of Black feminism (Collins, 2004), and was first articulated by Black scholars as a way of describing how an individual inhabits, and is formed by, more than one identity such as gender and race, and how these categories interact to create specific oppressions or privileges (Cho et al., 2013). These categorizations should not be seen as individual 'risky' identities, but as the social, political, and economic conditions that outline our lives through structural inequalities (Price, 2011). A fundamental realization within intersectionality is that oppression is not additive; that being female, poor, and racialized does not equal the sum of those marginalized positions, but intersectional interaction between and within structurally defined and dynamic positions create unique locations that bear different significance depending on situation and context (Bowleg, 2008). Oppression is not static, an inherent trait, but is experienced differently depending on where and how power, exclusion, and dominance are exerted. It is important to evoke the performativity of these power structures, recognizing that the categorization in itself can be used to further both oppression and unequal policies. It is by admitting the importance of dynamic intersectional locations, while concordantly looking beyond static or essentialist categorizations, that the vital analysis of how power is negotiated and exercised becomes possible.

Measuring effects of oppression and marginalization on health is fundamental for the field of social epidemiology, which is why an intersectional approach has been championed (Bauer, 2014). The dynamic, multidimensional, and socially-aware basis for intersectionality makes operationalization in a quantitative setting, where fixed categories are a necessity for statistical analysis, a challenge. The problem with classical 'multiple' approaches is that even if several social categorizations, which can be viewed as proxies for intersectional locations, are considered, they are not measuring the intersection of those categories (Hancock, 2007). As mentioned above, summing up categories of oppression is not sufficient, but neither is adjusting for them to try to isolate a specific effect. Namely, if adjustments are, for example, made for gender to try to isolate the effect of income, the model disregards that gender shapes particular conditions, oppressions, and experiences related to social class, and thus for income-related outcomes. Against this background, scholars have argued for a multilevel approach, where the intersectional locations can be mathematically treated as a higher-level context rather than individual traits,

consistent with the theoretical basis of dynamic intersectional locations rather than individual 'risky identities' (Bauer, 2014; Evans et al., 2018; Green et al., 2017; Merlo, 2018). Furthermore, intersectionality-inspired approaches admit heterogeneity within categories, something that can be operationalized with the help of the above-mentioned concept of discriminatory accuracy (Merlo, 2018). Intersectionality is a powerful analytical tool, and studies II-IV use it as a point of departure to provide new insights into how interlocking power dimensions predispose for adverse mental health effects and differentiate experiences of hormonal contraceptive use.

Reaching for reproductive justice

The reproductive justice movement is based in Black community activism and feminism, in advocating social change for women affected by racism, classism, and sexism (Ross, 2017). It stems from the realization that previous movements for reproductive health and freedom negated Black women's experiences, often of reproductive coercion such as forced sterilization, and limited possibilities to safely raise a family (Ross & Solinger, 2017). Reproductive justice stands on three pillars: the right to have children, not to have children, and raise children in a safe environment. The reproductive justice movement shines a light on the intersecting social positions that cause disproportionately poorer possibilities for reproductive autonomy, as well as pregnancy outcomes and child support systems, for those inhabiting positions composed of multiple structural oppressive systems, such as sexism, racism, ageism, and ableism (Morison, 2023).

Simply advocating reproductive rights, such as legalization of abortion, maternity health care, or available birth control methods, is insufficient in an unequal society. Social inequality needs to be acknowledged, accounted for in directing resources, and ultimately eliminated, to reach reproductive justice (Ross & Solinger, 2017). Minorities and oppressed groups of women and transgender persons in need of reproductive care and infrastructure, such as those living with disabilities, in poverty, or incarcerated, being undocumented immigrants, or belonging to a racialized group cannot be disregarded when reproductive policies, and broader social reforms, are discussed and implemented – rather, their voices and possibilities should be leading (Morison, 2023). While reproductive rights can be found on paper, reproductive justice is lived: it can only exist when the lived experiences of minority groups provide equal possibilities to have children, not to have children, and to raise children in a safe environment. Reaching reproductive justice is therefore impossible without exhaustive social reforms.

The notion of free 'reproductive choices' is also challenged within the reproductive justice movement, where feminist scholars and activists have shown that these choices are only presented within a very narrow neoliberal frame (Price, 2011; Wilk, 2020). Access to contraception, as well as abortion, safe environments to raise children, and notions of who is considered a respectable mother are all conditioned based on intersecting social inequalities. Different concepts have been brought forward to define and operationalize the goals of reproductive justice in a clinical setting. Reproductive autonomy is one, often defined as 'a woman's ability to achieve her reproductive intentions', and a checklist using 14 points grouped into three different subscales entailing freedom from coercion, communication, and decision-making has been suggested (Upadhyay et al., 2014).

Reproductive justice and intersectionality are central to three of the studies in this thesis. Reproductive justice has gained momentum as a useful analytical approach in academia in recent years (Alexander, 2022; Le Guen et al., 2021; Morison, 2021; Morison, 2023; Mulinari et al., 2023), but as yet no Swedish study has, to my knowledge, applied this theory in exploring possible hormonal contraceptive effects, along with contraceptive communication, experiences, and the underlying power dynamics. Study II uses reproductive justice as a point of departure for the intersectional multilevel analysis, contributing to the body of work that answers the call for further intersectional understandings in social epidemiology (Bauer, 2014; Wemrell et al., 2016). A novelty in our study is the combination of a prospective cohort design and intersectional multilevel analysis, the latter having previously mostly been usen in cross-sectional designs (Evans et al., 2020; Lederer et al., 2022; Mahendran et al., 2022). Study III juxtapositions the underlying concepts of socially and politically charged realities affected by dynamic and interacting power exchanges of reproductive justice, to the genderless and neoliberal subject rationally choosing contraception, to expose how contemporary contraceptive medical discourses reduce complex embodied and situated experiences to simple choices in a free market. It is the first study to depart from a reproductive justice standpoint in examining medical discourses on contraceptives communicated to the public, which clearly articulate a sensitivity to power, previously expressed more narrowly as a critique of capitalist or neoliberalist values (Mamo & Fosket, 2009; Medley-Rath & Simonds, 2010; Watkins, 2012). In study IV, when narratively tracing stories of contraceptive initiation, negotiation, and content, reproductive justice is used as a lens through which reproductive privilege and age as an intersectional location is explored. Without this framework, the finer nuances of contraceptive cohesion and paradoxes would not have become visible (Gomez et al., 2018).

Biomedicalizing reproduction

Medicalization, extending medical modes of understanding, medical authority, and medical interventions into new fields, e.g., pregnancy, birth, and contraceptive practices, previously not understood through a medical lens has been an ongoing process for the past one and a half centuries (Burfoot & Güngör, 2022a). Medicalization does not only encompass the extension of medicine but a normative dominance, with medicine becoming the neutral and objective field upon which judgements of individuals can be made without motives and power relations being questioned (Zola, 1972). Conrad (2007) argues that biomedicine becomes powerful not because of the authoritarian control it has over our lives, but because it is allowed to define what is normal and create standards for behaviour. Regarding reproduction, the medicalization process intensified during the latter part of the 20th century, alongside scientific developments in cellular biology, endocrinology, and biochemistry, allowing for ever more detailed understanding of, and intervention in, the female reproductive system (Burfoot & Güngör, 2022a).

This development has intensified and been reinforced through new technoscientific innovations and an ever-growing biomedical sector, into what some scholars conceptualize as biomedicalization. Clarke et al define biomedicalization as:

> …the increasingly complex, multisited, multidirectional processes of medicalization, both extended and reconstituted through the new social forms of highly technoscientific biomedicine. The historical shift from medicalization to biomedicalization is one from control over biomedical phenomena to transformations of them. Five key interactive processes both engender biomedicalization and are produced through it:
>
> (1) the political economic reconstitution of the vast sector of biomedicine;
> (2) the focus on health itself and the elaboration of risk and surveillance biomedicines:
> (3) the increasingly technological and scientific nature of biomedicine:
> (4) transformations in how biomedical knowledges are produced, distributed, and consumed, and in medical information management: and
> (5) transformations of bodies to include new properties and the production of new individual and collective technoscientific identities. (Clarke et al., 2003, p. 161)

While all the above developments frame reproductive, and thus contraceptive, understandings and possibilities, the emphasis on health, risk, and (self-)surveillance are the most central to this thesis. How to preserve and minimize threats to health, rather than just managing illness, requires constant attention to risk, normalized within a discourse of prevention and risk factors, together with continuous self-

surveillance, through new medical realizations and technologies. In this process, novel medicalized identities and forms of internalized self-governance emerge (Rabinow, 2005). These identities are not gender-neutral. Preventative and risk assessment services are primarily marketed towards women (Kelly, 2008). Self-surveillance, self-objectification, and body-consciousness are traditionally female properties, based on the culturally prevalent perception of the female body as unruly, leaky, and in need of refining. Moore (2010) describes health as a gendered project, where women are constructed as responsible for not only their own health, but for that of the whole family, and are consequently found guilty when ill health strikes.

Preventative health measurement within the reproductive arena is explicitly encouraged within the medical community, where unplanned, unintended pregnancies are framed as a problem. Unplanned pregnancies are seen as risky, since pregnancy outcomes have been shown to be poorer at a population level (Stern et al., 2015). Their persistent existence is used as a rational for promoting (female responsibility for) contraception, as exemplified below:

> Sweden has a large unmet need for contraception. In 2017, LARC use had increased compared with 2013. A large proportion of women had experienced an unintended pregnancy. Increasing overall contraceptive use is important to reduce the rates of unintended and unwanted pregnancies (Hellström et al., 2019, p. 154).

> The level of pregnancy planning should be queried routinely to enable individualized counseling, especially for women with unplanned pregnancies. Preconception recommendations need to be established and communicated to the public to increase health promoting planning behavior (Stern et al., 2016, p. 188).

The concept of an 'unmet need' for contraceptives is a common way to describe the gap between actual usage of contraceptives in a population and *estimated* usage if all women not actively trying to become pregnant used contraception (Bradley & Casterline, 2014). Unmet need does not take the individual woman's own will into account, but in medical studies these definitions are not always held apart. Women that do not express a will to become pregnant are seen as having an unmet need for contraception, no matter their own objectives (for example, being in a same-sex relationship, considering another pregnancy, being infertile) – displaying the undisputed medical interpretative prerogative (Bertotti et al., 2021; Takeshita, 2012).

Within a risk-avert biomedicalized and gendered discourse, the planned pregnancy becomes superior, and the effective contraceptives used to obtain it remain unquestioned (Aiken et al., 2016). Biomedicalization is used as a lens and a pivot in

studies III and IV to expose how a medical discourse on contraceptives becomes both normalized and used as a normative force within contraceptive communication and conceptualizations of reproductive trajectories.

More so than narrow disciplinarians, interdisciplinarians often treat themselves to the intellectual equivalent of travelling in new lands.

Moti Nissani, 1997

Methodology and methods

While all included papers explore an aspect of hormonal contraceptive use and mental health, different methodologies and approaches to data collection and analysis were applied. An overview is presented in Table 5 below. The methods chapter is structured as follows. First, a discussion of the central tenant of standpoint epistemology is given, followed by a summary of the design of all four studies, describing key elements. A description of data collection and duration follows, whereafter a section on analytical approach and analysis is presented. Lastly, a segment on ethical considerations closes the chapter.

Table 5. Overview of methodological approach, design, data collection, duration, subjects and sample, and main analytical approach for each of the four included studies.

	Methodology	Design	Data collection	Duration	Subjects and sample	Main analytical approach
I	Quantitative	Prospective cohort study	Record linkage of Swedish registers	Register data 2010-2011. Analysis 2017	800,000+ Swedish women	Statistical analysis with logistic regression
II	Quantitative	Prospective cohort study	Record linkage of Swedish registers	Register data 2013-2015. Analysis 2020	900,000+ Swedish women	Statistical analysis with intersectional MAIHDA
III	Qualitative	Text analysis	Texts from official Swedish heath care websites	Text collection 2020. Analysis 2020	3 websites, 68 texts in Swedish	Critical discourse analysis
IV	Qualitative	Interview study	In-depth Zoom-interviews	Interviews 2021. Analysis 2022	10 adult Swedish women	Political narrative analysis

Ontology and standpoint epistemology

Research paradigms, although central for directing the kind of research carried out, are often taken for granted within disciplines, and thus seldom made explicit (Chettiparamb, 2007). My aim in this section is to make the epistemologies guiding this thesis visible. Epistemology is based in ontology, often defined as 'view of reality'. The main line is drawn between viewing reality as existing outside of any human observations, or as constructed by preconceptions, power relations, interpretations, and interactions (Bergman et al., 2012). The latter perspective seldom encompasses rejecting material reality as such, but rather acknowledges that human thought and behaviour shape reality (Collins, 2004). Epistemology defines the view of what knowledge is, and who is a knower (Harding, 2005). The stance taken here usually guides the methodology and research questions, in turn shaping possible knowledges and answers (Baškarada & Koronios, 2018). An overview of research paradigms and their subsequent implications for research can be seen in Table 6.

Quantitative research is based in a positivist paradigm, meaning the aim is to capture an objective truth:

> It emphasises the measurement and analysis of causal relationships between isolated variables within a framework which is value-free, logical, reductionistic, and deterministic, based on a priori theories. A quantitative approach endorses the view that psychological and social phenomena have an objective reality that is independent of the subjects being studied, i.e., the knower or the researcher and the known or subjects are viewed as relatively separate and independent. Hence, reality should be studied objectively by the researchers who should put a distance between themselves and what is being studied. (Yilmaz, 2013)

Qualitative research is, on the other hand, based on a constructivist epistemology, where reality is seen as socially constructed and dynamic. Here, the relationships between knower and known are seen as inextricably intertwined and context-dependant, and the aim is to provide a deeper understanding of how meaning is created and social experience constructed, through a value-sensitive, rich, descriptive, and contextual framework (Yilmaz, 2013).

Table 6. Research paradigms.

Paradigm/world view			
Positivism	**Post-positivism**	**Critical Theory**	**Constructivism**
One observable truth	One truth, never truly observable	Multiple truths, influenced by power relations	Multiple truths constructed by people, interactions
Ontology			
Realism	**Critical Realism**	**Historical relativism**	**Relativism**
Reality is objectively observable, independent of human observer	Reality exists, but observations are fallible	Reality is shaped by different structures of power, such as gender	Multiple realities exist and can change with interactions and conflict
Epistemology			
Radical objectivism	**Relative objectivism**	**Relative subjectivism**	**Radical subjectivism**
Objective, value-free description of reality possible by researcher (View from nowhere)	Objective knowledge ideal, but impossible. Knowledge is based on falsifiable hypothesis	Knowledge is value-dependent, influenced by power and interaction (Standpoint epistemology)	Knowledges are constructions based on interactions between participant and researcher
Methodology			
Verification	**Falsification**	**Transformation**	**Interaction**
Hypothesis testing in controlled environment. Deductive approach. Aim is prediction and generalizable data	Hypothesis falsification, often in real world setting. Deductive approach. Aim is generalizable data, but outcomes cannot be truly objective	Inductive approach. Aim is deepened understanding of phenomena, contextualizing, social change	Inductive approach. Aim is recognizing and understanding constructions through dialogue, empowerment
Questions			
How many? How often? Which level? Causation?	How many? How often? Which group? Association?	Why? How? Affected by power relations?	Why? How? Human experience?
More quantitative			More qualitative

Adapted from Bergman et al (2012).

The studies included in this thesis stem from two different disciplines, with different ontologies: medical science and the humanities, more specifically the critical branch of gender studies. Medicine is traditionally a positivist science, while gender studies places itself within the tradition of critical social theory (Berndt & Bell, 2021).

Medical authority has often claimed its description and treatment of knowledge, of bodies, health, and illness is an objective and value-free truth, rather than part of, and contributing to, political power structures, and more or less intentional, as a means for social control (Burfoot & Güngör, 2022b; Zola, 1972). Feminist scholars, most notably Sandra Harding, have argued that the 'view from nowhere' claimed by positivist sciences obscures researcher bias of the default white male scientist and augments patriarchal and racist power structures already in place (Harding, 1991).

True 'neutrality' is not possible according to Harding, since no scientist exists in a value-free vacuum, but is entrenched in institutional and cultural traditions, and brings personal experiences stemming from inhabiting certain societal positions, all shaped by larger structural forces, which within science have been andro- and Eurocentric. Choice of research focus and method, interpretation and language use, together with funding and employment structures, are all affected by these not-at-all-random circumstances. The process of claiming impossible neutrality is coined 'weak objectivity' by Harding, contrasted by a 'strong objectivity' that explicitly considers the researcher's positionality and how it affects the research (Harding, 2005). This transparency is also called feminist standpoint epistemology and, when located in social history, allows for a fairer judgement by the scientific community (Collins, 2004). Narayan (2004) defines the central tenet of feminist standpoint epistemology as being located 'in the world as women make it possible for us to perceive and understand different aspects of both the world and human activities in ways that challenge the male bias of existing perspectives' (Narayan, 2004, p. 213). Examining situated, local, and collective knowledge as a means to join personal understandings and experiences of oppression to political and structural dimensions of societies becomes a way of generating and validating knowledge that does not comply with the male bias of mainstream science (Morison, 2023).

Medical scientists, especially within social medicine and social epidemiology, are not strangers to critical theory and qualitative methods, but often frame them within a positivist paradigm. For example, in Lane-Fall's (2023) important and well-argued call for more qualitative studies in social epidemiology, she still separates *exploratory* and *explanatory* qualitative methods based on whether the qualitative study predates (exploratory) or follows (explanatory) the quantitative studies:

> For example, an interview study that is used to develop a survey employs exploratory mixed methods.(…) An example of explanatory mixed methods is using a focus group to explain or contextualize findings from quantitative data like those derived from a survey or from statistical modelling. Such qualitative data can be especially useful for understanding ceiling and floor effects in quantitative data.

The aim for qualitative studies thus becomes to explain and strengthen the truths found in quantitative research, displaying an, according to Kelly (1996), narrow view of interdisciplinarity, and a firm position within a positivist paradigm. The tendency to view qualitative and critical studies as just an exploratory/explanatory adornment to 'real' science is common within medicine, and although proof of effect is fundamental in medicine, I would argue, in line with other scholars (Bauer, 2014; Collins et al., 2008; Fausto-Sterling, 2020; Merlo, 2018; Price, 2011), that true integration of other perspectives are also of value.

My approach does therefore not aim at using the qualitative studies to explain results in the quantitative ones, but rather to explore different aspects of, and meanings constructed within, the broad field of hormonal contraceptives and mental health, with the help of different methodologies. Using standpoint epistemology as an ontological base allows for critically gauging positivist assumptions of neutrality, while at the same time admitting material realities and soundness of conclusions, to allow for a multitude of rich, usable knowledges and nuanced interpretations.

Design

To capture different aspects of the field of hormonal contraceptives and mental health, each study has a different design. The first study was designed to investigate a possible association between hormonal contraception and development of psychological side effects through pharmacoepidemiology, and the second to describe the heterogeneity in depressive response within hormonal contraceptive users, utilizing an intersectional approach. The third study was designed to explore discourses of contraception communicated to the Swedish public, and the fourth to grasp narratives of hormonal contraceptive experience and their relation to societal and medical discourses. Studies I and II are based in a quantitative methodology while studies III and IV use qualitative methodological approaches. I will describe the design of each study in detail below.

Quantitative cohort studies

Both studies I and II are pharmacoepidemiologic, register-based, prospective cohort studies, utilizing record linkage to gain information on several different variables of interest. I will discuss the similarities of the designs first, and then move on to the specific intersectional multilevel design of study II. In both studies, hormonal contraceptive use, defined as a prescription fill of any hormonal contraceptive, is considered the exposure, and the outcome is subsequent use of psychotropic drugs (study I) or anti-depressants (study II). A prospective cohort study follows a cohort of people prospectively during a certain time window, to 'look' for an outcome during that time. Prospective thus means 'forward looking', in the sense that exposure is known and outcome unknown at the set starting date, and the cohort is followed forwardly in time thereafter. The cohorts in studies I and II are dynamically defined, meaning not every individual has the same starting or baseline date, although everyone is followed for the same amount of time. The individual baseline date was calculated by finding the first hormonal contraceptive prescription fill during a two-year (study I) or five-year (study II) period, thereafter following individual women for one year, to see if a subsequent prescription of a psychotropic drug/antidepressant was filled. Women who filled a prescription for hormonal contraceptives (HC) during this time were defined as HC-users. For women who did not fill a prescription, a date in the middle of this time period was assigned, whereafter she was followed for one year. Figure 7 is an illustration of this approach.

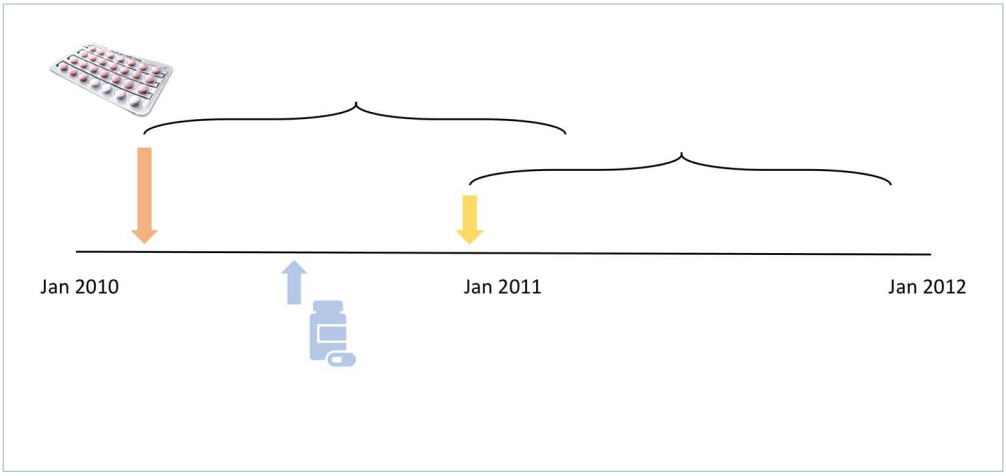


Figure 7. Illustration of dynamic baseline definition of the cohort studies. The orange arrow represents an HC-user, a woman with a prescription fill of HC on 3 February 2010. She was thereafter followed for one year, until 3 February 2011, during which we looked for a prescription fill of any psychotropic drug. She filled a psychotropic prescription in July 2010. The yellow arrow represents a non-user of HC, who is assigned the date of 31 Dec 2010, and followed until 31 Dec 2011. She did not fill any psychotropic drug prescription.

To prove causation within a positivist framework, i.e., that the exposure truly causes the outcome, complete randomization is needed. The ideal can be theoretically visualized as looking into a parallel reality, where all other circumstances are equal, and only the exposure, to HC for example, changes for an individual. This individual causal effect is obviously impossible to measure, since no parallel universes are available to us, and no-one can be simultaneously both exposed and unexposed. To infer causation on a group level is, conversely, possible with randomization techniques. Measuring the average causal effect, where outcomes for groups that differ in only exposure are measured, is the aim in randomized controlled trials. These trials are not free from bias, however, and always encompass a selection of a population, rather than looking at exposures in a real-world setting. No clinical trials have been conducted on HC and young teenagers, yet these girls often use HC, and their response to it is important to gauge (Schaffir, 2016).

In an epidemiological, observational setting, randomization is not possible, and inferring causation therefore becomes an issue of missing data (Thygesen & Ersbøll, 2014). Strictly speaking, unknown confounding factors, which affect both exposure and outcome independently but are not mediating variables in a causal pathway, always exist in observational studies (Delgado-Rodríguez & Llorca, 2004). Every

aspect possibly interfering with the correlation between exposure and outcome cannot be controlled for in a real-world setting. Nevertheless, a well-designed observational study can show sound associations, indicating real causation (Lidegaard, 2021). Within a post-positivist framework, the design of study I aimed at doing that. Previous depression or mood disorders are well-known and distinct risk factors for subsequent depression (Piccinelli & Wilkinson, 2000), rendering it an important confounding factor to consider when looking at depression or mood disturbances as an outcome. Women with a depression diagnosis or a dispensation of a psychotropic drug during four years prior to their individual baseline were therefore excluded in study I, to strengthen the possibility of finding an association indicative of causation. In study II, the design instead aimed at describing population heterogeneity dependent on interacting social positions, in response to HC, and previous mental health issues were therefore stratified for rather than excluded. A more detailed discussion of the specific design of study II follows. A closer look at the design of the two quantitative studies is provided in Table 7.

Table 7. Comparison of final cohort, exposure, outcome, duration, and handling of previous depression in study I and II.

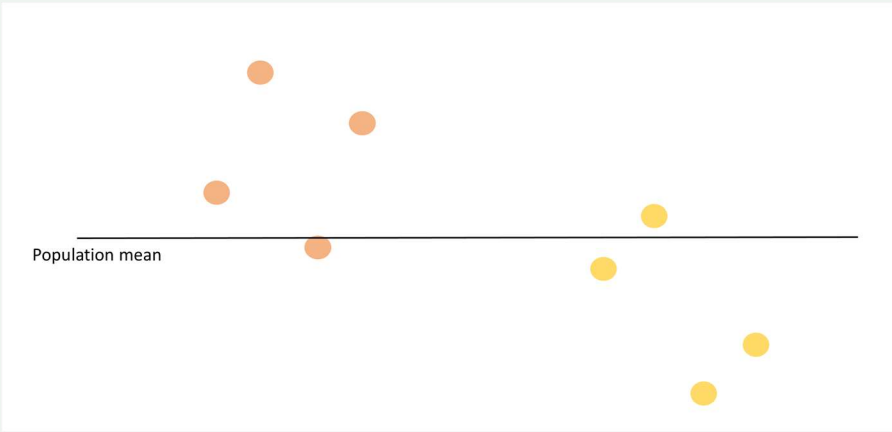
	Final cohort	Exposure	Outcome	Duration	Previous depression
I	815,662 women ages 12-30 residing in Sweden Dec 2010	Any hormonal contraception (+ subgroup analysis)	Psychotropic drug use: yes/no	Followed 1 year from individual start date	Excluded
II	915,952 women ages 12-30 residing in Sweden Jan 2013	Any hormonal contraception	Anti-depressant use: yes/no	Followed 1 year from individual start date	Stratified

Operationalizing intersectionality in a quantitative setting

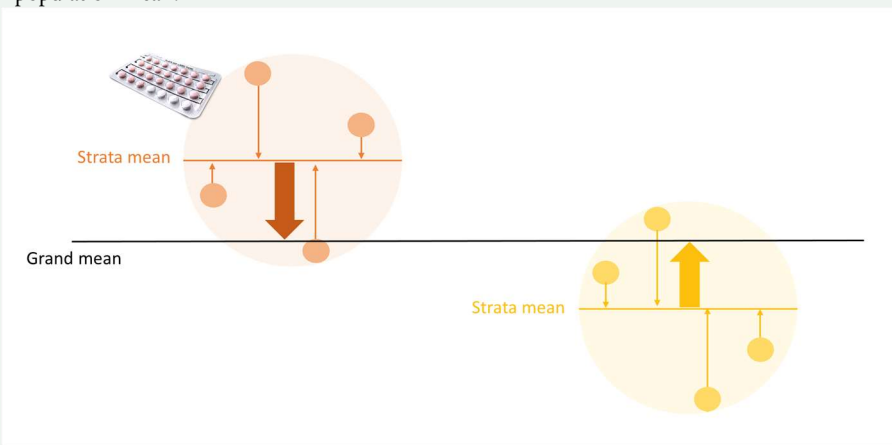
'Intersectional multilevel analysis of individual heterogeneity and discriminatory accuracy' (MAIHDA) is a term coined by Merlo in 2018 (Evans and Erickson, 2019). Multi-level approaches were originally applied in epidemiology to distinguish how much of the variance in an outcome could be explained by geographical neighbourhoods, thus separating the individual level and a higher order level of the neighbourhood (Merlo, Chaix, et al., 2005; Merlo, Yang, et al., 2005). In MAIHDA, the social location of an individual, formed by interwoven social dimensions, is treated as the higher-level context. Furthermore, comparisons are

made to the population mean, rather than to a predefined privileged 'reference group' (Evans et al., 2020). The multilevel approach is thus theoretically coherent with the intersectional view of health disparity arising through unequal distribution of power and resources, rather than through a sum of 'risky' or privileged identities. A detailed discussion of the statistical and theoretical concepts behind MAIHDA can be found in the works of Evans et al (2018) and the commentary by Merlo (Merlo, 2018).

Study II was designed as an intersectional MAIHDA. By combining categories of age, income, immigrant status, and previous mental health issues, 36 (3x3x2x2=36) strata were created, stratified for previous mental health issues (72 strata in total), each representing a specific social context. Ideally, these social dimensions should capture specific contextual locations, informed by previous research, and while our choice was based on common social epidemiological definitions and previous intersectional epidemiological studies, they were also limited by the available register data. Exposure to HC within each strata was then noted, to be able to distinguish whether the use of anti-depressants varied across strata, providing a detailed mapping of population heterogeneity. See Figure 8 on next page for a conceptual image of MAIHDA.



Circles represent individuals whose latent propensity to use antidepressants make up the population mean.



These individuals share a context: the intersectional strata, visualized as the larger circles. Each individual has a relationship to the strata mean, and different strata relate differently to the grand mean. In this simplified image, the orange strata represents HC users, while the yellow represents non-users. In the actual study, 72 different strata and over 900,000 individuals were included.

Figure 8. Visualizing MAIHDA. Visualization of how individuals and strata relate to the grand mean in the intersectional multi-level analysis of individual heterogeneity and discriminatory accuracy (MAIHDA). Latent propensity to use antidepressants is on the y-axis. Small circles represent individuals, whose latent propensity to use antidepressants make up a population mean. Individuals also share a context, the intersectional strata. Each individual has a relationship to the strata mean, and the strata then relates differently to the grand mean of strata means. These relationships are measured to provide information on heterogeneity between and within groups, and on how much variance in antidepressant use can be explained by the exposed and unexposed strata.

Use of anti-depressants is a dichotomous variable (0 or 1), and measures of variance around a mean value is thus not intuitive. The mathematical strategy entails using a latent variable, where the propensity for using an anti-depressant varies, and becomes a positive outcome when a threshold value is reached (Merlo et al., 2019). How much of the variance in latent propensity for use of antidepressants lies at each level (individual and intersectional strata) can then be calculated and expressed as the variance partition coefficient (VPC). Merlo, Wagner, and Leckie (2019), in their comprehensive conceptual MAIHDA paper, have shown how the variance partition coefficient can be interpreted in the same way when dealing with a continuous and dichotomous variable. This method is now established within the field (Evans et al., 2020; Lederer et al., 2022; Mahendran et al., 2022).

The VPC and area under the receiver operating curve (AUC) are correlated, but not exchangeable. A high VPC means that the higher order level, in our case the intersectional strata, explain much of the variance in anti-depressant use, meaning the strata are useful in understanding this health disparity. However, a high VPC does not exclude the possibility of a high variance within certain strata, often strata composed of many individuals. Knowledge of the VPC is thus insufficient to judge the accuracy of the model in discriminating which individuals will use anti-depressants. The AUC accounts for false negatives within large strata, and is thus a better tool for estimating discriminatory accuracy.

Qualitative studies

In study III, to explore the broader discourses of contraception and reproduction that are being drawn upon and reproduced in official online sources on contraceptive information in Sweden, I was inspired by the tradition of critical discourse analysis. Discourses are ways of speaking, writing, and organizing knowledge that shape our views of the world and social interactions (Cheek, 2004). Discourse analysis views language as a form of social practice, whereby the close reading of texts can reveal their sociocultural functions. Critical discourse analysis adds a critical layer, investigating the relationship between discourse and social elements, such as power relations, dominance, identity, and ideology (Norman Fairclough, 2013). It has both a normative and explanatory element.

> Critical social analysis can be understood as normative and explanatory critique. It is normative critique in that does not simply describe existing realities but also evaluates them, assesses the extent to which they match up to various values, which are taken (more or less contentiously) to be fundamental for just or decent societies (e.g. certain standards – material but also political and cultural – of human well-being). It is

> explanatory critique in that it does not simply describe existing realities but seeks to explain them, for instance by showing them to be effects of structures or mechanisms or forces that the analyst postulates and whose reality s/he seeks to test out (e.g. inequalities in wealth, income and access to various social goods might be explained as an effect of mechanisms and forces associated with 'capitalism'). (N. Fairclough, 2013, p. 9)

By normalizing and regulating certain ways of speaking about a subject, of acting and being in the world, discourses become potent sources of control and influence. Dominant discourses are important to investigate since they form taken-for-granted truths that sanction particular ideas and behaviours, and justify the elimination of others (Cheek, 2004). The texts examined in this study contained contraceptive information aimed at the Swedish public, and mainly at potential contraceptive users.

Study IV was designed to explore narratives of contraceptive experience through a hermeneutic tradition of in-depth interviews (Johansson, 2005). Following a feminist interview tradition, I wanted to explore the diversity of women's experiences and realities, while being aware of my own position and the inherent power discrepancy created between researcher and researched (Hesse-Biber, 2013). In-depth interviews are suitable for narrative approaches since they leave room for uninterrupted stories and rich accounts of experience (Johansson, 2005). The design was further inspired by political narrative analysis. In this approach, stories are seen as valuable in investigating connections between micro- and macropolitical levels and positioning within a certain community or context (Andrews, 2013). The embodied life trajectories of women using contraceptives can be seen as a micropolitical arena affected by the meso- and macropolitical conditions and narratives in contemporary Sweden, whereby study IV builds and relates directly to study III, as well as more generally to the quantitative studies.

Data collection and duration

All four included studies are based on Swedish data, either from national registers, official Swedish webpages, or interviews with women in Sweden. The first two studies in this thesis are based on data mainly collected during 2010-2015, while the second two gathered empirics during 2020-2021. Both the quantitative data and original interviews are stored on a protected Lund University server. I will describe the data collection for each study below.

Record linkage

For study I, information was obtained for four years prior and one year after the individual baseline date sometime during 2010-2011, resulting in information gathering from 1 January 2006 – 31 December 2012. For study II, the individual baseline date varied from 1 January 2010 – 31 December 2014, ensuing data collection from 1 January 2006 – 31 December 2015.

Information from the same records were used in both quantitative studies. These include the Total Population Register (TPR) (Ludvigsson et al., 2016), the Swedish Prescribed Drug Register (SPDR) (Wettermark et al., 2007), the Swedish Patient Register and the Longitudinal Integration database for health insurance and labour market studies (LISA) (Ludvigsson et al., 2019). The TPR records all births, deaths, immigration into and emigration out of Sweden, all thus rendering a complete record of the Swedish population. The SPDR contains all drug prescriptions dispensed at Swedish pharmacies and ordered under their respective Anatomical Therapeutic Chemical (ATC) code, since 2006. The Swedish Patient Register records all diagnoses given through the International Classification of Diseases 10th version (ICD-10) system, at inpatient and outpatient specialized care or hospital care. Diagnoses given at primary care units are not included in this register, but are recorded through regional registers, which were not part of our database. LISA contains information on socioeconomical variables such as educational level, income, and cohabitation. A database was constructed by Statistics Sweden and the Swedish National Board of Health and Welfare through record linkage of above registers, and was delivered to us pseudonymized, the personal identification number being replaced by an arbitrary number. The final database thus contained pseudonymized, linked, individual-level information from all the above-mentioned registers.

