
Factors influencing women's choice of contraception

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Till min älskade moster Esther

Abstract

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Aims: To describe contraceptive use and to identify factors influencing women's use of contraception in order to improve future contraceptive compliance.

Methods: Contraceptive use, reproductive health, weight/height and smoking were assessed by postal questionnaires distributed to random samples of 19-year old women resident in Gothenburg, Sweden, born in 1962, 1972 and 1982. Longitudinal and cross-sectional comparisons were performed between the cohorts from 1981 to 2006.

Results: Combined oral contraceptives (COCs) were the commonest method used ≤ 29 years of age while intrauterine methods were more common later in life. Condom use increased successively over time. Current contraceptive use in 19-year old women from the 82-cohort was higher (78%) and the number of women ≤ 19 yr who had been pregnant was lower whereas repeated abortions were higher compared to the 62- and 72-cohorts. Common reasons for cessation with COC's were mental side effects and weight increase. Smoking decreased over time and BMI increased over time and was higher in low socio-economic status areas in the 82-cohort. At 44 years of age there was a difference in contraceptive use and pregnancies between women who had been pregnant ≤ 19 years of age compared to those who had not been pregnant as teenagers. The only predictor found for weight increase was age resulting in a gain of 0.45 kg/year. COC use was not a predictor of weight increase (0.072 kg/year). Smokers decreased their weight by 1.64 kg per 15 years. Women from the 82-cohort reported a greater severity of dysmenorrhea. The efficacy of COCs to relieve dysmenorrhea was evaluated using a verbal multidimensional scoring (VMS) system and a visual analogue scale (VAS). COC use and increasing age independently of each other reduced dysmenorrhea.

Conclusion: Choice of contraception was strongly related to age and parity. COC use did not influence long-term weight increase. COC use and increasing age, independent of each other reduced dysmenorrhea severity. The prevalence of smoking decreased over time while body mass index (BMI) increased, in particular in lower socioeconomic status areas.

Keywords: Contraception; reproductive health; body mass index; smoking; socioeconomic status; dysmenorrhea; epidemiology; longitudinal; cross-sectional.

List of publications

This thesis is based on the following papers, which will be referred to in the text by their roman numerals

- I. Contraceptive use and pregnancy outcome in three generations of Swedish female teenagers from the same urban population. Lindh I, Blohm F, Andersson-Ellström A, Milsom I. *Contraception* 2009;80:163-169.
- II. A longitudinal study of contraception and pregnancies in the same women followed for a quarter of a century. Lindh I, Andersson Ellström A, Blohm F, Milsom I. *Human Reproduction* 2010;25:1415-1422
- III. The long-term influence of combined oral contraceptives on body weight. Lindh I, Andersson Ellström A, Milsom I. *Human Reproduction* 2011; doi: 10.1093/humrep/der094 [Epub April 19, 2011]
- IV. Are combined oral contraceptives effective in the treatment of dysmenorrhea? Lindh I, Andersson Ellström A, Milsom I. (Submitted 2011).

Abbreviations

BMI	Body mass index
CT	Chlamydia trachomatis
COC	Combined oral contraception
DMPA	Depot-medroxyprogesterone acetate
ECP	Emergency contraceptive pill
IUD	Intrauterine device
IUS	Intrauterine system
LARC	Long acting reversible contraception
LNG-IUS	Levonorgestrel releasing intrauterine system
NSAID	Non-steroidal anti-inflammatory drug
OC	Oral contraceptive
POP	Progestogen-only pill
RCT	Randomised controlled trial
SES	Socio-economic status
STI	Sexually transmitted infections
UN	United Nations
VMS	Verbal multidimensional scoring system
VAS	Visual analogue scale
WHO	World Health Organisation

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Abstract

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Introduction

In order to improve the efficacy of available contraceptive methods it is of importance to identify factors influencing women's choice of contraception and why they start or stop using a certain method. Such knowledge is of utmost importance for the better understanding of contraceptive compliance. The introduction of the "pill" more than fifty years ago provided women for the first time with the ability to control their own fertility and was an important milestone on the road to a more equal and liberal sexuality. Combined oral contraceptives (COCs) became very quickly the most frequently used contraceptive method among young women (Cole et al. 1975; Oddens et al. 1996; Larsson et al. 1997). Following the introduction of the oral contraceptive pill in the 1960's the continued development of contraceptive methods has resulted in the introduction of more long acting methods of contraception and methods utilising much lower doses of hormones which provide equivalent contraceptive efficacy. Women's choice of contraceptive method may be influenced by her perception of the possible physical, psychological or behavioural effects of the method (den Tonkelaar et al. 2001; ESHRE 2005) Contraceptive use is related to many factors, e.g. sexuality, age, parity, accessibility to family planning facilities, social policy, moral, cultural and religious convictions (Wellings 2005; Killick 2005; van Lunsen 2006). Interaction between these factors is complex and it is difficult to evaluate single factors.

Why women/couples don't use a reliable contraceptive method, stop using a contraceptive or are using it incorrectly is an important reason for unplanned and unwanted pregnancies (Swinyard 1980; Guillebaud 1987). The use or non-use of effective contraception is an important responsibility for the woman and her partner as well as for family planning counsellors when counselling on contraception. The United Nations (UN) conference on Population and Development emphasised that

population control is not only concerned with population control but also about ensuring that individual men and women are able to decide when and whether to have children and how many to have and hence in turn ensure their health and wellbeing (The Cairo conference 1994).

Historical background

Historically, there has always been a wish to control fertility. In Sweden there was a law in 1734 that gave capital punishment for performing an abortion. Women died because of illegal abortions and the first female doctor in Sweden, Karolina Widerström (1890), took the initiative to inform on sexual matters for young women in Sweden. In the beginning of the 20th century there were numerous members of the Women's Liberation who fought for women's rights in this issue. One famous male doctor called Hinke Bergegren fought for women's rights and propagated that the condom was the weapon against poverty and his lecture "love without children" was very controversial and he was prosecuted for promoting family planning. This resulted in a new law "lex Hinke" where information about contraception methods was prohibited in Sweden from 1911 to 1938. Another enthusiast and pioneer in sexual education was Elise Ottessen-Jensen, "Ottar", who travelled around in Sweden, informing about family planning and contraceptive methods and propagated for every woman's right to have an abortion. She was the founder of the Swedish Association for Sexual Education (RFSU) in 1933 and her work and ambition was to provide free abortion and sexual education in schools. She fought for women's right to decide over their own body and she argued for "all people despite social class should have access to contraceptives and pleasure" Sexual education in school became compulsory in 1955 (RFSU 2003; Andersson et al. 2003).

She expressed the vision for reproductive health:

"I dream of the day when every child that is born is welcome, when men and women are equal, and sexuality is an expression of intimacy, joy and tenderness"

Subsequent to abortion legislation in 1975, midwives in Sweden were granted permission to perform contraceptive counselling and prescribe contraceptive

methods to healthy women. Contraceptive counselling became more readily available and free of charge and today the vast majority of contraceptive methods are prescribed by midwives.

The desire to control fertility has been equally apparent for centuries in many other countries. The ancient Egyptians mixed a paste of crocodile dung and formed it into a vaginal insert which were called “diaphragms”. In the 1700s Casanova used half a lemon as a vaginal cap to detect syphilis and as birth control measure. The first condoms were made of linen and the gut from sheep and in the 19th century they were made of rubber. The great developments within the contraception area were the introduction of the plastic intrauterine device introduced during the 1950s, followed by the copper intrauterine device. Pincus developed the first oral contraceptive pill (*Enovid*) approved in United States in May 1960 and introduced in Sweden 1964 (Odlind et al. 2003).

The introduction of the first oral contraceptive made social commentators wonder if easy access to the “Pill” would make sex more casual and liberal. The gonorrhoea epidemic reached its highest level in the city of Gothenburg in 1970 and then decreased after massive and successful campaigns from public medical services and widespread national campaigns. After the reduction in gonorrhoea the incidence of *Chlamydia trachomatis* (CT) infections successively increased and in 1987 it was at a very high level. Large national campaigns about the protective effect of condoms against sexually transmitted infections (STI) and human immunodeficiency virus (HIV) in particular reduced the number of CT infections between 1989 and 1994. Unfortunately this trend was broken and a large increase has been reported again since 1995 (Stenqvist et al. 2002).

Contraceptive methods

Contraception is of importance for a large part of the general population and is of utmost importance for a good and healthy sex life without the risk of unintended pregnancy and STI. The use of a condom is of importance in two aspects: to protect against unplanned pregnancies and as a protection against STI. The occurrence of CT in Sweden has trebled during the last ten year period. There are several possible explanations for this increase involving several interacting factors, such as a change in young people's sexual behaviour. Adolescents and young adults constitute 88% of the 47 000 cases of Chlamydia reported in the year 2007. This may be a signal of a rising sexual risk taking in these age groups (The National Board of Health and Welfare 2009). A study performed in Sweden to study development of sexual attitudes and risk behaviour in adolescents and young adults concluded that risk behaviour increased for 16-24 year olds and in particularly among young women. To reduce STI they concluded that condom use be encouraged in risky sexual contacts (Herlitz et al. 2010). Another study demonstrated that an early sexual debut is an important indicator for continued risk behaviour regarding reproductive health (Andersson-Ellström et al. 1996). The mean age for sexual debut (coitarche) is ≈ 16 years in Sweden with girls some months ahead of boys and ≈ 17 years in the other Scandinavian countries as well as in the USA, Canada, France and Great Britain (Danielsson et al. 2001; Häggström-Nordin et al. 2002; Edgardh 2002a). In Sweden and in some European countries the birth of a women's first child is now later in life compared to several years ago. In Sweden today the mean age for the first child is 29 years of age (Statistics Sweden 2009) which in turn often enhances the need for effective contraception for more than 10-15 years when young women are sexually active but do not wish to have children (Larsson et al 1997; Wellings 2005). There is today a wide variety of contraceptive methods available and continued research is being performed to improve and develop new contraceptives

methods. In Sweden as well as in most European countries these different contraceptive methods include:

- Combined hormonal methods, combined oral contraceptives (COCs), the contraceptive patch and vaginal rings
- Progestogen-only pills (POPs)
- Progestogen-only injectables and implants
- Intrauterine devices (IUDs)
- Levonorgestrel releasing intrauterine system (LNG-IUS)
- Diaphragms and cervical caps
- Male and female condoms
- Natural family planning
- Male and female sterilisation
- Lactational amenorrhea method (LAM)

The most recently introduced contraceptive method is the oral contraceptive pill containing estradiol instead of ethinyl estradiol and a new emergency contraceptive pill (ECP) with an increased duration of efficacy which has been extended to 5 days. The health beliefs and opinion of both users and prescribers regarding methods of contraception differ from society to society, which may explain why a method can be popular in some countries whilst not in others (Burkman 1999).

Methods of contraception for use by men include condoms, withdrawal and vasectomy. Studies have been conducted on a 3-monthly injection and a daily transdermal gel but these male contraceptives are not on the market and the continued development has been suspended. After almost 50 years of female oral contraception, the attitude of men towards male contraception methods has changed. A review (Glasier 2010) about the acceptability of contraception for men concluded that at least 25% of men and in some countries even more would

consider using hormonal contraception. Despite commonly expressed views to the contrary, most women say that they are willing to trust their male partner to use a hormonal method. In a survey of almost 2000 women attending family planning clinics in Scotland, South Africa and Shanghai over 70% expressed that they would be willing to rely on male hormonal contraception if it became available (Glasier et al. 2000).

Contraceptive prevalence in Sweden, Europe and the world

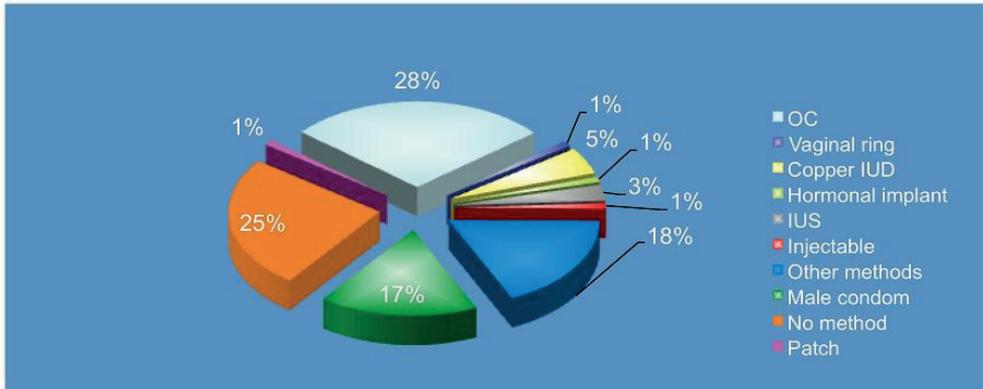
National studies from Sweden have shown that 71-76% of adolescents use contraception during their first intercourse (The National Board of Health and Welfare 2009) and the most commonly used method was a condom (Edgardh 2000; Edgardh 2002b). The use of condoms among men and women aged 16-24 years of age sometime during the last month was reported to be 47% among men and 33% among women (Swedish National Institute of Public Health 2009). A longitudinal study (Larsson et al 1997) reported that contraception had been used at some time by 73% of women by the age of 19 years and at 24 and 29 years of age the corresponding figures were 94% and 97%. The most common method at all three ages was COCs (47%, 51% and 22%). The second most common method was, at all three ages the use of condom. With increasing age women in Sweden tend to shift to IUD use and Larsson et al. 1997 reported that 19% at the age of 29 years used an IUD.