Women and girls ages 12-30 years, binarily defined as individuals with a female personal identification number, living in Sweden on 31 of December 2010 (study I)

or 1 January 2013 (study II), were included in the initial cohorts. Individuals were excluded if they died or emigrated any time before end of follow-up. In study I, women who had a diagnosis of child delivery during the one-year follow-up were excluded, while in study II, women who delivered a child during one year before and one year after baseline were excluded. In study II, country of birth was used to define immigrant background, which is why women with missing information here were excluded. Furthermore, in study II, women with a prescription for hormonal contraceptives issued by a physician rather than a midwife were excluded, since these are more likely issued for gynaecological treatment, rather than for a contraceptive purpose. As mentioned in the introduction, 90% of hormonal methods are prescribed by midwives in Sweden. The final cohorts consisted of 815,662 (study I) and 915,952 (study II) women who were followed for one year after their individual baseline date.

Assessment of variables in register studies

In both studies I and II, exposure was defined as a prescription fill of any hormonal contraception, defined as ATC codes G02B and G03A-C. Emergency contraception (ATC G03AD) was excluded, since it does not indicate continuous exposure, and is furthermore most commonly bought over the counter without a prescription. Outcome was defined as a subsequent prescription fill, during one year after the individual baseline, of either psychotropic drugs, ATC N05A, N05B, and N06A (study I) or antidepressants, ATC N06A (study II).

Health-related variables

Previous mental health issues were defined as either any psychiatric diagnosis, ICD-10 codes F00-99, or a prescription fill of a psychotropic drug, in the four years previous to individual baseline date in both studies I and II. Women with previous mental health issues were excluded in study I and stratified for in study II.

In study I, women with a child delivery at a hospital, ICD-10 O80-84, were excluded. In study II we had a more exhaustive definition of excluding all women with pregnancies one year previous to baseline and during follow-up, according to the 2019 version of the Nordic Diagnosis-Related Group classification (NordDRG), Major Diagnostic Categories, code M14, for pregnancy, delivery, and postpartum care. In study I, adjustments were made for a previous diagnosis of venous thromboembolism, epilepsy, migraine, endometriosis, PMDD, and bleeding disturbances (ICD-10 I26, I80, I82, G40-47, N80, N91-94) four years prior to individual baseline, since these conditions are known contraindications to combined

contraception, or in the case of endometriosis, PMDD, and bleeding disturbances, a non-contraceptive indication. We also adjusted for any hospitalization and outpatient contact to minimize the effect of a possible disparity in health care-seeking behaviour. Study II entailed a different approach with the same aim, where instead of adjusting for diagnosis, we only included HC prescriptions issued by midwives, who are authorized to prescribe hormonal methods for contraceptive purposes only.

Socioeconomic position, immigrant background and age

In both studies I and II, individualized disposable family income was calculated by dividing total disposable income of family with number of family members, accounting for distinctive consumption weights of children as determined by Statistics Sweden. The income variable was categorized into high, medium, and low income in the final analysis. In study I, highest educational level in family (to not wrongly categorize children in highly educated households) was also used, categorized into high (14 years or more) and low education. The cut-off was chosen based on the Swedish educational system, where a large majority graduate from upper secondary school (12 years)(OECD, 2023).

No data is available on self-identified race in Swedish registers, only country of birth, which is a very crude proxy for being racialized and subjected to racism. Immigrant background was instead defined at family level, as no family member over the age of 18 being born in Sweden, since understanding of, and access to, institutions such as health care differ depending on knowledge of the new country, but also on social position constructed by the power dimensions of race, and specific contextual factors of immigration to a predominantly white country. In the intersectional multilevel analysis, this variable (as the others) should be considered as an effort to capture a dynamic social position affecting possibilities and life trajectories, rather than an essentialist view of otherness.

In both quantitative studies, age was categorized into groups to perform stratified analysis, but also adjusted age was used as a continuous variable, since the use of anti-depressant and related drugs increase with age.

Source material in qualitative studies

In study III, data collection was conducted during fall 2020. All texts on contraceptives found on three official health care websites directed at the general public were analyzed: 1177.se, UMO.se, and RFSL.se. All websites had a similar structure in their information on contraceptives, with a first page that briefly described contraceptive methods and links to and/or a side menu with specific

methods. Contraceptive information could be found under the tabs 'sex'/'sexual health'/'sex and relationships' at UMO, 1177, and RFSU respectively. RFSU.se was generally a bit briefer in its descriptions, while 1177.se was more elaborate. All three websites had specific pages for all available methods in Sweden, both hormonal and non-hormonal. All reversible methods were included in the study. A total of 68 individual texts on contraceptive methods, each ranging from a couple of paragraphs to four pages, were included in the final analysis. The individual pages on a contraceptive method were constructed in a similar fashion with an introductory paragraph, explanation of the mechanism of action, instruction for usage, average cost, pregnancy protection efficacy, and finally advantages and disadvantages/side effects.

For study IV, the interview study, data collection began in January 2021 by finding participants. I presented my planned study in Swedish Facebook groups dedicated to reproductive issues, more specifically the vulva and vagina, open to women and transgender persons, as well as through my own social media channels, calling for persons with experience of hormonal contraceptive use. I did not specify type of experience (positive or negative). Ten interviews in Swedish, with self-identified women who responded to the call, were conducted over Zoom, because of the Covid pandemic raging at the time. The women were between 27 and 37 years old at the time of the interviews. They were all born in Sweden and spent their childhood and teenage years here. All women had some post-secondary education and the majority had a university degree, three of them within natural sciences. Two lived in rural areas of Sweden, while seven lived in a larger city and one abroad. They were all currently in a romantic relationship, one with a woman and the others with men. Two women had children, and one was pregnant at the time of the interview. These women represent a rather socially dominant and growing urban middle class that takes part in the public discussion on contraceptives. Each in-depth interview took about one hour. I used an interview guide to help cover certain areas, but the questions were open-ended and follow-up questions varied depending on the dynamic of the exchange. I aimed to let the women tell their stories uninterrupted.

Analysis

The analytical approaches of each study are presented below.

Statistical analysis

In study I, simple and multiple age-stratified logistic regression was applied to obtain odds ratios (OR) and 95% confidence intervals (CI) of psychotropic drug use in the age-stratified groups. Adjustments were made for health and health care utilization, socioeconomic position, and age as a continuous variable. We also calculated the area under the receiver operating curve (AUC) value, measuring the ability of the model to correctly classify someone as a psychotropic drug user based on knowledge of hormonal contraceptive exposure. The AUC assumes a value between 0.5 and 1, where 1 represents perfect discrimination and 0.5 corresponds with no predictive value, equal to that obtained by flipping a coin.

MAIHDA

In study II, we performed an intersectional multilevel analysis with individuals at the first level and the intersectional strata at the second level of analysis. We modelled propensity to use antidepressants in two consecutive models.

1) In the first model, the share of individual variance in anti-depressant use found at the intersectional strata level was calculated by utilizing the variance partition coefficient (VPC). We also calculated the stratum-specific use of antidepressants, and difference in

antidepressant use between similar pairs of strata differing only on the use of HC, to better map heterogeneity across intersectional strata. Finally, we obtained the AUC value, which informs on the discriminatory accuracy of the model in distinguishing women who used antidepressants from those who did not. The higher the value, the higher the influence of the intersectional context on individual use of antidepressants.

2) In model two, we calculated the intersectional interaction effects by first quantifying the association between intersectional dimensions and anti-depressant use, and then calculating the proportional change in the variance (PCV). The PCV measures the overall proportion of strata variance of the first model, explained by the specific intersectional dimensions. The intersectional interaction is the effect that remains after subtracting anti-depressant use attributable to the main effects from

total usage. A positive effect indicates that individuals in the stratum have a higher incidence than expected by mere addition of risks composed of the categories themselves – a purely intersectional effect, where the sum is more than its parts.

In MAIHDA, we can define how much of the variance in use of antidepressants lies at the intersectional strata level, as well as how much is due to an interaction effect. Intersectional MAIHDA furthermore enables viable assessment of numerous interactions, which is valuable since the number of strata and thus possible interactions is sizable in most intersectional models. The multilevel method also offers precision-weighted estimates of the strata-specific risk (shrunken residuals), which is beneficial when the number of individuals in strata is small. Detailed statistical directions and conceptual underpinnings of MAIHDA can be found in Axelsson Fisk et al. (2018), Evans et al. (2018), and Merlo (2018).

Critical discourse analysis

For both studies III and IV, initial reading and coding was conducted in Swedish, with final quotes later translated to English.

For the critical discourse analysis, I read each text and performed initial rough coding where I made note of words or phrases being used to describe different contraceptive methods and the presumed contraceptive user. Texts were re-read, and codes were categorized into emerging themes, which were then mapped out in greater depth through tracing patterns of ideas and language within and across texts. A continuous revision to collapse redundant codes, clarify code definitions and purpose, and generate additional codes was undertaken.

The data was read multiple times in order to ensure rigour and developing precise categories that captured the relevant constructions present in the texts. Rather than pay attention to the scientific value of medical claims being made in these texts, I focused on what was being communicated or represented, and how this was done in relation to other social dimensions. Reproductive justice was used as a theoretical point of departure in the analysis, and the concepts of biomedicalization and post-feminism were applied to lay bare negotiations of power and dominant, gendered discourses.

Political narrative analysis

The narrative analytical approach was inspired by Oikkonen's separation of narrative manifestation, the content of the story told, and underlying logic, the organizing basis forming a comprehensible form for the story:

> Whereas 'discourse' refers to the historically specific vocabularies through which we make sense of the world, narrative covers both the explicit narrative manifestation (the specific story that is told) and its underlying logic (the organizing rationale that gives it shape). (…) As an organizing logic, narrative is a textual engine that keeps the story going. Such a motor turns representation into particular spatially and temporally organized patterns, producing the sense of movement that we tend to identify with narrative. The familiarity of these patterns makes certain narrative events and textual outcomes seem likely while rendering others highly improbable. (Oikkonen, 2013, p. 298)

All interviews were recorded and transcribed verbatim in their entirety by me, including longer pauses and overt social sounds, such as laughter and sighing. In the final quotations some filler words, repetitions, and validating sounds were excluded for readability. The interviews were read in their entirety first, to gain a comprehensive sense of the narrative, then re-read and data related to the research questions were entered into a spreadsheet. I looked for narrative building blocks, turning points, and recurrent narrative manifestations (Johansson, 2005). I then searched for overarching types of stories or organizing logics that could be derived from the thematization f narrative manifestations (Oikkonen, 2013). The process was iterative, moving between inductive coding, and deductive reiteration of narrative manifestations within organizing logics. Lastly, the thematization was revisited and read through the lens of the two organizing logics to ensure soundness of interpretation.

Ethical considerations

The specifics of ethical considerations when researching hormonal contraceptive use or conducting interviews are discussed elsewhere, and only a short general discussion is provided here.

A fundamental ethical question to ask oneself is whether your research is actually helping, or has the potential to help, the populations you intend to – in short, if you are doing something good (Krieger, 2015). Research is not per definition beneficial to humanity, but can be harmful, or solidify injustices, sometimes by simply preserving status quo (Morison, 2021). By utilizing a reproductive justice approach, I aim to question the status quo of a dominant medical discourse on hormonal contraception and mental health, hopefully providing insights that are beneficial to those in need of contraception. This is achieved not only by amplifying women's voices and perspectives, but also through examining the power structures and discourses that shape reproductive understandings and choices. Simultaneously, it's important to scrutinize the power imbalance created by the researcher's power to define and interpret (Hesse-Biber, 2013). No strategy can completely erase this imbalance but acknowledging positionality, a strategy employed in the discussion of this thesis, can go some way towards doing so.

Finally, being humble and aware of the observational and qualitative nature of my studies in interpreting and communicating my own results is an ethical issue within an area of such public interest as contraception. A focus on minor, perhaps clinically insignificant, risk factors is a part of creating a 'risk society' whereby people are encouraged to organize their lives in response to risk rather than reality (Beck, 1992; Giddens, 1990), and mass media coverage of medical studies on hormonal contraceptive risks is known to have changed contraceptive behaviour before (Lackie & Fairchild, 2016; Postma & Donyai, 2021). The epidemiological methods applied here that mitigate this risk discourse, such as discriminatory accuracy and multilevel methods taking population heterogeneity into account, can go some way, but caution in interpretation and communication is still warranted. As I became well aware of when the mass media picked up on study I, the desire for easily understandable facts on hormonal contraception and mental health side effects is vast. And although this thesis provides a multitude of relevant knowledges, none are easily interpretable as a simple yes or no answer to whether hormonal contraceptives cause certain psychological effects.

Ethical permits

The regional Ethics Review Board in southern Sweden, along with the data safety committees from the National Board of Health and Welfare and Statistics Sweden, approved the construction of the database and pharmacoepidemiologic research in studies I-II (Dnr 2014/856, 2015/341). Study III used only official, publicly available text sources and did not require a permit. Study IV was approved by the Swedish Ethical Review Authority before the interviews were conducted (Dnr 2020-06682).

Science and everyday life cannot and should not be separated. Science, for me, gives a partial explanation of life. In so far as it goes, it is based on fact, experience and experiment.

Rosalind Franklin, 1940

Results

A summary of the results is found in Table 8. The results for each study are then outlined in the following pages.

Table 8. Aims and results for each included study.

	Aim	Results
I	To investigate a possible adverse effect of hormonal contraceptives on mental health in an age-stratified cohort.	Compared to non-users, HCs users were 30% more likely to subsequently use psychotropic drugs. The association was very strong in adolescent girls but decreased with age. Non-oral and progestin-only methods were more strongly associated with psychotropic drug use.
II	To address lack of knowledge about marginalized groups and population heterogeneity in mental health response to hormonal contraceptives.	Considerable population heterogeneity exists in depressive response to HC use. Intersectional location is important to consider together with HC use, since it can predispose mainly teenagers and low-income women with immigrant background for depression.
III	To explore the discourses of contraception and reproduction that are being drawn upon and reproduced in Swedish official health care online sources.	Contraceptive choices are presented as plentiful and possible to individualize, while convenience of hormonal methods is emphasized and side effects downplayed. Paired with a medical and state interest in well planned, less risky pregnancies, it becomes evident that the ideal contraceptive user is the rational woman who makes responsible choices by finding the right (hormonal) contraceptive.
IV	To diversify knowledges of the current hormonal contraceptive landscapes, by adding to a richer understanding of women's narratives of using, questioning, and discontinuing hormonal contraceptives and how these experiences are interwoven with social injustice.	A chronological and a positional narrative was found. Both demonstrate negotiations with dominant discourses: the 'hormonophilic' medical discourse promoting hormonal methods as a superior choice and the 'hormonophobic' (social) media discussion, painting these methods as unnatural and an enemy to female health. Contraceptive stories can be seen as micropolitical narratives connected to macropolitical structures such as a downsized health care sector, nation state incentives for population health or control, and an unequal society with a skewed reproductive and contraceptive burden.

Study I

The study population comprised 815,662 Swedish women ages 12-30, with no known previous mental health issues. Almost exactly half of the population were HC users, but current exposure varied with age. In the youngest age group, only 8% used a hormonal method, while use peaked at 68% among women 18-20 years old. No major differences in socioeconomic position or health were found between groups at baseline. The incidence of psychotropic drug use during follow-up was 2.5% in non-users and 3.7% in HC-users. Among non-users of HC, the absolute risk was very low for young teenagers, and increased with age to a peak of about 4%, while in HC-users, the absolute risk was steady around 4% for all ages.

Compared to non-users, users of HCs had an adjusted OR of a first-time use of psychotropic drugs of 1.34 during follow-up. As shown in Figure 9, the age-stratified analysis revealed a strong association in adolescent girls, which decreased with age to completely disappear after age 20. The highest ORs were found in the youngest age group of 12- to 14-year-olds (adjusted OR 3.46).

The non-oral methods were more strongly associated with psychotropic drug use than the oral forms, as were progestin-only methods compared to combined methods. This trend was consistent in all age groups, but with higher ORs in adolescents. The high dose progestin-only injection containing medroxy-progesterone had the strongest association with subsequent psychotropic drug use in adult women (adjusted OR 1.56), while for adolescent girls it was the IUD containing levonorgestrel (adjusted OR 2.90). See Table 9 for detailed results of age-stratified associations between different HC methods.

The AUC values can also be found in Table 9. In the adjusted model, they ranged from 0.60 in adult women to 0.68 in teenagers. These values show that the aptitude to categorize users of psychotropic drugs based solely on information of HC use was rather low.

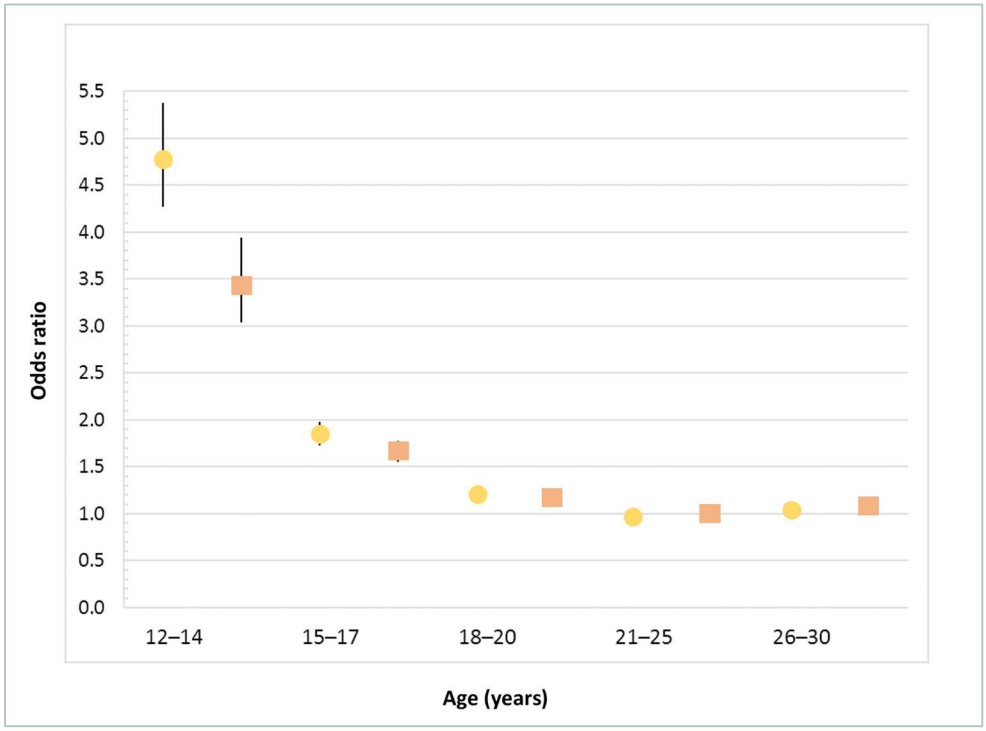


Figure 9. Age-stratified association between use of hormonal contraception and subsequent first-time use of psychotropic drugs within a one-year follow-up after baseline. Odds ratios with 95% confidence intervals (black lines) for crude (yellow circles) and adjusted (orange squares) values.

Table 9. Odds ratios (OR) with 95% confidence intervals (CI) stratified on adolescents and adults, for the association between use of different hormonal contraceptives and subsequent use of psychotropic drugs.

		Crude model	**Adjusted model**
HC type	Progesterone	OR (95% CI)	OR (95% CI)
Age 12-19			
Non-user		1.00 (ref)	1.00 (ref)
Combined monophasic pill	Norethisterone	1.80 (1.07–3.00)	1.19 (0.71–2.00)
Combined monophasic pill	Levonorgestrel	1.94 (1.84–2.06)	1.51 (1.42–1.60)
Combined monophasic pill	Desogestrel	2.51 (1.82–3.48)	1.61 (1.16–2.24)
Combined monophasic pill	Norgestimate	2.33 (2.07–2.62)	1.69 (1.50–1.91)
Combined monophasic pill	Drospirenon	2.92 (2.69–3.17)	2.05 (1.87–2.24)
Combined bi/triphasic pill	Levonorgestrel	1.67 (1.32–2.11)	1.19 (0.94–1.51)
Combined bi/triphasic pill	Norethisterone	2.19 (1.72–2.81)	1.54 (1.20–1.97)
Progestin only pill	Norethisterone	2.07 (1.31–3.27)	1.25 (0.79–1.98)
Progestin only pill	Lynestrenol	3.77 (2.52–5.65)	2.23 (1.47–3.38)
Progestin only pill	Desogestrel	2.72 (2.54–2.91)	1.93 (1.80–2.08)
Ring (combined)	Etonogestrel	3.01 (2.60–3.49)	2.05 (1.77–2.39)
Patch (combined)	Norelgestromin	3.69 (2.96–4.60)	2.46 (1.97–3.07)
IUD (progestin only)	Levonorgestrel	5.26 (4.05–6.83)	2.90 (2.22–3.79)
Injection (progestin only)	Medroxyprogesterone	4.33 (2.69–6.99)	2.37 (1.46–3.84)
Implant (progestin only)	Etonogestrel	3.55 (3.15–4.00)	2.36 (2.08–2.67)
AUC		**0.62 (0.61–0.63)**	**0.68 (0.67–0.68)**

		Crude model	Adjusted model
HC type	Progesterone	OR (95% CI)	OR (95% CI)
Age 20-30			
Non-user		1.00 (ref)	1.00 (ref)
Combined monophasic pill	Norethisterone	0.72 (0.54–0.95)	0.79 (0.60–1.05)
Combined monophasic pill	Levonorgestrel	0.83 (0.79–0.88)	0.89 (0.85–0.94)
Combined monophasic pill	Desogestrel	0.80 (0.69–0.92)	0.84 (0.72–0.97)
Combined monophasic pill	Norgestimate	0.87 (0.79–0.95)	0.95 (0.87–1.05)
Combined monophasic pill	Drospirenon	1.23 (1.17–1.30)	1.30 (1.23–1.37)
Combined bi/triphasic pill	Levonorgestrel	0.77 (0.70–0.85)	0.82 (0.75–0.91)
Combined bi/triphasic pill	Norethisterone	0.83 (0.72–0.94)	0.88 (0.77–1.00)
Progestin only pill	Norethisterone	0.99 (0.85–1.15)	0.96 (0.82–1.11)
Progestin only pill	Lynestrenol	0.99 (0.84–1.17)	0.96 (0.81–1.14)
Progestin only pill	Desogestrel	1.01 (0.97–1.06)	1.01 (0.96–1.05)
Ring (combined)	Etonogestrel	1.25 (1.16–1.34)	1.31 (1.22–1.41)
Patch (combined)	Norelgestromin	1.26 (1.05–1.50)	1.20 (1.01–1.43)
IUD (progestin only)	Levonorgestrel	1.23 (1.11–1.37)	1.08 (0.97–1.20)
Injection (progestin only)	Medroxyprogesterone	1.92 (1.67–2.22)	1.56 (1.34–1.82)
Implant (progestin only)	Etonogestrel	1.18 (1.07–1.30)	1.14 (1.03–1.26)
AUC		**0.54 (0.53–0.54)**	**0.60 (0.60–0.60)**

Study II

The study population consisted of 915,952 Swedish women ages 12-30, of whom 12.4% had previous mental health issues. One in four women used HC in both cohorts, while income level was higher in the healthy group and among HC-users in both groups. Among nonusers of HC, anti-depressants were dispensed to 1.9% of healthy women and to 39.8% of those with known mental health issues. For users of HC, these numbers were 2.7% and 41.2%, respectively.

In Table 10, results from the MAIHDA are shown. Hormonal contraceptives were significantly associated with subsequent anti-depressant use in both cohorts after adjustments for all intersectional dimensions, but more strongly so in healthy women (OR 1.62 compared to 1.19). Model 1 specifies that around 8% of the individual variance in propensity to use anti-depressants (VPC) can be found at the intersectional strata level, while the rest lies at the individual level. These numbers correspond to an AUC value of 0.62 and 0.64, respectively. Both of these measurements suggest a moderate intersectional effect.

In model 2, the PCV was high in both cohorts, but especially so in the group with previous mental health issues. This means that the intersectional dimensions, or main effects, explain more of the interstrata variance for these women. The VPC in model 2 was very small yet still existent (3% and 0.5%, respectively). This finding means that while the intersectional strata effect was mainly due the additive effect of variables defining the strata, a small component due to interaction of effects (a 'pure' intersectional effect) could also be detected.

Figure 10 shows the stratum-specific incidence rates for antidepressant use obtained in model 1, divided into one analysis for women with previous mental health issues who, as expected, had a much higher usage of antidepressants, and one for women without such issues. The highest use of antidepressants was observed in non-immigrant women ages 24-30 and using HC, with low income and previous mental health issues (50%). The lowest incidence was found in teenagers without previous mental health issues and no HC use, especially in the strata of immigrant girls from low- (0.5%) and middle-income (0.6%) households.

Despite associations being of different magnitude, they nonetheless varied with HC use across the other intersectional dimensions in a similar fashion in both cohorts. Overall, the propensity to use antidepressants was consistently higher in HC-users compared with non-users in younger women between 12 and 17 years of age in both cohorts. In adolescents, the tendency was that an immigrant background lowered the use of antidepressants, while the opposite was true for adult women, where a

positive association between HC use and later antidepressant use was mainly found in women with low income and immigrant background. The association between HC and antidepressant use was smaller in adult women native to Sweden no matter their income, and completely disappeared in adult women with high income, regardless of immigrant background.

Table 10. Results from the multilevel analysis of individual heterogeneity and discriminatory accuracy (MAIHDA), stratified on previous mental health issues, distinguishing between measures of association (odds ratios) and measures of variance and discriminatory accuracy. Values are point estimations (with 95% credible intervals) or percentages where indicated. VPC, variance partition coefficient; PCV, proportional change of the variance; AUC, area under the curve.

	Without previous mental health issues		**With previous mental health issues**	
	Model 1	*Model 2*	*Model 1*	*Model 2*
Measures of association				
Age				
12—17 years		Reference		Reference
18—23 years		1.78 (1.36-2.42)		1.57 (1.38-1.76)
24—30 years		2.09 (1.65-2.70)		2.66 (2.36-3.00)
Income				
High income		Reference		Reference
Medium income		1.05 (0.78-1.37)		0.87 (0.77-0.98)
Low income		1.10 (0.81-1.41)		0.87 (0.77-0.98)
Immigrant background				
None		Reference		Reference
Yes		0.63 (0.49-0.79)		0.55 (0.49-0.61)
Hormonal contraception				
No		Reference		Reference
Yes		1.62 (1.34-2.06)		1.19 (1.08-1.31)
Measures of variance and discriminatory accuracy				
Between strata variance	0.30 (0.18-0.50)	0.10 (0.06-0.18)	0.29 (0.18-0.49)	0.02 (0.01-0.03)
VPC	8.45%	3.02%	8.18%	0.49%
PCV		66.29%		94.48%
AUC	0.62 (0.62-0.62)	0.62 (0.62-0.62)	0.64 (0.64-0.64)	0.64 (0.64-0.64)

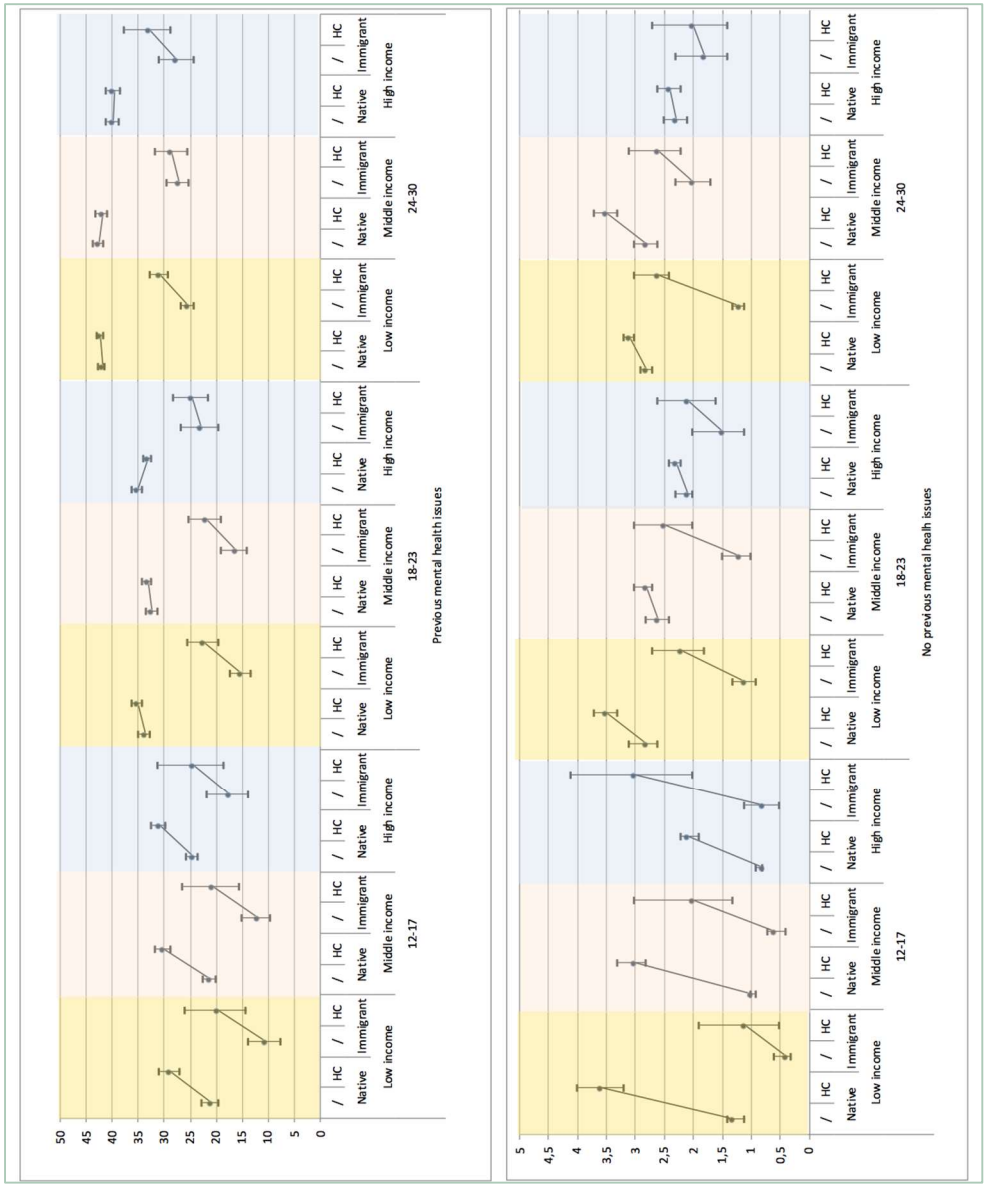


Figure 10. Difference in absolute risk, expressed as odds ratios (black circles) and 95% CI (black vertical lines), of antidepressant use in 36 intersectional strata differing only in HC use. Analysis divided on one cohort with (top), and one without (bottom), previous known mental health issues. Note that the y-axis is on a tenfold higher scale in the cohort with previous mental health issues.

Study III

The critical discourse analysis of reproductive discourses in the online texts yielded three interwoven themes and conclusions, which are presented together with exemplifying quotes in Table 11. These texts present contraceptive choices as plentiful and possible to individualize, while emphasizing convenience and downplaying the side effects of hormonal methods. Paired with a medical and state interest in well planned, less risky pregnancies, it becomes evident that the ideal contraceptive user is the rational woman who makes responsible choices by finding the right (hormonal) contraceptive. The analysis showed that the texts present agency as exerted by choosing the right contraceptive, obscuring both that this frame of reproductive possibilities is rather narrow, and the gendered, embodied effort is often takes.

In the first theme, it becomes evident that women in need of contraceptives have to balance two contradicting discourses: of hormones as both an 'unnatural' threat to their bodies, where exogenous hormones are seen as inauspicious vials for change; and these same hormonal methods as a desirable, effective regulator of a 'naturally unruly' female body. The second theme of a 'perfect contraceptive fit' builds upon this disrupted understanding of hormones. A 'suitable' contraceptive suits a women's lifestyle as well as effectively prevents pregnancy, but it is the woman who needs to accommodate to available methods.

In the third theme, the disembodied language in these texts is explored. What happens is that women are simultaneously made discursively invisible and constructed as individually responsible for reproduction. The disembodied, rational medical discourse in the material makes other embodied narratives of contraception incomprehensible, such as the messy realities of relationships, forgetfulness, lust, pain, and bleeding. Unplanned pregnancies can only be understood as lack of self-discipline, and an individual failure for the woman. These gendered power relations and expectations, both in intimate relationships and as part of a biomedicalized society, are all concealed when choice of contraceptive becomes a seemingly easy shopping experience for a genderless person.

Table 11. Results from critical discourse analysis of online medical information of contraceptive methods directed at the Swedish public.

Themes emerging from the critical discourse analysis	
Overarching theme:	**Individual (gendered) agency exerted through rational contraceptive choice**
Subthemes	*Exemplifying quote*
Un/natural: exogenous hormones as a norm, however 'unnatural' and undesirable	*When is the diaphragm suitable? The diaphragm is suitable if you don't want or can't use a pregnancy protection method containing hormones. (1177)*
Im/perfect: the gendered concept of a 'perfect contraceptive fit' and what it requires	*Remember: There is always a protection against pregnancy that suits you. Even if you tried one or several methods that you weren't comfortable with, don't give up. (UMO)*
Un/gendered: exploring the 'gender neutral' language in these contraceptive texts	*Withdrawal method is a way of protecting against pregnancy that means you interrupt the intercourse. That is, the penis is withdrawn from the vagina before ejaculation. (UMO)*

Study IV

The political narrative analysis of the in-depth interviews identified two different types of organizing logics in these stories of hormonal contraceptive use, each with different narrative manifestations, the chronological and the positional, which are presented together with exemplifying quotes in Table 12. These distinctive narratives both demonstrate connections between micro- and macropolitical levels and negotiations with dominant discourses: the 'hormonophilic' medical discourse promoting hormonal methods as a superior choice and the 'hormonophobic' (social) media discussion, painting these methods as unnatural and an enemy to female health.

The chronological story can be described as a familiar narrative of inexperience followed by growth, of perseverance in spite of setbacks, and a positive resolution. Within the organizing logic of the chronological growth saga, the narrative manifestations differ, but have common characteristics. Most stories begin with getting the contraceptive pill from a midwife and recounting how this practice was taken for granted as a teenage girl. I called this narrative block *Coming of contraceptive age.* Next, in *Perseverance in finding the perfect fit*, common themes in the narrative manifestations were overcoming struggles and finding a contraceptive fit. Lastly, in *Coming to terms with a contraceptive method,* the women approached their present-day contraceptive realities and described how they found a method they are happy with.

Within the organizing principle of the positional narrative, the easily recognizable story components of temporal movement are not as apparent, but the main 'textual engine' is instead the movement through social positioning, of identification with some communities or discourses, and disidentification with others. Two main themes of narrative manifestations were found, one more inward looking, reflecting on one's own identity, and the other more outward oriented, where discussions of different societal opinions on hormonal contraceptives became explicit. I call the first theme *Authenticity – is it me or the hormones?,* where stories of questioning personal contraceptive experiences in relation to medical expertise and social expectations emerged. The second one, *Dis/identification - the sensible adult in between crazy hippies and ignorant midwives*, sheds light on the balancing act between different dominant discourses on hormonal contraceptives that these women performed and how they positioned themselves as sensible.

These contraceptive stories can be seen as micropolitical narratives connected to macropolitical structures such as a downsized health care sector, nation state

incentives for population health or control, and an unequal society with a skewed reproductive and contraceptive burden.

Table 12. Results from political narrative analysis of in-depth interviews with Swedish women with hormonal contraceptive experience.

Organizational logic	Narrative manifestation	Exemplifying quote
Chronological	**Coming of contraceptive age:** obligatory teenage initiation of hormonal methods by seemingly mechanistic prescription for hormonal contraceptives	*I started because… the youth centre talked kind of like 'but the pill is something you start taking, so which one do you want?' I didn't have a boyfriend or… it was not like it was a contraceptive purpose really. (…) it just continued and I was never introduced to something non-hormonal.*
Chronological	**Perseverance in finding the perfect fit:** a period of trying out different contraceptives, despite painful setbacks such as side effects, self-doubt and not being heard	*I had constant breakthrough bleeds. I had small mini-bleeds all the time. They say that you should give it three months. So, I gave it three months and then they said I should continue and that sometimes it could take longer. So, I had some for almost six months. Then changed and had that for six months. Well, it didn't improve at all. … it's been the hardest part, not to actually have 'breakthrough bleeds', but the psychological part of not knowing.*
Chronological	**Coming to terms with a contraceptive method:** finding a suitable choice becomes in itself, with or without hormones, part of growing into an adult, responsible, and self-confident woman	*It's always been side effects and even if the IUD worked well, it's still something you put in your body and you have no fricking idea what it's doing there. Two pregnancies, two deliveries, I just felt … let this little body get some rest now. Also, from a point of justice, that my body has taken one, several, for the team. Not to say the least with pregnancies. And now it's your body's turn, for fuck's sake. (on choosing vasectomy)*

Organizational logic	Narrative manifestation	Exemplifying quote
Positional	**Authenticity – is it me or the hormones:** the authentic body as 'undisturbed' by exogenous hormones, and the 'story of a changed self' on hormonal contraceptives	*I mean, it was exiting to remove the IUD and like: how does my body work without the IUD? (sarcastic) Apparently* exactly *the same. I mean I hoped that I would become happy and energetic, oh everything will be amazing when I remove the IUD … but well, it didn't happen. I really feel the same except I got my period back and that's fun. Or, it's not fun, but it's good to get to know your body a bit again.*
Positional	**Dis/identification - the sensible adult in between:** positioning of oneself in opposition to unnuanced and irresponsible groups	*People are so very scared, maybe in vain. It would be great if it was a reflective questioning, but when it's more … that you dismiss things because you should, or because you read it somewhere. Then again maybe they outweigh each other, it wasn't great how it was when I went to upper secondary school, with no questioning at all. So, if they pull in different directions, maybe the middle way will be good. But it's a shame for those who end up at the margins then, on this scale.*

It is rather a lot of years' worth of feelings, or many years' laughter so to say, that I didn't get. And it was not a conscious decision in any way. The pill was just presented as a fact.

Interview from study IV, 2021

Discussion

The studies in this thesis have shown that 1) depressive and other mental health side effects are likely more common than previously acknowledged, particularly among young women; 2) these psychological side effects are affected by interacting power dimensions of oppression; 3) women are expected to choose and change (hormonal) contraceptive methods for years and plan pregnancies perfectly; together with 4) navigating often conflicting discourses on hormonal methods as either a simple and effective solution to all reproductive issues, or exogenous hormones as unnatural poison, obliging constant negotiation and self-surveillance. Taken together, it becomes clear that the medical discourse on hormonal contraception as an uncomplicated planning tool and benefit for women, obscures the arduous and fundamentally gendered work entrenched in a unequal society that hormonal contraceptive use is.

This thesis is situated at the crossroads between a medical and social science tradition. My aim is to bridge, rather than polarize, these often-conflicting knowledge traditions, and in this context it is essential to acknowledge the benefits of hormonal contraceptives. This technology allows for reproductive planning that, at the individual level, often increases autonomy (May, 2010), as well as alleviates menstrual cycle-related symptoms such as heavy bleeding or PMDD (Rapkin & Mikacich, 2013). Hormonal contraceptive methods are one important aspect of, if not the only necessary ingredient, to achieving reproductive autonomy in the sense of being able to decide number and spacing of children. In a historical and global perspective, hormonal contraception has been part of thoroughly changing not only individual reproductive experiences and choices, but whole societies, as women's educational level and participation in the labour force increases with fewer children (Drucker, 2020; May, 2010). Thus hormonal contraception has been a liberating force in several ways.

Many women suffer no side effects, and many are happy with their hormonal method of choice (Lindh, 2014). In a global perspective, lack of access to efficient hormonal methods is often the main issue (Drucker, 2020). Furthermore, non-contraceptive benefits such as reduction of anaemia and certain cancers on a

population level, and treatment of endometriosis and related disorders, are important benefits (Bahamondes et al., 2015; Maguire & Westhoff, 2011). Hormonal contraceptive use does not negatively impact fertility after cease of use, a common misconception (Farrow et al., 2002). The suffering and medical risks caused by unwanted (including some, but not all, unplanned) pregnancies should be acknowledged (Nelson et al., 2022). In the context of potential depressive side effects from hormonal contraceptives, it's important to recognize that women with unplanned pregnancies have been found more likely to develop depression than women with planned pregnancies (Faisal-Cury et al., 2017). Better hormonal contraceptives, with fewer side effects, are thus one part of reaching reproductive justice (Drucker, 2020). So too are increased access to, and equal availability of, these methods, including follow-up and the possibility to remove LARCs as soon as needed (Gomez et al., 2018).

The anguish caused by multiple, closely spaced pregnancies and child births that generations of women in Sweden suffered (Larsson, 2022), and still do in many parts of the world, should not be forgotten in the context of modern contraceptive practices. Yet neither should all progress in the reproductive arena be attributed to hormonal contraceptive regulation of fertility (Drucker, 2020). Social, medical, and political progress, alongside shifting reproductive norms interwoven with structural dimensions of power, affect and interact with contraceptive technologies to create the existing reproductive landscape, and shape our reproductive stories. Recognizing the significance of hormonal contraceptive access as one part of reproductive justice does not exclude the examination of how the ideological, political, and normative forces outlining the current reproductive arena affect contraceptive possibilities and experiences – rather, its significance makes this examination even more important. It is from an awareness of this complicated landscape that the ensuing discussion departs.

The discussion is organized as follows. First, each study is considered in relationship to previous research. A more wide-ranging discussion of meanings of hormonal contraceptive use in contemporary Sweden then proceeds. Finally, strengths and limitations are debated, before reaching the conclusions.

Findings in relationship to previous research

This thesis is located within a growing body of work investigating the link between hormonal contraceptives and mental health, and the contextual, structural factors affecting these understandings, both epidemiologically (Anderl et al., 2022; de Wit et al., 2020; Johansson et al., 2023; Lundin et al., 2022; Lundin et al., 2023; Skovlund, Morch, et al., 2016) and through qualitative approaches (Berndt & Bell, 2021; Dehlendorf et al., 2023; Littlejohn, 2013; Malmborg et al., 2020; Stevens, 2018). Below, each study is discussed in relation to previous and emergent research.

Establishing a possible link

Study I was the first Swedish study to prospectively investigate an age-dependant association between hormonal contraceptives and subsequent psychotropic drug use on a population level (Zettermark et al., 2018), strengthening previous findings from Denmark of a significant association between hormonal contraceptive use and depression in teenagers (Skovlund, Mørch, et al., 2016). Before the publication of our study in 2018, only cross-sectional studies existed in a Swedish setting (Lindberg et al., 2012; Wiréhn et al., 2010), with no possibility to distinguish the temporality of exposure and outcome. Although observational and with limitations (discussed in detail in the Strengths and limitations section below), study I filled an important knowledge gap by establishing a previously unknown association and, in hindsight, also motivated further research, as the close to 60 citations to date bear witness to (PLOS ONE, 2023).

Our findings of a probable negative mood effect, particularly among teenagers, has since been confirmed in a number of prospective cohort studies (Anderl et al., 2022; Anderl et al., 2020; de Wit et al., 2020; Johansson et al., 2023), randomized trials (Bengtsdotter et al., 2018; Zethraeus et al., 2017) and qualitative studies (Downey et al., 2017; Malmborg et al., 2020). A recent Swedish study by Lundin et al (2022) entitled 'There is no association between combined oral hormonal contraceptives and depression: a Swedish register-based cohort study' uses similar register data and design to ours, and seemingly contests our findings. However, a closer examination reveals that several unmotivated methodological choices explain the difference in outcome. First of all, Lundin et al (2022) exclude key populations: 1) women with a prescription fill of antidepressants within the first month of hormonal contraceptive use, though the highest risk of depression is close to introduction (Johansson, 2023); 2) women who got a prescription fill for anxiolytics or anxiety-related diagnosis, although anxiety is an known component of depression (Gotlib &

Joormann, 2010); and 3) all girls younger than 15, when the strongest associations have previously been found in young teenagers (Zettermark et al., 2018). Secondly and more importantly, they do find positive associations for all hormonal contraceptive methods and anti-depressants in teenagers, except for combined oral pills, as well as for adults when the reference group is changed from non-user to never-user. The headline is thus not incorrect but could mislead a hurried reader. Their overall results are in fact in line with ours; a stronger association with antidepressants is seen in younger girls and with progestin-only methods. There are convincing indications that progestin-only methods lead to a higher risk of depressive symptoms than combined forms (Elsayed et al., 2022; Hampson, 2023; Mu & Kulkarni, 2022). In study I, progestin-only methods were generally more strongly associated with subsequent psychotropic drug use in teenagers, but not in adults. All the strongest associations with subsequent psychotropic drug use were found in the youngest age group, and young users of non-oral combined methods (patch and vaginal ring), erroneously labelled as progestin-only methods in the published paper, were more than four times more likely to fill a prescription of antidepressants compared to non-users (Zettermark et al., 2018).

The consistent age-dependant discrepancy in response to hormonal contraceptive exposure has been discussed as a *healthy survivor/user bias* or *selective discontinuation bias*, both by us (Zettermark et al., 2021; Zettermark et al., 2018) and other scholars (de Wit et al., 2021; Johansson et al., 2023; Skovlund, Mørch, et al., 2016), where women who experience negative side effects in youth discontinue treatment and are thus classified as non-users in adulthood. This would lead to an underestimation of negative effects, since only discontent users discontinue, and women with persistent depressive symptoms after hormonal contraception use are classified as non-users. A life-course perspective has revealed that exposure to hormonal contraceptives in adolescence can increase depressive symptoms in adulthood, even if no current hormonal method is used (Anderl et al., 2022). These previously exposed women are simply classified as current non-users (reference group) in most study designs, including ours. This fact further underlines a potential underestimation of negative effects. One study that looked at both between-person and within-person associations with depression during and after combined oral contraceptive use found a significant association in the within-person analysis but not the between-person analysis (Morssinkhof et al., 2021), again suggesting that only current use is an insufficient variable, since women who have discontinued due to side effects are classified as non-users. A time-sensitive 'new user design', separating new from prevalent users, avoids this issue. In an elegantly designed study, taking time and new users into account, as well as doing a sibling-analysis, Johansson et al (2023)

showed that oral contraceptives were very likely causally associated with depression in both adolescents and adults, especially shortly after introduction. Studies I and II are both part of, and have contributed to, the growing body of epidemiological research establishing a link between hormonal contraception and mental health symptoms, each highlighting different aspects of the field.

Quantifying structural inequalities in response to hormonal contraceptives

In study II, we built upon the then-known age-dependant association between hormonal contraceptives and mental ill health, utilizing an intersectional multilevel analysis of individual heterogeneity and discriminatory accuracy (MAIHDA) to explore population heterogeneity in depressive response to hormonal contraception (Zettermark et al., 2021). The same dynamic prospective cohort design as in study I was deployed, making sure exposure to hormonal contraceptives preceded antidepressant use. To my knowledge, this is the first study utilizing an intersectional MAIHDA approach to investigate hormonal contraceptive use, and one of the first in a prospective cohort design. MAIHDA has, since its introduction in 2018 (Evans et al., 2018; Merlo, 2018), become acknowledged as the emergent gold standard when epidemiologically aiming to map effects of social injustice and heterogeneity at a population level (Evans et al., 2020; Lederer et al., 2022; Mahendran et al., 2022), as it statistically allows for taking multiple social dimensions into account simultaneously, without adjustment for one dimension (such as gender) within another (such as age) that would obscure the multidimensionality of oppression.

Despite MAIHDA being a rather novel approach, it has been applied to investigate mental health in several studies (Balloo et al., 2022; Ljungman et al., 2022; Lorthe et al., 2023; McGuire et al., 2023), albeit not in relation to contraceptive use. One US-based study found that the intersectional effects (the effect not explained by the main effects of the included variables, but only by intersectional interaction) of the intersecting dimensions of gender, race, and sexual orientation on developing major depressive disorder was rather substantial (12%) from a life-course perspective (McGuire et al., 2023). In our study, the intersectional interaction effect was minor (3 to 0.5%), which is in line with previous quantitative intersectional studies in diverse fields such as obesity, opioid dispensation, and mental health (Balloo et al., 2022; Evans et al., 2018; Kern et al., 2020; Merlo et al., 2019; Persmark et al., 2019). Despite the promising operationalization of the intersectional theoretical underpinnings in MAIHDA, few studies have thus found any substantial intersectional interactions effects. This could be because no matter how elegantly the

statistical modelling is done, the ingoing quantitative variables, such as high/low income, are just too crude a proxy for social dimensions of oppression and privilege, as is discussed further under the Strengths and limitations headline.

Intersectionality and reproductive justice is an established framework in qualitative contraceptive research (Dehlendorf et al., 2013; Dehlendorf et al., 2010; Gomez et al., 2018; Gomez et al., 2014; Grzanka & Schuch, 2020; Morison, 2021; Price, 2011), and has been applied as a critical lens when discussing the reductionist medical language often used to quantitively summarize reasons for discontinuation of hormonal methods (Le Guen et al., 2021). A call for including a power-sensitive analysis, aware of 'upstream factors', such as reproductive norms; socially ordered, normative health care institutions; and intersecting locations of vulnerability in exploration of contraceptive experience and patterns of use, has been made (Morison, 2023).

Previous intersectional approaches have shown that race, age, and poverty are all relevant for reproductive and contraceptive choices and practices (Alexander, 2022; Gomez et al., 2014; Grzanka & Schuch, 2020; James-Hawkins & Sennott, 2015). The design of the intersectional MAIHDA in study II departed from a recognition of these intersecting dimensions and an attempt to operationalize them quantitatively. Although the variables included by necessity create intersectional strata that are fixed in the statistical analysis, the interpretation is not that these are static 'risky identities', but in line with the intersectional theoretical underpinnings, context-specific vulnerabilities created by interwoven social dimensions that are dynamic and subject to change (Green et al., 2017; Mahendran et al., 2022; Price, 2011; Rice et al., 2019).

We found that the adult women in strata representing more oppressed locations (low-income and immigrant) were more likely to develop depressive symptoms requiring antidepressant use when using hormonal contraceptives than were those in more privileged contexts, providing a more fine-grained and power-sensitive picture than previous quantitative studies within this field. Although it is problematic to reduce complex and dynamic embodied experiences to dichotomous variables (Collins et al., 2008; Rice et al., 2019), our large-scale quantitative study still provides new insights, and adds statistical muscle to the importance of investigating intersecting power dimensions in the reproductive arena.

Making discourses in contraceptive information visible

In study III, to better understand this reproductive arena and the broader context in which contraceptive choices are presented in Sweden from a reproductive justice-informed point of departure, discourses in official medical contraceptive information aimed at the general public were explored through a biomedicalization lens (Zettermark, 2023a). To my knowledge, this is the first discourse analysis of official contraceptive information in Sweden, although teenagers' understandings of contraceptive information has been previously investigated (Ekstrand et al., 2005; Rivano Eckerdahl, 2011) and more quantitative approaches evaluating information campaigns for emergency contraceptives exist (Gainer et al., 2003; Larsson et al., 2006; Larsson et al., 2004). One recent discourse analysis of Swedish sexual and reproductive health policies in relation to immigrant populations, which found vulnerability and otherness relevant in these policies, specifically mentioned that contraceptive policies were void of the othering language (Amroussia et al., 2022). Another current exploration of family planning discourses in Swedish national media and politics, departing from a reproductive justice standpoint, found that racialized and immigrant women's childbearing was specifically targeted for regulation (Mulinari et al., 2023). Contemporary international studies of contraceptive information have concentrated on clinical communication (Bertotti et al., 2021; Carson, 2018), advertisement of new hormonal methods (Mamo & Fosket, 2009; Medley-Rath & Simonds, 2010; Watkins, 2012), or public debates on contraceptives (Eskeland Espejord & Sandset, 2022; Gunson, 2010), rather than medical information aimed at the public.

From the critical discourse analysis in study III, three interwoven subthemes emerged, and an overarching theme of individual (gendered) agency exerted through rational contraceptive choice. As previous scholars highlighted, contraceptive communication often appropriates feminist ideals of choice and independence, while still working within a context of capitalist gain and medicalized control (Mamo & Fosket, 2009; Medley-Rath & Simonds, 2010). That becomes apparent in study III, when the rational (invisible) woman choosing effective contraceptives within a biomedical sensibility emerges as the only possible position to inhabit. In the first subtheme, I found two contradicting logics, where women in need of contraceptives have to balance the discourses of exogenous hormones as both an 'unnatural' threat to their bodies and as a desirable, effective regulator of the same 'naturally unruly' body. The female body has long been conceptualized as too unrestricted and unbalanced, in need of regulation (Martin, 1987; Moore, 2010), which exogenous hormones offer.

In these informative texts, hormonal methods are presented both as simple to use, effective, and with several non-contraceptive benefits, such as regulating menstruation. Several scholars have discussed how hormonal contraceptives, particularly extended cycle regimens, are advertised as 'lifestyle drugs', that construct new forms of non-menstruating, regulated, and productive femininity through technoscientific transformation of both bodies and social realities (Gunson, 2016; Mamo & Fosket, 2009; Watkins, 2012). Nonetheless, the primary benefits of non-hormonal methods are presented as 'not interfering with the body' or 'not containing hormones' in my material, thus simultaneously juxta-positioning exogenous hormones as a potential threat to a natural body. Geampana (2019) found that women conceptualize risks involved in taking hormonal contraceptives as fundamentally different than those involved in pregnancy, since the latter is seen a natural process and the former is not. The perceived natural, untampered body is consequently at the core of contraceptive discourses, yet the biomedicalization of reproduction (Clarke et al., 2003), partly through contraceptive technologies (Burfoot & Güngör, 2022b), creates a tension within the conceptualization of the natural and ideal femininity, emerging as opposing logics in this medical contraceptive information.

The second subtheme concludes that in search of a 'perfect contraceptive fit' (Wigginton et al., 2015), it is the woman who needs to accommodate to available methods, rather than the other way around: 'Remember: There is always a protection against pregnancy that suits you. Even if you tried one or several methods that you weren't comfortable with, don't give up' (quote from UMO.se). The description of contraceptive methods as possible to individualize, combined with an emphasis on the efficacy of hormonal methods in preventing pregnancy, create a strong incentive to keep trying out new (hormonal) methods. Previous studies have shown that medical professionals accentuate efficacy over side effects, while (potential) side effects are very relevant to women in need of contraceptives (Geampana, 2019; Littlejohn, 2013; Littlejohn & Kimport, 2017; Lowe, 2005). Although side effects are mentioned in these texts, the language is medical and simple, devoid of any possible recognition of the embodied, emotional, and relational work that has been found highly relevant in trying and using these methods (Brown, 2015; Kimport, 2018; Wigginton et al., 2015). Bertotti et al (2021) found that in gynaecological textbooks, women's behaviour is constructed as risky, while contraceptive technologies are presented as safe. This is true for the material examined in study III where, for example, women's forgetfulness or lack of sexual spontaneity is constructed as problematic, rather than the available methods being problematized.

The third subtheme connects to this decidedly gendered contraceptive responsibility (Fennell, 2011) by demonstrating how women in these informative contraceptive texts are made discursively invisible, while simultaneously being constructed as individually responsible for reproduction. In the analyzed texts, explicitly gendered language, such as 'woman', is removed, while reproductive body parts remain, and the reader is addressed as 'you' most of the time. The disassociation between organs and biochemical processes, and the individual or body that contains them, is a well-known, modernistic phenomena, discursively hiding the body from view (Braidotti, 1989; Lie et al., 2011). Even though this biological language bears the potential to create new, normatively disordered interpretations of reproductive truths, and the rationale behind is to be trans inclusive, it can also enforce gender roles by attributing these to organs and tissues, creating an even more mechanistic gendered frame of interpretations. The 'you' in my material is overwhelmingly someone with ovaries and a uterus, who can (but should not) become pregnant. Previous scholarship has demonstrated that women's responsibility and emotional burden of contraceptive use goes beyond the biological necessity of using available (female) methods (Brown, 2015; Fennell, 2011; Kimport, 2018), and it could be argued that removing certain words does little less than obscure this gendered imbalance. From a reproductive justice standpoint (Ross, 2017), it becomes harder to pinpoint interlocking structural injustices when the individuals that embody these locations are taken out of the discourse, and only uteruses remain. Thus, this study demonstrates that biomedicalization of reproduction, through a disembodied, biomedical discourse and the promise of regulatory hormonal contraceptive regimens, is highly relevant in understanding contraceptive information from a reproductive justice standpoint.

Contextualizing (hormonal) contraceptive narratives

Study IV proceeded with exploring the intertwined processes of biomedicalization and structural injustice in the reproductive field, through narratives of hormonal contraceptive experience emergent in in-depth interviews with Swedish women (Zettermark, 2023b). This approach has not, to my knowledge, previously been applied in explorations of contraceptive practices and knowledges from a narrative perspective, while both reproductive justice and biomedicalization have been employed in previous studies investigating specific aspects of contraceptive involvement. For example, Berndt and Bell (2021) utilized a biomedicalization lens to map out negotiations of authority in the contraceptive meeting and found that the dominant biomedical discourse allows the provider's perspective to take precedence when interpretations clash. Reproductive justice is emergent theoretical ground in academia, but a number of scholars have used it to qualitatively study

reproductive and contraceptive issues, mainly in relationship to LARCs (Alexander, 2022; Gomez et al., 2018; Grzanka & Schuch, 2020; Morison, 2021).

Previous qualitative interview studies on contraceptive practices in Sweden have focused on contraceptive information literacy (Rivano Eckerdahl, 2011), sexual side effects (Malmborg et al., 2020), sexual risk taking (Ekstrand et al., 2005; Falk et al., 2010), and abortion (Holmgren, 1994), the latter framing discontinuation as a medical problem increasing reproductive risk, such as unplanned pregnancies. Berg and Lundgren (2022) looked at stories of hormones through both interviews and printed media, and exposed two discordant discourses. Hormones were either seen as something to understand and master (more and better biomedical knowledge required), or as something irrelevant and potentially reductionist (I am more than my hormones). International scholars have studied how power and gendered expectations are negotiated in the contraceptive counselling meeting (Berndt & Bell, 2021; Dehlendorf et al., 2013; Gomez et al., 2014; Littlejohn & Kimport, 2017; Lowe, 2005; Marshall et al., 2018), experiences of side effects (Geampana, 2019; Hoggart & Newton, 2013; Hoggart et al., 2013; Littlejohn, 2013), and the feminization of contraceptive use (Fennell, 2011; Kimport, 2018; Wigginton et al., 2015). Downey et al (2017) take a more holistic approach to contraceptive experiences in their interview study, outlining how contraceptive use is a long-term journey of changing, evaluating, and navigating different methods, rather than a final destination; something that also emerges in my study.

In study IV, two main types of narratives surfaced, one chronological and one positional. Within the chronological narrative, age became relevant as an intersectional location in stories of mechanistic introductions of the pill at the youth health centre. For some of these women, age and gender working in conjunction with a biomedicalized view of reproductive risk (Littlejohn & Kimport, 2017) created a climate without other options than hormonal contraceptives, and which scholars have conceptualized as part of the spectrum of reproductive coercion (Senderowicz, 2019; Upadhyay et al., 2014). The embodied suffering, and emotional and mental work needed to use, evaluate, and change hormonal contraceptives that previous studies have highlighted (Geampana, 2019; Kimport, 2018), also became evident in the chronological narratives. The search for a method that did not cause too many side effects yet still provided reliable-enough pregnancy protection often took years, if not decades, of suffering these side effects, to find. Wigginton et al (2015) coined this process 'finding a perfect contraceptive fit', and showed in their study how this work is naturalized as female, and thereby becomes invisible. In addition to this, I also found that the very expectation of psychological side effects, and negotiations with health care providers of what constituted 'real'

mental health side effects, created self-doubt and the need for constant self-surveillance. The internal surveillance process becomes concealed within a biomedicalized society, since the effort it requires is taken for granted as a 'natural' part of the moral obligation to stay healthy (Clarke et al., 2010).

Even though the overall narratives in my study were ones of iteratively trying out different contraceptive methods, the ending was more in line with actually finding the perfect fit conceptualized in Wigginton et al (2015), than the ongoing contraceptive journey found by Downey et al (2017). The women in my study all disclosed a current situation of contentment, mostly by using non-hormonal methods, but some with hormonal methods that improved symptoms caused by their natural cycle. This could be interpreted as a negotiation in neoliberal terms of agency through available choices on a market, as Grzanka & Schuch (2020) conclude in their study on making meaning of LARCs. These adult positions of content even with a less efficient method, could also be seen through a reproductive justice lens, with age again becoming an important intersection to acknowledge but this time, for these white and mostly middle-class women, as a position of privilege, where motherhood is constructed as desired (James-Hawkins & Sennott, 2015; Smart, 1996). The personal desire to have a child depends on many interrelated factors, of which reproductive norms and available contraceptive technologies are only part, and many women expressed that the prospect of a pregnancy was less worrisome now they were nearing 30, as other scholars have also noted (Geampana, 2019).

The positional narratives uncovered movement through social positioning, and raised questions of identity and authenticity that became intertwined with conflicting societal discourses on hormonal contraceptives as either medically encouraged and unproblematic, or unnatural and threatening. The women interviewed mainly located the critical, 'hormonophobic' discourse within social media and discussion forums, and the medical 'hormonophilic' discourse to medical professionals. This finding is interesting in light of the findings in study III, where the same discordant discourses were found within medical contraceptive information (Zettermark, 2023a). It shows that contraceptive discourses are not confined to certain spaces but permeate and affect different reproductive arenas. An important tension within previous scholarship is that of resistance to biomedical frames of interpretations. Both Berndt and Bell (2021) and Lowe (2005) found a dichotomy between embodied experience, stemming both from oneself and other women, and biomedical knowledge on hormonal contraceptives, where the former was seen as more trustworthy by the individual woman. In the narratives in study IV, the biomedical logic was not rejected but rather internalized. Embodied experiences were interpreted and made sense of through a medical lens. Berg and Lundgren (2022)

found the same denunciation of biomedical relevance of hormones but also a request for more biomedical knowledge, or medicalization, in their narrative analysis of Swedish hormone-related stories. This latter narrative resurfaced in my interviews also, when (the insufficient) research on women's health was discussed. This tension again highlights how contextual contraceptive experiences are related to prevalent discourses and structural conditions (Fulcher et al., 2021). However, this does not mean that the structural injustice partly hidden in this biomedical logic, by naturalizing norms in terms of numbers and risk (Berndt & Bell, 2021), went unnoticed by the participants in my study. They showed resistance by calling out the gendered injustice ingrained in the process of negotiating hormonal contraceptive use as a teenager and adult, and highlighted how unreasonable all reductive perspectives are, both hormonophilic and hormonophobic, since so many factors influence contraceptive experience.

Meanings of hormonal contraceptives in a Swedish reproductive landscape

The following segments explore different aspects of how hormonal contraceptive use and associated mental health matters can be understood through a biomedicalization lens. I depart from a reproductive justice perspective of admittance of the power-imbued structures that affect contraceptive practice and understanding.

First, I argue that hormonal contraceptive use is a form of modern *fertility work* dependent on biomedicalization and that mental health is at the core of this effort. Thereafter, I explore the role of hormonal contraceptives as normative regulators of reproduction in a broader sense, particularly in Sweden. Then follows a section on how hormonal contraceptive effects can be conceptualized as neither purely biochemical nor purely cultural, but rather as a contextual and interconnected result of different processes. Finally, I discuss how hormonal contraceptive use can be understood as an (im)possible area for mental ill health, and confront the discursive tensions between a medical and experience-driven understanding of psychological side effects.

Hormonal contraceptive use as fertility work

Prevention through contraceptive responsibility is, far from the linear success story of care-free sexuality after hormonal contraception (Tone, 2002), often hard, embodied work. A number of scholars have shown how the emotional and relational aspect of female contraceptive responsibility goes far beyond the physiological prevention of pregnancy (Brown, 2015; Downey et al., 2017; Fennell, 2011; Kimport, 2018; Wigginton et al., 2015), as also becomes evident in study IV (Zettermark, 2023b). The time and effort exerted in regulating fertility and preventing pregnancy has been coined fertility work by Bertotti (2013). This fertility work is obscured when medical discourse focuses solely on efficacy (Bertotti et al., 2021; Littlejohn, 2013; Littlejohn & Kimport, 2017; Lowe, 2005), and presents hormonal contraceptives as offering an uncomplicated shopping experience, as study III showed (Zettermark, 2023a). It is possible that the strong incentive for trying out and sticking with new hormonal methods found in both studies III and IV, the invisible fertility work, might in itself have a negative effect on mental health, which explains part of the associations with mental ill health found in studies I and II. In other words, that the contextual experience of using hormonal methods, alongside biochemical effects, puts a strain on mental health.

I would argue that mental health is at the core of fertility work, not only through the actual development of depression, mood symptoms, or diffuse unease that studies I and II (Zettermark et al., 2021; Zettermark et al., 2018), together with other recent research (Anderl et al., 2022; de Wit et al., 2020; Johansson et al., 2023; Larsen et al., 2023), have shown are likely more common than previously thought, but also through the possibility of those symptoms; the stories of a changed self, and of not being believed by medical professionals (Zettermark, 2023b). The colliding hormonophobic and hormonophilic discourses, particularly on inherently subjective mood effects, force constant negotiation with conflicting truth claims, and a need for self-surveillance to navigate them during hormonal contraceptive use. The self-surveillance needed to cross-examine your own mental health status takes time, energy, and often technological savvy to utilize mobile applications of menstrual tracking (Wilkinson et al., 2015), and thus mental health concerns regarding hormonal contraceptives becomes an important part of modern fertility work.

Modern fertility work is in turn dependent on both the medicalization of reproduction and biomedicalization in a broader sense. Key components of biomedicalization are defined by Clarke et al (2003) as increasing political and economic stakes in the biomedical sector, a focus on health itself and risks posed to it, an increasingly technological nature of biomedicine, alterations in how biomedical knowledge is distributed and consumed, and finally, transformations of bodies and identities through biomedical technology. Two aspects of this transformation of bodies are the (often welcomed) regulation of menstruation and fertility through hormonal contraceptives, along with the tracking of symptoms and fertility, based in biomedical knowledge and technology that changes understandings of reproduction (Burfoot & Güngör, 2022b). These are not inherently value-laden properties. However, I find that paired with a gendered obligation to preserve health, where women are disproportionately held accountable for reproductive and family health (Moore, 2010), and a gendered responsibility for contraception (Fennell, 2011; Kimport, 2018), the reproductive biomedical technology also obliges gendered fertility work, including mental health aspects, exerted and understood through it. Without disregarding the many benefits of female-controlled methods, this shift becomes obvious when considering that condoms and withdrawal once were the only available methods, requiring active participation of a male partner in the contraceptive aspect of fertility work. If anything, hormonal methods of today, exclusively working in reproductively female bodies, have shifted the responsibility even further onto women, often making it completely invisible to men (Bertotti, 2013). The common claim that hormonal contraceptives separated sex and reproduction might still hold true (May, 2010), but it is clear that the invention of

this contraceptive technology did not separate sex and *reproductive responsibility* for women. Fertility work certainly changed when hormonal contraceptives entered the market, but it did not extinguish it. And one possible cost of modern fertility work is the infringement on mental health.

Today, the prevention of pregnancy is entirely constructed as the responsibility of the woman, yet not always hers to define. The concept of an unmet need for contraceptives is a common way to describe the gap between actual usage of contraceptives in a population and estimated usage if all women not actively trying to become pregnant used contraception (Alkema et al., 2013). This concept has its roots in the population-control movement of the 1960s but has evolved over the years to represent a reproductive health perspective, where women's access to contraceptives is central (Bradley & Casterline, 2014). It is not, though, a measurement that takes the individual woman's own will into account. It is simply one way to gauge a certain definition of reproductive health rights (contraceptive uptake) on a population level, fraught with measurability issues such as only being able to include married women (Bradley & Casterline, 2014). Women who do not express an active will to become pregnant are often categorized as having an unmet need for contraceptives, despite personal motives such as 'do not want to use contraceptives', 'have no current need', or 'not sexually active' (Hellström et al., 2019). Within the medical discourse of unmet need, it is thereby clearly the researcher and medical authority that defines who needs contraceptives, rather than the woman herself. The concept of unmet need highlights how a medical prerogative redefines contraceptive need into strictly medical terms, rather than as a part of the holistic process of reproductive autonomy (Upadhyay et al., 2014).

As was demonstrated in study III (Zettermark, 2023a), the biomedical discourse on contraceptives is based in an economic model of rational choice. It states pregnancy risk as the only rationale for contraceptive choice – the more efficient, the more rational – and disregards the complex motives, emotions, relationships, and structural prerequisites that shape contraceptive choice (Bertotti et al., 2021; Takeshita, 2012). Women whose contraceptive choices do not align with plans for pregnancies are branded as irresponsible or irrational, despite their own logical reasoning behind their choices (Gomez et al., 2018; Sawhill, 2014). While planned and unplanned pregnancies are usually dichotomized in medical literature, with the latter constructed as risky (Nelson et al., 2022), women often place a pregnancy on a continuum between intended and unintended, citing complex and shifting conceptualizations and emotions (Aiken et al., 2016). When it comes to contraceptive practices, for some women preventing pregnancy is paramount and effectiveness is the main issue, while for others, side effects or possibility of self-

administration, spontaneity, or ability to forget about the method, and emotional and embodied experiences of previous methods are more important (Alspaugh et al., 2020; Geampana, 2019; Littlejohn & Kimport, 2017).