Contraceptive use varies between the Nordic countries, but these differences have decreased over time. According to sales figures expressed in daily doses per 1000 women aged 15-49 years in 2008, hormonal contraceptives (injections and implants excluded) were used most in Denmark (284), followed by Sweden (252), Norway (212) and Finland (204). Use of emergency contraception is quite widespread in the Nordic countries and is highest in Norway and lowest in Finland and Greenland. Sterilization as a means of birth control varies a lot between the Nordic countries

and sterilisation is lowest in Sweden and most common in Denmark (NOMESCO 2008).

In Europe, most of the northern countries have high levels of overall contraceptive use compared to a lower use in Southern European countries, such as Spain and Italy. These differences have become less marked in recent years because of increasing use of effective methods (Spinelli et. al. 2000; Skouby 2004; Cibula 2008). The most common contraceptives in Europe are COCs with the highest usage rates in France (49%) and the Czech Republic (44%) and condom use contributes between 10 and 22% in Northern Europe. The distribution of different methods of contraception in several European countries is shown in Figure 1.

COC's and female sterilisation have been the two leading contraceptive methods in the United States since 1982. However, sterilisation is the most common method among black and Hispanic women, while white women most commonly choose the pill. Condom is the third most used contraceptive and is especially used by teens and women in their 20s. IUDs don't constitute a commonly used method in the USA and are used by 5.5% of all women using contraception (The Alan Guttmacher Institute 2010).



*Countries include France, Germany, Italy, Spain, the United Kingdom, Russia, Scandinavia, Austria, Czech Republic and the Baltic States; OC = oral contraceptive; IUD = intrauterine device; IUS = intrauterine system
Cibula D. *Eur J Contracept Reprod Health Care* 2008;13(4):362–375

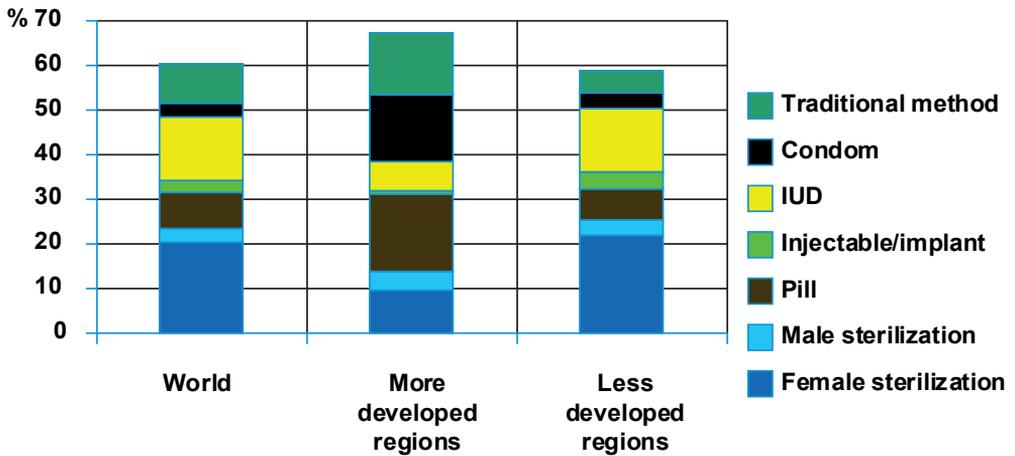
Figure 1. Contraceptive use in Europe* by D.Cibula 2008.

Globally, over 200 million women want, but currently lack access to modern contraceptives and as a result there are 76 million unintended pregnancies reported every year. An economic case is made in a new UK report, *Fewer Emitters, Lower Emissions, Less Cost*, which found that family planning is five times cheaper than conventional green technologies to combat climate change. They found that each US\$7 spent on basic family planning over the next four decades would reduce global carbon dioxide emissions by more than 1 ton and conclude that more research specifically looking at the links between reproductive health and climate change require greater investment (Lancet 2009).

On the other hand there are potential environmental drawbacks with hormonal methods. Approximately 80-90 million women in the world use COCs and the hormones present in COC's are found in surface waters worldwide which raises concerns about effect on aquatic organisms. A recent study where rainbow trout were exposed to sewage effluents showed high concentrations of the synthetic hormone levonorgestrel, used in e.g. ECP. The blood plasma concentration was

similar to human therapeutic concentrations and was shown to reduce the fertility of the fish (Fick et al. 2010).

According to the most recent data available from the United Nations report on World Contraception 2009, contraceptive prevalence among women of reproductive age, who are married or in union varies, between 3% in Chad and 88% in Norway, with a world average of 63%. For the whole world, female sterilisation is the most commonly used method, and is most prevalent in Latin America and also common in China and India. The IUD is used by 14% and most common in Asia and the third most widely used contraceptive method in the world is the pill with 9% of women aged 15 to 49. The male condom is ranked fourth among modern contraceptive methods (United Nations, World Contraceptive Use 2009). (Figure 2).



Catherine d'Arcangues, World Health Organization

Figure 2. Contraceptive prevalence globally, grouped by method 2005. (Source: United Nations, Contraception use 2005, Catherine d'Arcangues, World Health Organization)

Reasons for using or not using contraceptives

A lot of new contraceptive methods have been developed to meet expanding contraceptive needs. The decision to use or change a method is dependent on numerous factors e.g. possible side effects of the contraceptive method, such as weight increase, mental side effects, fear of the method itself, bleeding disturbances etc. It may also be related to social and developmental changes related to a change in the individual's personal life according Belfield 2005:

- The beginning of a sexual relationship
- An unplanned pregnancy or pregnancy “scare”
- Specific life change (illness, career change etc.)
- A planned birth
- Family considered complete
- The end of a relationship, the beginning of a new relationship
- The presence of problems or perceived problems with a contraceptive method
- Cost

Another important factor to consider when choosing a method of contraception is the risk of STI. In this respect condom as a contraceptive method provides both protection against unplanned pregnancy and a STI.

Large studies in Europe and the USA (Rosenberg et al 1995; Rosenberg et al. 1998b) have described reasons for discontinuation with particular attention to adverse effects. Women experiencing adverse effects were nearly twice as likely to stop using the pill while still at the risk of unintended pregnancy compared to women not reporting the same adverse effect. Another common reason for stopping a method is a change in fertility desires. Even more common is a change in partner

relationships and this may become a particular problem when sexual activity resumes before contraceptive use resumes (Westhoff 2005).

In the United States two out of three (64%) women stopped taking the pill because of side effects that they attributed to the pill and 13% stopped because they were worried about side effects. About 11% ceased because of menstrual bleeding disturbance, 10% stopped because they got pregnant and 10% considered the pill too difficult to remember every day. Cessation of condom use was commonly reported due to the partner not liking the use of condoms, it decreased sexual pleasure and woman worried that the method would not work (Centers for Disease Control and Prevention 2010).

Compliance

Compliance is defined as the extent to which the patient follows a regimen prescribed by a healthcare professional. Except for compliance, terms such as adherence, therapeutic alliance and concordance are used. Adherence may be explained as the ability to follow prescribed treatment. Reducing the required number of dosing occasions can improve adherence to a prescribed dosage regimen. Alliance and concordance may be described as a form of partnership between counsellor and client. Whatever term is used one of the most important determinants of compliance is the patients level of satisfaction with the prescriber and is one of few factors the prescriber may directly influence (Goodman & Gilman's 2006). An "ideal" contraceptive would be characterized by easy use, minimal side effects, excellent tolerability and high continuation rates. New contraceptive methods have been developed, including numerous types of pills, differently shaped IUDs and new ways of administering hormonal contraceptive methods have emerged to reduce side effects and make them more acceptable to users (Halpern et al. 2006). Despite these developments we have observed a rise in abortion rates in some European countries. Compliance was evaluated in the

Spanish REMO study where 26 000 typical users of a combined hormonal method were questioned about their compliance during the past months. Non-compliant behaviour was recorded by 71% of pill users, 32% of patch users and 22% of ring users. The authors concluded that in typical users, avoiding daily use of the contraceptive improved compliance. (Lete et al. 2008). Other studies have reported an increased adherence and continuation of methods when using the vaginal ring, COCs containing 20µg of ethinyl estradiol and the LNG-IUS (Diaz et al. 2000; Dieben et al. 2002; Gallo et al. 2005). Nearly half of COC users miss one or more pills each month, and more than a fifth miss two or more (Rosenberg et al. 1998a). According to another study 32% of new COC users discontinue during the first year of use (Schwartz 2002). Despite the very high theoretical effectiveness of hormonal methods, typical use has less favourable results. Typical use has been defined as: how effective methods are for the average person who does not always use methods correctly or consistently. It doesn't imply that a contraceptive method was actually used. Perfect use is defined as: when it is used consistently according to a specified set of rules. In the U.S., the first year failure rate of OC and the percentage of women experiencing an unintended pregnancy for typical use is about 8% whereas it is 0.3% for perfect use and this is due to human factors. Condoms are often selected for their ability to reduce both unwanted pregnancies and STIs. However in typical use, a 15% pregnancy rate has been reported with condoms, which suggests suboptimal utilization (Trussell 2004; Trussell 2010). The total pregnancy risk when performing an unprotected intercourse is estimated to about 6-7%. The risk is highest at the time of ovulation and estimated to about 20% but may be higher in younger women (Läkemedelsverket 2005). It is an important matter for all contraceptive counsellors to make the user aware of and emphasize the inherent failure risks associated with different methods. Efficacy differs among the different methods of contraception available today (Table I).

Table I. The estimated efficacy range of different contraceptive methods, expressed as Pearl Index (PI). (Source:Läkemedelsverket 2005)

Method	Approximately PI
Combined hormonal methods	0,5–1,5
Oral medium-dose progestogen	0,5–1,5
Oral low-dose progestogen	2–6
High-dose progestogen injectable	0,1–0,5
Implants	0,1–1,0
Copper IUD (surface area >250mm²)	0,7–1,0
Levonorgestrel releasing intrauterine system	0,2–0,6
Condom	3–14
Diaphragm	6–20
Natural family planning	2–20
Lactational amenorrhea method (LAM)	0,8–1,2
Sterilisation female/male	0,1–0,5

Antikonception Workshop, 2005. 3

The importance of counselling

A Cochrane review (Halpern et al. 2006) identified six RCTs evaluating advanced counselling techniques to improve adherence and continuation rates of hormonal contraception methods. The Cochrane review evaluated the importance of communication between clients and providers for the successful use of hormonal contraception but found little evidence from randomized controlled trials to support this. They came to the conclusion that intensive counselling interventions with multiple contacts may be needed to improve adherence and acceptability of contraceptive use. In a study examining women's knowledge about OCs, women who had counselling also had more precise responses on questions about OC use, benefits and side effects (Gaudet et al. 2004). Counselling methods with

motivational interviews may be a possible means of improving contraceptive compliance (Petersen et al. 2004). However some studies have shown that providers can help with the selection of a method. In a study (Harper et al. 2010) of the choice of contraceptive method, women reported that provider counselling and their own contraceptive knowledge after the visit was associated with the hormonal method initiated. The same study concluded that more extensive counselling and patient education is important for integration of new hormonal methods. The waiting room could be an important potential time to utilise e.g. using visual education (Harper et al. 2010). In a Canadian study, information regarding the possibility of weight increase during pill use was given by 68% of doctors and 52% of the women themselves thought their weight would increase on the pill. After consultation and counselling 14% more women believed the pill would increase their body weight (Gaudet 2004). A study of recent use of condoms and emergency contraception by women who selected condom as their contraceptive method concluded that inconsistent use of condoms and low use of ECP are very frequent. Education about the probability of pregnancy and STI transmission is of importance to higher consistent condom use and greater use of ECP (Nelson 2006). Patient satisfaction with the provider and continuity of care has a significant impact on compliance behaviour (Goodman & Gilman's 2006) and a study has shown that this is connected with more consistent use of OC (Frost et al. 2008). The same author proposed some main questions for a provider (Frost et al. 2007) that are presented below.

- Regular assessments of method use difficulties
- Improving counselling on method choice and pregnancy risk
- Identifying and assisting women at higher risk for inconsistent method use because of disadvantage, relationship characteristics or ambivalence about pregnancy prevention

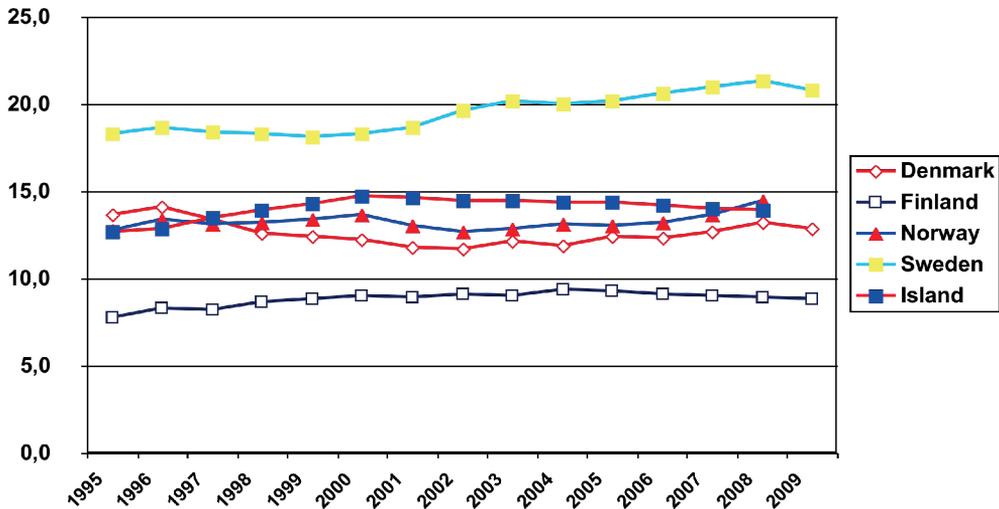
Abortions

The International Conference on Population and Development 1994 recommended that there should be access to safe abortion services in countries where abortions are legal (ICPD 1994). In the year 2000, eight Millennium Development Goals were set up by the UN. Maternal Health was one of these goals. A very important target was to achieve universal access to reproductive healthcare and to reduce maternal mortality by 70% before 2015. This target was said not to be reached without addressing the issue of unsafe abortion (United Nations 2000). The World Health Organization (WHO) published international guidelines for safe abortion care in the year 2003 (WHO 2003) and the International Federation of Gynecology and Obstetrics stated the right for women everywhere to safe, effective and affordable methods of contraception and safe abortion services (FIGO 2006).