The beautiful, existential turbulence surrounding reproductive choices and the contextual understanding of contraceptives is all visible in the narratives of study IV. A reduction of complex contraceptive and reproductive knowledges and motives into a simple rejection or approval of hormonal contraceptives is futile (Inoue et al., 2015). The women interviewed in study IV show how hormonal contraceptive use is far from a simple economic calculation of pregnancy risk, but rather an ongoing, embodied, and existential experience of fertility work. This fertility work comprises a myriad of meanings and consequences in which mental health is central, and of which effectively avoiding pregnancy is only one (Zettermark, 2023b).

Regulating reproduction

This section aims to further explore the normative and regulatory elements of hormonal contraceptive use and communication, by delineating the role of these methods in expectations on reproductive planning and suitable motherhood, irrevocably connected with dimensions of power. These elements became apparent in both studies III and IV, and can be traced in the heterogeneity in utilization of hormonal methods and associations with anti-depressants found in study II.

Teenage pregnancies are constructed as inherently risky, both medically, because of an increased risk of preterm birth and infant mortality (DeMarco et al., 2021; Olausson et al., 1997), and socially, since life-time educational and income levels are reduced for teenage mothers and their offspring, both in Sweden (Olausson et al., 2001) and abroad (Coyne et al., 2013; DeMarco et al., 2021). However, most of these risks are correlated to low socioeconomic status and lack of social support, and no real consensus on the biological risks exist (Amjad et al., 2019; Imamura et al., 2007; Olausson et al., 2001). Scholars have argued that the most important interventions to reduce poor outcomes for mother and child would be tailored support to teenage parents (Paranjothy et al., 2009). At a population level, lower teenage pregnancy incidence correlates with higher hormonal contraceptive use (Darroch et al., 2001; Linders & Bogard, 2014), creating a strong incentive for targeted encouragement of these methods to youth within a medical logic of reproductive risk reduction (Lindh, 2014), in Sweden institutionalized through the youth health clinics.

On the other side of the spectrum, delaying childbearing has also been highly problematized in the West in recent years, since it carries its own medical risks, along with the risk of not being able to conceive at all (Bewley et al., 2009; Mills et al., 2011; Waldenström, 2016). Beyond the scope of this thesis are the artificial reproductive techniques (ARTs) that make pregnancy possible beyond former biological barriers, such as in vitro fertilization (IVF) and egg donation, along with the reconceptualization of pregnancy and reproduction it carries (Burfoot & Güngör, 2022b; Gunnarsson Payne, 2018), and I will only mention them as one important aspect of the medicalization, and regulation, of reproduction. Being pregnant and over 35 years old is referred to as 'advanced maternal age' and generally deemed high risk for poorer outcomes (Lampinen et al., 2009). In Sweden, the age of first-time mothers has steadily increased since at least 1970, when the average maternal age for the first child was 24 (Waldenström, 2016) whereas it was 30.3 years in 2022 (Statistics Sweden, 2023b). This has been voiced as an issue of poor individual choices and lack of knowledge of declining fertility with age, redeemed by, for example, reproductive life plans (Tydén, 2016), but also as a consequence of, and possible to counteract with, social policy changes (Mills et al., 2011). The issue with modern contraception in the case of 'reproductively older' women is hence that when used, it seems too efficient at preventing pregnancies.

The beginning and end of the potentially reproductive years is thus deemed risky, or even inappropriate, for conception within a medical discourse. Furthermore, the unplanned pregnancy of a woman of any age is also articulated as a concern (Stern et al., 2016; Tydén, 2016), being associated with poorer health outcomes for mother and child at a population level (Nelson et al., 2022). Not only actual unintended pregnancies, but the mere possibility of them, has also been the focus of medical studies, where women are conceptualized as 'at risk' for unintended pregnancy (Wu et al., 2008). To counteract this risk, a higher uptake of effective hormonal methods, particularly LARCs, is promoted (Finer & Zolna, 2014; Gomez et al., 2014). In Sweden, women seeking abortions are encouraged to use LARCs afterwards (Mödrahälsovårdsenheten Region Stockholm, 2023a), and the uptake among patients is used as a quality indicator: the higher, the better (SFOG, 2019). Scholars have also argued that the prevalence of unplanned pregnancies is used as an argument to promote 'pre-pregnancy care', that is, population-level interventions that could enhance the chance of healthy pregnancies, if they occur – discursively constructing all fertile women as potential mothers (Waggoner, 2017). For example, the Swedish Food Agency recommends all women 'who can conceivably become pregnant within a few months' to take folic acid supplements (Swedish Food Agency, 2023). Finally,

multiparity and close spacing of children is also understood as medically risky (Shechter et al., 2010).

The construction of these medical risks feeds into and cocreates reproductive norms and desirability that relate to structural injustice and power relations (Gomez et al., 2014; Morison, 2023). Here, the reproductive justice lens become imperative (Ross, 2017). Age and planning behaviour are not the only relevant aspects of a desired pregnancy. A body of work exists that investigates the economic and racialized aspects of reproductive policies and communication, consistently finding that poor, immigrant, Black, and non-white multiparous women are being disproportionately targeted with effective hormonal methods to regulate (and reduce) their childbearing (Alexander, 2022; Dehlendorf et al., 2010; Gomez et al., 2018; Gomez et al., 2014; Price, 2011; Ross & Solinger, 2017; Senderowicz, 2019). For example, in 2015, poor unmarried mothers in Arkansas were suggested to receive a substantial monetary incentive to have an IUD implanted (Hammer, 2015).

In Sweden, midwives have been found to promote hormonal methods to immigrant women to encourage participation in the work force (Arousell et al., 2017). Mulinari et al (2023) exposes a deeply racist and eugenic discourse in current political communication on family planning in Sweden, specifically targeting immigrant women's childbearing in the name of integration and the well-being of the nation state, rather than reproductive autonomy. The authors connect the contemporary discourse with the state-sanctioned forced sterilizations of 63,000 individuals, the overwhelming majority being women, that took place during 1935-1975 in Sweden (Eivergård & Jönsson, 2000). It is relevant to add that forced sterilizations of transgender persons, conditioning juridical transition on proven sterility through medical intervention, were carried out in Sweden up until 2013 (SFS, 2013). Hence, in a rather recent Swedish reproductive landscape, forced sterilization was a reality, and caution in regard to state-sanctioned reproductive regulation is pertinent. That intersectional location matter in hormonal contraceptive use became clear in study II. We showed how immigrant women with low income were more likely to start antidepressant use after initiation of hormonal contraceptives than both non-users of hormonal methods in corresponding social groups and more privileged groups (Zettermark et al., 2021). This indicates that women at intersectional locations already under the structural burdens of relative poverty and racism are more sensitive to negative mood effects from hormonal methods. Despite the limitations outlined below, this in an important contribution to understanding contraceptive use and vulnerabilities from a reproductive justice standpoint.

The ideal pregnancy is consequently constructed as painstakingly planned, in a non-immigrant, adult (but not over 35) woman, with few children. Hormonal

contraceptives lie at the heart of this normative regulation, just because their efficacy in preventing pregnancy make planning possible, and therefore shameful to 'fail' at. In medical literature and contraceptive information, a gendered moral incentive to plan pregnancies with effective contraceptives can be traced (Bertotti et al., 2021), which study III also demonstrated. This regulation of reproduction is both a consequence of, and a contributing factor to, biomedicalization; of preserving, and optimizing health through biomedical technology (Clarke et al., 2003). Within a reproductive context, the female responsibility for health is extended to future generations through ideally postponing pregnancies until health is optimized (but not until fertility drops) (Waggoner, 2017). Hormonal contraceptive use hence becomes part of an ideological tale of socially-suitable reproducers and mothers (Gomez et al., 2018; James-Hawkins & Sennott, 2015; Price, 2011), able to perfectly plan every pregnancy (Aiken et al., 2016), and that can create institutional and interactional incentives for their use and risk infringing upon reproductive autonomy. As Senderowics (2019) argues, contraceptive coercion is not necessarily exerted through interpersonal violence, but sits on a spectrum. Policies and discourses can 'incentivize coercive practices', even in health care professionals working in good faith (Senderowicz, 2019). The dominance of a medical discourse helps obscure this process, as was illustrated in both studies III and IV. Since medical risks are understood as objective truths, rather than knowledge constructed and communicated in an ideological context, bearing social significance and normative meaning (Zola, 1972), their contribution to relations of dominance is often hidden.

This biomedical logic now permeates every aspect of society and individual bodies through the process of biomedicalization (Clarke et al., 2010), which is highly relevant in reproductive matters since it underlines the individual responsibility of risk reduction. Evidently, modern medicine has done wonders in the reproductive arena, and saved millions of lives with monitoring, surgery, and contraceptive drugs. However, disparities in health and reproductive autonomy remain, as outlined above. Placing all focus on the individual woman and her 'responsible pregnancy planning', constructing certain women as risky reproducers, does not solve this disparity. From a reproductive justice stance, social disparities should be redeemed with policy changes, allocation of recourses to those in need, and social measures (Ross & Solinger, 2017), not by further regulating female bodies. Within the biopolitical reproductive landscape of Sweden described in the background, with universal health care currently undergoing large cutbacks (Hall, 2013), a sexually liberal agenda and progressive reproductive health policies, yet few teenage mothers (Linders & Bogard, 2014; Rivano Eckerdahl, 2011) – high hormonal contraceptive uptake at a population level is thought of as a success factor, and a decline in usage

as worrisome (Hellström et al., 2019; Sjöberg, 2018). Hormonal contraceptives are thereby attributed meaning well beyond their biochemical effects or reproductive decisions of individuals, and it becomes clear how the mere effectiveness of hormonal contraceptives helps cocreate and enforce reproductive norms. This in turn creates tension with the reproductive autonomy of individuals, although the same methods can, in other circumstances, strengthen the same autonomy. This pinpoints the contraceptive paradox: the potential of both regulation and control, as well as autonomy and freedom through contraceptive technologies (Gomez et al., 2018). The normative elements of this paradox, I would argue, are even more poignant in Sweden because of the excellent availability and active subsidizing of hormonal methods, sexual education, and strong expectation on reproductive planning.

Sex hormones as natural-cultural forces: An (im)possible arena for unrest

Sex hormones are both tangible, biochemical compounds, and cultural symbols imbued with gendered meaning (Berg & Lundgren, 2022; Oudshoorn, 1994), and since our comprehension of them will always be coloured by these cultural understandings, it can be argued that the biological does not precede the cultural, but that they interact in cocreating reality (Irni, 2013). A large body of critical research into the false dichotomy of the nature/culture divide in the field of exogenous and endogenous sex hormones exists (Ahmed, 2008; Birke, 2003; Fausto-Sterling, 2020; Irni, 2013; Lie et al., 2011; Roberts, 2002, 2007). As Irni argues, hormonal change consists of interlocking natural-cultural forces:

> … whether 'hormonal change' in any body is enacted is not only a 'natural' or 'biological' process. It is a question of a complex intertwining of natural-cultural forces, including how environmental chemicals affect our endocrinological systems, what biomedical hormone treatments exist, and how they are used. As evident in the quote above, for Roberts, the specific conditions for the materialization of hormonal change consist of technoscience and biomedicine (Roberts, 2007: 198). However, I argue that these are by no means the only power-imbued 'apparatuses' (about the notion of apparatus, see Barad, 1998: 98–103) within which sex hormones materialize. I take the welfare state here as one example of such an apparatus (…) I hence argue for a broadening of the focus within which hormonal action as well as its regulation is researched. In addition, I argue for a more nuanced approach to power than claiming that hormone products per se are problematic. (Irni, 2013, p. 43)

Irni (2013) goes on to reason how both technoscience and the welfare state are preconditions for how hormonal change is enacted. The same reasoning on the

importance of understanding bodies as part of society is found in the ecosocial tradition of social medicine (Krieger, 2001; Krieger, 2011; Krieger, 2015).

Within a biomedical discourse, however, only measurable biochemical effects of hormones are seen as real, and other hormonal effects discussed in a medical context are conceptualized as 'belief effects' (Irni, 2013, p. 47), corresponding to the 'hormonophobia' described in medical studies as a cause for rejection of hormonal contraceptives (Le Guen et al., 2021). Irni's main argument, as I understand it, is that 'real' effects from hormones cannot be reduced to biochemical effects, but that the cultural meaning attributed to them by, for example, associating testosterone levels with masculinity, also affect emotions, behaviour, and norms, and thus are equally 'real'. This conceptualization is useful in understanding the negative effects of hormonal contraceptives on mood that studies I and II demonstrate, by bridging the divide between a possible biochemical and contextual (emotional, relational, social, or cultural) effect, as neither exclusionary nor hierarchical, but equally real and imperative to understand.

Keeping this irrevocable interconnectedness in mind, within a dominant medical discourse, biochemical effects are still seen as more 'real'. Following this logic, in a medicalized society, exogenous hormones in the form of contraceptives, with their strictly defined biochemical compositions contained in tangible forms of pills and implants, are seen as legitimate causes of measurable effects. Hormonal contraceptive agents signify legitimate medical intervention and effects, and thus form a possible arena to place both ill health and existential turbulence upon. Side effects, depression or anxiety, and a psychotropic drug as a treatment become a way of speaking with the health care sector, which corresponds to being legitimized, recognized, and made intelligible (Shaw, 2012; Zola, 1972). The rising burden of mental ill health is well recognized in the West in general, but is particularly strong in Sweden (Bremberg, 2015), and girls and women are disproportionately affected (Piccinelli & Wilkinson, 2000). The effect of hormonal contraceptives on this trend is difficult to discern, but no corresponding increase in utilization of hormonal methods can be seen during the same period in Sweden (Statistics Sweden, 2023a). That does not change the fact though that these pills, implants, and IUDs are used by a majority of young women, and many of these women live under substantial strain and have mental health issues (Bremberg, 2015). One way of getting the very real suffering acknowledged and recognized within a medicalized society is through attributing symptoms to an external biomedical cause, such as possibly exogenous hormones, and seeking health care. In this context, the real and distinct suffering that mental health side effects causes, exemplified in study IV and by other scholars (Bertotti et al., 2021; Hoggart et al., 2013; Littlejohn, 2013), needs to once again be acknowledged. By no means

do I aim to delegitimize experiences of psychological side effects in this section, only to foreground the context and medicalized backdrop they are experienced against. As biomedicalization is also an internalized process, the dominant discourse available to comprehend internal psychological or existential distress is medical, and thus the answer of its cure should be medical.

The problem is that health care for either reproductive or mental ill health is not readily available in Sweden. The wait to see a specialist has increased in the past decade, and women ages 18-45 wait longer than men on average (SKR, 2022, p. 20). Both psychiatry and women's health place among the top five categories for patients who have waited more than a year for a first consult (SKR, 2022, p. 22). Gynaecologists outside of specialist care are scarce, since most contraceptive consultations are carried out by midwives (Lindh, 2014). Feeling rejected when seeking health care is a common experience, of not being 'ill enough' to qualify for care and attention by the health care sector (Winneby et al., 2014). In a pressured health care system, there is no place for ambiguous, varying, or indistinct symptoms such as mental health issues not filling criteria for a psychiatric diagnosis. The wish to be seen, and made legitimate through medicalization, cannot be fulfilled.

Furthermore, women who experience and explicate mental health symptoms from their hormonal contraceptives are cast under suspicion. They are called hormonophobic and disregarded as unnecessarily fearful (Le Guen et al., 2021). Even though biomedicalization constructs exogenous hormones as a possibly acceptable, biochemical cause for health symptoms, the gendered, cultural understanding of sex hormones as almost magical messengers of sex, of representations of unreliable and subjective womanhood, seeps back into (or rather, was never disentangled from) the biomedical discourse (Roberts, 2007). Hormonal fluctuations are after all not seen as legitimate causes of mental health symptoms. Thus, even when adhering to a medical discourse, women are often either disregarded or denied health care. Hormonal contraceptive use becomes an impossible arena to place any unrest upon.

This line of reasoning show that further biomedical advances, such as better contraceptives or male methods, even if important, can never be the only answer. The normative and structural causes behind the current reproductive landscape must also be addressed to reach reproductive justice. As long as women in need of contraceptives are disregarded and denied health care, further biomedical advances are redundant. This would entail both social reforms, such as increased access to care, and feasibly an epistemological shift with admittance of more than 'hard end points' as relevant to mental health in regard to hormonal contraceptive use. While studies I and II highlight the relevance of adverse psychological effects, they can only gauge

the tip of the iceberg. What study IV shows is that ambiguous symptoms are highly relevant although, as study III illustrates, seldom communicated as such. Taken together, all included studies contribute to showing how intersectional location, and upstream factors of reproductive norms within medical discourse and society, along with organization of health care, matters.

On positionality

This segment aspires to underline that my point of view is not universal, and voices from other, more reproductively vulnerable positions would sound different – and bring other, highly relevant insights into contraceptive and reproductive research. Following the tradition of feminist standpoint epistemology (Narayan, 2004), and the call for reflexivity in qualitative research (Yilmaz, 2013), I aim to move away from the supposedly objective researcher position and instead be explicit about my location within the nexus of social control, biomedical technology, politically regulated population health, and deeply personal experiences – that contraceptive practices and knowledges constitutes. This allows the reader to understand and correctly judge the claims made, as opposed to me hiding the subjectivity we can never escape (Harding, 2005).

I am educated and trained as a physician. My first contact with university was through a bachelor's degree in gender studies, but after that I spent five and a half years in medical school, completely enmeshed in a medical discourse of measurability, biochemistry, and risk. I have worked as a clinician in hospitals, and am currently specializing at a primary care centre, leaning on that biomedical knowledge daily to do my own risk assessments and diagnosing. Being part of a medical profession is relevant to the thesis in many ways, but perhaps most tangibly so when I was conducting the interviews during study IV. I presented myself as a PhD student, but the physician part often became obvious during the interviews. I was thus both an outsider, a junior researcher trying to gain knowledge, a physician with the assumed power to convert symptoms into medical reality through diagnosing, and an insider in the sense that I was a woman of the same age, sharing the same cultural context and language, with my own contraceptive experiences.

I was 17 when I first went on the pill. Much as the women I interviewed expressed, it was expected. First boyfriend and all. In the years that followed, I tried a few versions of the combined pill, the vaginal ring, the combined patch, and also got a prescription for a mini-pill that I never filled. I had a long period when contraception was irrelevant because of a same-sex relationship. When I met my current partner, I thought about getting an IUD, but something held me back. I did not want to get pregnant, but somehow, I did not want to exclude the possibility of it – on an existential, rather than rational, realistic plane. I went back on the pill. I never suffered any noticeable side effects, apart from extreme pelvic girdle pain when I tried a combined oral method after my pregnancies. (Who knew that could happen? Not me, and I'm a physician researching hormonal contraceptives.)

I am a reproductively privileged woman in almost every aspect possible; white, middleclass and highly educated, living in a country with legal and available contraceptives and abortion, free maternal health care, and comparatively generous child support. My partner and I could get pregnant without medical intervention. Moreover, my medical training gives me unique access to biomedical knowledge and understanding of the health care infrastructure. Yet, my continuous reproductive journey does not feel straightforward. My pregnancies, half of which ended in miscarriages, were all somewhere on that continuum of planned to unplanned (Aiken et al., 2016). Internal negotiations with reproductive norms, expectations and relations, all affecting current contraceptive choices, are ongoing. Bringing these evolving experiences with me hopefully deepens the understanding for the phenomena explored in this thesis, as it simultaneously allows for the realization that other interpretations, stemming from other intersectional positions, could also have been made.

Strengths and limitations

The strengths and weaknesses of the papers in this thesis, some in common, and some specific for each study, will be discussed below. A joint segment on aspects applicable to both quantitative studies is followed by a separate discussion of each of the four studies. Lastly, a short discussion of the strengths and limitations of the thesis as a whole closes the section.

What is considered sound science depends on the epistemological viewpoint, which I will explicate in the following discussion. The evaluating criteria of internal validity, reliability, and generalizability are usually applied to quantitative studies (Heale & Twycross, 2015), and while sometimes applied in a qualitative setting (Leung, 2015), scholars mostly argue that other criterion be used for studies where the aim is exploring context-dependant experience and meaning; such as credibility, transferability, and dependability (Creswell, 2009; Patton, 2002; Yilmaz, 2013). A summary of suggested criteria can be found in Table 13.

Table 13. Criteria for evaluating quality of research studies.

	Quantitative studies	Qualitative studies
Truth value	**Internal validity** Measures what it's supposed to measure. Accuracy of data.	**Credibility** Content-rich, detailed description, internally coherent, systematically related data, counter-narratives explored
Consistency	**Reliability** The test is consistent in its results, reliable results from data with retest.	**Dependability** Clear research questions, grounded in theory, meaningful parallelism between informants, reflexivity
Applicability	**Generalizability** Findings true in other or broader setting. 'Always true'	**Transferability** Knowledge transferable to other similar settings
Neutrality	**Objectivity** Ideally results unaffected by researcher	**Confirmability** True for respondents and reader

Adapted from Yilmaz (2013).

Causal inference and validity in quantitative studies

In both studies I and study II, a main limitation is the use of register data as a proxy for both drug intake and depressive/mental health symptoms. We use information on dispensed drugs, which means we can be sure the medication was collected at a pharmacy, but not what happened thereafter (Wettermark et al., 2007). It is reasonable to assume that most people take the medication they fill a prescription for, but not possible to know on an individual level. A similar limitation and question of internal validity concerns the use of psychotropic drugs or antidepressants as a proxy for mental ill health outcomes (Momen et al., 2022). These drugs are prescribed for a variety of reasons, even if depression and anxiety diagnoses make up the majority (Gardarsdottir et al., 2007). Also, even if we can assume that the indication is mental health issues in most cases, not every woman with mood symptoms will want, need, or be prescribed a psychotropic drug as treatment. A limitation in studies I and II is that we did not have access to mental health diagnosis at primary care units. However, the same logic of not every symptomatic woman being diagnosed also applies to psychiatric diagnoses, which are sometimes used as outcome measures in similar study designs (de Wit et al., 2019; Skovlund, Mørch, et al., 2016). The mental health issues captured by this method can therefore be assumed to be only the tip of the iceberg (Anderl et al., 2022; Skovlund, Mørch, et al., 2016).

The same properties of register-based research that introduces the above-mentioned limitations also contains strengths. In register studies such as ours, recollection bias is avoided (Norell et al., 1998), since all data is automatically entered into a register when the drug is dispensed (Wettermark et al., 2007). Investigating the whole population also circumvents the selection bias that all other study designs are prone to (Thygesen & Ersbøll, 2014). In controlled trials, for example, the likelihood of disproportionately enrolling women with previously positive experiences of hormonal contraceptives is evident (Poromaa & Segebladh, 2012). Furthermore, a population approach can discern patterns of health and illness that are uncommon, only appear in certain groups deemed inappropriate for randomized studies, or unethical to investigate in other fashions (Thygesen & Ersbøll, 2014). For hormonal contraceptives, most controlled trials have been carried out on adult women, since giving placebo contraceptives to teenagers is largely considered unethical (de Wit et al., 2021), yet teenagers make up a sizable portion of hormonal contraceptive users. Their patterns of use, and possible age-dependent side effects, are therefore of great importance to investigate in epidemiological studies, as study I was one of the first to highlight (Zettermark et al., 2018). Another strength in both of these studies is

the prospective design. We can be sure that exposure precedes the outcome for every individual, making an actual correlation more likely.

As mentioned in the background, observational studies can never fully gauge causality since the associations can be affected by unmeasured or unaccounted confounding factors. The possibility that an unknown confounding factor, something that affects both exposure and outcome, and is the real reason the unexposed and exposed groups differ, is always there, even when plausible factors are accounted for (Thygesen & Ersbøll, 2014). In studies I and II, several known confounding factors, including socioeconomic position, age, and previous psychiatric issues are either controlled or stratified for, but unknown confounding factors must still be considered. Since the association with psychotropic/ antidepressant drugs is mainly attributed to teenagers using hormonal contraception, it is possible these girls differ from their peers. Even though we control for health care utilization, our variable is not exhaustive, and it is conceivable that the association between these two drugs can be attributed to an increased health care-seeking behaviour.

Another possible confounding factor is that an early sexual debut drives both utilization of hormonal contraceptives and psychotropic drugs, as studies have shown it's a risk factor for mental ill health (Lara & Abdo, 2016). The mean age for sexual debut in Sweden is 16 years old (Public Health Agency of Sweden, 2017), while many of the girls included in our studies are younger. Menstrual irregularities, endometriosis, premenstrual dysphoric disorder, and other non-contraceptive indications for hormonal contraceptives, again controlled for but not exhaustively so, could also be more common in young users compared to non-users of hormonal methods, and correlate with depressive symptoms (Hofmeister & Bodden, 2016; van Barneveld et al., 2022). Furthermore, contextual factors that have been shown to be relevant to contraceptive experience, such as close social and relational spheres (Downey et al., 2017), being sexually active or in a heterosexual relationship (Brown, 2015), negotiating contraceptive responsibility and experience in a broader sense (Kimport, 2018), and which this type of register study never comes near grasping, could all potentially affect mental health.

From a positivist standpoint, the above-mentioned limitations are mostly relevant in limiting the studies' potential for causal interference. Some scholars argue this type of inference should never be made from observational studies, while other's mean a careful study design can make causal claims acceptable (Hammerton & Munafò, 2021). In our studies, the prospective design, and controlling for the most well-known confounding factors such as socioeconomic position (Lidegaard, 2021), are two aspects that can make it possible to interpret the findings as indications of a

causal link between hormonal contraceptives and mental health side effects. Since a large share of the female population uses hormonal methods, this is an important finding in need of further scientific investigation. The main strength in both studies I and II is, however, identifying population heterogeneity. Study I mainly addresses this heterogeneity through the age-stratified analysis, showcasing a strong association for subsequent use of psychotropic drugs in teenage hormonal contraceptive users, not previously determined in a Swedish context at the time of publication. Study II takes a more comprehensive approach to population heterogeneity through the intersectional MAIHDA.

Using constructivism or critical social theory as a point of departure, other limitations of the register studies become visible. It is problematic to reduce gender to binary numbers and mental health to psychotropic drug use, not merely because of the issue with internal validity discussed above, but because gender, age, and mental health are not objective, dichotomous boxes, but part of complex human experience interwoven with relational, social, and structural conditions (Narayan, 2004). In Yilmaz' words, quantitative approaches,

> …because they require a deductive approach and predetermined sets of standardised responses based on theory, they fail to provide insight into the participants' individual or personal experiences. They do not let the respondents describe their feelings, thoughts, frames of reference, and experiences with their own words. (Yilmaz, 2013, p. 313)

Obviously, is not possible to provide this kind of rich insight into the personal experiences of the nearly one million girls and women included in the quantitative studies, but it raises the question of what these experiences are and motivates qualitative investigations. This inherent limitation of reductionism should be acknowledged (Patton, 2002), although our quantitative studies still provide important, assessable, and generalizable information on populations trends and heterogeneity in mental health response to hormonal contraceptives.

Study I

The principal aim of this study was to demonstrate a previously unexplored association between hormonal contraceptive methods and subsequent psychotropic drug use in an age-stratified prospective cohort, indicating an adverse mental health effect from these methods at a population level. The main strengths are utilization of population-wide registers, avoiding selection bias, and the dynamic, prospective design with complete follow-up for all included individuals. The appliance of measures of discriminatory accuracy is also a strength, germinating a straightforward discussion of (the low) risk at an individual level and avoiding stigmatization (Merlo & Mulinari, 2015).

Limitations, apart from the general limitation with observational register studies discussed above, is the binary and static outcome provided by the multiple logistic regression approach. A time-sensitive approach, measuring time from exposure to psychotropic drug use, would have provided more and possibly better information on the patterns of potential psychological side effects (Johansson et al., 2023). One possibility would have been to utilize Cox proportional hazards to measure time to event, i.e., a prescription fill of psychotropic drugs (Xue et al., 2013). However, since follow-up was short and complete, little new information would have been provided, and the regression model becomes the most parsimonious. Stratifying for never-users, current non-users, new users, and continuous users of hormonal contraceptives would have allowed for more precise inferences about a possible adverse effect on mental health in the advent of a healthy survivor bias (Johansson et al., 2023). Unfortunately, we only had information on medication dating back four years. The field has developed since the publication of this study in 2018, and a future study design would greatly benefit from this kind of stratification.

Another issue is that of grouping of hormonal contraceptive methods. We did run separate analyses for all different progestin components and administrative routes as a sensitivity analysis, but grouped the methods for the main analysis to increase comprehensibility. Grouping the methods into the four generations of progestins would conceivably have provided more information on a possible biochemical effect than did the chosen route of grouping into oral and non-oral combined or progestin-only methods. For example, there is emergent evidence that fourth generation progestins could have a more detrimental effect on mental health than previous generations (Elsayed et al., 2022), a factor to consider in the design of future studies. Finally, study I is not explicitly based in social theory, and apart from adjusting for socioeconomic variables, a socially-conscious and power-sensitive element of analysis is lacking.

Study II

The chief strength of study II is utilizing intersectional theory in a quantitative setting through the emergent gold standard methodology of MAIHDA (Merlo, 2018), to investigate a previously unknown population heterogeneity in depressive response to hormonal contraceptive exposure. The intersectional strata are composed of combinations of social dimensions representing different intersectional locations, which are theoretically considered dynamic and dependant on contextual conditions that are subject to change, in line with an intersectionality framework (Collins et al., 2008; Green et al., 2017; Hancock, 2007). However, in the statistical model, the strata are treated as static properties based on quantifiable variables from register data, and herein lies the greatest limitation of the study, apart from the general limitation with observational register studies discussed above.

Our approach to quantitative intersectional research has been defined by McCall (2005) as categorical, where categorization is seen as a tool for highlighting the interwoven threads of oppression that intersectionality targets. McCall contrasts this to an anti-categorical approach, where the very existence of categories is thought to perpetuate injustice through enforcing difference rather than admitting the inherent fluidity of intersectional positions. The anti-categorical approach is commonly used in qualitative inquiries, but difficult to operationalize in a quantitative setting. Using register data on age, income, and years of residence in Sweden as proxies for structural dimensions of power is not without faults. Knowledge of income tertials does not capture all the complex and changing embodied experiences constituting relative poverty or economic privilege, and chronological age is not directly translatable to experiences of ageism. The variable used to operationalize immigrant background calls for specific attention. Information on race, which would ideally be used, is not available in Swedish nation registers, while country of birth and length of stay in Sweden is. This is a major limitation. Country of birth is sometimes used as a proxy for racialization, but since recent immigration in itself poses health risks, operationalizing the variable as such is relevant (Wemrell et al., 2017). Utilizing intersectionality in a categorical capacity comes with both theoretical and methodological challenges, but the methodology itself does not (dis)qualify an inquiry as intersectional. Rather, the central intersectional tenants of systematic critique, interconnected dimensions of power, and a social justice perspective need to be addressed (Cho et al., 2013), as the present study does.

The intersectional interaction effects are generally small in quantitative intersectional studies, as in ours, a fact that could point to the impossibility of reducing power and oppression to simple categories. The more precise mapping of hormonal

contraceptive exposure and subsequent antidepressant use is still important to show that heterogeneity exists, and that even with our flawed categorizations, strata representing more vulnerable groups are more inclined to have an adverse effect on mental health.

Study III

Study III fills a knowledge gap on discourses present in medical contraceptive information aimed at the Swedish public by critically examining them from a reproductive justice standpoint. Its strengths lie in providing awareness of how the ideal contemporary contraceptive user is constructed within a neoliberal logic of transactions, along with a critical and conceptually transferable analysis on the consequences of biomedicalization and post-feminism within the contraceptive arena.

A limitation with the critical discourse analysis is that texts can be interpreted differently, and although discussed with a senior supervisor, the analysis was performed by a single author. That understandings of texts differ both as a result of the selection and context, as well as the properties of the interpreter, such as social position, knowledge, and values, is a known property of the methodology (Norman Fairclough, 2013), and the clearly stated selection criteria, methods, and theoretical grounding of the present study increase the credibility and dependability of the study (Yilmaz, 2013). Yet, the discussion highlights only certain aspects of the reproductive discourses present, and other important lines of reasoning could have been unknowingly excluded.

Another drawback is that the source material of the study was limited. I only collected data from official health care and sexual health organizations' online websites, which is far from all medical contraceptive information aimed at the public in Sweden. Brochures and pamphlets at youth health clinics or midwives' offices, textbooks, public health campaigns, or other online sources could also have been considered, and possibly contributed to a broader or more comprehensive view on current reproductive discourses. Additionally, a more thorough literature review would have benefitted the study.

Study IV

The final study included in this thesis provides deep insights into certain knowledges, practices, and negotiations of hormonal contraceptives through narrative analysis of in-depth interviews with Swedish women, which is its principal strength. It contributes with novel insights into how biomedicalization and intersectional location become relevant in contraceptive narratives. The study also includes critical and analytically transferable discussions emanating from a reproductive justice standpoint on the intersecting power dimensions or upstream factors shaping and framing personal contraceptive experience.

An interview differs from a written story in that the knowledge is co-produced in a certain micropolitical, social setting (Andrews, 2013), and these narratives were clearly framed by the micropolitical situatedness of the interview situation, with me as a researcher asking about experiences of hormonal contraceptives. I was roughly the same age and inhabited a similar class position, and was assumed to have similar contraceptive experiences, but was also a physician and researcher asking questions. These aspects could all affect the final material.

In a broader perspective, it is critical to ask not only which stories are possible but from whom they arise. The narratives in study IV belong to a predominantly white urban Swedish middle class, to women who think their perspective matters, and are used to verbalizing it. Those women deprived of a reproductive language, living in cultural contexts where contraceptives are tabu or where the women are unfamiliar with academia, are less likely to answer a call for an interview, and were unfortunately not represented in this study. Transgender perspectives are also excluded, which limits both the interpretative and emancipatory potential. It is a major limitation that diversity of perspectives is lacking, particularly when the research emanates from a reproductive justice stance. However, exploring positions of relative privilege is also important, as long as no claim to universalize them is made (Morison, 2023). The generalizability, or in qualitative terms, transferability, of this study is thus rather low, both due to the homogeneity of the women included and the small sample size. Finally, the same limitations of different possible interpretations, as outlined above for study III, prevail for this study too.

General strengths and limitations of the thesis

A strength in this thesis as a whole is the interdisciplinary approach, where the included studies complement each other. The quantitative studies based in a nationwide dataset provide robust, parsimonious, and easily comprehensible data on plausible mental health effects of hormonal contraceptives requiring medical attention, while the qualitative studies offer relevant context for both upstream social and normative factors, and personal circumstances and interpretations of hormonal contraceptive experience and mental health. The scale and methodology in the quantitative studies allows for generalizability to some extent, while the inherent predisposition of reducing multifaceted experiences of hormonal contraceptive use and mental health to a numerical association is a limitation, as 'they fail to provide insight into the participants' individual or personal experiences' (Yilmaz, 2013). However, this deep insight and contextualization is provided in the qualitative studies, although it in turn means a low ability to generalize the findings (Patton, 2002). Parts of the respective limitations of the studies are thus, to some capacity, counteracted through the interdisciplinary approach. Yet, interdisciplinarity should not be reduced to only complementarity. The wide interdisciplinarity also provides the space for new and transgressive interpretations (Kelly, 1996), which in itself is a strength. The broad methodological span present in this thesis does nevertheless also come with drawbacks, such as the lack of substantial methodological and theoretical development that a more constricted focus would have allowed for.