Globally the number of induced abortions is unknown but has been estimated to be approximately 41.6 million which is a decrease from 45.5 million 15 years ago. The biggest decline has been in more developed countries. Most abortions occur in less developed countries, (35 million annually compared to 7 millions abortions annually in developed countries). The majority of abortions continue to be unsafe and illegal in less developed countries (The Guttmacher Institute 2009).

The lowest abortion rates in the world are in Western and Northern Europe (Myers et al. 2010). The Netherlands has a history of low abortion rates due to sexual and contraceptive education as an ongoing process (Lunsen 1993). They also have a history of the combined use of OC and condom, the so called “double Dutch” method (Ketting et al. 1994).

Despite the increased availability of different contraceptives, the development of better and safer methods and access to emergency contraceptive pills (ECP) the occurrence of unplanned pregnancies and legal abortions remain high in many developed countries (Jones et al. 2002; Abortion Statistics, England and Wales 2008; Jones et al. 2008; Jones et al. 2009). Sweden has among the highest abortion rates in Western Europe (20.8/1000 women in 2009) and 39.3% of all abortions in 2009 (Abortion statistics Sweden 2009) were performed in women who previously had undergone an abortion which is an increase compared to previous years. The current abortion law, which was passed in 1975, permits abortion on the request of the pregnant woman until the 18th week. The number of abortions rose on a yearly basis from the early 1960s, but soon levelled off following the liberalisation of the abortion law in 1975. Since then the yearly number of abortions has averaged between 30.000 and 38.000. Since 1977 fewer abortions have been performed in teenagers compared to women aged 20 to 24 years old. The number of abortions among teenagers was 22.5 per 1000 women in 2009 which was a decrease of 8.4 percent since 2008 (Abortion statistics Sweden 2009). When comparing the Nordic countries the abortion rates are highest in Sweden when comparing women 15-49 years of age (Fig. 3).



FOS Statistikrapport 9/2009, www.socialstyrelsen.se

Figure 3. Abortions in the Scandinavian countries 2009 per 1000 women (15-49 yr).

(Source: The National Board of Health and Welfare)

One possible reason why teenage abortions in Sweden are higher may be that they to a greater extent choose to perform an abortion rather than deliver a child compared to Norway and Finland. It is twice as common that Finnish teenagers choose to deliver a child. Another possible explanation for this difference in the number of abortions may be that Finland has improved sexual education for school teachers in recent years.

In Sweden as well as in the other Nordic countries the most common age to undergo an abortion is between 20 to 24 years of age (The National Board of Health and Welfare 2009). Studies indicate that legal abortion may be sought by women in many circumstances such as various relationship aspects, both high and low socioeconomic reasons, young and middle-aged, highly educated and those with different schooling (Kero et al. 2001; Uygur et al. 2001) and is not confined to those in special risk groups. There is also a continued increased risk of unintended

pregnancy in women who already have undergone an abortion (Falk et al. 2006; Heikinheimo et al. 2008).

The questions therefore arise if it would be beneficial to recommend more often the use of “forgettable contraception” a term recently described by Grimes (Grimes 2009). Forgettable contraception is defined as a method requiring attention no more often than every third year and includes sterilisation, IUD’s and implants (levonorgestrel or etonogestrel) which helps overcome human fallibility.

Body Weight

The global epidemic of overweight and obesity, “globesity” is becoming a major public health problem in many parts of the world. It is important to note that obesity among young people in Europe is increasing and obesity as a phenomenon is not restricted to North America. Many studies have reported a successive increase in the prevalence of obesity over time in the United States, in Europe and especially in Great Britain where the most dramatic increase has been observed. In some of the Scandinavian countries there has been less of an increase among women in recent years e.g. Sweden (WHO: Global database on BMI 2000; Silventoinen et al. 2004; Rennie et al. 2005; Ogden et al. 2006) It is possible that the prevalence of overweight and obesity is lower in Sweden due to the high level of physical activity together with a decrease in the selection of food containing fat and sucrose. This may have contributed to the stability of BMI in Swedish women compared to many other parts of the world (Lissner et al. 2008). In Sweden every third women is overweight (BMI 25-29) and this increases with age up to the age of 44 years. This change according to age is also apparent for women classified as obese (BMI ≥ 30) where the occurrence among women is reported to be 7% in the age group 16-29 years old increasing thereafter. Obesity in Sweden among both women and men has increased from 12 to 14% the last two years. Overweight and obesity are more common among those with low social group, low education and also among women born abroad compared to Swedish-born persons (Swedish National Institute for Public Health 2010). Body mass index (BMI) is an important factor when considering choice of contraception. It is more difficult to find a suitable method of contraception when counselling overweight/obese women and to find a safe and comfortable contraceptive alternative that is acceptable and safe. A retrospective analysis regarding an association between higher body weight or BMI from a large randomized multicenter study found a small non significant

increased risk of pregnancy (Burkman et al. 2009) while other studies have suggested there is no association (Dinger et al. 2009, Lopez et al. 2010). The medical eligibility criteria for contraceptive use in women with a BMI ≥ 30 published by the WHO (Medical Eligibility criteria for contraceptive use 2004) place COC at Level 2 (i.e., a condition where the advantage of the method generally outweigh the theoretical or proven risks). However, guide-lines from both Sweden (Läkemedelsverket 2005) and the UK (UKMEC 2005/2006) are more restrictive. In Sweden, the guidelines for women with a BMI ≥ 30 indicate that combined hormonal contraceptives are contraindicated and progestogen-only methods or other non hormonal methods are recommended.

Weight gain, fear or a belief of weight increase associated with contraceptive use is an important factor that may affect contraceptive acceptability among women of fertile age (Oddens et al. 1994; Rosenberg et al. 1995; Larsson et al. 1996; Rosenberg et al. 1998b; Gupta 2000; Wysocki 2000; Davis et al. 2003).

It is important for young women to be informed, that some weight gain and an increase in percentage body fat are normal during the teens (Malina 1999) and that weight change in young women is more likely to be seen as natural growth rather than a result of COC use (Rekers, 1988). Another study examined young women for four cycles and mean weight didn't change (Rosenberg 1998c).

Two systematic reviews (Gallo et al. 2004; Gallo 2008) have evaluated the relationship between COC use and weight gain and concluded that the evidence was insufficient to conclude what effect combined contraceptives had on weight. The majority of studies included in the review did not have weight gain as the primary end point and the majority of studies were of short duration.

Dysmenorrhea

Dysmenorrhea is the Greek word for difficult monthly bleeding and throughout history and ancient cultures menstruation has been described as a “mysterious flow” that must be repressed for the safety of the menstruating woman and all with whom she comes in contact. In many Asian and African cultures, women are still placed in so called menstrual huts.

Dysmenorrhea is a frequently occurring condition involving the symptoms of periodic cramps with or without associated vegetative symptoms such as headaches, nausea and vomiting, affecting a large proportion of young women. Dysmenorrhea has been reported to be as high as 50-75% among adolescent women (Andersch & Milsom 1982; Robinson et al. 1992, Harlow et al. 1996, Campell et al. 1997, Davis et al. 2001, Harlow et al. 2004). About 15% of adolescent and young women describe their dysmenorrhea as severe causing regular absenteeism from school and work (Sundell et al. 1990; Burnett et al. 2005; Dawood et al. 2006). According to official statistics from the Swedish Department of National Insurance, dysmenorrhea caused more than 230 000 lost working days in Sweden in 1974 and in the USA alone it was estimated there was an annual loss of 600 million work hours costing over 2 billion dollars (Dawood 1984).

Dysmenorrhea has been classified as primary or secondary. Primary dysmenorrhea starts at or shortly after the menarche (within 6 to 12 months), when ovalutory cycles have been established. It is not associated with any pathological conditions and therefore has been named as essential or primary dysmenorrhea. In contrast to primary dysmenorrhea there is always an organic explanation (eg endometriosis, cervical stricture, pelvic adhesions, fibroids, endometrial polyps or an intrauterine device) behind the occurrence of secondary dysmenorrhea.

The severity of primary dysmenorrhea is associated with early menarche, heavier menstruation, longer duration of menstruation and a mother or sister with dysmenorrhea (Andersch & Milsom 1982). Pain is experienced most often during the first 12-24 hours of menstruation. Women with dysmenorrhea have more frequent uterine contractions, contractions of higher amplitude and a higher basal uterine tonus. Uterine activity can be measured using a microtransducer intrauterine catheter technique and the intrauterine pressure recording below performed in a woman with primary dysmenorrhea, shows a clear hyperactivity, with three to four times higher frequency of contractions and amplitude approximately four times higher than normal (Fig. 4).

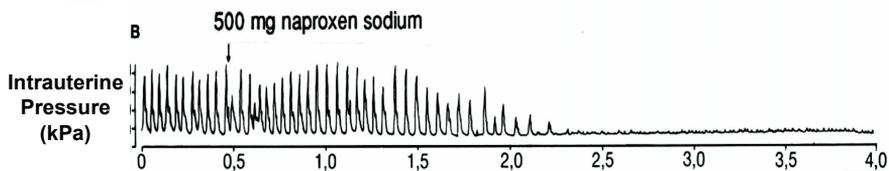


Figure 4. An intrauterine pressure registration in a woman with severe primary dysmenorrhea treated with 500 mg naproxen sodium. The amplitude and frequency of uterine contractions was reduced following treatment.

The importance of prostaglandins for the occurrence of primary dysmenorrhea has been demonstrated and women with dysmenorrhea have higher concentrations of prostaglandin in the endometrium during menstruation compared with women with no dysmenorrhea. There is also evidence for the fact that inhibition of uterine circulation leads to ischemia and endometrial necrosis, which may be a result of muscle contractions but may also be a result of increased vasopressin activity (Milsom 2008).

The occurrence and severity of menstrual cramps is influenced by potentially modifiable characteristics including weight, smoking and alcohol consumption. Menstrual cramps in smokers tended to last longer and the same was seen in women who reached menarche at age 11 or younger, with frequent cycles longer than 35 days or with bleedings lasting a week or longer (Harlow et al. 1996).

Treatment for dysmenorrhea includes lifestyle modifications, complementary and alternative treatments, over-the-counter and prescription analgesics and hormonal contraceptives. Non-steroidal anti-inflammatory drugs (NSAID) are effective treatment for dysmenorrhea by inhibiting a stage in prostaglandin synthesis. Women using them need to be aware of the significant overall risk they may cause such as indigestion or drowsiness (Milsom et al. 2002; Marjoribanks et al. 2010). Women with dysmenorrhea who also require contraception can be recommended COC's which may provide effective pain relief (Milsom et al. 1984; Milsom et al. 1990; Hendrix et al. 2002; Winkler et al. 2004; Davis et al. 2005; The ESHRE Capri Workshop Group 2005). NSAID's and COC's may also be combined to increase efficacy.

Socio-economic factors

In Sweden, the civil registry has been maintained by the Swedish Tax Agency since the 1990s, and before this the Church of Sweden was responsible. Recording of births and deaths was stipulated in the early 17th century. Formal national censuses have been performed since the mid-18th century and Sweden has one of the longest and most comprehensive histories of civil records of any country.

The population register in Sweden contains information regarding civil status, nationality, home address, income etc. linked to the individual's personal identification number. This makes it possible to permit analysis of data obtained grouped according to the socio-economic status of the area of residence. This is not possible in most countries where they don't have the use of personal identification numbers that were introduced in Sweden in 1947 (The Population Register in Sweden). The city of Gothenburg has up to the year 2010 been divided into 21 districts and each district has been classified according to a 3-point socio-economic index (SES) (low, medium, high socio-economic status) based on the mean level of education, income and profession/social group for all the inhabitants in each district (Statistics Sweden, 2001).

Aims of the study

The overall aim of this thesis was to study and identify factors influencing women's use of contraception in order to improve future contraceptive compliance.