A main limitation is the rather narrow context of an advantaged northern European country. Sweden is, despite current cutbacks, a functioning welfare state with generally good quality of care, also in the reproductive arena (SKR, 2022; Vengberg, 2022). Contraception is legal and almost all methods on the market are available, abortion is legal up until 18 gestational weeks gestation, maternity care and health care for children is free of charge, and childcare is heavily subsidized for young children. Even though this thesis points toward a number of tensions and reproductive injustices, the larger reproductive inequalities, such as systematic reproductive violence in wars, illegalized abortions and contraceptives, or absence of health care facilities for maternity care and delivery, are not found here. Globally, more poignant issues of both access to contraception, overt contraceptive coercion, as well as covert use in the light of reproductive violence exist (Wood et al., 2023). These gendered reproductive injustices are pressing matters to research, highlight, and change.

Finally, the reflexivity expressed in this thesis could be seen as a strength not only for the qualitative studies, but for the thesis as a whole. Quantitative methodologies are

no less affected by the structural and institutional preconditions, social positioning, values, and methodological choices of the researcher than qualitative ones (Narayan, 2004). It has been shown that variability in analytical choices leads to great variability of results in quantitative studies, even when the same dataset is used, as when Silberzahn et al (2018) found that none of the 29 research groups which analyzed the same data, with the same research question in mind, got the same results. The variable definitions and methodological choices in the quantitative studies are no more God-given than the follow-up questions and thematizations of the qualitative studies in this thesis, yet all provide knowledge within their respective frames of interpretation, and an even richer knowledge base together.

This thesis shows that mental health effects of hormonal contraceptives are both biologically plausible and socially important and, what is more, that these effects are interconnected.

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Conclusions

Conclusions from the individual studies are presented first, before the overarching concluding remarks map out answers to the general aim of this thesis, how to move closer to reproductive justice and possible directions for the future.

Study I

In a nationwide prospective cohort, we find an age-dependant, statistically significant association between hormonal contraceptive use and subsequent use of psychotropic drugs, indicating an adverse effect on mental health. The strongest associations are found in adolescent girls. This finding indicates a selective discontinuation bias, where adult women who are discontent with their hormonal method have discontinued and thus do not contribute to the effect. The study adds to a growing body of research indicating an adverse effect of hormonal contraception on mental health in certain girls and women.

Study II

In a nationwide prospective cohort, population heterogeneity in depressive response to hormonal contraceptive use is considerable, mainly varying because of previous mental health issues, but also dependent on intersectional context. The analysis of the intersectional strata highlights the need to consider disadvantages consisting of several interlocking structural dimensions to better comprehend how hormonal contraceptive use disproportionately seems to predispose certain women, mainly teenagers and low-income women with immigrant background, for depression. These vulnerabilities are based in inequalities that are not static but structurally created and therefore possible to redeem.

Study III

A critical discourse analysis of reproductive discourses in Swedish online medical texts directed at the public yielded three interwoven conclusions: 1) women in need of contraceptives have to balance the discourses of exogenous hormones as both an 'unnatural' threat to their bodies and as a desirable, effective regulator of the same

'naturally unruly' body; 2) in search of a 'perfect contraceptive fit', it is the woman who needs to accommodate to available methods, rather than the other way around; and 3) women are made discursively invisible, while at the same time being constructed as individually responsible for reproduction.

Underpinning all these themes is the discourse of the rational woman making responsible choices, of exerting agency by choosing the right contraceptive. These texts present contraceptive choices as plentiful and possible to individualize, while emphasizing safety and convenience and downplaying the side effects of effective, hormonal methods. The medical discourse premiering well planned, less risky pregnancies becomes apparent. One way forward would be recognizing that women's reproductive choices are affected by intersectional location, stemming from different structural and personal resources and embodied experiences.

Study IV

In this in-depth interview study, two conflicting discourses emerged within narratives of hormonal contraceptive use and discontinuation. These can be described as 1) a 'hormonophilic' medical discourse, promoting hormonal methods as an easy fit for everyone, and negating the diverse lived experiences of women, and 2) a simplified 'hormonophobic' media and online discourse, painting hormonal methods as unnatural and an enemy to female health.

In a biomedicalized society, there is a poignant ontological divide between the medical use of categorization, clear cut offs, and biochemically verifiable pathology, and the unnumbered but often distinct contextual knowledges of women using hormonal contraceptives. The narratives make it clear that navigating hormonal contraception, stories thereof, side effects, and relational aspects require both physical and mental effort in the form of self-surveillance, particularly when mood or personality is affected. This study shows the importance of acknowledging that embodied experience, ambiguous symptoms, fearing or wanting certain changes, or questioning oneself based on prevalent contraceptive macro-stories are relevant to contraceptive practice, and intricately interwoven with upstream factors such as gendered social injustices, reproductive norms, and a biomedical expansion.

Bridging the divide? Concluding remarks

Human reproductive experience, contrary to the common narrative, seldom begin with conception, pregnancy, and birth. More frequently, it begins with preventing pregnancy. Women in Sweden often spend decades preventing pregnancies, and only a few years trying to become pregnant. Hormonal contraceptives are paramount to this experience, not only the actual utilization of them and side effects experienced, but also the strong expectation to use hormonal methods that are presented as simple, effective, and possible to individualize. This thesis departed from a question of possible adverse mental health effects from hormonal contraception, and how and why the medical discourse often differs fundamentally from the experience-driven discussion.

The studies of this thesis have traced the tensions and ruptures between a medical discourse and experience-driven knowledges of hormonal contraceptives and mental health through several paths. First, the medical paradigm of a minute, clinical significance of mental health side effects was questioned by establishing an association between hormonal contraceptive use and mental ill health in a prospective population-wide cohort, strengthening the indications of adverse effects reported in clinical practice (Wiebe et al., 2012; Wiebe, 2013), as well as qualitative (Downey et al., 2017; Littlejohn, 2013; Littlejohn & Kimport, 2017) and cross-sectional epidemiological scholarship (Lindberg et al., 2012; Wiréhn et al., 2010). Secondly, population heterogeneity and the relevance of intersecting dimensions of power was explored, exposing that women already under structural burdens are likely more sensitive to unfavourable mental health effects from hormonal contraceptive use, highlighting the importance of integrating a structural and power-sensitive perspective (Morison, 2021). Thirdly, to better grasp how a medical contraceptive discourse is communicated to the public, the medical pregnancy planning paradigm in contraceptive communication was studied (Bertotti et al., 2021). I found that the medical incentive to promise a perfect contraceptive fit, and use pregnancy risk as the only rationale for contraceptive choice, disregards the complex motives, emotions, relationships, and structural prerequisites that have been found to shape contraceptive choices, and might widen the discursive gap. Forth and finally, narratives of hormonal contraceptive use were explored and found to be affected by these colliding discourses, along with a myriad of factors, of which mental health and side effects were central.

The thesis has further explored the divide between women's experiences and medical research findings through the concepts of fertility work, normative reproductive regulation, and hormones as natural-cultural forces. Within a strictly biomedical

discourse, the only relevant or even imaginable conceptualization of hormonal contraceptive effect on mental health is biochemical, while the critical interdisciplinary approach allows for more in-depth, contextual exploration. In this exploration, drawing on the empirical material from the present studies and previous scholarship, I found that embodied, emotional, and relational aspects of fertility work are important for mental health aspects of hormonal contraceptive use. These experiences are in turn shaped and framed by upstream factors of reproductive norms and discourses, political incentives and regulations, medical infrastructure, and technology. I have shown that the medical contraceptive information presented as objective fact is permeated by an ideological tale of both neoliberally responsible womanhood and normatively respectable motherhood. Yet hormonal contraceptive methods, and informing on them, is simultaneously part of the crucial technology of birth control methods and medical infrastructure that enable certain aspects of reproductive autonomy (Ross, 2017a).

Studies I and II indicate a small increase in depression at a population level for hormonal contraceptive users, which hints at more subtle mood changes in a larger share of the population, explored in depth in study IV. It is obvious that neither biology nor human experience work with clear cut offs and binary outcomes, even if statistics do. Focusing only on 'hard end points' is not sufficient when researching this topic, and the medical focus on the easily measurable is likely one part of the discursive divide this thesis set out to explore.

I understand our quantitative results of an increased risk of anti-depressant or psychotropic drug use as a negative effect of hormonal contraceptive use on mental health, that do not exclude a particular effect of certain progestins, but also regards contextual circumstances, or the interaction of them. One beauty of epidemiology is that these effects are seldom separable, something often conceptualized as a limitation, but that in the light of an ecosocial model could just as well be seen as a strength. From an ecosocial perspective, hormonal contraceptives are part of an interplay of biochemical cellular signalling, individuals, relationships, networks, and a structurally and politically ordered environment, that makes it impossible to separate biological and social effects (Krieger, 2001). The interdisciplinary approach of this thesis makes clear that the contextual, intersectional position of women who use hormonal contraceptives matters, as does ambiguous, vague, intermittent mental health symptoms, along with the expectation of them, all affected by both a simplistic hormonophobic media discourse and hormonophilic medical discourse focusing solely on efficacy.

Just because of the complexities involved, it is vital to research mental health effects of hormonal contraceptives through a broad approach, including the

communication of contraceptive advice and women's own experiences. The narratives of women using hormonal contraceptives in this thesis does not comply to any dichotomous discourse but show resistance to simplifying explanations. Using or discontinuing a hormonal method is neither a simple rational decision based on calculations of pregnancy prevention efficacy, nor a rejection based on misinformation or fear, but a deeper, contextual, and sometimes existential decision. It is necessary to acknowledge the inherent tensions made visible in this thesis: that being located as a young woman is difficult in itself, and that hormonal contraceptives affect mental health, simultaneously and interconnectedly; that hormonal contraceptive use is concurrently hard (fertility) work and a convenient, necessary technology; that both realities of poor access to hormonal methods, and reproductive coercion by them exist; that more biomedical knowledge on reproductive matters is important, and that it is not sufficient without examining the underlying ideological workings.

Hormonal contraception is evidently a helpful medical technology, which has provided reproductive autonomy, pain relief, and bleeding control to millions of women and transgender persons throughout the world. My aim is not to contest the medical and personal benefits that hormonal methods bring, but simply to add nuance to the linear success story of a liberating technology that seems to solve all inequality issues. Hormonal contraceptive methods are a key part of the biomedicalization of reproduction, that goes beyond an extension of medical authority (such as medical control over prescription drugs) and biomedically-defined truth claims (such as reproductive risk definitions), moving from the normative towards the transformative. It changes bodily functions, along with conceptualizations of reproduction and pregnancies. Within this process, a normative story of what women should and should not do develops, yet is made invisible by the dominance of a medical discourse.

The discursive tension has different causes, as outlined above, but boil down to the unfeasibility of reducing complex human emotion, experience, and knowledge to dichotomous variables within a biomedical discourse that disregards any intertwined natural-cultural forces (Irni, 2013). The social injustices of gendered fertility work and the juxtaposing of science to women's experiences as subjective and unreliable, work in concordance with biomedicalization to obscure situated knowledges of contraceptive use. However, this thesis shows that mental health effects of hormonal contraceptives are both biologically plausible and socially important and, what is more, that these effects are interconnected. A more explorative approach by the medical community, in patient contact and in research on psychological side effects of hormonal contraceptives, could possibly start bridging the divide. In addition to

balanced medical information, more humbleness, and less of a 'myth busters' attitude in clinical practice (Stevens, 2018), and contraceptive communication, would likely go a long way towards finding the mutual understanding necessary for those in need of contraceptives to feel safe, seen, and empowered to navigate complicated reproductive ground.

Moving towards reproductive justice

The first two studies in this thesis find that women using hormonal contraceptives seem to be more prone to mental ill health than their non-user peers, while the second two studies provide a deeper and richer understanding for this relationship. The associations with psychotropic drug use found in studies I and II can be attributed to different causes: 1) a direct side effect on mood through, for example, progestin metabolites; 2) an indirect result of other adverse side effects that affect mental health, such as constant breakthrough bleeds and the associated discomfort; 3) the extensive relational, emotional, and physical fertility work needed to use hormonal contraceptive methods (even without direct side effects); and 4) the intersectional location, affected by a myriad of upstream factors such as reproductive norms, health care access, and intersecting systems of oppression, creating vulnerabilities to both biochemical and contextual effects. One significant deduction that the empirical material in this thesis allows for is that mental health in relation to hormonal contraceptive use cannot be reduced to only biochemical side effects on mood. A 'purely' biochemical effect from progestins and oestrogen (all other conditions alike) is still plausible, but neither possible to prove through the methodologies chosen in this thesis and neither, I would argue, the most interesting finding. Instead, I argue that it is futile to disentangle biochemical effects from societal, relational, and personal effects – and an integrated understanding is paramount (Irni, 2013). All factors mentioned above are thus equally real, and likely all are relevant, as is the interaction of them, albeit in different situations. Furthermore, and most importantly, they are all redeemable in their own way.

To move toward reproductive justice and fair contraceptive discussions and options, several changes, distinct yet interrelated, would have to take place. 1) A better neurobiological understanding of progestin and oestrogen effects on the brain is needed to propel drug development toward formulas that have a less negative mood effect. Identifying the relevant research questions, allocating funds, performing the biomedical research and developing and marketing new drugs are all important factors, which depend on biomedical infrastructure, monetary incentives, and medico-political will. A corresponding development would be beneficial for the control of 2) other adverse side effects. Development of male hormonal methods is also one sought-after solution that does not, however, solve the underlying gendered responsibility of reproduction and comes with new challenges. Apart from the biomedical and technological steps, 3) an acknowledgement that the burden of fertility work does not cease with hormonal contraceptive use, but simply changes form, is principal. Foregrounding the often extensive emotional and intellectual

work needed to navigate both contraceptive choices and colliding discourses on them, along with the self-surveillance and doubt involved, particularly when mental health is affected, is necessary to challenge the medical paradigm on hormonal contraceptives as a simple planning tool. The third step is irrevocably intertwined with number 4), the broader reproductive landscape. This is in turn affected by gendered and racialized socio-political incentives, cultural and communal norms, health care organization and access and, circling back to the beginning, biomedical technology and the driving forces behind its development and distribution. Simply bettering the hormonal contraceptive alternatives does not solve issues of contraceptive access, coercion and oppression, or the broader issues of reproductive justice involving being able to have and raise children in safe environments. To do that, an exhaustive social justice approach is needed (Ross, 2017). Although no specific interventions can be recommended based on the findings in this thesis, more general inferences can be made. Allocating resources to the health care sector in general and women's health in particular is imperative, as are social reforms strengthening the rights and possibilities of non-normative families. Finally, highlighting and challenging reproductive norms in medicine and society at large that limit both actual and imaginable reproductive life trajectories would strengthen the reproductive autonomy of individuals.

Future directions

It is apparent that we need a wider research agenda on fertility work emanating from a reproductive justice standpoint (Morison, 2021; Ross, 2017). An exploration of the conditions of modern reproduction that venture to stay in the grey zone between normative medicine and radical constructivism. Admitting the relevance of biomedicine and modern reproductive techniques, while neither villainizing them as a threat to the 'natural', nor arguing for their intrinsic emancipatory potential without recognition of the gendered sociocultural context imbued with dynamic power relations that work behind, within, and through these technologies (Irni, 2013). It is critical to examine further how personal reproductive experiences are framed and shaped by reproductive technologies and the reproductive norms they exist within and cocreate.

Moving beyond the current hormonal contraceptive landscape, there are several recent developments in the contraceptive arena that need the attention of feminist scholarship grounded in reproductive justice. One is the approval of the first over-the-counter hormonal contraceptive pill in the US: Opill, a progestin-only pill approved by the Food and Drug Administration in July 2023 (FDA, 2023). Use of the drug mifepristone, which can be used for medical abortions, is also potentially changing. In Sweden it is currently used for induction of medical abortions in hospitals, but a recent state report found it safe for home use (SBU, 2023), and a change of praxis is now discussed to aid home abortions without involvement of health care professionals (Martinsson, 2023). It has been known since the 1990s that mifepristone at lower doses also has a contraceptive effect (Marions et al., 1998), preventing implantation (Boggavarapu et al., 2016), which has led to arguments of using it as a non-hormonal contraceptive pill that would only be required to be taken weekly or perhaps even more seldom (Alptraum, 2022). The possibility of male hormonal contraceptives should be mentioned, as an ongoing clinical trial shows promising results (NIH, 2022). It is often argued that with such a method on the market, many reproductive equality issues would be solved. Although these methods that could increase the available contraceptive repertoire and reproductive autonomy of certain people, I would argue they should be regarded with caution when presented as a simple solution. First of all, it seems difficult to get male contraceptives on the market, not because of any biological barrier, but because of insufferable side effects, and no method has yet reached stage III in a clinical trial (NIH, 2022). The emotional and sexual well-being of men has been found to be a stronger driving force for reproductive scientists when researching male contraceptive possibilities than female, and the apprehensions of men are taken more seriously than those of women

when it comes to contraceptive development and policies (Kammen & Oudshoorn, 2002). Secondly, the structural inequalities than condition disparities in contraceptive access, information, and reproductive autonomy are still in place, alongside gendered reproductive violence that, for some, could possibly take new forms with male-controlled contraceptive methods. In light of forced pregnancies, limited access to abortion and maternal and childcare, female-controlled methods that allow covert use are still, if not a remedy for the root cause of reproductive violence, a necessary part of resistance (Wood et al., 2023).

Another example of reproductive technologies in need of academic exploration is the (very) early pregnancy home testing, that has been hailed in the medical community as a simple health benefit aiding optimization of early pregnancy health (Minkin, 2009). Yet this technology has wider implications, having reconceptualized the very definition of pregnancy into 'chemical' and 'physiological', and is stressed as a key node for exploring the concept of feminist technologies (Layne, 2009). The tensions between promised benefits of (biomedical) information and the complexities of real-life utilization, including grief from early miscarriages and disempowerment by offering consumerism rather than self-trust (Freidenfelds, 2020), bears both parallels to, and is distinct from, the tensions inherent in hormonal contraceptive technologies. A more exhaustive approach to reproductive journeys, naming complicated experiences of fertility work, such as ambiguous reproductive wishes and practices, in addition to the spectrum of (un)planned and (un)wanted pregnancies (Aiken et al., 2016), of resisting or being forced to deviate from the normative reproductive trajectory of the two, perfectly planned, easily conceived children in young (but not too young) adulthood, is sorely needed. How these choices and understandings are affected by intersecting social injustice, relative privilege and oppression, as well as medical infrastructure and discourse is important to gauge, to take yet another step in bridging the gap between medical discourse and personal experience and knowledges in reproductive matters. Of specific interest is the often overlooked and insufficiently explored area of miscarriage and pregnancy loss in relation to a reproductive justice agenda (Wieber Lens, 2021). Feminist scholars argue that it's vital to make pregnancy loss visible and comprehensible as more than private grief, as an often shameful or lonely experience, but as an experience framed by gendered assumptions and mythologies, embedded in social power relations (Lind & Deveau, 2017). 'Failed' pregnancies are significant in understanding reproductive journeys because they are disruptive of the 'linear biomedical progress' narrative:

> Pregnancy loss at any stage of gestation 'does not conform to the norm' of joyful maternity, and represents 'an incomplete rite of passage' for women in the normative

> route to motherhood (Layne 2003: 27, 39). It also contradicts medical norms of correct reproductive embodiment, since it exposes and disrupts the myth of linear 'biomedical progress' implicit in western 'technobirthing' discourses (Peel & Cain, 2012, p. 79)

Conceptualizations of miscarriages lie at the nexus of a gendered health and pregnancy planning paradigm (Aiken et al., 2016; Moore, 2010), technological advancements in home testing, neonatal care and artificial reproductive techniques along with gene-editing and ectogenesis (Segers, 2021), all connected to biomedicalization and the marketization of health (Clarke et al., 2010), as well as a turbulent and unequal political landscape where both fundamental abortion rights and the welfare state are under threat. Furthermore, the collision between medical rationality and existential pain and turbulence is seldom so obvious as during a miscarriage. A theoretically grounded, structurally aware exploration of the sometimes disparate emotional, social, medical, and existential meanings and implications of miscarriages as part of diverse reproductive journeys could illuminate ways of thinking about reproduction beyond a medical risk discourse or neoliberal logic of production, success, and failure; an exploration to which I aim to contribute in the future.

Jag tror att forska,
det är ungefär som att tänka.

Agnar Zettermark, 5 år

Populärvetenskaplig sammanfattning på svenska

Varför mår så många kvinnor psykiskt dåligt på hormonella preventivmedel, när vetenskapen verkar säga att humörbiverkningar är ovanliga, eller till och med omöjliga? Hittar kvinnor bara på? Forskas det inte på humörbiverkningar? En stor majoritet av svenska kvinnor använder någon form av hormonellt preventivmedel under livet: p-piller, minipiller, hormonspiral, implantat, vaginal ring eller plåster. Många unga kvinnor mår också psykiskt dåligt. Ändå vet vi fortfarande ganska lite om sambandet mellan hormonella preventivmedel och psykiskt mående.

Den här avhandlingen tar avstamp i gapet mellan den medicinska synen på hormonella preventivmedel som en okomplicerad och effektiv metod för att förhindra oönskade och oplanerade graviditeter, och användarbaserade erfarenheter som ofta belyser en mer komplex bild med biverkningar, svårigheter att hitta en passande metod och blandande känslor kring att reglera sin fertilitet. Avhandlingen tar ett brett grepp på hormonella preventivmedel, men har ett särskilt fokus på mental hälsa i relation till användningen av dessa metoder, något som uppmärksammats de senaste åren inom vetenskapssamhället. Teoretiskt använder jag mig av reproduktiv rättvisa, ett ramverk sprunget ur intersektionalitet och Svarta kvinnors aktivism för rätten att inte bara förhindra graviditet, utan även få de barn man önskar, och låta dem växa upp i en trygg miljö. Biomedikalisering är också ett centralt teoretiskt begrepp. Det refererar till en sentida expansion av den biomedicinska sektorn inte bara i form av ny teknik och diagnosticering, utan även i hur en biomedicinsk logik formar vår världssyn, våra kroppar och vår självbild.

Avhandlingen består av fyra studier. Den första studien baseras på rikstäckande register om läkemedelsuttag för alla flickor och kvinnor 12-30 år i Sverige, som följs ett år var. Den visar att de kvinnor som tar hormonella preventivmedel i högre utsträckning tar ut anti-depressiva, lugnande och sömnmedel det efterkommande året, jämfört med de som inte hämtat ut något recept på preventivmedel med hormoner i. Bland kvinnor över 20 år försvinner denna association, vilket kan tyda på en selektionseffekt, där de kvinnor som mådde dåligt som tonåringar slutat med

sina preventivmedel, medan de som mådde bra fortsätter upp i vuxenåren. Den andra studien baseras på samma registerdata, men vi använder oss av intersektionalitetsteori för att utforma en multinivå-design där del av effekten av interagerande sociala dimensioner på depressivitet kan mätas. Studie två visar att variationen i negativ respons på hormonella preventivmedel varierar mycket i befolkningen, baserat på tidigare psykisk ohälsa, relativ fattigdom och antal år som boende i Sverige. Resultaten tyder på att de kvinnor som redan lever under strukturella bördor i form av fattigdom och rasism, i högre uträckning tar ut anti-depressiva när de äter preventivmedel, än kvinnor som lever under mer privilegierade förhållanden eller inte äter preventivmedel.

Den tredje studien är en analys av svensk medicinsk preventivmedelinformation online riktad till allmänheten. Där visar jag hur informationen presenterar hormonella preventivmedel som säkra, enkla att använda och möjliga att individualisera, och tonar ned både risken för biverkningar och det arbete som krävs för att navigera, ansvara för, och utvärdera preventivmedelsval. Den fjärde studien är en djupintervju-studie med tio kvinnor som har egna erfarenheter, både positiva och negativa, av att använda hormonella preventivmetoder. Där framkommer att narrativ kring preventivmedel kan förstås både kronologiskt och positionellt. Den kronologiska resan börjar ofta i förgivettagen start på p-piller, fortsätter genom olika hormonella metoder med ibland svåra och långvariga biverkningar, ibland subtila men klart störande sådana, som påverkas av och påverkar både relationer, livssituation och den egna kroppen. Resan landar i en vuxen position av att känna sig tillfreds, även om den aktuella metoden inte är perfekt. Den andra typen av narrativ handlar om att navigera mellan vad som upplevs som olika extrempositioner, mellan vårdens avfärdande av psykiska biverkningar och en överdrivet kritisk mediediskussion, och mellan att finna sitt autentiska jag genom eller utanför medicinsk-hormonella förklaringsmodeller.

I avhandlingens övergripande diskussionen redogör jag för olika sätt att förstå relationen mellan hormonella preventivmedel och mental hälsa i dagens Sverige. Jag diskuterar begreppet ”fertilitetsarbete” och hur användningen av hormonella preventivmedel kan konceptualiseras som ett fysiskt, psykiskt, relationellt och emotionellt arbete. Detta arbete osynliggörs både genom att preventivmedelsval presenteras som en enkel shoppingupplevelse, snarare än förkroppsligad erfarenhet, och genom att den könade aspekten av det kvinnliga reproduktiva ansvaret tas för givet. Hormonella preventivmedels roll i att reglera reproduktionen, inte bara på individnivå, utan även på en samhällelig nivå, diskuteras också. Genom deras effektivitet i att förhindra graviditeter bidrar de till att möjliggöra inskärpningen av normer kring en ”lämplig” reproduktion, det vill säga välplanerade graviditeter hos

kvinnor i ”rätt” ålder, med låg medicinisk risk. Att ”misslyckas” med att reglera sin fertilitet riskerar att bli mer stigmatiserat, när det anses så enkelt att bara använda en hormonell metod. Till sist diskuterar jag också hormonella preventivmedel som verkande i ett samspel mellan natur och kultur. Jag menar att det är svårt att separera rena biokemiska effekter från sociala effekter beroende av aktuell livssituation, förväntningar och erfarenheter.

Sammanfattningsvis tyder studierna i denna avhandling på att det finns ett samband mellan hormonella preventivmedel och påverkad mental hälsa, samt att detta samband är komplext och påverkas av både strukturella och individuella förutsättningar. En mer ödmjuk och utforskande inställning i forskningen kring mentala biverkningar och från vårdens sida i kontakten med personer i behov av preventivmedel, skulle sannolikt kunna överbrygga en del av det gap som finns i dagens diskussioner om hormonella preventivmedel.

For the yesterdays and todays, and the tomorrows I can hardly wait for – Thank you.

Cecilia Ahern, 2010

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My hope is that this thesis provided more pleasure than anxiety to the reader, gave some insight into the important field of hormonal contraceptives and mental health, and perhaps foremost, helped underscore the significance of the reproductive stories we all carry.

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Paper I

PLOS ONE

RESEARCH ARTICLE

Hormonal contraception increases the risk of psychotropic drug use in adolescent girls but not in adults: A pharmacoepidemiological study on 800 000 Swedish women

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Abstract

The burden of depression and anxiety disorders is greater in women, and female sex hormones have been shown to affect mood. Psychological side effects of hormonal contraception (HC) are also a common complaint in the clinic, but few previous studies have investigated this subject. We therefore wanted to investigate whether use of HC was associated with adverse psychological health outcomes, and whether this association was modified by age. All women aged 12–30 years on 31 December 2010, residing in Sweden for at least four years and with no previous psychiatric morbidity (n = 815 662), were included. We followed the women from their first HC use (or 31 December 2010, if they were non-users) at baseline, until a prescription fill of psychotropic drugs or the end of the one-year follow-up. We performed age-stratified logistic regression models and estimated odds ratios (OR) to measure the association between different HC methods and psychotropic drug use, as well as the area under the receiver operating curve to estimate discriminatory accuracy of HC in relation to psychotropic drugs. Overall, we found an association between HC and psychotropic drugs (adjusted OR 1.34, 95% confidence interval [CI] 1.30–1.37). In the age-stratified analysis, the strongest association was found in adolescent girls (adjusted OR 3.46, 95% CI 3.04–4.94 for age 12 to 14 years), while it was non-existent for adult women. We conclude that hormonal contraception is associated with psychotropic drug use among adolescent girls, suggesting an adverse effect of HC on psychological health in this population.

Introduction

In clinical practice and among the general public, psychological side effects are a well-known factor for dissatisfaction with hormonal contraception (HC) [1]. Discontinuation rates of HC are high, especially among adolescents, and mood complaints are one of the most frequently stated reasons for discontinuation [2, 3]. Depression and anxiety disorders are twice as prevalent in women as in men; a difference that is yet to be fully understood [4–6] and rates of psychiatric diagnosis and visits to mental health professionals are increasing in young Swedish

Ministry of Health and Social Affairs. It is not their policy to provide individual level data to researchers abroad. Instead, they normally advice researchers in other countries to cooperate with Swedish colleagues, to whom they can provide data according to standard legal provisions and procedures. Data from the Swedish prescribed drug register have legal restrictions prohibiting the authors from making the minimal data set publicly. The data is available upon request from the Swedish National Board of Health and Welfare following a presentation of an appropriate project description and ethical permit. Researchers can contact Sara Segelson (sara.segelson@socialstyrelsen.se) for more information. For information please see: http://www.socialstyrelsen.se/register/halsodataregister/lakemedelsregistret.

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women [7]. The gender disparity in psychological health does not exist in children but starts at the onset of puberty, rendering female sex hormones one plausible explanation [8]. Several mechanisms have been suggested to explain the mood-altering effect of these hormones. Estrogen is a regulator of serotonin levels, a known factor in depression [9, 10]. Progesterone most likely influences mood through the action of its neuroactive metabolites, to which not all women respond in the same way despite similar levels [11].

The scientific literature on psychological side effects of HC is relatively scant and inconclusive. Few randomized controlled trials have been performed, but most existing studies show a protective association between the most prevalent HC, combined oral contraception (COC), and anxiety, mood disturbances and depressive symptoms [12, 13]. The field is, however, disputed, and recent studies have also found adverse mental health effects [14, 15]. A new Danish register-based cohort study found an association between HC and subsequent use of antidepressants and a hospital diagnosis of depression, which was higher in adolescents [16]. This could be due to a *healthy survivor effect*, or more correctly, *a selective discontinuation bias*, where only women content with their treatment continue, creating a false protective association in older women.

Against the above background we aimed to investigate a possible adverse effect of HC on psychological health, using a nationwide cohort of 815 662 women during 2010–2011. Our main hypothesis was that this association would be stronger in adolescents since, being new users of HC, this population should be less affected by a *selective discontinuation bias*.

Methods

Population

We designed a nationwide database by record linkage of several Swedish registers, using the official unique personal identification number assigned to every individual residing in Sweden [17]. The database was constructed by Statistics Sweden and the Swedish National Board of Health and Welfare, and it was delivered to us after replacing the personal identification number by an arbitrary one to ensure anonymity of subjects. Based on the Total Population Register, we defined an initial cohort containing all 1 094 069 women aged 12–30 years residing in Sweden on 31 December 2010 [18]. We obtained information on medication use from the Swedish Prescribed Drug Register (SPDR), which contains individual level data on all dispensed drug prescriptions at Swedish pharmacies (excluding dispensation at hospitals and nursing homes) for the whole population in Sweden since 2006 [19].

We assigned a baseline date to every woman, defined by the first dispensed prescription of an HC drug (Anatomical Therapeutic Chemical (ATC) codes G02BA, G02BB, G03AA, G03AB, G03AC) between 1 January 2010 and 31 December 2011. The baseline date was set to 31 December 2010 if the woman did not have any HC prescription during these two years. Each woman, user and non-user, thereby got an individual baseline date based on her first prescription fill or the assigned date of 31 December 2010. From the individual baseline date, a one-year follow-up and a previous period of four years were recorded, meaning all women were followed for exactly one year. With this definition, we can furthermore be sure that the non-users of HC were true non-users during four years before, and one year after their baseline date of 31 December 2010.

After calculating the individual baseline date, we excluded 99 052 women who were not residing in Sweden for four years prior to, and one year after their own baseline date, since information on diagnosis and medication were lacking in those cases. Women with pre-existing psychiatric disorders were excluded by using information on diagnoses from hospital discharges and outpatient visits recorded at the Swedish Patient Register. Through the

International Classification of Diseases, 10th version (ICD-10), women with a psychiatric diagnosis (ICD-10 codes F00–F99) in the previous four years were excluded. Since diagnosis from primary care visits are not available in Swedish registers, we also used information from the SPDR, which includes prescriptions from primary care as well as specialised care to identify women with less severe mental health issues. Women having a prescription fill of a psychotropic drugs (ATC N05 or N06) in the previous four years were therefore also excluded (n = 156 302). The period of four years was determined because of restrictions in the available information on medications. Finally, we excluded 23 053 women who had a diagnosis of child delivery (ICD-10 O80-84) at a hospital during follow-up. The final cohort consisted of 815 662 women.

Assessment of variables

Hormonal contraceptive use. We defined *non-users* of HC as those who did not fill a prescription for HC between 1 January 2010 and 31 December 2011, and took this category as reference in all comparisons with *users of HC*. Users of HC were identified according to the first HC prescription fill during baseline.

Since HC can only be acquired via a prescription from a physician or midwife in Sweden all users were included. The exception is emergency contraceptives that are mainly dispensed over the counter and are therefore not registered in the SPDR. A small number, 288 prescription fills of emergency contraceptives, were recorded in the SPDR, but were excluded from the analysis. HC prescriptions in Sweden are filled every three months or annually.

Psychotropic drug use. The outcome of our study was use of psychotropic medication defined as filling at least one prescription with anxiolytics, hypnotics and sedatives or antidepressants (ATC N05B, N05C or N06A) during the one-year follow-up, from the first dispensation of HC or 31 December 2010, if the individual did not use HC at baseline. Use of psychotropic medication can be considered as a proxy for impaired psychological health [20].

Socioeconomic position. We obtained individual and family level data on socioeconomic factors as of 31 December 2010 from Statistics Sweden's *Longitudinal integration database for health insurance and labour market studies* and operationalized SEP by means of education and income [21]. Education was categorized according to the number of years into low (less than 14 years) and high (14 years or more) level of educational achievement, with a category for missing values. We used the highest educational level achieved by any member of the woman's current household, since many individuals in our cohort were children. Individualized disposable family income was calculated by dividing the total disposable income of the family by the number of family members, taking into account the different consumption weights of adults and children determined by Statistics Sweden. Thereafter, we created three categories (i.e., low, medium, and high) of income using the total Swedish population aged 18–80 years. We considered the high income category as the reference in the comparisons.

Other variables. We categorized age into the following groups; 12–14, 15–17, 18–20, 21–25 and 26–30 years, as well as into adolescents (12–19 years) and adult women (20–30 years) and used these age categorizations to perform different stratified analyses. We created dichotomous variables to adjust for the presence or absence of any previous diagnosis related to thromboembolism (ICD-10 I26, I80 and I82), epilepsy or migraine (ICD-10 G40-47) and menstrual disturbances including abnormal bleeding, premenstrual disorders and endometriosis (ICD-10 N80 and N91-94) in the previous four years. Information on diagnosis were not available from primary health care clinics. Contraindication of certain HCs for women with these diagnoses, and presence of menstrual disturbances, could affect both HC prescription and mood and therefore confound the results. Thereafter, we adopted a more exhaustive approach and adjusted for the presence or absence of any hospitalization or contact with an outpatient

hospital clinic in the past four years. In the case that a potential association between HC use and use of psychotropic medication were mediated by an increased contact with health care services, our results would underestimate this association. Since the use of psychotropic drugs rises with age, we also adjusted for age as a continuous variable within each age stratum.

Statistical analysis. Since the follow-up was short and complete, we applied logistic regression to estimate odds ratios (OR) and 95% confidence interval (CI) of psychotropic drug use in relation to the different HC categorizations, with non-users of HC as the reference group. We performed simple and multiple age-stratified logistic regression models.

In the multiple regression models, 2545 cases were dropped due to missing information on family education level.

We obtained the predicted probabilities from the models to calculate the area under the operating receiver operator characteristics curve (AUC) [22]. The AUC measures the ability of the model to correctly classify those using or not using psychotropic medication, based on knowledge of HC use. The AUC assumes a value between 0.5 and 1, where 1 represents perfect discrimination and 0.5 corresponds with a predictive value equal to that obtained by flipping an unbiased coin.

We performed all analyses using SPSS 22.0 (Statistical Package for Social Sciences, SPSS Inc., Chicago, IL, USA) software.

Ethical approval

The database was approved by the Regional Ethical Review Board in Lund, Sweden, the Data Safety Board at Statistics Sweden and the National Board of Health and Welfare (Dnr: 2014/856, 2015/341).

Results

The study population consisted of 815 662 women aged 12–30 years (mean age 20.44 years; standard deviation (SD) 5.3) on 31 December 2010, residing in Sweden since at least four years and having no previous psychiatric morbidity. Overall, 49.5% (n = 411 559) of the women were users of HC. Psychotropic drugs were dispensed to 3.1% (n = 24 973) of the women during the follow-up. Among HC users the incidence of psychotropic drug use was 3.7%, while this figure was 2.5% for non-users. For detailed information on prevalence and types of HC included, see S1 Table.

Hormonal contraceptive users

The age-stratified baseline characteristics of the population are presented in Table 1. The mean age for non-users of HC was 19.3 years (SD 5.8), and users were somewhat older, with a mean age of 21.6 years (SD 4.4). We did not find any major differences between the groups at baseline. Health care utilization was higher among HC users (21.7% vs. 17.9% had been hospitalized), and so was the frequency of menstrual disorders (4.1% vs. 2.8%).

Patterns of HC use varied with age. In the youngest age stratum, 7.77% were HC users, while as many as 48.8% of the girls aged 15–17 years and 68.2% of the women aged 18–20 years used HC during 2010–2011.

Hormonal contraception and psychotropic drug use

In users of HC the absolute risk of using psychotropics was around 4% for all age groups (Fig 1). In non-users of HC, however, this risk was very low in young adolescents and increased with age, to reach the level of HC users at the age of 21 or older.

Table 1. Prevalence of different hormonal contraceptive methods in our cohort. Use of hormonal contraception, socioeconomic characteristics, contact with health care, and previous diagnoses at baseline (2010–2011) by age groups and use of hormonal contraceptives in our cohort of 815 662 Swedish women. Values are percentages, unless otherwise indicated.

Age (years)	**12–19**		**20–30**		**All**	
Number of women	**380 818**		**434 844**		**815 662**	
	Non-user	**User**	**Non-user**	**User**	**Non-user**	**User**
Hormonal contraceptive	-	40.1	-	59.5	-	49.5
Income						
Low	52.5	46.3	39.0	30.3	46.6	36.2
Middle	33.4	37.3	34.9	38.0	34.1	37.8
High	14.1	16.4	26.1	26.1	19.3	26.0
Education						
Low	48.2	57.2	46.4	46.4	47.1	50.8
High	51.5	42.7	53.0	53.0	52.2	49.0
Missing data	0.2	0.1	0.7	0.4	0.4	0.2
Health care						
Hospitalizations	8.1	12.1	30.9	27.4	17.9	21.7
Outpatient care	50.5	59.8	62.4	65.4	55.7	63.6
Diagnoses						
Thrombosis	0.0	0.1	0.2	0.2	0.1	0.1
Epilepsy or migraine	1.3	1.4	1.3	1.2	1.3	1.2
Menstrual disturbances	1.2	3.7	4.9	4.3	2.8	4.1

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Overall, compared to non-users, users of HCs had an adjusted OR of a first-time use of psychotropic drugs of 1.34 (95% CI: 1.30–1.37). Adjustments were made for age, family income, educational level, health care utilisation, and having a diagnosis of thromboembolism, epilepsy or migraine, or menstrual disturbances. However, the age-stratified analysis (Fig 2) revealed a strong association in adolescent girls, which decreased with age to disappear after adolescence. We observed this pattern for all groups of HC. The highest ORs were found in the youngest age group of 12- to 14-year-olds, with an adjusted OR of 3.46 (95% CI: 3.04 to 3.94).

In the analysis differentiating between oral and non-oral forms of combined and progesterone-only methods, we observed a pattern where use of HC in young adolescents displayed strong associations with psychotropic drug use (Table 2). The strongest association was found among 12–14 year olds using a non-oral progesterone-only method such as a skin patch or intravaginal ring, with an of OR 4.47 (95% CI: 2.08–8.78). The non-oral methods generally had higher ORs than the oral methods, as did the progesterone-only methods compared to combined methods regardless of administrative route. For example, users of the vaginal ring/patch in the age group 15–17 years had an adjusted OR of 2.27 (95% CI: 1.85–2.79) for a first use of psychotropic drugs compared to non-users, while COC users had an OR of 1.52 (95% CI: 1.41–1.64) in the same age group.

The analysis of separate HC types showed distinct differences between adolescents (12–19 years) and adult women (20–30 years) (S2 Table). While the majority of HC substances where positively associated with a first-time use of psychotropic drugs in adolescents, we observed few conclusive associations in adult users. Non-oral HC forms did however display stronger associations in both adults and adolescent users.

Use of the depot medroxyprogesterone acetate (DMPA) injection (ATC G03AC06), a high dose progesterone-only method, had the strongest association with subsequent use of psychotropic drugs in adult women, with an adjusted OR of 1.56 (95% CI: 1.34–1.82). For adolescents, the levonorgestrel containing IUD had the strongest association with use of

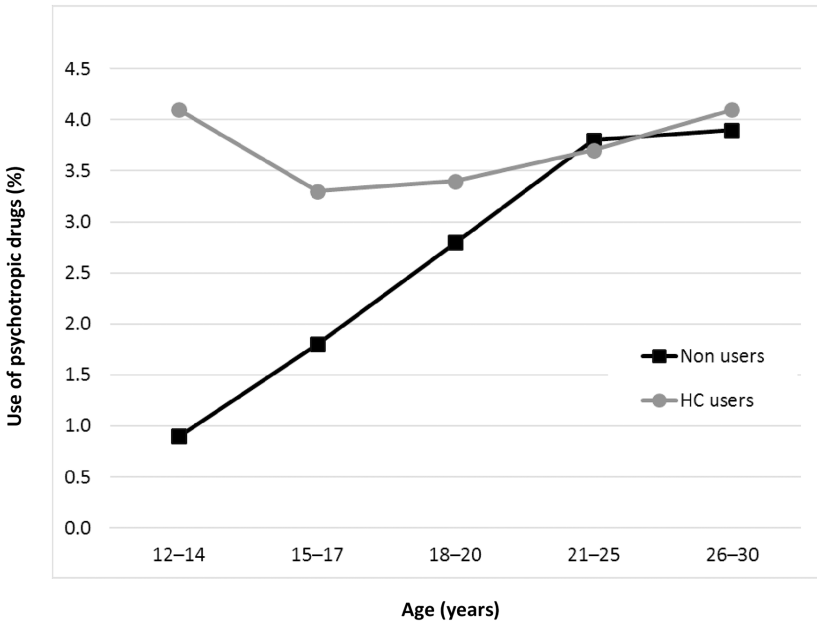

Fig 1. Psychotropic drug use in users and non-users of hormonal contraception. Percentage (i.e. absolute risk) of first-time use of psychotropic drugs during a one-year follow-up from baseline (2010–2011) by age, in users (gray line with circles) and non-users (black line with squares), of hormonal contraceptives in 815 662 Swedish women.

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psychotropic drugs, with an adjusted OR of 2.90 (95% CI: 2.22–3.79), followed by DMPA (OR: 2.37; 95% CI: 1.46–3.84).

We also performed a sensitivity analysis excluding women diagnosed with a number of illnesses (i.e., thromboembolism, endocrine disorders, migraine or epilepsy, disorders of the female genital tract, and malignant diseases) that could influence both use of HC and of psychotropic drugs, and the results were very similar (S3 Table).

Area under the receiver operating curve

Finally, calculations of the AUC showed that the ability to categorize users of psychotropic drugs based on information on HC use was very low. In women over 18 years, the AUCs ranged between 0.54 and 0.60 for unadjusted and adjusted values, respectively (S2 Table). For adolescents the AUC was somewhat higher with values between 0.62 and 0.68 in the youngest age stratum. We also ran a model with all the explanatory variables except HC, and then added use of HC in a consecutive model, to be able to assess how much knowledge of HC use added to the AUC (S4 Table). This analysis showed that HC added nothing to the AUC in women over 18 years of age. In adolescent girls, knowledge of HC added between 0.02 and 0.04 units to the AUC of the model containing only individual predictors.

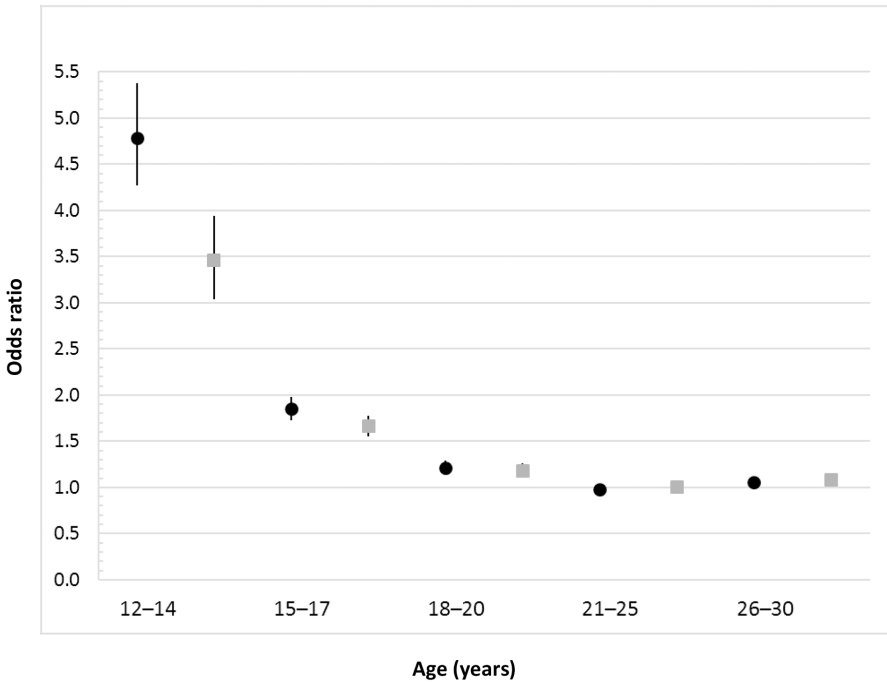

Fig 2. Age-stratified association between use of hormonal contraception and a first-time use of psychotropic drugs. Age-stratified odds ratios with 95% confidence intervals (black lines) for the association between use of hormonal contraceptives and use of psychotropic drugs within a one-year follow-up after baseline (2010–2011) in 815 662 Swedish women. Crude (black circles) and adjusted (gray squares) values. Adjustments were made for age, family income, highest educational level in family, previous hospitalizations, outpatient hospital visits, and having a diagnosis of thromboembolism, epilepsy or migraine, or menstrual disturbances including endometriosis.

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Discussion

Our findings show strong associations between the majority of hormonal contraceptives and subsequent use of psychotropic drugs in adolescent girls without previous psychiatric morbidity. We found the highest odds ratios in 12- to 14- year old girls using non-oral progesterone-only methods. The association was persistent and conclusively high for most HC formulas in adolescents, but it weakened or became absent for women over 19 years.

A possible selective discontinuation bias

Our results could be explained by a *selective discontinuation bias*. As an expression of a heterogeneous response to HC, the effect of HC on psychological health may vary due to, for instance, personality traits, disorders such as premenstrual dysphoric disorder (PMDD) or dysmenorrhea, or different sensitivity for neuroactive metabolites of progesterone [13, 23–26]. Some women might therefore experience a negative influence of HC on psychological health and discontinue treatment, while those without symptoms continued on HC into adulthood,

Table 2. Association between different oral and non-oral hormonal contraceptive methods and use of psychotropic drugs within one-year follow-up. Adjusted age-stratified odds ratios (OR) with 95% confidence intervals (CI) for the association between oral and non-oral hormonal contraception (HC) methods and use of psychotropic drugs within one-year follow-up after baseline (2010–2011) in 815 662 Swedish women. Non-users used as reference within each age group. The analyses distinguish between combined and progesterone-only methods within the oral and non-oral forms of contraceptives. Adjustments were made for age, family income, highest educational level in family, previous hospitalizations, outpatient hospital visits, and having a diagnosis of thromboembolism, epilepsy or migraine, or menstrual disturbances including endometriosis.

Age (years)	Oral HC			Non-oral HC		
		OR (95% CI)	AUC (95% CI)		OR (95% CI)	AUC (95% CI)
12–14	Non-users	1.00 (ref)		Non-users	1.00 (ref)	
	COC	3.3 (2.85–3.81)	0.70 (0.68–0.71)	Patch/ring[a]	4.27 (2.08–8.78)	0.65 (0.63–0.67)
	POP	3.9 (3.14–4.84)		IUD/inj/impl.[b]	3.37 (2.10–5.40)	
15–17	Non-users	1.00 (ref)		Non-users	1.00 (ref)	
	COC	1.52 (1.41–1.64)	0.63 (0.62–0.64)	Patch/ring	2.27 (1.85–2.79)	0.64 (0.63–0.66)
	POP	1.83 (1.65–2.03)		IUD/inj/impl.	2.48 (2.10–2.94)	
18–20	Non-users	1.00 (ref)		Non-users	1.00 (ref)	
	COC	1.08 (1.01–1.16)	0.61 (0.60–0.62)	Patch/ring	1.42 (1.24–1.62)	0.62 (0.61–0.64)
	POP	1.29 (1.18–1.41)		IUD/inj/impl.	1.58 (1.39–1.80)	
21–25	Non-users	1.00 (ref)		Non-users	1.00 (ref)	
	COC	0.94 (0.89–1.00)	0.60 (0.59–0.60)	Patch/ring	1.24 (1.13–1.36)	0.60 (0.59–0.61)
	POP	1.00 (0.93–1.07)		IUD/inj/impl.	1.12 (1.00–1.24)	
26–30	Non-users	1.00 (ref)		Non-users	1.00 (ref)	
	COC	1.10 (1.03–1.17)	0.59 (0.58–0.59)	Patch/ring	1.30 (1.16–1.46)	0.60 (0.59–0.61)
	POP	0.97 (0.91–1.04)		IUD/inj/impl.	1.19 (1.07–1.32)	
All	Non-users	1.00 (ref)		Non-users	1.00 (ref)	
	COC	1.29 (1.26–1.33)	0.65 (0.65–0.65)	Patch/ring	1.57 (1.45–1.67)	0.69 (0.68–0.69)
	POP	1.28 (1.24–1.33)		IUD/inj/impl.	1.46 (1.38–1.55)	

HC; Hormonal contraceptive, COC; combined oral contraceptives, POP; progesterone-only pills, Patch; skin patch (Evra), Ring; intravaginal ring (NuvaRing), IUD; Intrauterine device, Inj.; injection (Depo-Provera), Impl.; implant (Implanon, Jadelle)*

[a]Non-oral combined methods.

[b]Non-oral progesterone-only methods

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which would explain the lower association with psychotropic drugs in older women. This could explain why previous observational studies focused on adult women have found that HC has a protective effect on adverse psychological symptoms [27–29], while several other studies have found negative influences on mood, especially from progesterone only methods [14, 30–32]. A recent Swedish randomized controlled trial investigating the effect of a second generation COC also found an adverse effect on sexuality [15].

Our results validate the previously reported cross-sectional association between HC and psychotropic drug use as the association remains when temporality between exposure and outcome is taken into account [31, 33]. Our results are furthermore in line with a recent Danish study applying a similar design as the one used by us, which found a high risk of antidepressant consumption in teenagers using HC in general and progesterone-only HCs in particular [16]. Our comparable results demonstrate that these associations are not country specific, and therefore do not depend on, for example, different prescribing cultures. Even if Sweden and Denmark are both Scandinavian countries, their respective health care systems are not identical. Furthermore, our study complements the Danish investigation by including younger girls, among which the association between HC and psychotropic drugs had not previously been investigated.

An age-dependent heterogeneity in response to HC

A possible mechanism that could explain our results, apart from a *selective discontinuation bias*, is that adolescents are more sensitive to exogenous hormones. One study of 14-to 17-year-old girls found that they exhibited adverse mood effects while on DMPA, compared to non-users as well as oral contraceptive users, and concluded that adolescents react differently than adults to HC [34]. DMPA displayed one of the strongest associations with psychotropic drugs in our study. Another randomized study performed on adolescents with dysmenorrhea found no differences between users of a second generation COC and placebo treatment regarding depressive symptoms [35]. An interesting finding in relation to our results, if still only confirmed in an animal model, is that female mice react differently to allopregnanolone during puberty. The usual sedative effect instead becomes increased anxiety, due to an upregulation of a certain GABA receptor at the onset of puberty [36].

Another route of explanation is found within the social realities of adolescents using HC. It has been concluded that an early sexual debut is associated with augmented risks of destructive behaviour and poor mental health [37]. Since use of HC is a reasonable proxy for an active sex life, the effect of beginning treatment at an early age might instead refer to the effect of early sexual debut. Another aspect of this issue is that HC is used not only for pregnancy prevention, but also for somatic disorders or symptoms such as dysmenorrhea and PMDD, indications that could be more common in adolescents and adversely affect mood in itself. In one Australian cohort study on women in their 20s, the association between HC and depressive symptoms disappeared when controlling for confounding in the form of non-contraceptive use of HC [38].

Our subanalysis of oral and non-oral HC shows a consistent pattern of non-oral forms being more strongly associated with psychotropic drug use (except in the youngest age stratum, where the cases are few and, therefore, the confidence intervals are wide), despite the fact that these methods often contain lower levels of hormones. A plausible assumption is that girls and women in need of a method less dependent on remembering a pill every day might belong to a more vulnerable population. Indeed, adolescents with depression have been found to be more likely to select an IUD as their contraceptive method [39]. Users of levonorgestrel IUDs also report higher rates of anxiety and non-clinical depression, but clinical depression is not more prevalent among users [40]. This can be contrasted against a systematic review that concluded that users of the vaginal ring reported less depression, irritability, and emotional liability than COC users [41]. However, in our study the association with psychotropic drugs was still high for progesterone-only pills for adolescents, which indicates that the effect cannot be exclusively attributed to administrative route.

Strengths

A strength in our study is the inclusion of all women aged 12–30 years living in Sweden 2006–2013, where the individual woman is followed for one year after her first dispensed HC prescription. This design makes it possible to define the temporality of the exposure and outcome, although causation is difficult to determine by observational studies. Inclusion of girls and women in an age-stratified analysis also makes it possible to derive age-specific patterns of use and associations. Moreover, we excluded women with a previous psychiatric diagnosis made at a hospital visit or use of psychotropic drugs, to be able to focus on the possible effect of HC without the confounding of previous psychiatric illness. Including sedatives and hypnotics in the outcome could also capture a broader spectrum of adverse psychological effects than just focusing on antidepressants, as with previous studies [16, 31, 33]. Finally, a benefit of register data is that it is free from recall bias. Misclassification of information can still occur, but since

the SPDR gathers its data directly from the pharmacies' computer systems, this is a minor problem.

Limitations

An apparent limitation for a study with the objective of measuring effects on mental health is the use of a crude proxy such as psychotropic medication. A study investigating indications of antidepressants in general practice in the Netherlands found that they were most commonly prescribed for depression, anxiety/panic disorder, and sleeping disorders, but other rare indications were neuropathic pain, headache, and enuresis, meaning that such prescription could not comprise a direct proxy for mental health [20]. Also, with prescription fill data, it is not possible to determine whether the individual took the medicine, although it allows for analysis of large population datasets. Another aspect to consider is that not all women with adverse mental health effects of HC would have symptoms severe enough to get a prescription for a psychotropic drug, leading to many missed cases. This limitation would therefore suggest that our results are an underestimation of the problem at hand. Primary care diagnosis of psychiatric disorders was not available since it is not registered in national registers, which limits the scope of and conclusions possible to draw from our analysis. It is possible that in some women psychological distress which did not warrant psychotropic drugs or a psychiatric diagnosis made at a hospital visit could have predated the prescription fill of HC, which we cannot tell with available data. An additional limitation is the grouping of HC in the age-stratified analysis, which does not allow for investigation of specific formulas, but which, on the other hand, could disclose larger patterns of hormonal content and psychological health and allow for analysis in the adolescent population where the use is low.

The strong association found in adolescent girls could also be a result of an unadjusted confounding, for example, HC as a marker for living conditions, social circumstances that increase the risk of depressive or neurotic symptoms or non contraceptive uses for HC [37]. In our study, the associations held firm when controlling for menstrual disturbances, which could be read as proxy for non-contraceptive uses of HC, and a sensitivity analysis excluding women with these diagnoses did not change the results. However, some women with these diagnoses, as with psychiatric diagnosis, would have gotten them through the primary care system, from where data were not available to us. Due to this fact, as well as the general limitation of register-based data, the variables included in our adjusted analysis were neither optimal nor exhaustive.

Finally, even with adjustments the observational nature of our study only allows for measurements of associations and cannot determine causation. An important aspect of epidemiological research is the ability to accurately interpret and weigh one's findings and appreciate that high odds ratios for a certain risk factor do not necessarily equate to clinical importance [42]. One method for acquiring this information is to use measures of discriminatory accuracy like the AUC, which reveal with what accuracy individuals can be categorized into groups, depending on certain factors [22]. In our analysis, the discriminatory accuracy for the unadjusted analysis was low, and adding HC to the other explanatory variables increased the AUC only marginally, meaning that we need to seek additional explanations aside from use of HC, to understand the high use of psychotropic drugs and poor psychological health in young girls.

Conclusion

We find an association between hormonal contraception and subsequent use of psychotropic drugs for women of reproductive age. The association is large for young adolescents, and insignificant in adult women, pinpointing the need to bear population heterogeneity in mind and identifying adolescent girls using hormonal contraception as a vulnerable population. Our also

study adds to a growing body of evidence that hormonal contraception could adversely affect psychological health in certain girls and women, and warrants further investigation of the influence of different hormonal contraception on psychological health, particularly in young women.

Supporting information

S1 Table. Prevalence of different hormonal contraceptive methods in our cohort. Prevalence of different hormonal contraceptive methods in 2010–2011 by contraceptive type in our cohort of 815 662 Swedish women aged 12–39. All combined HC contain estrogen in addition to progesterone, except for G03AA14 (Zoely), which contains estradiol.
(DOCX)

S2 Table. Association between use of different hormonal contraceptives and a first time use of psychotropic drugs. Odds ratios (OR) with 95% confidence intervals (CI) and area under the curve (AUC), stratified on adolescents and adults, for the association between use of different hormonal contraceptives and a first time use of psychotropic drugs within a one-year follow-up after baseline (2010–2011) in 815 662 Swedish women.
(DOCX)

S3 Table. Sensitivity analysis. Sensitivity analysis excluding women with certain diagnosis. Odds ratios (OR) with 95% confidence intervals (CI) for the use of hormonal contraceptives (HC) (ATC G02BA, G02BB, G03AA, G03AB, G03AC) and use of psychotropic drugs (ATC N05B, N05C, N06A) within a one-year follow-up after baseline (2010–2011) in 815 662 Swedish women. A sensitivity analysis excluding women with different illnesses (delivery: ICD-10 O80-84, pregnancy and delivery complications: ICD-10 O00-O99, menstrual disturbances; ICD-10: N80 and/or N91- 94, endocrine disorders, epilepsy and migraine, malignant disorders, thrombosis or disorders of the female genital tract: E00E3, G40G43, C00C97, I80, I82, I26 and/or N70N98). Both crude and adjusted values shown. Adjustments were made for age, family income, educational level and health care utilization.
(XLSX)

S4 Table. AUC change. Change in area under the receiver operating curve (AUC) with addition of hormonal contraceptive use to a model containing individual predictors. Age stratified change in the area under the curve for use of psychotropic drugs when adding information on use of hormonal contraceptives (ATC G02BA, G02BB, G03AA, G03AB, G03AC) to a model already including age, family income, highest educational level in family, previous hospitalizations, outpatient hospital visits and having a diagnosis of thromboembolism, epilepsy or migraine, or menstrual disturbances including endometriosis in the 815 662 Swedish women.
(DOCX)

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Paper II

BMJ Open

Population heterogeneity in associations between hormonal contraception and antidepressant use in Sweden: a prospective cohort study applying intersectional multilevel analysis of individual heterogeneity and discriminatory accuracy (MAIHDA)

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ABSTRACT

Objectives From a reproductive justice framework, we aimed to investigate how a possible association between hormonal contraceptive (HC) and antidepressants use (as a proxy for depression) is distributed across intersectional strata in the population. We aimed to visualise how intersecting power dynamics may operate in combination with HC use to increase or decrease subsequent use of antidepressants. Our main hypothesis was that the previously observed association between HC and antidepressants use would vary between strata, being more pronounced in more oppressed intersectional contexts. For this purpose, we applied an intersectional multilevel analysis of individual heterogeneity and discriminatory accuracy approach.

Design Observational prospective cohort study using record linkage of national Swedish registers.

Setting The population of Sweden.

Participants All 915 954 women aged 12–30 residing in Sweden 2010, without a recent pregnancy and alive during the individual 1-year follow-up.

Primary outcome measure Use of any antidepressant, meaning being dispensed at least one antidepressant (ATC: N06A) during follow-up.

Results Previously mentally healthy HC users had an OR of 1.79 for use of antidepressants compared with non-users, whereas this number was 1.28 for women with previous mental health issues. The highest antidepressant use were uniformly found in strata with previous mental health issues, with highest usage in women aged 24–30 with no immigrant background, low income and HC use (51.4%). The largest difference in antidepressant use between HC users and non-users was found in teenagers, and in adult women of immigrant background with low income. Of the total individual variance in the latent propensity of using antidepressant 9.01% (healthy) and 8.16% (with previous mental health issues) was found at the intersectional stratum level.

Conclusions Our study suggests teenagers and women with immigrant background and low income could be more sensitive to mood effects of HC, a heterogeneity important to consider moving forward.

Strengths and limitations of this study

- Entire Swedish population of women aged 12–30 included.
- Pharmacy dispensing automatically linked to individual personal identification number in Sweden through the Swedish Prescribed Drug Register and thus very reliable.
- Intersectional multilevel analysis of individual heterogeneity and discriminatory accuracy is a fruitful way of epidemiologically investigating heterogeneity within a population while considering individual conditions determined by societal power dimensions such as class, gender and race.
- Antidepressant dispensing is not a perfect proxy for depression.
- Registers cannot measure actual use of any medication.

INTRODUCTION

In recent years, attention in the medical community has increasingly been drawn towards depression and other adverse effects on mood related to use of hormonal contraception (HC).[1 2] Discontinuation rates are high, with mood disturbances or depression being one of the most common complaints.[3–5] Two large epidemiological studies, one in Denmark and the other performed in Sweden, have recently shown a higher risk of antidepressants and psychotropic

drugs use in adolescent users of HC.[6 7] Randomised controlled trials are rare, but suggest a negative influence of HC on well-being and sexual function,[8 9] as well as evidence of HC modulating brain activity with subsequent mood alterations in some women.[10 11] Even though oestrogen and progesterone are known to affect mood,[12] the growing body of evidence in this field is contradictory, with recent reviews concluding that both protective and negative effects of HC on mood exist and more research is needed.[13–16] Despite this uncertainty, many scholars agree that certain subgroups of women seem more vulnerable to psychological side effects of HC than others, particularly teenagers and women with previous mental health issues.[10 13 17–20] A call for further investigation into these vulnerable subgroups has been made.[14]

A fruitful way of epidemiologically investigating heterogeneity within a population while considering individual conditions determined by societal power dimensions such as class, gender and race has been developed through intersectional theory in recent years.[21–26] Intersectionality theory was first articulated by Black feminist scholars as a way of understanding how an individual inhabits and is formed by more than one social relation such as gender, 'race' or class, and how these classification systems interconnect to create specific contexts of oppression or privilege.[27 28] These categorisations should not be seen as individual 'risky' identities, but as the social, political and economic contextual conditions that outline our lives through structural inequalities.[29] Reproductive justice is a theoretical framework that builds on intersectionality and centres diverse groups of unprivileged women's reproductive experiences to recognise that societal context and differing resources available shape reproductive health.[30] Applying a reproductive justice framework, it becomes clear that we need to take notice of disparate sociocultural contexts and interlocking power dimensions to understand different patterns of usage as well as possible diverse responses to HC.[31 32]

To operationalise an intersectional mapping of heterogeneity in use of antidepressants in relation to HC on a population level, we used a multilevel analysis of individual heterogeneity and discriminatory accuracy (MAIHDA).[21–23 33 34] We created intersectional strata based on previous literature showing that age, socioeconomic position and previous mental illness are relevant intersecting dimensions in understanding the relation between HC and depression.[17 20 35 36]

We conceptualise the intersectional strata as social contexts rather than static individual traits, thereby visualising how intersecting power dynamics can act in combination with HC to predispose for depressive mood. Our main hypothesis was that the previously observed association between HC and use of antidepressants would vary between strata and that this association would be more pronounced in more oppressed intersectional contexts. We investigate this hypothesis on the whole population of women susceptible to HC use in Sweden.

METHOD

Databases and study population

After allowance from the Swedish Ethical Authority and the data safety committees from Statistics Sweden and the Swedish National Board of Health and Welfare, we obtained a database created by record linkage of several nationwide registers administered by Statistics Sweden (the Swedish Population Register and the Longitudinal Integration Database for Health Insurance and Labour Market Studies, LISA) and the Swedish National Board of Health and Welfare (National Patient Register, the Swedish Prescribed Drug Register (SPDR) and the Cause of Death Register). The Swedish authorities linked the registries using a unique personal identification number, but the database was anonymised before delivering it to us.

We defined an initial cohort containing all 1 064 171 women aged 12–30 years residing in Sweden 1 January 2010 and obtained individual level data on medication use from SPDR, which contain all dispensed drug prescriptions at Swedish pharmacies since 2006.

Every woman was assigned an individual baseline date, defined by the first dispensed prescription of an HC drug between 1 January 2010 and 31 December 2014 after 12 years of age, and was then followed for 1 year after her individual baseline date. A woman obtaining her first prescription on 1 September 2013 was therefore followed to 1 September 2014. For non-users of HC, the baseline date could not be based on a HC-prescription and was therefore assigned, to 1 July 2012 for all adults, but later for some of the younger girls turning 12 during our period of investigation. This means all non-users had been true non-users for at least 1.5 years before their follow-up started (1 January 2010 to 1 July 2012) but also continued to be non-users all the way to 31 December 2014. From the individual baseline date, the women were followed for 1 year to find out if a prescription of an antidepressant was dispensed. Data were also collected on psychiatric disorders and psychotropic drug use in the past 3 years (see Assessment of variables). After excluding women with incomplete follow-up time due to death, emigration, missing information on country of birth, and pregnancies 1 year before and after the baseline as well as, the final database consisted of 915 952 women. This database was divided into two cohorts according to the presence or absence of previous mental health issues, see figure 1.

Assessment of variables

Users of HC were defined as any women who, according the SPDR, filled a prescription of HC (Anatomical Therapeutical Chemical (ATC) classification system codes G02B, G03AA-C) between 1 January 2010 and 31 December 2014, while non-users did not have a prescription filled during the same period. Emergency contraception (G03AD) that are mainly bought over the counter in Sweden was excluded. The majority of HC prescriptions are acquired via midwifes in Sweden (86.0% in our original cohort), whom can only prescribe HC for

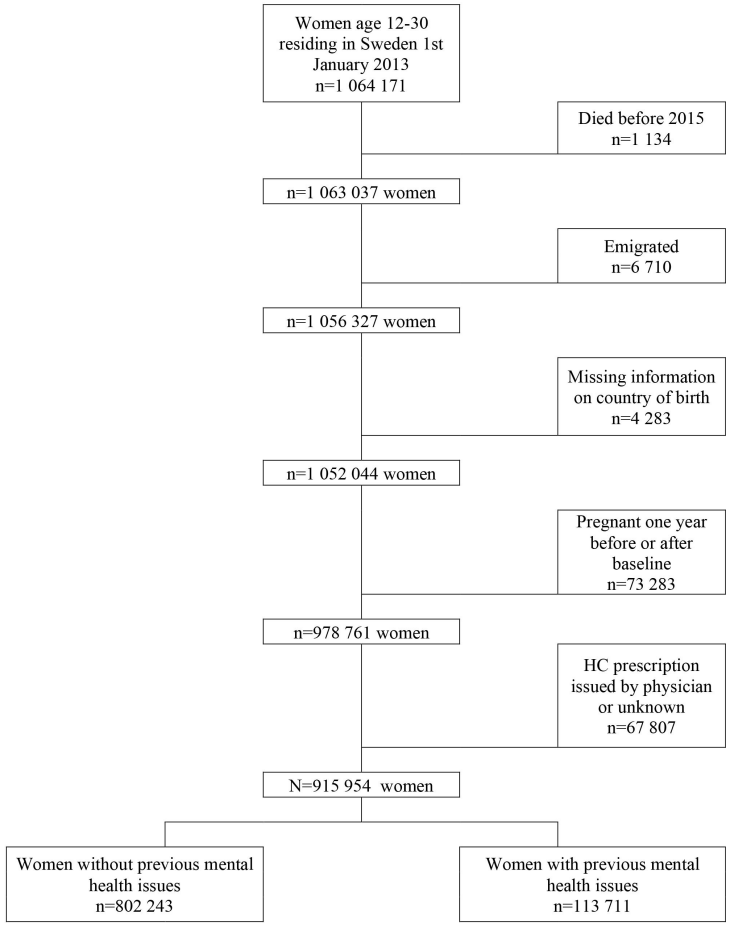

Figure 1 Selection of the study population. HC, hormonal contraception.

contraceptive purposes. Physicians, most often gynaecologists, can also can prescribe HC for other purposes such as in response to bleeding disturbances or endometriosis. Since these indications could confound our results, we excluded women with physician-issued prescriptions, see figure 1. HC prescriptions can be dispensed by pharmacies annually or every 3 months.

Antidepressant use, the outcome of our study, was defined, according to the SPDR, as being dispensed at least one prescription of antidepressants (ATC: N06A) during the individual 1-year follow-up.