- To describe contraceptive use, reasons for discontinuation and pregnancy outcome in three birth cohorts of women born in 1962, 1972 and 1982, respectively.
- To describe the relationship between socioeconomic status and contraception, smoking and BMI in the same three birth cohorts.
- To describe contraceptive use and pregnancies in the same women followed from 19-44 years of age in a population based longitudinal study.
- To identify factors e.g. bodyweight that influences women's choice of contraception in two populations of women born in 1962 and 1972.
- To assess the efficacy of combined oral contraceptives (COC) and the influence of age on the severity of dysmenorrhea

Methods

Conditions in Sweden are extremely favourable for epidemiological studies. The Swedish Population Register with its personal identification number system provides information on the total population and can be used to obtain random samples of the total population for the purpose of longitudinal studies. In 1981 (Andersch et al. 1982), a prospective longitudinal population study of women living in the city of Gothenburg was initiated. The women were born 1962 and were 19 years of age. This age was chosen in order to be able to deal with women of legal age, enabling information to be collected via the individuals themselves without the necessity of consent from their parents. There were 2621 women aged 19 years living in the city of Gothenburg in 1981 and a random sample of every fourth woman was obtained ($n = 656$) from the population register. The women were sent a postal questionnaire and if no reply was received, reminder letters were sent out after 2 and 4 weeks. Women who returned the questionnaire in 1981 were contacted again every fifth year.

In 1991, a new group of 19 year old women, (born in 1972) also residing in Gothenburg was invited to participate in a similar study. A one in three sample of the 2342 women aged 19 years ($n = 780$), resident in Gothenburg at the time of the study, was obtained from the population register. The women were invited by letter to complete and return an enclosed questionnaire similar to the one used in 1981. The women from the birth cohort 1972 were subjected to the same follow-up procedure as the 1962 cohort.

A similar postal questionnaire was sent out ten years later in 2001 to a third cohort of 19-year old women residing in Gothenburg (born 1982). A one in three sample of the 1998 women ($n = 666$) resident in Gothenburg at the time of the study, was obtained at random from the population register. The same procedure as in the

other cohorts was performed and they were contacted again every fifth year. The last assessment point for the three cohorts of women was in 2006 and next follow up will be during 2011 (Table II).

Table II. Summary of study design permitting both longitudinal and cross-sectional comparisons.

Year of assessment								
	1981	1986	1991	1996	2001	2006	2011	2016
Cohort 62	19y	24y	29y	34y	39y	44y	49y	54y
Cohort 72			19y	24y	29y	34y	39y	44y
Cohort 82					19y	24y	29y	34y
Cohort 92							19y	24y

In **Paper I** a cross-sectional comparison of contraceptive use and pregnancy outcome was performed in the 19-year-old women born in 1962, 1972 and 1982, living in the city of Gothenburg in 1981, 1991 and 2001 respectively. The city of Gothenburg is divided into 21 districts and each district has been classified according to a three-point socioeconomic index (low, medium, high). Using this index, it was possible to group contraceptive use and factors such as smoking and BMI to the SES in the various districts.

In **Paper II** a longitudinal study was initiated in 1981 and contraceptive use and pregnancy outcome was assessed longitudinally in the same women from 19-44 years of age. Of the original women in the 62-cohort (656) there were 286 women

(44%) who responded to all questionnaires every fifth year during a period of 25 years.

In **Paper III** two cohorts of women born 1962 and 1972 were used to assess the long-term influence of combined oral contraception on body weight. The 62- cohort was assessed between 19 - 44 years of age and the 72-cohort between 19-34 years of age with regard to contraceptive use, body weight, smoking, exercise and children. There were 614 women in the two cohorts ≤ 34 years of age who completed questions about current use of COC, number of COC months, number of children, weight/height, smoking and exercise and these women were included in the analysis when comparing COC use and weight development. BMI was categorized according to the WHO guidelines (World Health Organization, 1998) as underweight (<18.5), normal range (18.5-24.9), overweight (≥ 25). Pre-obese (25.0-29.9), obese class 1 (30.0-34.9), obese class 2 (35-39.9) and obese class 3 (≥ 40).

In **Paper IV** longitudinal and cross-sectional analyses were performed in all three cohorts of women (-62, -72, -82) at the age of 19 and 24 years old in order to assess the influence of combined oral contraceptives on dysmenorrhea.

Methodological Considerations

Ethics

The study protocol of Papers I-IV was approved by the Research Ethics Committee at Sahlgrenska Academy, Gothenburg University, Sweden and the National Data Inspection Board

The study populations

The study populations were not selected groups and should be seen as random samples of the total population of women in that age group resident in the city of Gothenburg, Sweden. Every fourth woman in Gothenburg at the age of 19 years, in the 62-cohort was included in the study and in the other two cohorts every third woman was included. In the analyses the women were grouped according to the socio-economic status of the area where the woman was resident at the age of 19 years. Height and weight in all four studies were self reported data.

Paper I: A cross-sectional study, comparing three cohorts of women consisting of randomly selected samples of 19 years old women resident in the city of Gothenburg 1981 (n = 594), 1991 (n = 641) and 2001 (n = 514).

Paper II: A longitudinal study of 286 women who at the age of 19 years were resident in Gothenburg 1981 and were followed every fifth year prospectively for a period of 25 years.

Paper III: Two cohorts of women randomly selected at 19 years of age in the city of Gothenburg 1981 and 1991. The two cohorts of women were followed

longitudinally every fifth year from 19-44 years of age (n = 286) and from 19-34 years of age (n = 375) respectively.

Paper IV: A cohort study including random samples of 19 year old women resident in Gothenburg 1981 (n = 489), 1991(n = 523) and 2001 (n = 392) followed longitudinally from 19 to 24 years of age.

The questionnaire

The questionnaire (Appendix I) contained approximately 40 questions concerning contraception, reproductive history and factors concerning contraception, possible pregnancies, reproductive health and factors such as body weight, height etc. Face-validity and reliability of the questionnaire were evaluated in a sub-sample of 30 women. Face-validity was assessed at an interview with the woman where the answers given in the questionnaire were checked verbally and by measurement e.g. weight measurement, height measurement, the name of the COC used etc. The agreement ranged between 92-100% which was considered to be satisfactory. Reliability was tested by answering the questionnaire twice within a 3-week interval and the agreement of the answers to five specific questions was tested (agreement ranged between 90-100%). Ten questions were selected and the women were interviewed to see if they understood the meaning of the questions. The level of understanding ranged from 89-100% which we also considered satisfactory.

Women who returned the questionnaire at the age of 19 years were contacted again every fifth year. The questionnaire has undergone only minor changes during the course of time when the new cohorts were included. We considered it of utmost importance that the same questions were asked at each assessment point for the different cohorts. The only changes made are the addition of new questions about contraceptive methods previously not available, e.g. implants and the LNG-IUS and this is included in all the questionnaires for the three different cohorts in their

follow-up questionnaires. In the latest questionnaire (2006) one question about price was added and this was if the expense of a contraceptive method influenced the woman's choice of contraception.

Response rates

The response rates at 19 years of age were high in all three cohorts. In *Paper I* three cohorts of women were compared at 19 years of age. The questionnaire from 1981 (62-cohort) was returned by 594 (91%) and ten years later 641 (82%) responded from the second cohort of 19 year old women (72-cohort). In 2001 a cohort of 19 year old women, born in 1982 was recruited and 514 out of 666 (77%) responded to the questionnaire, a lower percentage than in the previous cohorts. This might be due to the fact that people are becoming more tired of answering different forms of questionnaire and that different types of population studies have become more common. Fear of registration in studies may be another factor. A review concluded that strategies that shorten the questionnaires, recorded delivery, contacting participants before sending could improve response rates whereas questions of a sensitive nature were less likely to be returned etc (Edwards et al. 2002). Another study reported little evidence for the effectiveness of electronic reminders to increase response rates or time to respond for the return of questionnaires (Man et al 2011).

Assessment of dysmenorrhea

In *Paper IV* the severity of dysmenorrhea was assessed by a verbal multidimensional scoring system (VMS) and by a visual analogue scale (VAS).

The VMS is a scoring system which grades pain as none, mild, moderate or severe and takes also into account the effect on daily activity, systemic symptoms and if analgesics are required (Andersch et al. 1982). The VAS (Huskisson 1974; Melzack et al. 1994) is a technique where a 100 mm line on a paper represents the

continuum of the woman's opinion of the degree of pain. The two end-points represent extremes of the variable and the subject chooses a point representing her actual status. It was explained that one extremity of the line represented "no pain at all" and the other extremity "unbearable pain".

Data analysis and statistical methods

In *Paper I* the accuracy of the data-entry was checked on an individual basis for each parameter in all subjects. Fisher's exact test and ANOVA with Tukey's Studentized Range (HSD) test for post hoc comparisons were used in the analysis of possible differences in basic characteristics, contraceptive use and pregnancy outcome between the three cohorts.

In *Paper II* the accuracy of the data-entry was checked on an individual basis for each parameter in all subjects. Fisher's exact test, ANOVA with Tukey's Studentized Range test for post hoc comparisons or Dunnett were used in the analysis of possible differences in basic characteristics, contraceptive use and the number of pregnancies and children.

In *Paper III* data description of groups includes number (n), mean, standard deviation and 95% confidence limits. Group differences were tested with an ordinary two sample t-test, which throughout was confirmed with the Wilcoxon rank sum test. Individual changes within groups between follow up occasions were tested with a matched paired t-test and also confirmed with a corresponding Wilcoxon signed rank test. Analysis of variance was used to investigate whether COC use is associated with weight gain. Weight was analysed using a longitudinal linear model with repeats of values on four occasions, at 19, 24, 29 and 34 years of age together with the factors of age, COC use, children, smokers and exercise. A comparison of the estimated weight changes and observed weight changes over 15 years period was performed in this longitudinal model. Analysis of variance was also done with nested design to include the two cohorts and test the interplay between the cohort and predictors.

In *Paper IV* data description of groups includes number (n), mean, standard deviation and 95% confidence limits. Group differences were tested with an ordinary two sample t-test which throughout was confirmed with the Wilcoxon rank sum test. Individual changes within groups between follow up occasions were tested with a matched paired t-test. Analysis of variance was used to investigate the influence of various factors on dysmenorrhea. Dysmenorrhea was analysed using a longitudinal linear model with repeats of values on two occasions, at 19 and 24 years of age. The following factors COC use, age, child/no child, smoker/no smoker and BMI were included in the model. A comparison of the estimated dysmenorrhea changes and observed dysmenorrhea changes over 5 years period was performed in this longitudinal model. Analysis of variance was also done with nested design to include the two cohorts and test the interplay between the cohort and predictors. To further establish differences between cohorts, post hoc tests of multiple comparisons due to Tukey were performed. To compare the subjective measurement scales VMS and VAS we used a Pearson correlation test.

Statistical analyses were performed using the SAS 9.1 statistical software package, SAS Institute Inc, Cary, NC, USA.

Results

Paper I

The response rates in the three cohorts of 19-year-old women were as follows: 62-cohort 594/656 (91%), 72-cohort 641/780 (82%) and for the 82-cohort 514/666 (77%).

Comparison of current contraceptive usage in the 19 year-old women is shown in Figure 5. The self-reported current use of contraception was higher in the -82 cohort ($p < 0.01$) compared to the other two cohorts. COC was the most commonly used method of contraception in all three cohorts. However the combined use of both COC and a condom had increased in the 72 and 82 cohorts compared with the 62 cohort ($p < 0.01$) and there was a successive increase in the use of condom alone over time ($p < 0.01$).

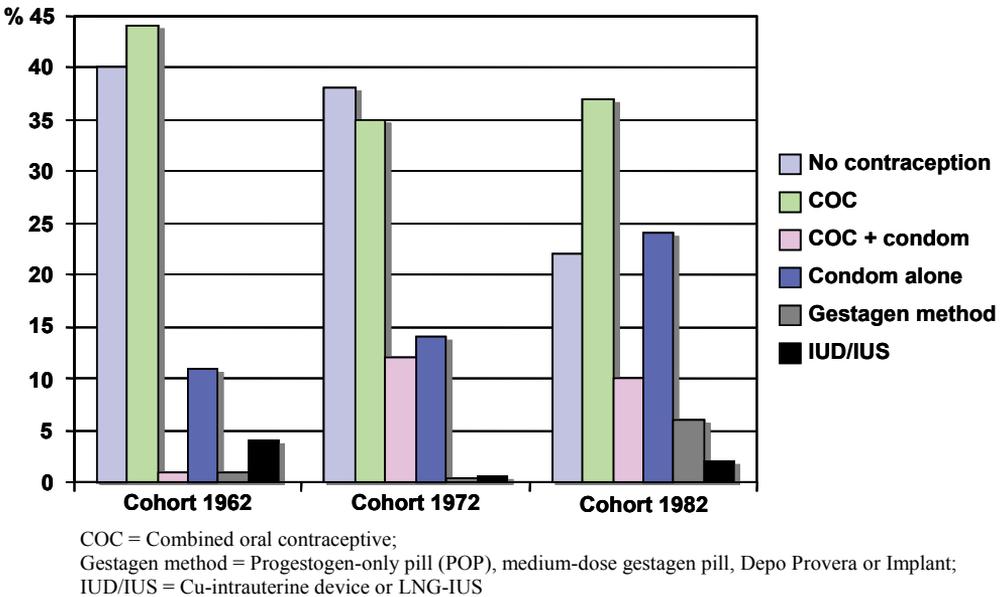


Figure 5. Contraceptive use in the 19-year old women from the 1962, 1972 and 1982 cohorts.

COC's were mainly taken for contraceptive reasons in all three cohorts (-62/-72/-82:95%/91%/97%). Additional reasons mentioned for taking COCs were to reduce dysmenorrhea (33%/41%/38%) and to reduce menstrual bleeding (19%/29%/39%). Several reasons for cessation of COCs were reported. Weight increase and fear of COCs were common reasons for cessation in all three cohorts whereas the proportion of women who reported that contraception was no longer required varied considerably between cohorts (Figure 1 in Paper I). Cessation due to mental side effects increased successively ($p < 0.01$) over time.

The number of 19-year-old women who had ever been pregnant ≤ 19 years of age in the 82-cohort (7%) was lower ($p < 0.01$) than in the 72-cohort (13%). However there was a successive increase over time in the percentage of women who had been pregnant more than once at ≤ 19 years of age in the 82-cohort vs. the 62-cohort ($p < 0.001$).

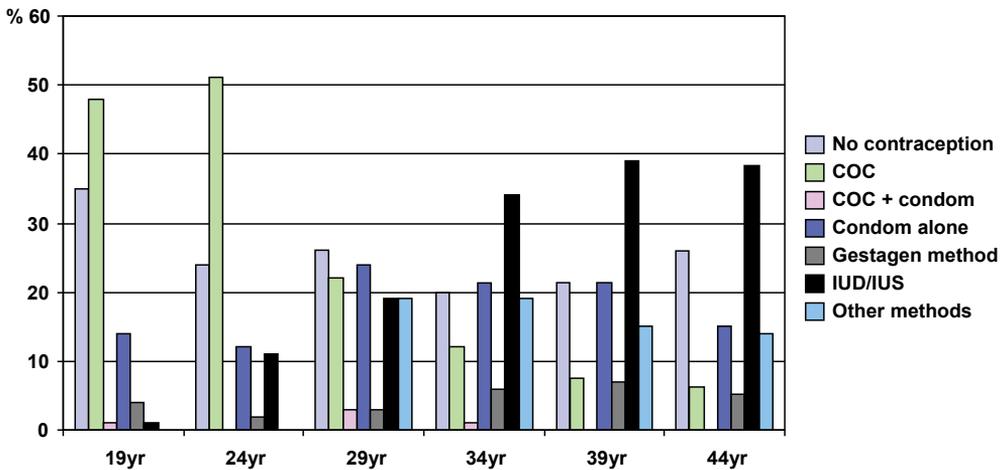
There was no difference in the prevalence of contraceptive use according to the SES area where the women were resident. The prevalence of smoking decreased in all SES groups and BMI increased and was significantly higher in the low SES group compared with the middle and high groups in the 82-cohort.

Paper II

The questionnaire was completed and returned every fifth year between 19 and 44 years of age by 286 women who constituted 44% of the original sample of 656 women followed for a quarter of a century.

Body weight and BMI increased and smoking decreased during this 25-year study period.

At 19 years of age 74% of the women had already used contraception and this increased to 98% at 44 years of age. COC had been used by 95% of the women up to 44 years of age. COC's were the most commonly used method of contraception up to 29 years of age, whereas intrauterine methods of contraception were more common after 29 years of age. The use of condoms varied during the 25-year study period (12-24%) and was most used at 29 years of age (Fig. 6).



COC = Combined oral contraceptive;
 Gestagen method = Progestogen-only pill (POP), medium-dose gestagen pill, Depo Provera or Implant;
 IUD/IUS = Cu-intrauterine device or LNG-IUS;
 Other methods = sterilization, barrier methods except condom, NFP and coitus interruptus

Figure 6. Contraceptive use in the same women born 1962 (n=286) at 19 to 44 years of age.

The mean number of pregnancies/children increased from 0.2/0.1 at 19 years of age to 3.1/2.1 at 44 years of age. Women who had been pregnant (n = 47) and women who had not been pregnant (n = 226) ≤19 years of age were compared. At 24 years of age the mean number of pregnancies had increased more (p<0.01) in the group of women who had been pregnant ≤19 years of age (from 1.2 - 2.3) compared with women who had not been pregnant at the same age (from 0 - 0.5). At 19 years of age, COC use was the commonest method in both groups (51% for the women who had been pregnant and 52% for the women who had not been pregnant). At 24

years of age COC use was still high in the group of women who had not been pregnant ≤ 19 years of age (56%) but was lower (34%) in the group of women who had been pregnant ≤ 19 years of age ($p < 0.01$). IUD use increased to 32% in women who had been pregnant ≤ 19 years of age compared with 7% among women who had not been pregnant ≤ 19 years of age ($p < 0.001$). No further increase in the number of pregnancies between groups from 24 to 44 years of age was seen. Women who had been pregnant ≤ 19 years of age were compared with women who had not been pregnant ≤ 19 years of age with regard to continued contraceptive use and the mean number of pregnancies and children at 44 years of age: months of COC use: 69/107, $p < 0.01$; months of IUD use: 126/91, $p < 0.01$; 4.2 v 2.9 pregnancies, $p < 0.001$; 2.5 v 2.1 children, $p < 0.09$.

Paper III

The 19-year old responders in the -62 and -72 cohorts were followed longitudinally and the same women were contacted again every 5th year from 1986 - 2006 and from 1996 - 2006 respectively. The questionnaire was returned by 286 (44%) at all assessment points in the 62-cohort and by 375 (48%) in the 72-cohort.

Between 19 and 44 years of age the 62-cohort had successively increased ($p < 0.0001$) their body weight/BMI by 10.6 kg/3.7. Weight development in the two cohorts of women is shown in Figure 7.

There was no significant difference in weight/BMI increase between women who had used COCs ($n = 568$) 7.18 kg/2.50 at some time and women who had never used COCs ($n = 46$) 6.72 kg/2.36.

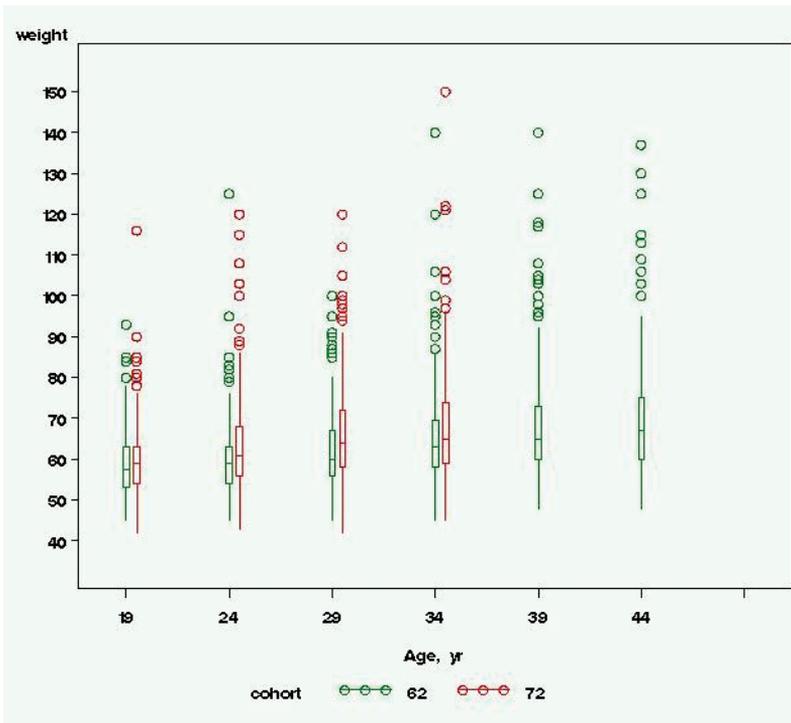


Figure 7. Box plot illustrating weight (kg) development in the two cohorts of women born 1962 (n=286) 19-44yr and 1972 (n=375) 19-34 yr.

In order to find whether COC use is associated with weight gain we performed a longitudinal analysis and the following factors age, COC use, children, smoking and exercise were included in the model to find predictors for weight change. COC use and duration of COC did not predict for weight increase (0.072 kg/year). The only predictor for weight increase was age ($p < 0.001$) resulting in a gain of 0.45 kg/year. Smokers decreased ($p < 0.001$) their weight by 1.64 kg for the total 15-year period. We also performed the longitudinal analysis with “cohort” included in the analysis in order to control for possible differences in life experiences between the two cohorts. There was no effect of cohort and the identified predictors were unchanged i.e. there was no influence of COC use, number of children or exercise whereas age and smoking were significant predictors of weight change. A comparison of the estimated weight changes and observed weight changes over 15

years period was performed and showed a good fit ($R^2 = 0.85$, $p < 0.0001$) in this longitudinal analysis model (Fig.8)

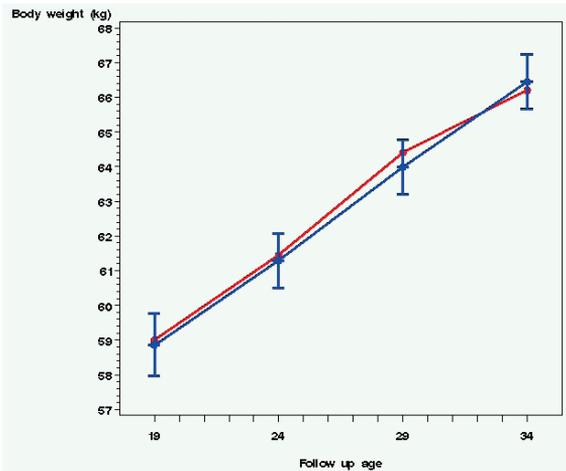


Figure 8. Results of the longitudinal analysis of changes in body weight from 19 to 34 years of age in the women from the 62- and 72-cohorts (n = 614). The blue line indicates changes in bodyweight estimated from the longitudinal model every fifth year with respective 95% confidence interval (CI) and the red line indicates the observed changes every fifth year.

Paper IV

The questionnaire was completed and returned at both 19 and 24 years of age by 489 (75%) of the women born in 1962, by 523 (67%) of the women born in 1972 and by 392 (59%) of the women born in 1982.

There was a successive increase in bodyweight between the three cohorts. The frequency of smoking decreased ($p < 0,001$) over time and the proportion of women using COCs was lower ($p < 0,001$) at the age of 24 years old in the 82-cohort compared to the 62- and 72- cohorts. The type of oral contraceptive used at 19 and 24 years of age varied between cohorts. Monophasic pills (most often containing levonorgestrel (LNG) were the most commonly used COCs in the 62-cohort and in

the 72- and 82-cohorts use of COCs containing 30 µg or 20µg ethinyl estradiol in combination with desorgestrel/drospirenone and triphasic pills were the most commonly used.

Women from the 82- cohort reported a greater severity of dysmenorrhea (assessed by both the VMS system and a VAS) compared to the -62 and -72 cohorts at both 19 and 24 years of age. Absenteeism due to dysmenorrhea was reported between 31-32% at the age of 19 years and decreased in all three cohorts at the age of 24 years.

A longitudinal individual analysis comparing differences in dysmenorrhea severity (according to the VMS system and the VAS) in the same women when using COC at 19 years of age and not using COC at 24 years of age were compared to women with no COC use at 19 years of age and COC use at the age of 24 years. Thus the women served as their own control in this case-control model. The severity of dysmenorrhea was lower ($p<0.0001$) in COC users compared to non users (Fig. 9).

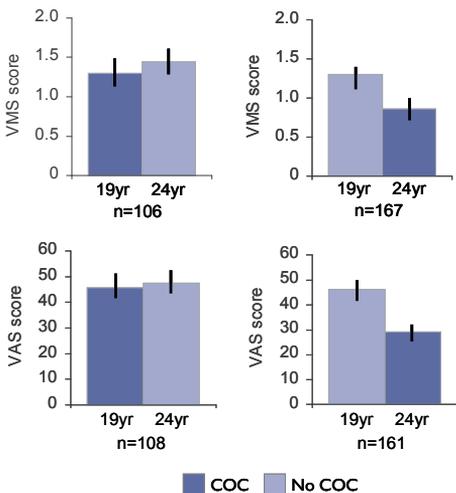


Figure 9. The result of VMS and VAS with respective 95% confidence interval (CI).

In a longitudinal analysis of factors influencing the severity of dysmenorrhea, COC use and increasing age independently of each other reduced dysmenorrhea severity. COC use: VMS score: a reduction of 0.3 units/VAS: a reduction of 9 mm, ($p < 0.0001$); Increasing age: VMS score: a reduction of 0.1 units per 5 years ($p < 0.0001$)/VAS: a reduction of 5 mm per 5 years, ($p < 0.0001$). Childbirth also reduced dysmenorrhea severity (VAS, $p < 0.01$ with a reduction of 7 mm). A comparison of the estimated changes in dysmenorrhea severity and observed changes in dysmenorrhea severity over the five years period was performed and showed a good fit when using both the VMS system ($R^2 = 0.76$, $p < 0.0001$) and the VAS ($R^2 = 0.76$, $p < 0.0001$). We also performed the longitudinal analysis with “cohort” included in the analysis in order to control for possible differences in life experiences between the three cohorts. There was no effect of cohort and the identified predictors were unchanged.