Previous mental health issues were defined as having any psychiatric disorder diagnosed at a hospital (ICD: F00-F99) or a dispensed prescription of a psychotropic drug (ATC: N05A, N05B, N06A) in the past 3 years.

Pregnancies 1 year previous to baseline and during follow-up were identified according to the 2019 version of the Nordic Diagnosis-Related Group classification (NordDRG), Major Diagnostic Categories codes M14 for pregnancy, delivery and postpartum care.[37]

We used family level data on income as of 31 December 2010 from Statistics Sweden's LISA. Individualised disposable family income was calculated by dividing the total disposable income of the family by the number of family members, taking into account the different consumption weights of adults and children determined by Statistics Sweden. Thereafter, we created three categories (ie, low, medium and high) of income using tertile cut-offs based on the total Swedish population aged 18–80 years. We considered the high-income category as the reference in the comparisons.

We defined immigrant status at the family level as no family member >18 years of age born in Sweden, since understanding of and access to institutions such as

healthcare differ depending on social position such as it is constructed by the power dimensions of race/immigration, as well as the experience of xenophobia. This variable should therefore be considered as an effort to capture a social position affecting possibilities and life trajectories rather than an essentialist view of otherness. We categorised age at the individual baseline into the following groups: 12–17, 18–23 and 24–30 years to capture age specific conditions of adolescents, young adults and adult women.

Intersectional strata

Within each cohort stratified by previous mental health issues, we generated 36 intersectional strata by combining three categories of age, three categories of income, two categories of immigrant background and two categories of HC use. Mental health issues can be considered as a valid category of intersectional investigation in a society that considers an able body and mind vital, in other words relating to the power dimension of able-bodiedness.[38 39] Mental health issues were also included in the analysis since they are a strong determinant of antidepressant use that needs to be addressed. We could consider that over and above individual characteristics, mental illness-related stigma may condition inequities in healthcare.[40] As with gender or income, able-bodiedness concerning mental health can therefore be conceptualised as a contextual dimension when defining intersectional strata.

Statistical analysis

We performed an intersectional MAIHDA with individual women at the first level of analysis and the 36 intersectional strata at the second level, stratified by previous mental health issues (see online supplemental material 1–4). The use of antidepressants in the population was thus analysed through two successive multilevel logistic regression models distinguishing between measures of association and measures of variance and discriminatory accuracy.

Model 1

The first model included only an intercept and a random effect for the intersectional strata with no covariates. In this model 1, we first (i) performed a simple analysis of components of variance and calculated the variance partition coefficient (VPC). That is, the share (expressed as a percentage) of the total individual variance in the latent propensity of antidepressant use, that is, at the intersectional strata level. In this simple model, the VPC correspond with the intraclass correlation coefficient which informs on the clustering of antidepressant use within intersectional strata. The VPC values extend from 0% to 100%. Second, (ii) we calculate the stratum-specific absolute usage of antidepressants and their 95% credible intervals (CI) by transformation of the information from the logistic regression to the probability scale. We used this information to map the user heterogeneity across the intersectional strata. Then, (iii) using these stratum-specific predictions, we calculated the Area Under the receiver operator characteristics Curve (AUC). The AUC informs on the accuracy of the intersectional strata information for discriminating those women who used antidepressants from those who did not. The AUC values extend from 0.5 to 1, where 0.5 represents absence of accuracy and 1 represents total accuracy. Both the VPC and the AUC in model 1 can be interpreted as measures of discriminatory accuracy,[41] and inform on the magnitude of the general intersectional effects. The higher the VPC and AUC values, the higher the influence of the intersectional context on individual use of antidepressants. Finally, (iv) we calculated the difference in antidepressant use and 95% CI between similar pairs of strata differing only on the use of HC. This represents the stratum specific association between HC and antidepressant use.

Model 2 or fixed main effects model

This model includes the fixed, main effects of all the intersectional dimensions (ie, age, income, immigrant background and HC use) used to define the intersectional strata. In model 2, we quantified, (i) the association between the intersectional dimensions and use of antidepressants as expressed by OR and 95% CI. We also to calculate (ii) the proportional change in the variance (PCV). The PCV measures the overall proportion of strata variance of model 1 explained by the specific intersectional dimensions. Since model 2 contains all the variables used to construct the intersectional strata as main effects, it should explain all the strata variance (ie, PCV=100%). If this is not the case, the remaining between strata variance would be due to the existence of multiplicative interaction of effects between the intersectional dimensions defining the strata.[22 42]

The AUCs of the models 1 and 2 are expected to be the same because model 2 only decomposes the stratum-specific predicted probabilities obtained in model 1 into fixed and random-effect components and their sum equals the prediction obtained only by random effects in model 1.

We ran the models using MLwiN V.3.00 by calling it from within Stata V.14.1 using the *runmlwin* command.[43] The estimations were performed using Markov chain Monte Carlo (MCMC) methods. All point estimations and their 95% CIs were based on the parameter and random-effect chains obtained from the MCMC estimation. See elsewhere for further information on the statistical MAIHDA analysis including Stata commands,[33 42] and discussion on the theory and methodological approach.[22 44]

Patient and public involvement statement

The research was developed with a grassroot perspective in mind, whereby women's experiences of use of HC inspired and informed the choice of research area and research questions. The anonymised data and scope of the study, including around 1 million women, prohibited direct patent involvement.

Table 1 Characteristics of the 915 954 women aged 12–30 years by previous mental health issues and use of hormonal contraceptives

	Previous mental health issues			
	Yes 12.4 (113 711) Use of HC		No 87.6 (802 243) Use of HC	
	Yes 42.5 (48 302)	No 57.5 (65 409)	Yes 42.0 (337 297)	No 58.0 (464 946)
Antidepressant during follow-up	41.2 (19 886)	39.8 (26 013)	2.7 (9215)	1.9 (8699)
Age				
12–17 years	14.2 (6838)	19.4 (12 698)	16.7 (56 343)	42.1 (195 937)
18–23 years	48.3 (23 347)	31.2 (20 381)	50.1 (168 968)	23.3 (108 939)
24–30 years	37.5 (18 117)	49.4 (32 330)	33.2 (11 986)	34.6 (160 616)
Income level				
Low income	40.4 (19 513)	45.6 (29 803)	31.8 (107 119)	33.1 (154 098)
Medium income	27.1 (13 078)	27.5 (17 954)	25.4 (85 620)	29.5 (137 098)
High income	32.5 (15 711)	27.0 (17 652)	42.9 (144 558)	37.4 (173 750)
Immigrant background				
None	94.6 (45 674)	89.1 (58 264)	94.2 (317 716)	82.6 (383 878)
Yes	5.4 (2628)	10.9 (7145)	5.8 (19 581)	17.4 (81 068)

Values are percentages (number of women in parenthesis).
HC, hormonal contraception.

RESULTS

Characteristics of the population

The selection of the study population is shown in figure 1. Out of the 915 952 women, 12.4% (n=113 711) had previous mental health issues. Mean age was somewhat older for women with previous mental health issues (22.5 years; SD 4.8) than for those without such concerns (20.8 years; SD 5.3). Online supplemental material 5 shows pooled statistics for usage of previous mental health issues and HC use, while online supplemental material 6 displays a frequency table over all included HC. Table 1 displays the baseline characteristics of the population by previous mental health issues and use of HCs.

The share of HC users was very similar in healthy women and those with previous mental health issues, 42.0% and 42.5%, respectively. Antidepressants were dispensed to 2.7% of HC users compared with 1.9% of non-users among healthy women during follow-up. For women with previous mental health issues, 41.2% of HC users and 39.8% of non-users dispensed an antidepressant prescription. The income levels were generally higher among women without mental health issues, and HC users were somewhat more affluent in both cohorts.

Results from the MAIHDA

Table 2 shows the results from the MAIHDA distinguishing between measures of association and measures of variance and discriminatory accuracy.

Model 1 indicates that 8.45% (without mental health issues) and 8.18% (with previous mental health issues) of the total individual variance in the latent propensity of using antidepressant is at the intersectional strata level. These VPCs correspond with AUC values of 0.62 and 0.64, respectively. Both measures suggest the existence of a moderate intersectional effect. The PCV was high in both groups, but especially so in the group with previous mental health issues, meaning the intersectional dimensions or main effects explain more of the interstrata variance for these women. Model 2 shows that HC was associated with increased usage of antidepressants after adjustment for all other intersectional dimensions. This result was seen within both cohorts, but more strongly so in women without previous mental health issues (OR 1.62 compared with 1.19). Finally, the VPC in model 2 was very small (3.02% and 0.49%, respectively) but did not vanish. This finding means that while the intersectional strata effect was mainly due the additive effect of variables defining the strata, a small component due to interaction of effects could also be detected.

Heterogeneity concerning antidepressant use in our cohort

Women with previous mental health issues had a much higher usage of antidepressants than women without such issues, but the association with HC use nonetheless varied across the other intersectional dimensions. Table 3 shows the stratum-specific incidence rates for antidepressant use and 95% CI obtained in model 1.

The highest use of antidepressants were observed in non-immigrant women, aged 24–30, with previous mental health issues, using HC and with low income (50.1%). The lowest usage were found in teenagers without previous mental health issues and no HC use, especially in the strata of immigrant girls from low (0.50%) and middle-income (0.60%) households.

Table 2 Results from the multilevel analysis of individual heterogeneity and discriminatory accuracy (MAIHDA) distinguishing between measures of association (ORs) and measures of variance and discriminatory accuracy.

	Without mental health issues		With mental health issues	
	Model 1	Model 2	Model 1	Model 2
Measures of association				
Age				
12–17 years		Reference		Reference
18–23 years		1.78 (1.36–2.42)		1.57 (1.38–1.76)
24–30 years		2.09 (1.65–2.70)		2.66 (2.36–3.00)
Income				
High income		Reference		Reference
Medium income		1.05 (0.78–1.37)		0.87 (0.77–0.98)
Low income		1.10 (0.81–1.41)		0.87 (0.77–0.98)
Immigrant background				
None		Reference		Reference
Yes		0.63 (0.49–0.79)		0.55 (0.49–0.61)
Hormonal contraception				
No		Reference		Reference
Yes		1.62 (1.34–2.06)		1.19 (1.08–1.31)
Measures of variance and discriminatory accuracy*				
Variance	0.30 (0.18–0.50)	0.10 (0.06–0.18)	0.29 (0.18–0.49)	0.02 (0.01–0.03)
VPC	8.45%	3.02%	8.18%	0.49%
PCV		66.29%		94.48%
AUC	0.62 (0.62–0.62)	0.62 (0.62–0.62)	0.64 (0.64–0.64)	0.64 (0.64–0.64)

The analyses are stratified by the existence of previous mental issues.
Values are point estimations (with 95% credible intervals) or percentages where indicated.
*Between-strata variance.
AUC, area under the curve; PCV, proportional change of the variance; VPC, variance partition coefficient.

Heterogeneity concerning the association between hormonal contraceptive and antidepressant use

Overall, the propensity to use antidepressants was consistently higher in HC users compared with non-users in younger women between 12 and 17 years of age, both without previous mental health issues (0.7–2.4 percentage points), and with a mental health history (5.7–7.8 percentage points) with the magnitude being higher in the latter group. However, the 95% CIs were broad since the number of individuals was relatively small in these latter strata. Table 3 gives detailed information on these associations. In adolescents, the tendency was that an immigrant background lowered the use of antidepressants, while the opposite was true for adult women, where a positive association between HC use and later antidepressant use was mainly found in women with low income and immigrant background, again with higher magnitudes in women with previous mental health issues. The association between HC and antidepressant use was smaller in adult women native to Sweden no matter their income, and completely disappeared in adult women with high income regardless of immigrant background.

DISCUSSION

The main hypothesis of our study was that the previously observed association between HC and antidepressant use, mainly seen in adolescent girls,[6–9 17 45] would be modified by the intersectional context of the women, being more pronounced in more oppressed intersectional contexts. We confirmed that subsequent use of antidepressants after an HC prescription compared with non-users of HC within the same intersectional context was heterogeneous across intersectional strata pairs. As hypothesised, the difference in propensity to use antidepressants was more pronounced in more oppressed intersectional contexts like those composed by immigrant, low-income women with previous mental issues. That is, the use of antidepressants and to some extent the difference in use between HC users and non-users varied mainly depending on previous mental health issues, but the HC-antidepressant association was considerably modified across pair of strata with other characteristics equal but where HC use and non-use differed, in both cohorts. Aside from adolescent girls, low-income and middle-income adult women with immigrant background had a more pronounced

Table 3 Distribution of antidepressant use between different intersectional strata, and difference in usage between user and non-users of hormonal contraceptives but otherwise sharing the same intersectional stratum.

Previous mental health issues	Age (years)	Income level	Immigrant background	Number of women	Use of hormonal contraceptives (%)		
					Yes	No	Yes–no difference
No	12–17	Low	No	28 182	3.7	1.3	**2.4 (1.9, 2.8)**
			Yes	7643	1.2	0.5	**0.7 (0.1, 1.5)**
		Middle	No	75 836	3.0	1.0	**2.0 (1.8, 2.3)**
			Yes	10 110	1.8	0.6	**1.2 (0.5, 2.1)**
		High	No	125 903	2.0	0.9	**1.1 (0.9, 1.2)**
			Yes	4606	2.5	0.8	**1.6 (0.6, 2.8)**
	18–23	Low	No	44 723	3.5	3.0	**0.5 (0.2, 0.9)**
			Yes	11 174	2.3	1.2	**1.1 (0.5, 1.7)**
		Middle	No	72 018	2.8	2.8	0.1 (–0.2, 0.3)
			Yes	8776	2.3	1.2	**1.1 (0.5, 1.8)**
		High	No	136 284	2.3	2.3	0 (–0.2, 0.1)
			Yes	4386	2.0	1.8	**0.2 (–0.6, 0.9)**
	24–30	Low	No	130 127	3.1	3.2	–0.1 (–0.3, 0.1)
			Yes	39 368	2.7	1.4	**1.3 (0.9, 1.7)**
		Middle	No	45 013	3.6	3.0	**0.5 (0.2, 0.9)**
			Yes	10 965	2.7	2.4	0.4 (–0.3, 1.1)
		High	No	43 508	2.4	2.6	–0.2 (–0.5, 0.1)
			Yes	3621	1.9	2.3	–0.3 (–1.3, 0.7)
Yes	12–17	Low	No	3402	30.5	22.7	**7.8 (4.7, 10.8)**
			Yes	434	20.8	13.7	7.1 (–0.3, 15.1)
		Middle	No	6854	31.2	23.4	**7.8 (5.6, 10.1)**
			Yes	569	19.9	14.2	5.7 (–1.2, 13.1)
		High	No	7906	34.2	28.1	**6.1 (3.9, 8.3)**
			Yes	371	30.4	19.8	**10.6 (1.4, 19.9)**
	18–23	Low	No	10 937	39.2	37.8	1.4 (–0.4, 3.2)
			Yes	1127	28.5	19.7	**8.8 (3.4, 14.4)**
		Middle	No	12 915	37.8	36.3	1.5 (–0.2, 3.1)
			Yes	844	27.4	19.7	**7.7 (1.9, 13.7)**
		High	No	17 276	38.3	39.8	–1.5 (–3, 0)
			Yes	629	28.1	25.4	2.8 (–4, 9.4)
	24–30	Low	No	29 333	50.1	49.9	0.2 (–1, 1.4)
			Yes	4083	37.3	32.4	**4.9 (1.5, 8.4)**
		Middle	No	8629	49.7	50.8	–1.1 (–3.4, 1.1)
			Yes	1221	33.5	37.1	–3.6 (–10, 2.6)
		High	No	6686	48.5	48.9	–0.4 (–2.9, 2)
			Yes	495	43.7	37.5	6.3 (–3.2, 15.8)

The values are calculated from the multilevel analysis of individual heterogeneity and discriminatory accuracy (MAIHDA).
Numbers are percentages.
Bold values indicate a statistically significant difference.

difference in propensity for using antidepressants, while adult women without immigrant background had both the lowest antidepressant use and a low grade of modification by HC use.

Independently of previous mental health issues, the propensity for using antidepressants was consistently higher for HC users than for non-users in teenagers aged 12–17, a result aligned with previous studies that has

found a heterogeneous response with regard to both age and other factors.[6 7 17 18 20 45–47] As discussed in a previous paper, this higher risk for adolescents could be due to a *selective discontinuation bias,*[7] a development of the *healthy worker survivor effect,* describing how bias is introduced through a continuous selection where those staying in the workforce are healthier than those who leave.[48] Women who experience a negative influence of HC on psychological health might discontinue treatment in early ages, while those without symptoms continued on HC into adulthood, creating this age-dependent *selective discontinuation bias*. This could explain why the observed association between HC and adverse mental health outcomes are stronger in adolescents. Most Swedish women do however continue their HC treatment with the same method.[49] A previous study found that new users of HC has a higher risk of obtaining antidepressants within the first 6 months of HC use than continuous users.[6] To address this possible bias, we ran two different sensitivity analyses differentiating between women who filed a first prescription of an HC for the first time during the study period (26.2% of HC users) and those that had a repeat prescription. In our cohort, the association between HC use and subsequent antidepressant use was very similar in new and continuous users, but slightly higher among new users, as expected (OR 1.52 and 1.45, respectively, with overlapping 95% CIs). We then excluded all women with HC use any time during 5 years before baseline, thus including using only new users of HC during baseline and never-users as reference group (n=532 543) and reran the analysis. The association between HC use and subsequent antidepressant use became somewhat stronger in women without mental health issues (OR 1.86) and the VPC also increased. The pattern of antidepressant use in the intersectional strata stayed the same, but the CIs increased since the number of women included was smaller, see online supplemental material 7.

As expected, among adult women the overall propensity for using antidepressants was higher, as it is known that antidepressant use increases by age,[50 51] and the difference between HC users and non-users was smaller. Women native to Sweden had a higher propensity for using antidepressants, but this was moderated by HC exposure to a lower extent than for immigrant women. In adult women native to Sweden, HC use gave no increase of antidepressant use among those with high income. The lower utilisation of antidepressants does not necessarily mean that immigrant women are healthier, since earlier studies have found immigrants utilise healthcare to a lesser extent, even though the need is pronounced, with reasons including discrimination.[52 53] A recent study found that adjustement for healthcare access eliminated the association between HC initiation and subsequent antidepressant use in a US population.[54] Although the healthcare system is different in Sweden and visits to midwifes for contraceptive purposes free, we conducted a sensitivity analysis including only women who had accessed healthcare within the last 3 years to adress this. Using only care-accessors as the reference group did not change our results in any substansive way, see online supplemental material 8.

Intersectional considerations

The big difference in antidepressant consumption depending on HC use for lower income immigrant women could be interpreted as the intersectional contexts embodied by these women are more susceptible to the potential detrimental effect of HC on mood. The interrelating negative consequences of low income as a proxy for class or social position, gender and xenophobia may accumulate over the life course and lead to a higher vulnerability to exposures that predispose for antidepressant use later in life,[55–57] whereas this diverse vulnerability to HC exposure might not be visible in teenagers. Social experiences can vary depending on, for example, social position, which in turn impact psychological development, mood and cognition, thus influencing health.[58 59] In understanding how HC can impact women's mental health differently, both possible individual biological predispositions and social settings need to be investigated, since the emotional response to HC is influenced by context.[32] In other words, the interlocking power axes that create oppression could predispose women already under structural burdens for adverse mental health reactions when using HC. The fact that adult women native to Sweden were almost unaffected by HC use, could strengthen this suggestion. Without the intersectional strata, this disparity would not have been so easily identified and visualised.

Focusing on women whose lives are affected by several interlocking power dimensions such as low social position and xenophobia is fundamental to achieving reproductive justice.[30] Nonetheless, our intersectional strata should not be considered static categories of inherently 'risky identities' but must be interpreted as context-specific vulnerabilities of women within certain interlocking positions, constituted in relation to power dynamics created by unequal schemes such as the economic system.[25 29] It is likely that in other contexts, other groups could be more vulnerable. It is also important to remember that the purpose of HC most commonly is protection against unwanted pregnancy, a situation that if it arises in itself can have negative mental health effects. In identifying the underlying power systems creating these intersectional categories and acknowledging their constant movement and changing dynamics on a societal level, it furthermore becomes possible to address these inequalities through social change.

In this study, we have combined a classical epidemiological approach of exposure to HC and an intersectional MAHIDA to create a novel understanding of how intersecting power dynamics could create particular vulnerabilities to this specific exposure. Because of our study design, where women are followed for 1 year after a dispensed prescription of HC, it is more theoretically coherent to view use of HC as an exposure rather than

a component of the intersectional strata. However, it is possible to within our approach view HC use as a socio-contextual factor that captures certain living conditions (eg, more likely to be sexually active or in a heterosexual relationship), which somewhat changes the interpretation of the results. This epistemological tension is not necessarily a limitation, but could enrich the dialogue in social epidemiology on whether it is possible to separate contextual factors from 'pure' exposure.[60–62]

Limitations

The findings from this study must be interpreted in the context of its limitations. The SPDR has highly reliable data on dispensed prescriptions but cannot measure the actual use of dispensed medications. Whether the women was exposed to HC treatment during her entire follow-up is thus not possible to determine with our method, although previous Swedish data suggest continuation rates for any HC after 6 months are almost 90%.[47] Our methodology does furthermore not allow for differentiation between new users and continuous users of HC. Previous studies has shown an increased risk for depression in new users,[6] which could mean we underestimate the associations when also including continuous users. Nevertheless, a sensitivity analysis (see online supplemental material 7) showed that the pattern of antidepressant use and heterogeneity between groups that the MAIHDA shows remain the same when including only new users. Combining MAIHDA with a survival analysis would possibly address this issue better and could be considered in the future. Use of antidepressants can be considered a proxy for depression, but antidepressants are also prescribed for other reasons than depression, including generalised anxiety disorder, obsessive–compulsive disorder and panic disorder.[63] Therefore, it is not a perfect proxy of depression but may be a more general indication of impaired mental health.[64] However, out of all women with potentially unfavourable mental health effects from HC, only a subset would have symptoms severe enough to get an antidepressant prescription, leading instead to many missed cases. Since the outcome is rather common, the risk of underestimation is further enhanced and the true risk of adverse mental health effects could be higher.

As in any observational study, ours only allows for measurements of associations and cannot determine causation. Furthermore, apparently strong average associations do not necessarily convey a high discriminatory accuracy (see elsewhere for a short review and discussion).[65] Nevertheless, since our analysis yielded a moderate accuracy (ie, AUC=0.6), the intersectional strata do matter for the propensity to use antidepressants. A consideration in every quantitative intersectional study is the basis for creating intersectional categories, since comprehensive information on background and lived experiences are lacking and the categories are created based on available but crude proxies such as income level. For example, in our study, the group of women with immigrant background was very heterogeneous, so we cannot exclude that the increased antidepressant use is located on more specific country of birth categories. There is an ongoing debate whether these crude categorisations are feasible, and extra caution should be taken when investigating emerging intersectional categories rather than established ones.[66]

Conclusion

It is important to recognise intersectional perspectives and interacting axes of oppression to tailor better public health interventions, as well as acknowledging the experiences of oppressed women to reach reproductive and social justice.[29 67] Our intersectional MAIHDA methodology operationalises this idea by providing information on the discriminatory accuracy of the contexts that define the intersectional strata. It highlights the need to consider disadvantages consisting of several interlocking structural dimensions such as income/class, age and immigration to better understand how HC might predispose certain women, mainly teenagers and low-income women with immigrant background, for depression. These vulnerabilities are based in inequalities that are not static, but structurally created and therefore possible to redeem.

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data safety committees. The National Board of Health and Welfare is a government agency under the Ministry of Health and Social Affairs. It is not their policy to provide individual level data to researchers abroad. Instead, they normally advise researchers in other countries to cooperate with Swedish colleagues, to whom they can provide data according to standard legal provisions and procedures. Requests for access to the data can be made to the National Board of Health and Welfare and Statistics Sweden (http://www.socialstyrelsen.se/statistics; https://www.scb.se/en/services/guidance-for-researchers-and-universities/).

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Paper III

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Invisible, Responsible Women in Sweden – Planning Pregnancies, Choosing Contraceptives

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ABSTRACT

In this study I explore discourses of contraception and reproduction, which are drawn upon and reproduced in Swedish official online sources on contraceptive advice, through the theoretical frameworks of biomedicalization and reproductive justice. The analysis yielded three interwoven themes: 1) women in need of contraceptives have to balance discourses of exogenous hormones as both an "unnatural" threat to their bodies and as desirable, effective regulators of the same "naturally unruly" body; 2) in search of a "perfect contraceptive fit", it is the woman who needs to accommodate to available methods, rather than the other way around; 3) women are made discursively invisible, while simultaneously being constructed as individually responsible for reproduction. Underpinning all these themes is the discourse of rational, responsible choices, of exerting agency by choosing the right contraceptive. In the era of biomedicalization, finding a "contraceptive fit" becomes a moral and gendered health practice demanding thorough self-surveillance. The rational woman, exercising control over her reproduction and body, by planning her pregnancy with safe contraceptives, emerges as the only possible position. Recognizing that women's and fertile person's reproductive choices are made amid a societal context, with differing personal resources and experiences, would bring us even closer to reproductive justice.

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> Remember: There is always a protection against pregnancy that suits you. Even if you tried one or several methods that you weren't comfortable with, don't give up.
> Quote from the section on contraceptives at UMO.se, an official public health care website for youth provided by the Regions of Sweden

In the medical community, scientific consensus has long promoted the benefits of hormonal contraception, both for effective pregnancy prevention and treating period-related conditions such as dysmenorrhoea (Sitruk-Ware et al., 2013). The medical discourse on contraceptives is submersed in a feminist progress saga, perhaps best illustrated in this opening speech from the Annual Clinical Meeting of the American College of Obstetricians and Gynecologists in 2014:

> Our imperative, as obstetrician-gynecologists, is to champion the vital importance of contraception and advocate at every level to expand access. The moral imperative extends beyond contraception, family

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> planning, or any particular sphere of feminist engagement. (. . .) Women constitute half of humanity; empower women, and we double our productivity, our intellectual capacity, and hence our ability to preserve and enhance the world we inhabit. (Espey, 2015, p. 196)

Among women using hormonal contraceptives, however, a different narrative is often present. The feminist denunciation of hormonal methods has its roots in the women's health movement of the 1970s, developing the idea that medical institutions were inherently patriarchal and unreceptive to women's needs and wishes. It high-lighted the many unwanted side-effects of high dose oestrogen as well as the partly eugenic motifs and racist trials behind the Pill (Carson, 2018; Tone, 2002). Numerous investigations inspired by qualitative methodologies have found that many women are sceptical about hormonal methods, and also unhappy with what are considered medically less serious side-effects, such as breast tenderness or mood disturbances (Ekstrand et al., 2005, Wiebe, 2012). Methods that enhance a feeling of control during intercourse, such as the diaphragm, are often preferred, although less effective in preventing pregnancy (Alspaugh et al., 2020; Dehlendorf et al., 2015). Many women report that their complaints are not taken seriously by health care representatives (G. Falk et al., 2010). A discrepancy between the medical community, pushing for effective contraceptives without the risk of unplanned pregnancy, and women in need of contraceptives who resist these effective hormonal methods to a higher degree than anticipated, thus becomes visible.

The particular health systems, styles of medical communication, and societal norms of a country or region also affect contraceptive practices. Sweden has a long tradition of liberal sexual politics and promoting gender equality, and is often considered one the most gender-equal countries in the world (Arousell et al., 2017; Ekstrand, 2008). Contraceptives and informing about them has been legal since 1938, the same year that abortions was conditionally legalized. The contraceptive pill was approved soon after its introduction in 1964 and the hormonal intrauterine device (IUD) in 1966. Active encouragement of fathers' participation in child care as well as prenatal care has been part of Sweden's gender equality agenda for decades (Jungmarker et al., 2010). Sweden's paid parental leave policy wants to "encourage both parents' caregiving responsibility and close relationship to the infant, and to encourage dual breadwinning and stimulate women's participation in the labour market" (Lidbeck et al., 2018). The gender equality discourse is also present in contraceptive counselling, where women's participation in the labour market has been shown to be an ideological motif (Arousell et al., 2017). Despite the active effort of engaging men in reproductive matters, feminist studies have pointed to the gendered labour divide in contraceptive responsibility wherein women are expected to take responsibility for contraception in committed heterosexual relationships (Ekstrand, 2008; Fennell, 2011; Wigginton et al., 2015).

Today, hormonal contraceptives are an integrated part of the lives of women and fertile persons in Sweden. Hormonal methods are completely subsidized by the government for women up until 20 years of age. Sweden is unique in the sense that nurse midwives, rather than physicians, are the main providers of contraceptive counselling and prescriptions (Lindh, 2014). Youth clinics are available in every municipality and provide contraceptive counselling as well as condoms free of charge, up until 23–25 years of age. The combined oral contraceptive pill is the most commonly used contraceptive method for adolescents, while the hormonal intrauterine device (IUD) dominates for women over 29 years (Lindh, 2014; Lindh et al., 2010; Swedish Medical Products Agency, 2014). The latter is a form of long-acting reversible contraceptive (LARC) method, in which the copper spiral and contraceptive implant are also included. These methods are actively advocated for by the medical profession today, particularly for younger women, since they are not user-dependent and thus the most effective in preventing pregnancies (Kopp Kallner et al., 2015; Lindh, 2014). The "morning after pill", or emergency contraceptive, is available over the counter at pharmacies while

condoms and diaphragms can be bought in stores or over the internet. Sterilization is rather uncommon for all genders in Sweden and only allowed after the age of 25.

An explicit goal in Swedish reproductive health care is to limit the number of unwanted pregnancies and, even though it is less clearly articulated in later policy documents, the relatively high number of abortions compared to neighbouring countries (G. Falk, 2010; Lindh, 2014; National Board of Health and Welfare, 1990; Sedgh et al., 2015). Within the medical community, unplanned pregnancies are framed as risky, since both prenatal conditions and pregnancy outcomes have been shown to be poorer on a population level, and an "increase health promoting planning behaviour" is seen as desirable (Stern et al., 2015). Contraceptive compliance, with good accessibility and communication on contraceptive regimens, is seen as key to this, and a body of work within a risk-taking framework investigating non-use of contraceptives in Swedish adolescents exists (Ekstrand, 2008; G. Falk et al., 2010; Lauszus et al., 2011). UngKAB15, a large national survey from 2015 investigating sexual health in 7,775 young Swedish persons aged 16–29, found that most young people primarily used the Internet and official sites from public health care, such as 1177.se and UMO.se, as a source for information regarding sexuality and contraception (Public Health Agency of Sweden, 2017).

The above-mentioned tension between the medical community wanting women to use effective contraceptives and scepticism among the intended users, becomes extra poignant in Sweden because of excellent availability of contraceptives. How well-read official health sources communicate about contraceptives thus becomes interesting in exploring the power relations involved. Against this background, the aim of this article is to explore the broader discourses of contraception and reproduction that are being drawn upon and reproduced in Swedish official health care online sources. How are hormonal contraceptives and non-hormonal alternatives discussed? How is the ideal contemporary contraceptive user constructed? How and where are trust and responsibility allocated and what power relations are involved in contraceptive communications?

The article is organized as follows. First, after having introduced the Swedish contraceptive and reproductive health context, the concept of biomedicalization and a gendered health imperative will be presented, followed by two central analytical devices framing the analysis: the neoliberal, post-feminist disciplinary subject and the notion of reproductive justice. Then follow a presentation of the material and methodology, a thematized discourse analysis of the texts, and a concluding discussion.

Theoretical Reflections

Biomedicalization and Post-Feminism

The process of medicalization, extending medical authority into fields previously outside its scope, began at the turn of the last century. During the past decades, this process has intensified and been reinforced through new technoscientific innovations and an ever-growing biomedical sector to what some scholars conceptualize as biomedicalization (Clarke et al., 2003). Where the concept of medicalization describes how medical authority is used as a rationale for control over biomedical phenomena and people (Zola, 1972), biomedicalization extends to transformation of these same phenomena. This process is tightly associated with economic growth of the biomedical sector, technoscientific advances such as home diagnosing and health monitoring tools (for example, fertility apps and early pregnancy testing) and alterations in production and distribution of biomedical knowledge, as well as a focus on health and technoscientific transformations of bodies and identities (Clarke et al., 2003).

In a biomedicalized society, health itself has become increasingly central. That is, how to maintain and minimize threats to health, rather than just managing and treating illnesses and diseases, is of increasing concern not only for the medical professions and the biomedical industry, but for every individual. Being and staying "healthy" has been transformed into a moral incentive.

This health prerogative requires two things: constant attention to risk within a discourse of prevention and risk factors, and self-surveillance through new knowledges and technologies, creating novel medicalized identities and forms of internalized self-governance (Clarke et al., 2003; Rabinow, 2005).

Biomedicalization and the transformation of health are not gender-neutral processes. Moore (2010) discusses how self-surveillance and body-consciousness are traditionally female attributes based on a notion of the (female) body as uncontrollable and in need of refining, rendering the healthy body a distinctly female project. Women are constructed as responsible for not only their own unruly bodies but for the whole family's health, and found guilty when ill health strikes. Preventative and risk assessment services are mainly marketed towards women, as a way of "taking control" of one's health (Kelly, 2008). Health is therefore increasingly a gendered project, and in "doing health" today, we are, a number of scholars argue, also "doing gender" (Moore, 2010). It has also been claimed that femininity itself has become more of a bodily property, mainly within a post-feminist logic (Gill, 2007). Post-feminism can be described as a standpoint emerging in popular media in the 90s, that takes feminist conquests for granted, assuming women and men have equal opportunities in every aspect of life, and hence, all differences are individual and freely chosen (McRobbie, 2008). Gill (2007) builds on Foucauldian ideas of surveillance and defines post-feminism as:

> a distinct sensibility [that] include the notion that femininity is a bodily property; the shift from objectification to subjectification; an emphasis upon self-surveillance, monitoring and self-discipline; a focus on individualism, choice and empowerment; the dominance of a makeover paradigm; and a resurgence of ideas about natural sexual difference." (p 147)

The post-feminist sensibility has the self-discipline and surveillance in common with the biomedicalization process, but is distinctly gendered in how this effort and emotional labour is poured into achieving a position as a desirable heterosexual subject. Post-feminism is also closely related to a neoliberal logic, where all practices are presumed to be made by free choices in a free market (Brown, 2005), "no longer constrained by inequalities or power imbalances whatsoever" (Gill, 2007, p. 152), and thus rendering critique at a structural, political level nearly impossible. A fundamental theoretical frame of this article is the parallel and intertwined processes of biomedicalization and post-feminism, that set the stage for the ideal neoliberal disciplinary subject: the liberated woman in constant need of self-discipline, self-surveillance and internalized objectification.