Discussion

Identification of women's choice of contraception is of importance for our better understanding of factors influencing women in their decision to start or stop using contraception. Sweden is one of the countries in Western Europe with the highest abortion rate (Abortion statistics Sweden 2009). In particular repeated abortions in the same woman have increased in recent years whereas there has been a more favourable trend in teenage abortions which have decreased. Our findings in *Paper I* show an increased use of contraception over time among 19- year old women with a concomitant decreased number of pregnancies. This is in agreement with other studies showing that one way of reducing the risk of unplanned pregnancy is to improve young people's access to and use of contraception. The USA which has one of the highest teenage pregnancy rates among developed countries recorded a decline of 27% in their rates between 1991 and 2000. The decline has been a result of increased contraceptive use, while promotion of abstinence-only programmes has had little impact (Santelli et al. 2007). The general decrease in teenage pregnancy rates observed in Europe has been attributed to improved access to contraception as well as improved knowledge (Avery et al. 2007). In Gothenburg where our studies have been performed, Youth Centres were introduced during the 1990's and these centres have increased the accessibility of contraceptive counselling close to where you live. As with many other cities, the socio-economic status varies within different areas of the city. We were however unable to demonstrate any differences in contraceptive use according to the SES area where the women were resident which may be a result of the possibility to reach a Youth Centre close to where you live. The increased contraceptive use in our later cohorts of women consisted of more condom use alone and COC use together with condom use. Thus even if 34% of the 19 year old women in 2001 reported they used a condom alone or in combination with oral contraception there is no guarantee that

condoms were consistently used which may partly explain the unchanged CT incidence. The use of COC and condoms in young women is similar to other European countries (The Omnibus survey 2003; Skouby 2004; Cibula 2008) and in the USA (Guttmacher Institute, 2008). The increase of condom use may be explained by the fact that the city of Gothenburg made the decision to provide condoms free of charge from 1998 to those who visited Youth centres. In addition the cost of COC's was subsidised for women up to 20 years of age in the Region of Västra Götaland where Gothenburg is the major city. Sale figures from the pharmacy indicated an increased sale of COC's and during the same period a decrease in teenage abortions was reported. The importance of the cost of contraception for young people was confirmed in a Focus Group study among young women on the importance of the price of contraception and also the lack of professional education in school (VG regionen; Utvärdering subventionerade avgifter för preventivmedel 2000). Most abortions in Sweden are performed among women aged 20 to 24 years old while teenage abortions continues to decrease which may be an effect of the subvention system for COCs that differ a lot in Sweden but cease after the age of 20 in Gothenburg. Another possible reason may be that young women of this age no longer use the Youth Centres to the same extent as in younger ages and loose the continuous contact with the same prescriber. It is also possible that sexual activity in this phase of life is higher. The same study (*Paper 1*) found an increasing proportion of women with repeated pregnancies terminating in abortions that may indicate difficulties in finding suitable contraception. An important finding is the importance of providing counselling about contraception close to the time of abortion in order to prevent further unintended pregnancies. A study examining documentation in medical records concluded that there was often a lack of information about contraception at abortion clinics (Falk et al. 2009).

Cessation of contraception may contribute a risk of unplanned pregnancies and common reasons for discontinuation of COCs are as described in *Paper I* side effects, fear of serious side effects such as deep venous thrombosis and pulmonary emboli, mental side effects, bleeding disturbances and weight increase etc. Alarming reports in the media about COCs and thromboembolism may have influenced many women to stop using COCs and even midwives who in Sweden prescribe most COCs may feel worried about these alarming reports. It is important to encourage women to contact the health clinics when worried or dissatisfied with their contraception and it is important for midwives and doctors to provide support when alarming reports about COCs are highlighted in the media. Mental side effects as a reason for discontinuation of COCs increased over time. This may be the result of hormonal side effects, in particular the gestagen component of COCs but may also be an expression of increased stress and anxiety in society. Today there are an increasing number of young women who are on antidepressive treatment. A large longitudinal study in young Australian women failed to show any association between OC use and risk of depressive symptoms (Duke et al.2007) nor did a study from the Netherlands (Oddens 1999). As a prescriber it is important to identify and assist women at higher risk for inconsistent method use and to offer follow-up visits. Intensive counselling interventions and multiple contacts may improve adherence and acceptability of contraceptive use (Halpern et al. 2006).

Smoking and overweight are factors which may limit the possibility for a woman to receive the contraception she desires (Läkemedelsverkets 2005). These factors may increase risks of e.g. thrombosis when using COCs and it is therefore important to combat bad lifestyle factors. Smoking has decreased successively over time among our women and is no longer greater in low SES areas compared to other SES areas. There are several possible explanations for this decrease. Considerable resources have been devoted to national anti-smoking campaigns, smoking is no longer permitted in restaurants and bars and specific non-smoking campaigns have been

performed in Swedish schools. In addition, the role of Youth Clinics and Family Planning Clinics has been widened in recent years to include the prevention of smoking. On the contrary we have seen a successive increase in body weight/BMI among our women and BMI was highest among women who were resident in low SES areas compared to middle and high SES areas among women born in 1982. Our results are in line with a recent study among a representative sample of schoolchildren in Sweden where areas with low economic status were high-risk areas for overweight and obesity (Sjöberg et al. 2011). BMI is an important health issue to deal with among health providers in order to prevent further risks of increasing socioeconomic polarisation followed by serious public health consequences.

In *Paper II* a comparison was made regarding contraceptive use and pregnancy outcome between women who had been pregnant ≤ 19 years of age and women of the same age who had not been pregnant. The increasing number of pregnancies among women who had been pregnant continued to increase up to the age of 24 years. After this age there was however no further increase in the number of pregnancies between the groups from 24 to 44 years of age. COC use was the most common method used at 19 years of age in both groups but this changed in the group of women who had been pregnant ≤ 19 years and at 24 years of age IUD was a more commonly used contraceptive whereas COC use still was most commonly used in the group of women with no pregnancies ≤ 19 years. From this subgroup analysis it would appear that IUD was important for the observed change in pregnancies between the groups. This is in accordance to a large Finnish study concluding that use of intrauterine contraceptives for post-abortal contraception was associated with decreased risk of repeat abortion. The same study pointed out the importance of focus on women with a history of abortion (Heikinheimo et al. 2008). This indicates the importance of follow-up visits after abortions and discussions with the woman/couple about a suitable contraception and information

about long acting reversible contraception (LARC) such as IUDs. LARC has attracted considerable attention and is defined as a method requiring less than monthly administration which may decrease the risk of stopping and starting contraception without contacting a health clinic (Grimes 2009). LARC includes IUDs, implants and some injectable hormonal contraceptives.

There is still a need for effective contraception in women who are 40+ as the decline in fertility with age does not provide adequate protection against unplanned pregnancy. More than 40% of the 40+ women reported no contraception or the use of less effective forms of contraception. Female sterilisation is the most popular form of contraception in Europe and USA among women in these ages (ESHRE Capri Workshop Group 2009). In Sweden sterilisation is uncommon and intrauterine methods are more frequently used in these age groups. Approximately 40% of the women aged 39-44 years were using an intrauterine method. The high dosed Cu-IUDs and the LNG-IUS are highly effective forms of reversible contraception, with a long term efficacy comparable to tubal occlusion. The LNG-IUS also has the added advantage for many women that they have a reduced blood loss during menstruation or become amenorrhoeic which is particularly important and attractive for women in the later stages of the fertile period where menorrhagia is more common (ESHRE Capri Workshop Group 2008). It is important for women of this age to contact family planning clinics when needed and not rely on decreased fertility because of age.

Fear of weight gain when using COCs may lead to poor compliance (Rosenberg et al. 1998) and this was a common reason for cessation with COC in all our cohorts. Not only the users but also many prescribers are uncertain of the influence of weight (Gaudet, 2004). A Cochrane review (Gallo et al., 2008) concluded that evidence was insufficient to conclude an effect of combined contraceptives on weight. However, the same Cochrane review pointed out that in most trials of

COCs weight change was not a primary outcome and studies have been of short duration and a longer observation period may be required to demonstrate evidence of weight gain. In *Paper III* where two longitudinal cohorts were assessed in order to investigate if COC was a predictor for weight increase we found no significant influence of COC use on long term weight increase. The only significant predictor for weight increase was age. Analysis of the literature reports either minimal weight increase or little evidence for a causal relationship (Gupta 2000; Milsom et al. 2006; Berenson et al. 2009; Beksinska et al. 2010). One of the strengths in this study was the possibility to follow weight development during 25 years in the same women, another was the possibility to use these two large groups of women during 15 years of their fertile life and investigate the possible influence of COC use on weight. Information regarding the normal pattern of weight increase and factors influencing weight increase in the general population of women of fertile age is important in order to be able to subsequently assess the influence of extrinsic factors on weight development. Our results are in accordance with two studies using longitudinal data suggesting that increase in BMI with ageing is underestimated in all age groups by studying cross sectional data only (Sheehan et al. 2002; Nooyens et al. 2008). Most women in our study had a BMI within the normal range according to WHO. Possible weaknesses with the study may be the self-reported weight and no information about nutrition, alcohol consumption and daily life that may influence body weight. It is also possible that women with a higher BMI didn't answer the questionnaire initially at 19 years of age as they did not want to report their weight. In this study childbearing was not found to be a predictor for weight increase. The results of this study that didn't indicate a long-term influence of COC on weight gain may help women using COC to re-consider their possible fears for weight increase during COC use. The findings may also assist prescribers in their meetings with women worried about possible weight increase with the pill.

In addition to contraception, COCs are used by some women to reduce dysmenorrhea and heavy bleeding. A Cochrane review (Wong et al. 2009) which assessed the effectiveness of oral contraceptives for primary dysmenorrhea concluded that although oral contraceptives are widely advocated as standard treatment there was only scanty rigorous evidence to support this practice. The result of our study (*Paper IV*) has shown a positive effect of COCs to decrease the severity of dysmenorrhea. Another predictor for reducing severity of dysmenorrhea was increasing age. These two factors have been discussed as relieving dysmenorrhea (Wong et al. 2009) and our results show that these two predictors independent of each other reduce dysmenorrhea. Childbirth was also shown to reduce dysmenorrhea severity but COC use reduced dysmenorrhea more than both childbirth and increasing age. Midwives can provide valuable assistance to women for the relief of dysmenorrhea. The use of COCs may thus for the individual woman reduce in turn absenteeism from school or work which commonly occurs as a result of dysmenorrhea.

These studies have illustrated different factors influencing a woman's choice of contraception. To identify and assist women at risk for inconsistent contraceptive use and as a consequence at greater risk for an unplanned pregnancy and STI is an important issue for prescribers. Long acting contraception such as an IUD may be beneficial for women with a history of an abortion. Informative and balanced counselling about the health benefits of using COC's such as reduction of dysmenorrhea severity, protection against ovarian cancer and the lack of a long-term risk of weight increase may increase compliance when using COCs. Another important issue which deserves greater attention is the involvement of the partner in family planning as this is a mutual responsibility.

Conclusions

- Combined oral contraception (COC), was the commonest method used up to 29 years of age and were used mainly for contraceptive reasons. Additional reasons for their use were to reduce dysmenorrhea and menstrual bleeding. Reasons for cessation were fear of side effects with COCs, mental side effects and weight increase.
- Choice of contraception was strongly related to age and parity in a longitudinal analysis of the same women followed from 19-44 years of age.
- The percentage number of women who had been pregnant at 19 years of age decreased over time, while women with repeated pregnancies increased.
- Women who had been pregnant ≤ 19 years of age reported more pregnancies at the age of 44 compared to women with no pregnancies ≤ 19 years. IUD use increased among women who had been pregnant ≤ 19 years of age and pregnancies didn't increase more after the age of 24 years compared to the women with no pregnancies.
- The mean number of months of COC use at 44 years of age was higher and IUD months was lower among women who had not been pregnant ≤ 19 years of age compared to the group of women who had been pregnant ≤ 19 years of age where IUD use was higher and COC use was lower.
- There was no difference in the prevalence of contraceptive use among 19-year old women according to the SES area where the woman were resident.

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- The use of COC, even long-term use, was not found to be a predictor for weight increase.
 - Body weight increased with age and smoking decreased bodyweight.
 - Bodyweight at 19 years of age increased over time between the cohorts.
 - In the 62-cohort body weight/BMI increased 10.6 kg/3.7 from 19-44 years of age.
 - BMI was higher in 19-year old women who were resident in a lower socio-economic area among women born in 1982
 - The prevalence of smoking decreased over time
 - COC use and increasing age, independent of each other, reduced dysmenorrhea severity.

Svensk sammanfattning/Swedish summary

Faktorer som inverkar på kvinnors val av preventivmedel

Introduktionen av p-piller i Sverige 1964 öppnade möjligheter för en friare sexualitet och gav kvinnor större frihet att bestämma över sitt barnafödande. Kombinerade p-piller blev snabbt den vanligast förekommande preventivmetoden bland unga kvinnor. Efter p-pillrets introduktion har forskarna fokuserat sina insatser på att utveckla andra preventivmedel med hög säkerhet och lägre östrogen- och gestagens vilket medför en ökad valmöjlighet för kvinnan. Flera nya preventivmedelsmetoder har utvecklats på senare år och idag finns förutom kondomer, kopparspiraler och p-piller, även hormonspiraler, implantat, plåster och vaginalringar. Dessutom finns det numera akut p-piller som blev receptfria 2001 och delas ut gratis på vissa ungdomsmottagningar. För att utvärdera dessa nya metoder är det viktigt med randomiserade jämförande studier. Det är också viktigt att genom epidemiologiska studier identifiera faktorer som påverkar kvinnors val av preventivmetod och orsaker till att de slutar med preventivmedel. Majoriteten av tidigare studier för att kartlägga kvinnors preventivmedelsanvändning har oftast genomförts hos selekterade grupper av befolkningen, t.ex kvinnor som besöker preventivmedelsmottagningar, studenthälsan och abortkliniker, vilket inte är representativt för hela populationen.

Syftet med dessa studier har varit att beskriva preventivmedelsanvändning och graviditetsutfall samt att undersöka p-pillers inverkan på vikt och menssmärtor

I Sverige finns goda möjligheter att bedriva epidemiologiska studier, speciellt longitudinella studier. Mot bakgrunden av dessa goda förutsättningar för populationsstudier startades 1981 en prospektiv longitudinell studie avseende preventivmedelsanvändning och graviditeter bland 19-åriga kvinnor (födda 1962) i

Göteborg. Därefter har nya kohorter 19-åriga kvinnor fått besvara samma frågeformulär 1991 (kvinnor födda 1972) och år 2001 (kvinnor födda 1982). Femårsuppföljningar har därefter gjorts på samma kvinnor för att undersöka preventivmedelsanvändning och graviditeter över tiden.

Resultaten av dessa studier (delstudie I) har visat att antalet kvinnor som varit gravida vid 19 års ålder minskade hos kvinnor födda -82 jämfört med kvinnor födda -62 och -72, medan andelen tonåringar med mer än en graviditet ökade i 82-kohorten. Den ökade preventivmedelsanvändningen i de senare kohorterna bestod av ökad kondom användning och p-piller i kombination med kondomanvändning. Trots den ökade kondomanvändningen bland våra senare kohorter sågs ingen förändring i klamydia förekomsten vilket kan bero på att kondom inte alltid används under hela samlaget. Detta belyser vikten av undervisning i skolorna runt kondomanvändning och även samtal runt denna metod vid förskrivning av preventivmedel.

Kombinerade p-piller var den vanligaste preventivmedelsmetoden och användes även för att lindra menssmärtor och stora mensblödningar. En av de vanligaste anledningarna till att upphöra med sina p-piller var mentala bieffekter vilket successivt har ökat med tiden. Rädsla, viktuppgång och att man inte längre behövde preventivmedel var andra vanliga orsaker till att man slutade. Preventivmedelsanvändningen skiljde sig inte socioekonomiskt. Rökning minskade med tiden och var lägst bland kvinnor födda -82 där man inte längre såg någon signifikant skillnad beroende på vilket socioekonomiskt område man bodde i. BMI ökade successivt och var högre bland kvinnor födda -82 boende i lågstatusområden.

En longitudinell uppföljning under 25 år av kvinnor födda 1962 visade att valet av preventivmedel var starkt relaterat till ålder och paritet (delstudie II). Samma studie visade även att kvinnor som varit gravida vid 19 års ålder jämfört med kvinnor som

inte varit gravida vid motsvarande ålder rapporterade ett totalt högre antal graviditeter vid 44 års ålder. Spiral användningen ökade hos dessa kvinnor som varit gravida redan som tonåringar. Detta hade en bra preventiv effekt så till vida att antalet graviditeter efter 24 års ålder inte ökade mer bland dessa kvinnor jämfört med gruppen av kvinnor som inte varit gravida. Denna skillnad i preventivmedelsanvändning bestod och vid 44 års ålder rapporterades en kumulativ högre spiral användning och lägre p-piller användning i gruppen av kvinnor som varit gravida vid 19 års ålder.

Viktuppgång och rädsla är vanliga anledningar till att sluta med p-piller. Det kan också utgöra ett skäl till att inte börja med p-piller vilket i sin tur kan öka risken för att bli ofrivilligt gravid. Resultatet i vår viktstudie (delstudie III) visade att kvinnor födda -62 hade en vikt/BMI ökning under 25 år (19-44 år) på 10.6 kg/3.7. Gruppen kvinnor födda 10 år senare vägde vid 19 års ålder 1 kg mer och hade en fortsatt högre viktuppgång. För att undersöka p-pillers eventuella inverkan på vikt analyserades olika faktorer som kan påverka vikt såsom kombinerade p-piller, ålder, barn, rökning och motion. Den enda faktor som visade sig påverka vikt var ålder, vilket gav en ökning på 0.45 kg per år. Kombinerade p-piller oavsett kort eller lång användning gav försumbar vikt förändring (0.072 kg/år). Rökning minskade vikten med 1.64 kg under den 15 årsperiod som mätningen utgjorde. Förhoppningen är att dessa resultat skall minska rädslan för viktuppgång hos p-piller ätande kvinnor.

P-piller används av en del kvinnor inte enbart som preventivmedel utan även för att minska menssmärtor. Resultatet av vår studie (delstudie IV) har visat p-pillrens positiva inverkan för att reducera menssmärtor. Förutom kombinerade p-piller bidrog ökande ålder till minskande menssmärtor. Barnafödande reducerade också menssmärtor. Kvinnor födda -82 upplevde kraftigare menssmärta än övriga kvinnor i studien.

Rökning och övervikt är faktorer som kan påverka möjligheten att få det preventivmedel som kvinnor önskar då dessa faktorer kan öka risken för blodpropp hos kvinnor som använder kombinerade p-piller. Våra studier visar minskad rökning och en tilltagande viktuppgång bland våra senast födda grupper av kvinnor. Ett fortsatt arbete på Ungdomsmottagningar och Barnmorskemottagningar med information och stöttande samtal runt dessa livsstilsfaktorer kommer att gagna unga kvinnor ur ett hälsoperspektiv. Att identifiera kvinnor med ökad risk för oplanerade graviditeter liksom vikten av att uppmärksamma kvinnor på långsiktiga preventivmetoder såsom exempelvis spiral är av största vikt för abortmottagningar liksom andra mottagningar där preventivmedel förskrivs. Även en god information angående p-pillers hjälp vid menssmärtor liksom obefintliga risk att ge viktökning kan öka kvinnors kontinuitet vid preventivmedelsanvändning och minska ofrivilliga graviditeter. Att erbjuda eventuell partner att få delta vid samtal på preventivmedelsmottagningen kan öka möjligheten till ett gemensamt ansvar i preventivmedelsfrågan.

Slutsatser av våra fynd

- Kombinerade p-piller var den vanligaste preventiv metoden upp till 29 års ålder och användes i huvudsak som preventivmedel men även för att minska menssmärtor och mensblödningar. Orsaker till att sluta med p-piller var rädsla, mentala bieffekter och viktökning.
- Valet av preventivmedel var starkt relaterat till ålder och paritet visade en longitudinell studie där samma kvinnor följdes från 19 till 44 års ålder.
- Antalet kvinnor som varit gravida vid 19 års ålder minskade över tid medan kvinnor med upprepade graviditeter ökade.

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- Kvinnor som varit gravida ≤ 19 års ålder rapporterade fler graviditeter upp till 44 års ålder jämfört med kvinnor som inte varit gravida ≤ 19 års ålder. Spiralanvändningen ökade bland dessa kvinnor som varit tidigt gravida och efter 24 års ålder ökade inte antalet graviditeter mer bland dessa kvinnor jämfört med gruppen av kvinnor som inte varit gravida.
 - Spiralanvändning var högre och användningen av kombinerade p-piller upp till 44 års ålder var lägre bland kvinnor som varit gravida ≤ 19 års ålder.
 - Det förelåg ingen skillnad i förekomsten av preventivmedelsanvändning bland 19 åriga kvinnor oavsett vilket socioekonomiskt statusområde kvinnorna bodde i.
 - Kombinerade p-piller oavsett kort eller lång användning gav försumbar viktförändring
 - Vikt ökade med ålder och rökning gav viktnedgång.
 - Vikt vid 19 års ålder ökade över tid.
 - Hos 62-kohorten ökade vikt/BMI med 10.6kg/3.7 från 19-44 års ålder.
 - Rökning minskade över tid.
 - Kombinerade p-piller och ökad ålder oberoende av varandra minskade menssmärtorna.

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References

A

Abortion Statistics, England and Wales: 2008: Department of Health – Publications. http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsStatistics/DH_099285.

Abortion Statistics, Sweden. The national Board of Health and Welfare, Centre for Epidemiology, Stockholm, Sweden. http://www.socialstyrelsen.se/en/Statistics/Statistical_databases.htm;2009.

Andersson S, Sjö Dahl S. SEX En politisk historia Alfabet A Anamma/RFSU 2003.

Andersson-Ellström A, Forssman L, Milsom I. Age of sexual debut related to life-style and reproductive health factors in a group of Swedish teenage girls. *Acta Obstet Gynecol Scand*. 1996;5:484-9.

Andersch B, Milsom I. An epidemiologic study of young women with dysmenorrhea. *Am J Obstet Gynecol* 1982;144:655-660.

Avery L & Lazdane G. What do we know about sexual and reproductive health of adolescents in Europe? *Eur J Contracept Reprod Health Care* 2007;13:58–70.

B

Belfield T, Wellings K. Trends in sexual behaviour. *In: Contraception and contraceptive use*. Editors: Glasier A, Wellings K, Critchley H. RCOG Press, London 2005, pp. 78-87.

Beksinska ME, Smit JA, Kleinschmidt I, Milford C, Farley TM. Prospective study of weight change in new adolescent users of DMPA, NET-EN, COCs, nonusers and discontinuers of hormonal contraception. *Contraception*, 2010;81:30-4.

Berenson AB, Rahman M. Changes in weight, total fat, percent body fat, and central-to-peripheral fat ratio associated with injectable and oral contraceptive use. *Am J Obstet Gynecol*. 2009;200:329.e1-8.

Burkman RT. Compliance and other issues in contraception. *Int J Fertil Womens Med* 1999;44:234-240.

Burkman RT, Fisher AC, Wan GJ, Barnowski CE, LaGuardia KD. Association between efficacy and body weight or body mass index for two low-dose oral contraceptives. *Contraception* 2009;79:424-427.

Burnett MA, Antao V, Black A, Feldman K, Grenville A, Lea R, et al. Prevalence of primary dysmenorrhea in Canada. *J Obstet Gynaecol Can* 2005;27:765-70.

C

Campbell MA, McGrath PJ. Use of medication by adolescents for the management of menstrual discomfort. *Arch Pediatr Adolesc Med* 1997;151:905-913.

Centers for Disease Control and Prevention (CDS). Number 29; August 2010. Use of Contraception in the United States: 1982-2008.
<http://www.cdc.gov/>

Cibula D. Women's contraceptive practices and sexual behaviour in Europe. *Eur J Contracept Reprod Health Care* 2008;13(4):362-375.

Cole JB, Beighton FCL, Jones JH. Contraceptive practice and the unplanned pregnancy among single university students. *Br Med J* 1975;4:217-219.

D

Danielsson M, Rogala C, Sundström K. Teenage Sexual and Reproductive Behavior In Developed Countries: Country Report for Sweden. New York and Washington: The Alan Guttmacher Institute; 2001. Occasional Report No. 7.

Davis A, Teal S. Controversies in adolescent hormonal contraception. *Obstet Gynecol Clin North Am* 2003;10:391-406.

Davis AR, Westhoff C, O'Connell K, Callagher N. Oral contraceptives for dysmenorrhea in adolescent girls: A randomized trial. *Obstet Gynecol* 2005;106:97-104.

Davis AR, Westhoff CL. Primary Dysmenorrhea in Adolescent Girls and Treatment with Oral Contraceptives. *J Pediatr Adolesc Gynecol* 2001;14:3-8.

Dawood MY. Ibuprofen and dysmenorrhea. *American Journal of Medicine* 1984;77:87-94.

Dawood MY. Primary Dysmenorrhea – Advances in pathogenesis and management. *Obstet Gynecol* 2006;108:428-41.

den Tonkelaar D, Oddens BJ. Factors influencing women's satisfaction with birth control methods. *Eur J Contracept Reprod Health Care* 2001;6:153-8.

Diaz J, Bahamondes L, Monteiro I, Petta C, Hildalgo MM, Arce XE. Acceptability and performance of the levonorgestrel-releasing intrauterine system (Mirena) in Campinas, Brazil. *Contraception* 2000;62:59-61.

Dieben TO, Roumen FJ, Apter D. Efficacy, cycle control, and user acceptability of a novel combined contraceptive vaginal ring. *Obstetrics and Gynecology* 2002;100:585-93.

Dinger JC, Cronin M, Möhner S, Schellschmidt I, Minh TD, Westhoff C. Oral contraceptive effectiveness according to body mass index, weight, age, and other factors. *Am J Obstet Gynecol*. 2009;201:263.e1-9.

Duke JM, Sibbritt DW, Young AF. Is there an association between the use of oral contraception and depressive symptoms in young Australian women? *Contraception* 2007;75:27-31.

E

Edgardh K. Sexual behaviour and early coitarche in a national sample of 17- year- old Swedish girls. *Sex Transm Infect* 2000;76:98-102.

Edgardh K. Sexual behaviour and early coitarche in a national sample of 17- year- old Swedish boys. *Acta Paediatr* 2002;91:985-91a.

Edgardh K. Sexual behaviour in a low-income high school setting in Stockholm. *International journal of STD & AIDS*. 2002;13:160–7b.

Editorial. Sexual and reproductive health and climate change. *Lancet* 2009;374 (9694):949.

Edwards P, Roberts I, Clarke M, DiGuiseppe C, Prata S, Wentz R, Kwan I. Increasing response rates to postal questionnaires: systematic review. *BMJ* 2002;324:1183.

ESHRE Capri Workshop Group. Noncontraceptive health benefits of combined oral contraception. *Hum Reprod Update* 2005;11:513-25.

ESHRE Capri Workshop Group. Intrauterine devices and intrauterine systems. *Hum Reprod Update* 2008;14:197–208.

ESHRE Capri Workshop Group. Female contraception over 40. *Hum Reprod Update* 2009;15:599-612.