Gendered Hormones and Birth Control

How hormones, more specifically the "female hormones" of oestrogen and progesterone, are imbued with meaning is central to understanding discourses around hormonal contraceptives. Although the biological reality is complex and all "sex hormones" impact many different organs in the bodies of animals of all sexes, these hormones have been described as simple chemical messengers of femininity and masculinity, ever since their discovery at the beginning of the twentieth century. Oudshoorn describes how the hormonal model has developed:

> ...into one of the dominant modes of thinking about the biological roots of sex differences. Many types of behavior, roles, functions and characteristics considered as typically male or female in western culture have been ascribed to hormones. In this process, the female body, but not the male body, has become increasingly portrayed as a body completely controlled by hormones. (Oudshoorn, 1994, p. 8)

Irni (2013) develops the concept of how hormones, besides chemical effects, have a unique cultural power and affect us through a material-discursive interplay that also that has real effect on bodies. She argues that a feminist approach to sex hormones should not be reduced to a critique of the medicalization of women's bodies through hormonal products, but should take "account for the context-specific power relations within which many of the existing 'hormonal changes' come to materialize" (Irni, 2013, p. 53). Using a framework of bio/medicalization solely as a critique of

medicine is not only reductionist but can hide the fact that modern medicine alleviates suffering and has very real positive consequences for human lives (Purdy, 2001). However, it is still crucial to examine how biomedical expansion is legitimized or denied, in particular when such efforts construct both individuals and their behaviours as risky or abnormal (Pickersgill, 2009).

Previous studies have found that medical texts on birth control "universalize and essentialize women based on their ability to reproduce" while ignoring heterogeneity of women's experiences (Carson, 2018). To understand contraceptive advice and the practices that are encouraged, it is thus necessary to move away from a dichotomous view of bio/medicalization as good or bad, while at the same time examining how suitable non/reproduction is constituted through biomedicalization. In their research on discourses surrounding extended cycle-birth control Kissling (2013) and Gunson (2016) both discuss how the use of "nature" or naturalness works within a neoliberal logic to make non-menstruation the desirable choice, which also happens to align with a controlled, neoliberal subject who's body is docile and permits constant productivity. Gunson argues that "The natural has the effect of obscuring the ways in which reproduction is politicized and oversimplifying the complexities of material bodily functions" (2016, p. 316), meaning "nature" cannot be treated as a singular entity with morals of itself, but the interplay between social spheres, bodies, medical science and the environment needs to be acknowledged.

I use reproductive justice as a point of departure in my analysis. Reproductive justice is a theoretical framework based in community activism that centres oppressed women's experiences to recognize that societal context and differing resources available shape reproductive health for individuals (Ross & Solinger, 2017). The notion of "reproductive choices" has been challenged within this framework since these choices are only presented within a very narrow neoliberal frame, where access to contraceptives as well as abortion, a safe environment to raise children, and who is considered a respectable mother, are conditioned based on intersecting social inequalities (Price, 2011; Wilk, 2020). For example, a disparate prescribing pattern of HC has been observed in which women of colour or low income are disproportionately frequently prescribed LARCs (Dehlendorf et al., 2010), which could be interpreted within a reproductive justice framework as these women being considered "unfit" mothers (Ross & Solinger, 2017). The reproductive justice movement thereby recognizes that reproductive choices, such as contraceptive use, are made within a frame of possibilities that differ for each fertile person, based on embodied experiences stemming from intersectional locations, rather than positioning those in need of contraceptives as purely rational agents making choices in an unconstrained market.

Methodology and Methods

My aim in the selection of these texts is to grasp and explore the broader discourses of contraception and reproduction that are being drawn upon and reproduced in official online sources. To do this, I am inspired by the tradition of critical discourse analysis (Fairclough, 2013). Discourse analysis is based on the concept that language is a form of social practice, and that analysing texts can reveal sociocultural functions. Discourses organize our views of the world and social interactions. Critical discourse analysis furthermore acknowledges that discursive events work ideologically and contribute to relations of dominance (Fairclough, 2013). Dominant discourses form taken-for-granted truths and can justify the elimination of particular ideas, behaviours and individuals, while sanctioning others (Cheek, 2004). By normalizing certain ways of speaking about a subject, of acting and being in the world, discourses become powerful. A critical discourse analysis also entails exploring what, or whom, is not spoken about or is missing from the specific discourse. My purpose in taking this critical approach is to make visible that which is taken for granted: more precisely here, discourses of reproduction and contraception.

Official internet information sources concerning contraceptives, directed at the general population in Sweden, was analysed. The two official public health care websites provided by the Regions of Sweden (administrative and geographical regions consisting of several counties that are partly

self-governing and economically responsible for health care), one directed at youth (https://UMO.se) and the other at adults (https://1177.se), were examined. The website 1177.se is a combined information resource with texts on diverse health care topics written and fact-checked by health care personnel, as well as an administrative site for citizens to carry out health care errands. UMO.se was launched as a "digital youth centre". Its description reads "UMO is a webpage for everyone between 13 and 25. At UMO.se you can get knowledge about the body, sex, relationships, mental health, alcohol and drugs, self-worth and a lot more" (UMO.se). In addition to those, the website of the largest non-profit organization for reproductive health and rights in Sweden, RFSU (ad verbatim "The national organization for sexual enlightenment") was analysed (https://RFSU.se).

All websites have a similar structure in their information on contraceptives, that can be found under the tabs "sex"/"sexual health"/"sex and relationships" at UMO, 1177 and RFSU respectively, with a first page that briefly describes contraceptive methods and links to and/or a side menu with specific methods. All three websites have specific pages for all available methods in Sweden, which are: condom, emergency contraceptive pill, combined contraceptive pill, progesterone-only pill (low-dose, called mini-pill and medium dose called middle-pill in Swedish), the contraceptive ring, implant, injection and patch, hormonal IUD, copper IUD, diaphragm, contraceptive apps/computers and safe periods, withdrawal method and sterilization. The pages were constructed in a similar fashion with an introductory paragraph, explanation of the mechanism of action, instruction for usage, average cost, pregnancy protection efficacy and finally advantages and disadvantages/side-effects (this last section was named "when is this contraceptive suitable/not suitable" at the 1177 website). All reversible methods were included in the study. Quotes are translated from Swedish to English and I have aimed to stay as close as possible to the original wording to capture the meaning.

For the analysis, I read each text and performed initial rough coding where I made note of words or phrases being used to describe different contraceptive methods and the presumed contraceptive user. Texts were re-read, and codes were categorized into emerging themes, which were then mapped out in greater depth through tracing patterns of ideas and language within and across texts. The data was read multiple times in order to ensure rigour and develop precise categories that captured the relevant constructions present in the texts. Rather than pay attention to the scientific value of medical claims being made in these texts, I focused on what was being communicated or represented, and how this was done.

The Ideal Contraceptive User: Navigating Choice

Three themes emerged from the analysis, each one within its own field of tension of un/natural, im/perfect and un/gendered. The first theme explores exogenous hormones as a norm, however "unnatural" and undesirable. The second theme departs from the concept of a "perfect contraceptive fit" and what it requires. The final theme deepens the discursive investigation to look at what the "gender neutral" language in these contraceptive texts means. The notion of gendered individual choice and agency can be traced throughout the thematization, which is followed up on in the concluding remarks.

Un/Natural—Exogenous Hormones as a Non-Desirable Norm

> A diaphragm is a contraceptive without hormones that is used together with a diaphragm-gel.
> (. . .)
>
> Advantages of a diaphragm:
> A diaphragm that is used correctly provides a good protection against an unwanted pregnancy. A diaphragm is hormone-free. (RFSU)
>
> Vaginal diaphragm
> Advantages:

> Can be used many times. It does not affect the body since it does not contain hormones. Environmentally-friendly. (UMO)
>
> Withdrawal method
> Advantages: It does not affect the body in any way. (UMO)

A contraceptive method being free from hormones was in itself presented as an advantage, as can be seen in the above quotes from the UMO and RFSU websites. The capacity of not "affecting the body" of the user is desirable, and contraceptive hormones are thus constructed as a threat, something exogenous that has the potential to change the body in unwelcome ways. However, this discourse of desirable bodily integrity, or undisturbedness, also underlines what is taken for granted here: that any possible effect is about hormonal influence. A condom or diaphragm, or withdrawing during intercourse, does have obvious and immediate physical impact on bodies and could have lasting effects through allergies or local irritation, but it is not conveyed via hormones and seemingly does not "count". Furthermore, non-hormonal methods and even the hormonal fluctuations of the untampered menstrual cycle were measured against hormonal contraceptives, that thus become the model contraceptive agent:

> When is the diaphragm suitable? The diaphragm is suitable if you don't want or can use a pregnancy protection method containing hormones.
> (1177)
>
> When the IUD is in place it constantly gives off a small dose of hormone that goes into the body. That means the body get an even uptake of hormone. (UMO)

While not containing hormones could be described as an advantage in a contraceptive method, containing hormones was not described as a disadvantage, but as a fact possible to navigate around, or a positive trait:

> The body needs time to get accustomed
> The hormone in the mini-pill affects the body and it often needs a little time to get used to it. You can get discomfort in the beginning that disappears later. This can, for example be breakthrough bleeding, headaches, acne, low mood or decreased libido. (UMO)
>
> Positive effects from the combined pill
> The hormones in the combined pill can make the discomfort of heavy periods, cramping and PMS less. Some kinds of contraceptive pills also have a very good effect on acne. The contraceptive pill reduces the risk of ovarian cancer, uterine cancer and colon cancer. (1177)

In my material exogenous sex hormones in the form of contraceptives are constructed as both a threat to the (female) body and a desirable regulator of the same body. The particular cultural power of hormones becomes relevant in this context (Irni, 2013). Within this tension of danger and desirability, the will to normalize hormonal contraception in a cultural context that understands sex hormones as potent messengers and disruptors, and as signifiers of gender itself, becomes visible.

Hormones as signifiers of anything needs to be understood in context. With the expansion of biomedical sciences, the body as an entity has faded from the discursive view and been exchanged with ever smaller pieces of biological relevance: organs, tissues, cells, hormones, genes and molecules (Braidotti, 1989). This development allows certain biological compounds to take on a meaning well beyond their chemical, context-dependent mechanisms. It becomes possible to detach "hormones" from the body with its ever-changing flow of information and give them new discursive significance. This discursive shift is visible in my material. Hormones, in this case oestrogen and progesterone, are treated as simple, separate entities possible to disconnect from their biological and social web of meaning with certain (wanted or unwanted) effects on the body. Of interest here is that the focus on these "detached" hormones and their potential action on the body helps obscure other possible narratives of contraception such as, for example the social and relational. The

decision to start birth control is not made in a social vacuum, but by real people with emotions and relationships interwoven in an unequal societal fabric.

Contemporary research has shown that women often prefer "natural" contraceptive methods and are sceptical about hormonal methods because they are considered "unnatural" (Alspaugh et al., 2020). In a government-initiated Swedish survey directed at youth, one question regarded the reason young women had not been using hormonal contraceptives in the last 12 months and 25% of respondents answered that they did "not want to use hormonal methods" (Public Health Agency of Sweden, 2017). That the question was posed at all can be seen as an indication of how hormonal methods are desirable and the reason for not using them needs to be questioned.

The un/natural tension can be traced back to the invention of the contraceptive pill and subsequent encyclical *Humanae vitae* by Pope Paul VI in 1968, in which he officially labelled hormonal contraception as artificial and thereby forbidden (Tone, 2002). The "unnaturalness" of hormonal contraceptives, although consisting of hormones present in all human bodies, was thereby used as a way of legitimizing a continued influence on female reproduction by the church. While many feminists championed hormonal contraceptives and access to them evidently changed many lives for the better, a parallel critique of patriarchal medical institutions that disregarded women's experiences of side-effects and general needs also grew, feeding into the "natural is best" narrative (Carson, 2018). Exogenous hormones are clearly not viewed as "natural" in this material, but as something alien that can disturb the body, but that also have desirable properties. Looking at how menstruation was discussed reinforces this narrative. The fact that dysmenorrhoea often subsides and monthly bleedings get lighter or disappear altogether, and that this is possible to control yourself, was mentioned as an advantage in all webpages for all hormonal methods. Gunson (2016) argues that the approval of extended cycle-regimen of the combined pill in 2003 was "a landmark attempt by the pharmaceutical industry to shift dominant public discourses about women's menstruation", towards non-bleeding as both natural and desirable. In the texts analysed here, the shift Gunson describes has successfully occurred and a new discourse is established. Menstrual suppression is not discussed as a medical issue but as a taken for granted option. For the modern woman in a biomedicalized society, menstruation should be an option.

The advantages of hormonal contraceptives for both effective pregnancy prevention, and for alleviating embodied experiences of pain, extensive bleeding, and anaemia, should not go unmentioned in a critical examination of reproduction as a biomedicalized arena (Purdy, 2001). The access to these drugs has given many women increased autonomy and freedom, although not equally distributed across and within societies. However, it's interesting to note that by constructing hormonal contraceptives as the norm and hormones as central to well-being, reproductive control becomes equated with hormonal control. In Gunson's words, hormonal contraceptives have "become an entrenched part of women's embodied landscapes" (2016, p. 321), as they chemically influence hormonal levels while at the same time changing our way of thinking about reproduction, menstruation, autonomy, and control (Roberts, 2002). The dominance and effectiveness of hormonal methods has medicalized reproduction and menstruation to an extent that it is impossible not to relate to them as practical regulators of a potentially "messy" body (Moore, 2010). What is noteworthy is the tension that women in need of contraceptives have to balance: exogenous hormones as both a potential, "unnatural" threat to their bodies and as a desirable, effective regulator of the same "naturally unruly" body.

Im/perfect - The Promise of a Perfect Contraceptive Fit

> Most users have no side-effects from their contraceptives. But if you start using a contraceptive with hormones its common to have minor side-effects during the first time period. That is because the body needs time to adjust. Usually the side-effects disappear within the first three months.
> These are some side-effects you can have: low mood, less sex drive, acne, tender breasts, headaches.

> You could get one or two side-effects, but it's uncommon to get all side-effects at the same time. If you have been using your contraceptive for more than three months and still have side-effects, you should talk to your prescriber. (UMO)

> Side-effects
> All contraceptives that contain hormones affect the body, but since the hormonal IUD gives off such a small amount of hormone, side-effects are uncommon. Some who use the hormonal IUD get acne, low mood or decreased libido. Some get irregular bleeds during the first months. Most side-effects disappear within six months. You can change to another contraceptive if you are suffering from the side-effects. (1177)

> It is also important to consider your medical history when choosing contraception. If, for example, you have had a blood clot or have severe migraines, you should avoid contraception that contain oestrogen. The midwife or doctor who is helping you with contraception will ask you about this. (1177)

Blood clots are a serious and feared side-effect of hormonal contraception and clear medical guidelines exist to minimize the risk (Swedish Medical Products Agency, 2014), which is plainly expressed in the material, as in the above quote from the first page of the website 1177. Other side-effects, more common but less serious, attain less attention. It is stressed that most side-effects are temporary, indicating that they should be tolerated. Mood changes, weight gain, and irregular bleeding are the most common reasons for discontinuing hormonal contraceptive methods (Lindh, 2011; Rosenberg & Waugh, 1998; Sanders et al., 2001; Simmons et al., 2019). By down-playing or not acknowledging embodied experiences that do not constitute medical emergencies, such as irregular bleeding or low mood, these experiences are regarded as irrelevant. Even if side-effects are down-played, women are not expected to tolerate them for too long and are encouraged to seek out help if they have side-effects that last more than three months (or six months for the hormonal IUD, which has the lowest occurrence of pregnancies and is therefore encouraged as a first-hand choice (Kopp Kallner et al., 2015; Lindh, 2014)).

The word "safety" occurred frequently in the material, but only in relation to pregnancy prevention, and never when discussing side-effects. The following quote is from the introductory page at UMO.se.

> How you protect yourself against pregnancy
> Before you start having intercourse, it's important that you get a protection against pregnancy if you don't want children. The responsibility for pregnancy protection lies both on you who can get pregnant and on you who can get someone pregnant. Protection against pregnancy is also called contraceptive agents or birth control methods. There are birth control methods where the risk of becoming pregnant is small or very small if used in the correct way.
>
> The very safest is:
> Hormonal IUD, copper IUD, implant
>
> Other safe protections against pregnancy:
> The pill, the ring and patch, the low dose and medium dose pill, the shot, condom, femidom*
>
> There are also methods that are less safe and the risk of getting pregnant is bigger. Especially if you are young and have an irregular cycle.
>
> Unsafe methods:
> Safe periods and birth control apps, withdrawal method, diaphragm
>
> Which protection you should use
> Which protection you should choose is affected by different things, for example if you have any diseases, which protection you like best, and how you are as a person. Maybe you should have another protection than the pill if you have a hard time remembering to take a pill every day. A midwife or a doctor at the youth clinic can help you find the protection that is most suitable for you.

I have directly translated what was written in the original text, but the naming of different hormonal methods for a general audience differs in Swedish and English. The combined contraceptive pill containing both oestrogen and progesterone is usually just called "the pill" in English, and "p-piller" (P as in preventive) in Swedish. The low-dose and medium dose progesterone pills are called "mini-piller" and "mellan-piller" (literally "mini-pill" and "medium-pill", without specifying hormonal content). The contraceptive injection is known by its brand name Depo-Provera in English, but is just referred to as "p-spruta" (p-shot) in the text. In this quote taken from the introductory page it's therefore not possible for the reader to discern the hormonal content of the methods, but that is specified in the specific pages for each method, which are reached by following the links.

The aim here is clearly to give medically-relevant information in an accessible way. A contraceptive method's effectiveness in preventing pregnancy is undoubtably of great importance, with real-life implications. Acknowledging that does not, however, make the context and the way this information is communicated irrelevant (Purdy, 2001). Although a contraceptive's ability to prevent pregnancy is important, it is neither the only relevant safety measure since serious side-effects with impact on health or even life do occur, nor the only factor of relevance to women using it. Contraceptive methods that enhance women's sense of immediate control, such as the diaphragm or pills, are often preferred even though they are less efficient in preventing pregnancies (Alspaugh et al., 2020; Dehlendorf et al., 2015). Possible, serious side-effects of hormonal methods, such as cancer or infertility, are rare and often exaggerated in women's own narratives compared to a scientific consensus (Alspaugh et al., 2020). Providing the dominance of the medical consensus and interest in keeping unplanned pregnancies low, the rationale for down-playing side-effects and focusing on safety as pregnancy prevention becomes clear. Using "safety" in this way, together with the common phrase "protection against pregnancy", as well as directly addressing pregnancy as a risk, frame the unplanned pregnancy as a threat within these texts. Safety is thereby constructed as protection against not just any pregnancy, but against the unplanned pregnancy. Youth is pointed out as an especially risky period for unwanted pregnancies, and the desirable pregnancy is thus constructed as only occurring later in life.

> The withdrawal method can be suitable if you are planning to become pregnant, soon and it doesn't matter if it happens earlier than planned.
> (1177)

The planned, adult pregnancy is the goal and the only rationale for using a contraceptive method less apt for preventing pregnancy is if a planned pregnancy is already imminent, as stated in the above quote.

> How do I use the pill? (. . .)
> You take a pill at the same time every day for at least three weeks. You can decide yourself which time during the day you want to take your pills. It can be a good idea to take them in conjunction with another recurring activity, such as brushing your teeth or eating breakfast. Whatever time you choose, it's good to set an alarm in the beginning. This decreases the risk of you forgetting your pills. There are also "pill-apps" for download on your phone.
>
> Do this if you don't want to have a period
> You can get rid of your period completely or just postpone the time when you get it by eating pill charts together.
> Start on a new chart right after the last hormone-pill on the chart. If you have a chart with sugar-pills this means that you leave those and start on a new chart. When you do that you get no period.
> To make postponing your period work as well as possible it's good to first eat your pills according to the chart for two months. That way you're reducing the risk of break through bleeding. It's common to have break-through bleedings if you try to postpone your period by eating pill charts together when you just started on the pill.
>
> If you have a breakthrough bleed
> Most who postpone their period bleed after a while. Pause for four days if you bleed. (1177)

This short section from the page on 1177.se on the combined pill is filled with the seemingly contradictory discourses of choice and rigid regulation. The second person language of "you can

decide" and "you choose" is intermingled with rather complicated instructions for how these choices are best carried out. It appears as though it's possible to choose when or if a period bleed should take place, when in fact it requires thorough self-surveillance and discipline, and even then there's no guarantee the body will react as planned. An interesting fact is that even though menstruation was mainly framed as inconvenient and unnecessary, the possibility that some contraceptive users would want to have a period was also acknowledged. Thereby not only timing of, but the very existence of, menstruation is also located within the discourse of individual choice. Again, while acknowledging the potential for alleviating suffering that period suppression can have, it has also been argued that menstrual suppression is a way of creating docile, productive individuals that contribute to the neoliberal economy without the nuisance of monthly bleeding or hormonal fluctuations (Kissling, 2013; Wilk, 2020).

Wigginton et al. (2015) discusses in their study of Australian women using hormonal contraceptives how contraceptive practices have been feminized and women position themselves as responsible not only for preventing pregnancy but also for finding the perfect contraceptive to do so. The reader is not explicitly referred to as a woman in my material. The fact that the text is written in second person, paired with how all contraceptive methods except the condom and withdrawal are to be used by someone with a female reproductive system, most commonly a woman, still implicates this female responsibility.

> Remember: There is always a protection against pregnancy that suits you. Even if you tried one or several methods that you weren't comfortable with, don't give up.
> To use a protection against pregnancy does not mean that you are protected against STDs. To protect yourself against both pregnancy and STDs, use a condom. (UMO)

> You might have to do some trial and error, some like a certain method and others prefer another. Since there are many different protections, the prospect of finding something that works is great. (1177)

> To consider if you are using birth control apps and computers:
> The method does not protect against STDs.
> You can never be completely sure when you ovulate, even if you have regular periods.
> The method can lead to pregnancy if you have unprotected intercourse during the fertile period according to the app.
> To keep track of ovulation and count days can be a nuisance and you might not be able to have intercourse right when you want to. (1177)

> The diaphragm is less suitable if you want to be completely spontaneous, since using the diaphragm demands some planning. (1177)

Wigginton et al. (2015) found that women go to lengths to find a "contraceptive fit", no matter how many previous negative experiences or side-effects, another female method could always be considered. To minimize side-effects by surveilling your own body also became the woman's responsibility and was interpreted as an act of agency (Wigginton et al., 2015). In the quotes above, the promise of the "perfect contraceptive fit" is explicitly spelled out. "There is always a protection against pregnancy that suits you" indicates that the choices are both endless and possible to individualize. The urging "don't give up" further enhances the feeling that it's the individual woman's responsibility to find a contraceptive that suits her (and her partner). Wigginton et al. (2015) locate their findings of the female responsibility to find a contraceptive fit within a broader discourse of (hetero)sex and heterosexuality, where spontaneity and pleasure during (hetero)sex should be prioritized, but with discordant gender distribution of both responsibility and pleasure. That contraceptives ideally should not interfere with "natural" (hetero)sex becomes visible in this material when drawbacks with diaphragms and birth control apps are presented as being less spontaneous. It has been argued that inscribed in menstruation from the start is the responsibility of reproduction and possible motherhood, whereas male sexual maturity is marked by representations of future pleasure such as ejaculation (Grosz, 1994). In these texts, pleasure is only mentioned as a possible absence, lower sexual desire as a side-effect of hormonal

methods. What is excluded can be just as important as what is included. By never addressing the driving force for sexual encounters but solely focusing on the obligation of pregnancy prevention, women are again created as rational and responsible for reproduction, exercising agency purely through responsible contraceptive choices.

Although contraception is subsidized and generally accessible in Sweden, not all women have the same possibility to prioritize or access health care, particularly in a contemporary setting of downsizing public health care, an issue voiced within the reproductive justice-movement (Ross & Solinger, 2017). In my material, it is stressed that women should contact their prescriber themselves in case of dissatisfaction with their contraceptive. Follow-up visits are generally not scheduled in this type of care in Sweden. The (hormonal) contraceptive user is thereby constructed as rational, resourceful, and responsible in her quest for the perfect contraceptive fit.

The promise of the perfect contraceptive fit thus includes no side-effects, perfect protection against unwanted pregnancy and being able to be spontaneous during (hetero)sex. However, the reality of contraceptive choices is imperfect. The underlying gendered health prerogative becomes visible when women need to take responsibility for pregnancy prevention, minimizing side-effects and tracking their cycles, requiring constant planning, self-surveillance and self-discipline. It becomes obvious that it's the woman who need to accommodate to available methods, whether it's by "letting the body adjust" for six months, trying another female-controlled method, or being content with some "minor" side-effects, rather than the other way around. A critical reading of the contraceptive discourse shows that "the problem" is not constructed as the available birth control methods, but the unruly female body.

Un/Gendered—Inclusive Language or Disembodied Discourse?

> This is how you use the vaginal ring
> You place the ring in your vagina, in a similar way that a tampon is inserted. You can't feel the ring when it is in place, not during intercourse either. It gives off hormones all the time that goes directly into the body. That means the body gets an even uptake of hormones compared to the pill, when you take one pill a day.
> (. . .)
> The ring causes you to not ovulate. It also affects the secretion in the cervix so it becomes sticky and thick. That makes it hard for sperm to enter the uterus. The ring also makes uterine lining thin so that it can't receive a fertilized ovum. (UMO.se)

> This is how birth control apps and computers work
> Some birth control apps and computers use the body temperature you have when you wake up. You measure your temperature yourself and fill in the results in the app or computer. To be able to measure the temperate in this way you need a thermometer with two decimals. A regular thermometer does not work. (1177.se)

> Withdrawal method* is a way of protecting against pregnancy that means you interrupt the intercourse. That is, the penis is withdrawn from the vagina before ejaculation. (UMO.se)

> Drawbacks with withdrawal method
> The method has several uncertain elements. It's of importance that the penis-carrier reacts in the right moment before ejaculation to be able to interrupt in time. (RFSU.se)

> **In Swedish, the term used is "interrupted intercourse" (avbrutet samlag), a name that in itself points to a male-oriented norm where intercourse culminate with male ejaculation.*

At 1177.se and its sister-website UMO.se, the words "woman/women" is never mentioned, neither is "man/men", but gendered body parts and fluids, such as uterus, vagina, ovum, cervical mucus, penis and sperm are often referred to. RFSU.se interchangeably uses a passive language and the informal second person address of the other websites, but also refers to "women" in a few of their texts of hormonal methods and to "penis-carriers" in the withdrawal method. The language choices at 1177.se and UMO.se need to be understood in context. Removing men and women from

all texts on these websites (not only those regarding contraceptives) was a conscious decision. In a document titled "Woman—avoid" at 1177.se, the following rationale is given:

> We do not write the words woman, man, boy or girl where it's not necessary.
> We avoid the words in our texts for several reasons:
>
> - We use the informal form of "you" (du) in all our texts. It is a direct way of addressing the reader that makes them feel included. Using "you" is practical in all circumstances where the gender is unknown, or doesn't matter. (. . .)
> - In health care it's important to be correct about facts and anatomy. We can use the illness endometriosis as an example. It does not foremost depend on you being anatomically a woman, but that hormones makes tissue grow outside the uterus. (. . .)
> - Everyone does not identify as a man or a woman. By avoiding those words in the texts and instead using the informal form of "you", we include more people. It is of extra importance since transgender people have worse health than the average person, according to studies. Our language directives partly emanates from the discrimination act (Diskrimineringslagen).

The aim is thereby clearly to be informal, inclusive, and transgender friendly by using a second-person address and removing certain words referring to the sex of an individual, in an important and societally-relevant effort to present an inclusive democratic agenda. The question still remains, though, as to what happens in that process, and what is communicated when explicitly gendered language is removed, and only body parts and hormones remain. To focus on organs, tissues and hormones rather than the body as a whole has been the general direction in medicine for decades, as the development within biomedical sciences has allowed for ever more detailed analysis. This has also meant that the body as such is no longer a discursive phenomenon that needs to be addressed (Braidotti, 1989). This is true of reproductive narratives as well. In their investigation of modern reproductive narratives in Norway, Lie et al. (2011) found that rather than talking about men and women, reproduction was framed through a biological lens, focusing on the cell level.

> We observe how, in contemporary stories of conception, sperm and egg cells have increasingly become the entities that occupy center stage, even more so than the actual gendered persons themselves. This is a process whereby, on the one hand, egg and sperm cells may take on the meaning of women and men or, on the other hand, displace the association with the bodies from which they originate. (Lie et al., 2011, p. 231)

They reach the conclusion that the disassociation of biological processes from actual individuals bears the potential to both overthrow and enforce gender roles; the former by making room for new interpretations of reproductive realities and the latter by attributing egg and sperm cells the same gendered qualities as men and women, establishing them as a biological facts. Traces of this discourse are visible in my material, as in the above on the vaginal ring from UMO.se quote where sperm seem to have a will to entering the uterus, which the ring prohibits.

However, the main discursive shift exhibited in these websites happens with the genderless second person address, where responsibility for contraception is reduced to having certain organs: most commonly a uterus, ovaries, and vagina. The social expectations and complex relational interplay that contraceptive practices encompass in real life is diminished to a purely rational, medical choice dictated by body parts. This focus on body parts creates a rather detached, disembodied discourse that also obscures the gendered imbalance in reproductive responsibility, which still lies heavily on women, even if the words are changed (Ekstrand, 2008; Fennell, 2011; Wigginton et al., 2015). The imbalanced responsibility is enhanced by how the "you" in these texts all refer to a person with ovaries, uterus and vagina, except for the texts on condoms and withdrawal method (where it's not always clear whom is addressed, but sometimes it's a person with a penis). The person that can become pregnant is clearly constructed as responsible for preventing this, a gendered divide in contraceptive responsibility previously found to be more pronounced with hormonal methods (Ekstrand, 2008; Fennell, 2011). Drawing on Wigginton et al. (2015) I would argue that the discourses of female reproductive control and responsibility, that becomes visible in this material, risks limiting the discursive space for shared responsibility and excluding the

possibility of using and developing new male contraceptives. The disembodied discourse makes it impossible to address this responsibility imbalance by, for example, explicitly encouraging the involvement of male partners in contraceptive counselling, since uteruses don't have partners. This choice is somewhat surprising, bearing in mind how important men are considered in prenatal care and childcare in Sweden (Jungmarker et al., 2010; Lidbeck et al., 2018). The line for male involvement seems to be drawn at a conceived pregnancy, while the woman or person with a uterus is accountable for everything that happens before.

The second person address, although meant to be informal and accessible, also sometimes lends itself to a disciplinary tone, as in this quote on progesterone only pills at UMO.se: "You have a low risk of pregnancy if you take the pills as you are supposed to". Another issue is that the disembodied discourse is not necessarily gender-neutral or inclusive; for example the assumption that a person in need of a hormonal contraceptive has traditionally female anatomy, periods and hormonal fluctuations, all of which vary along the transgender spectrum. It's not possible to discern, for example, which contraceptives could be used during testosterone treatment, information that could benefit transgender readers.

One could argue that these medical information websites are not the place for addressing power imbalances in society, but that would suggest it's possible to disconnect medicine from society and ignore how biomedicalization functions as a both normative and transformative force (Clarke et al., 2003). Female contraceptive responsibility is still there in the texts despite the word "woman" being removed, only harder to pinpoint and critique. A parallel can be drawn to the post-feminist sensibility of how all choices are made out to be unconstrained by gender inequalities in a free market, rendering critique at a structural level difficult. Making gender invisible can be progressive and transinclusive, but it also comes at the risk of obscuring power imbalances. In other words, the biological narrative has emancipatory potential, but might also enforce gendered responsibilities. The consequences of reproduction are not gender-neutral, but exist in a context of intersecting power dimensions within which gender and gendered expectations are central and have real-life impact (Ross & Solinger, 2017). What happens in these texts is that women are made discursively invisible, while at the same time being constructed as individually responsible for reproduction.

The Invisible, Responsible Woman in Control of Her Reproduction

These informative contraceptive texts are part of a medical infrastructure that facilitates reproductive control and equality. Accessible information is imperative to enable autonomy in contraceptive choices and effective pregnancy prevention, such as that offered, for example by hormonal methods, are fundamental to achieve reproductive justice. Acknowledging the essential right to effective contraceptives and their positive impacts does not mean, however, that the aims and culture within which this field of medicine operates should go unexamined.

The analysis of reproductive discourses in these online texts has yielded three interwoven themes and conclusions: 1) women in need of contraceptives have to balance the discourses of exogenous hormones as both an "unnatural" threat to their bodies and as a desirable, effective regulator of the same "naturally unruly" body; 2) that in search of a "perfect contraceptive fit", it is the woman who needs to accommodate to available methods, rather than the other way around; and 3) women are made discursively invisible, while at the same time being constructed as individually responsible for reproduction.

Underpinning all these themes is the discourse of the rational woman making responsible choices, of exerting agency by choosing the right contraceptive. These texts present contraceptive choices as plentiful and possible to individualize, while emphasizing safety and convenience and down-playing the side-effects of effective, hormonal methods. The interest in well planned, less risky pregnancies, that the medical community and state advocate, can be traced throughout this contraceptive advice.

Finding a "contraceptive fit" is a moral and gendered health practice demanding self-surveillance, but marketed as a form of self-expression (Wigginton et al., 2015). A "suitable" contraceptive suits a women's lifestyle as well as prevents pregnancy. The female body is especially "at risk" within the gendered health prerogative of biomedicalization, for unplanned pregnancy, unwanted bleeding or mood effects, but the risk could be remedied by suitable choices, discipline, and self-surveillance (Moore, 2010). A situation of uncertainty, of doubt regarding whether to become a parent or whether to have sex, becomes discursively impossible, and what is more; forgetfulness, lust and lack of self-discipline that could lead to unplanned pregnancies becomes an individual failure. The most telling example might be birth control apps that require rigorous self-surveillance, but still might "fail" since the (female) body is unpredictable.

The disembodied, rational medical discourse in the material also obscures other, embodied narratives of contraception, such as pain and bleeding, or the "messy" relational driving forces and gendered expectations. Self-discipline and emotional labour in sexual and emotional relationships is expected to a much higher degree from girls and women, as the desirable heterosexual female subject is both available for sex and responsible for preventing any unwanted effects such as pregnancies (Gill, 2007). My material also shows how the ideal is that sex should be spontaneous, but pregnancy planned. The gendered power relations and expectations, both in intimate relationships and as a part of a biomedicalized society, are all concealed when choice of contraceptive becomes a seemingly easy shopping experience for a genderless person. Contradictorily, the rational woman exercising control over her reproduction and body, by planning her pregnancy with safe contraceptives, emerges as the only possible position. That this subject has been described as "white and middle class by default" (Tasker & Negra, 2007) further highlights the narrow repertoire of desired positions.

The goal of providing different contraceptives within a system apt to meet diverse reproductive needs constant effort. Readily available information on contraceptives is one important part, but also recognizing that women's and fertile person's reproductive choices are made amid a societal context, with differing personal resources and embodied experiences, would bring us even closer to reproductive justice.

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Coming of Contraceptive Age

Sofia Zettermark is a medical doctor that studied Medicine at Lund University, and is currently undertaking a residency in General Medicine in Gothenburg. She also has a BA in Gender Studies from Uppsala University, and has been engaged in public debates on feminist and equity issues for more than a decade.

Coming of Contraceptive Age is a thesis that explore the tensions and fractures between a medical discourse and situated, experience-driven knowledges of mental health aspects of hormonal contraceptives.

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