F

Falk G, Östlund I, Magnusson A, Schollin J, Nilsson K. Teenage mothers-a high-risk group for unintended pregnancies. *Contraception* 2006;74:471-475.

Falk G, Brynhildsen J, Ivarsson AB. Contraceptive counselling to teenagers at abortion visits-a qualitative content analysis. *Eur J Contracept Reprod Health Care* 2009;14:357-64.

Fick J, Lindberg RH, Parkkonen J, Arvidsson B, Tysklind M, Larsson DG. Therapeutic levels of levonorgestrel detected in blood plasma of fish: results from screening rainbow trout exposed to treated sewage effluents. *Environ Sci Technol*. 2010;44:2661-6.

FIGO (2006). Ethical issues in obstetrics and gynaecology. International Federation of Gynecology and Obstetrics (FIGO) Committee for the Study of Ethical Aspects of Human Reproduction and Women's Health, 2006.

Frost JJ, Darroch JE. Factors associated with contraceptive choice and inconsistent method use, United States, 2004. *Perspect Sex Reprod Health*. 2008;40:94-104.

Frost JJ, Singh S, Finer LB. Factors associated with contraceptive use and nonuse, United States, 2004. *Perspect Sex Reprod Health*. 2007;39:90-9.

G

Gallo MF, Grimes DA, Schultz KF et al. Combination estrogen-progestin contraceptives and body weight: systematic review of randomized controlled trials. *Obstet Gynecol* 2004;103:359-373.

Gallo M, Nanda K, Grimes DA, Schulz KF. Twenty micrograms vs.>20mcg estrogen oral contraceptives for contraception: systematic review of randomized controlled trials. *Contraception* 2005;71:162-9.

Gallo MF, Lopez LM, Grimes DA, Schulz KF, Helmerhorst FM. Combination contraceptives: effects on weight. *Cochrane Database of Systematic Reviews* 2008, Issue 4. Art. No.:CD003987. DOI: 10.1002/14651858. CD003987. pub3.

Gaudet LM, Kives S, Hahn PM, Reid RL. What women believe about oral contraceptives and the effect of counselling. *Contraception* 2004;69:31-6.

Glasier A. Acceptability of contraception for men: a review. *Contraception* 2010;82:453-456.

Glasier A, Anakwe R, Everington D, Martin CW, van der Spuy Z, Cheng L, Ho PC, Anderson RA. Would women trust their partners to use a male pill? *Hum Reprod* 2000;15:646-9.

Goodman & Gilman's. Compliance. *In: The Pharmacological Basis of Therapeutics*, 11 edition 2006. Editors: page 1784-1786.

Grimes DA. Forgettable contraception. *Contraception* 2009;80:497-499.

Guillebaud J. The forgotten pill and the paramount importance of the pill-free week. *Br J Fam Plann* 1987;12:35-43.

Gupta S. Weight gain on the combined pill – Is it real? *Hum Reprod Update* 2000;6:427-431.

H

Halpern V, Grimes DA, Lopez L, Gallo MF. Strategies to improve adherence and acceptability of hormonal methods for contraception. *Cochrane Database Syst Rev*.Cochrane 2006 Jan 25;(1):CD004317.

Harlow SD, Campell OM. Epidemiology of menstrual disorders in developing countries: a systematic review. *BJOG* 2004;111:6-16. Search date 2002.

Harlow SD, Park M. A longitudinal study of risk factors for the occurrence, duration and severity of menstrual cramps in a cohort of college women. *Br J Obstet Gynaecol* 1996;103:1134-1142.

Harper CC, Brown BA, Foster-Rosales A, Raine TR. Hormonal contraceptive method choice among low-income women: How important is the provider? *Original Research Article Patient Education and Counseling* 2010;81:349-354.

Heikinheimo O, Gissler M, Suhonen S. Age, parity, history of abortion and contraceptive choices affect the risk of repeat abortion. *Contraception* 2008;78:149-5.

Hendrix SL, Alexander NJ. Primary dysmenorrhea treatment with a desogestrel- low-dose oral contraceptive. *Contraception* 2002;66:393-399.

Herlitz CA, Forsberg M. Sexual behaviour and risk assessment in different age cohorts in the general population of Sweden (1989-2007). *Scand J Public Health* 2010;38:32-9.

Huskisson EC. Measurement of pain. *Lancet* 1974;2:1127-31.

Hägström-Nordin E, Hanson U, Tyden T. Sex behavior among high school students in Sweden: improvement in contraceptive use over time. *Journal of Adolescent Health*. 2002;30:288–95.

I

ICPD (International Conference on Population and Development) Programme of action: adopted at the international conference on population and development. United Nations, 1994.

J

Jones RK, Darroch JE & Henshaw SK. Patterns in the socioeconomic characteristics of women obtaining abortions in 2000–2001. *Perspectives on Sexual and Reproductive Health* 2002;34: 226–235.

Jones RK, Kost K, Singh S, Henshaw SK, Finer LB. *Clin Obstet Gynecol.* 2009;52:119-29.

Jones RK, Zolna MR, Henshaw SK, Finer LB. Abortion in the United States: incidence and access to services, 2005. *Perspect Sex Reprod Health* 2008;40:6-16.

K

Kero A, Högberg U, Jacobsson L, Lalos A. Legal abortion: a painful necessity. *Social Science & Medicine.* 2001;53:1481-1490.

Ketting E, Visser AP. Contraception in the Netherlands: the low abortion rate explained. *Patient Education and Counseling* 1994;23:161-171.

Killick S. Patterns of contraceptive use: cross-sectional surveys. *In: Contraception and contraceptive use.* Editors: Glasier A, Wellings K, Critchley H. RCOG Press, London 2005, pp. 88-97.

L

Larsson G, Milsom I, Andersch B, Blohm F. A comparison of contraceptive habits and pregnancy outcome at 19 years of age in two cohorts of Swedish women born 1962 and 1972. *Contraception* 1996;53:259-265.

Larsson G, Milsom I, Sundell G, Andersch B, Blohm F. A longitudinal study of birth control and pregnancy outcome in a Swedish population. *Contraception* 1997;56:9-16.

Lete I, Doval JL, Pérez-Campos E, et al. Self-described impact of noncompliance among users of a combined hormonal contraceptive method. *Contraception* 2008;77:276-82.

Lissner L, Sjöberg A, Schütze M, Lapidus L, Hulthén L, Björkelund C. Diet, obesity and obesogenic trends in two generations of Swedish women. *Eur J Nutr* 2008;47:424-431.

Lopez LM, Grimes DA, Chen-Mok M, Westhoff C, Edelman A, Helmerhorst FM. Hormonal contraceptives for contraception in overweight or obese women. *Obstet Gynecol.* 2010;116:1206-7.

Lunsen RWH van: Double Dutch; the double message in prevention and some results of a prospective population based study on contraceptive behaviour in The Netherlands. In: Abstracts, 21st Current Fertility Control and Reproductive Health Symposium London: Royal College of Obstetricians and Gynaecologists 1993.

Läkemedelsverket 7:2005. Antikonception. Behandlingsrekommendationer.
www.lakemedelsverket.se.

M

Malina R. Normal weight gain in healthy children. *Healthy Weight J* 1999;13:1–4.

Man MS, Tilbrook HE, Jayakody S, Hewitt CE, Cox H, Cross B, Torgerson DJ. Electronic reminders did not improve postal questionnaire response rates or response times: a randomized controlled trial. *J Clin Epidemiol.* 2011 Feb 1. [Epub ahead of print]

Mansour D. Overview of contraceptive methods: a providers perspective. *In: Contraception and contraceptive use.* Editors: Glasier A, Wellings K, Critchley H. RCOG Press. London 2005, pp. 44-56.

Marjoribanks J, Proctor M, Farquhar C, Derks RS. Nonsteroidal anti-inflammatory drugs for dysmenorrhea. *Intervention Review. Cochrane Database of Systematic Reviews* 2010, Issue 1. Art. No.: CD001751. DOI: 10.1002/14651858.CD001751.pub2.

Medical Eligibility criteria for contraceptive use. *Reproductive Health and Research, World Health Organization.* Third Edition 2004.
www.who.int/reproductive-health/publications/mec/mec.pdf

Melzack R, Katz J. Pain measurement in persons in pain. *In: PD Wall, R Melzack editor(s). Textbook of Pain.* 3rd Edition. London: Churchill Livingstone, 1994:337-351.

Milsom I, Andersch B. Effect of various oral contraceptive combinations in dysmenorrhea. *Gynecol Obstet Invest* 1984;17:284.

Milsom I, Sundell G, Andersch B. The influence of different combined oral contraceptives on the prevalence and severity of dysmenorrhea. *Contraception* 1990;42:497-506.

Milsom I, Minic M, Dawood MY, Akin MD, Spann J, Niland NF, Squire RA. Comparison of the efficacy and safety of non-prescription doses of naproxen and naproxen sodium with ibuprofen, acetaminophen, and placebo in the treatment of primary dysmenorrhea: a pooled analysis of five studies. *Clin. Ther.* 2002;24:1384-400.

Milsom I, Lete I, Bjertnaes A, Rokstad K, Lindh I, Gruber CJ, Birkhäuser MH, Aubeny E, Knudsen T, Bastianelli C. Effects on cycle control and bodyweight of the combined contraceptive ring, NuvaRing, versus an oral contraceptive containing 30 microg ethinyl estradiol and 3 mg drospirenone. *Hum Reprod.* 2006;21:2304-11.

Milsom I. Dysmenorrhea. *In Urogenital Pain in Clinical Practice.* Editors: Baranowski AP, Abrams P, Fall M. 2008 by Informa Healthcare USA, Inc. Page 263-275.

Myers JE, Seif MW. Global perspective of legal abortion – Trends analysis and accessibility. *Best Practice & Research Clinical Obstetrics and Gynaecology* 2010;24:457–466.

N

Nelson AL. Recent use of condoms and emergency contraception by women who selected condoms as their contraceptive method. *American Journal of Obstetrics and Gynecology* 2006;194:1710-6.

NOMESCO 2008

<http://nomesco-eng.nom-nos.dk/default.asp?side=111>

Nooyens ACJ, Visscher TLS, Verschuren WMM, Schuit AJ, Boshuizen HC, van Mechelen W, Seidell JC. Age, period and cohort effects on body weight and body mass index in adults: The Doetinchem Cohort Study. *Public Health Nutrition* 2008;12:862-70.

O

Oddens B, Milsom I. Contraceptive practice and attitudes in Sweden 1994. *Acta Obstet Gynecol Scand* 1996;75:932-940.

Oddens BJ, Visser AP, Verner HM, Everaerd WT, Lehert P. Contraceptive use and attitudes in Great Britain. *Contraception* 1994;49:73-86.

Oddens BJ. Women's satisfaction with birth control: a population survey of physical and psychological effects of oral contraceptives, intrauterine devices, condoms, natural family planning, and sterilization among 1466 women. *Contraception* 1999;59:277-86.

Odland V, Milsom I, Bygdeman M. *Modern familjeplanering*. Sundbyberg: Origo AB, 2003.

Office for National Statistics on behalf of the Department of Health. *Contraception and Sexual Health, 2003. A report on research using the ONS Omnibus survey produced by the Office for National Statistics, London: The Stationary Office;2004.*

Ogden CL, Carroll MD, Curtin LR, McDowell MA, Tabak CJ, Flegal KM. Prevalence of overweight and obesity in the United States, 1999-2004. *JAMA* 2006;295:1549-1555.

P

Petersen R, Payne P, Albright J, Holland H, Cabral R, Curtis KM. Applying motivational interviewing to contraceptive counselling: ESP for clinicians. *Contraception* 2004;69:213-7.

R

Rekers H. Multicentre trial of monophasic oral contraceptive containing ethinyl oestradiol and desogestrel. *Acta Obstet. Gynecol. Scand.* 1988;67:171-174.

Rennie KL, Jebb SA. Prevalence of obesity in Great Britain. *Obes Rev* 2005;6:11-12.

RFSU <http://www.rfsu.se/sv/Sex--relationer/Sex-i-Sverige/>

Robinson JC, Plichta S, Weisman CS, Nathanson CA, Ensminger M. Dysmenorrhea and the use of oral contraceptives in adolescent women attending a family planning clinic. *Am J Obstet Gynecol* 1992;166:578-583.

Rosenberg MJ, Waugh MS, Burnhill MS. Compliance, counselling and satisfaction with oral contraceptives: a prospective evaluation. *Family Planning Perspectives* 1998;30:89-92a.

Rosenberg MJ, Waugh MS, Meehan TE. Use and misuse of oral contraceptives: risk indicators for poor pill taking and discontinuation. *Contraception* 1995;51:283-8.

Rosenberg M, Waugh M. Oral contraceptive discontinuation: a prospective evaluation of frequency and reasons. *Am J Obstet Gynecol* 1998;179:577-82b.

Rosenberg M. Weight change with oral contraceptive use and during the menstrual cycle: *Results of daily measurements* Contraception 1998;58:345-349c.

S

Santelli JS, Duberstein L, Finer LB et al. Explaining recent declines in adolescent pregnancy in the United States: the contribution of abstinence and improved contraceptive use. *Am J Public Health* 2007; 97:150–156.

Schwartz JL, Creinin MD, Pymar HC, Reid L. Predicting risk of ovulation in new start oral contraceptives users. *Obstetrics and Gynecology* 2002;99:177-82.

Sheehan TJ, DuBrava S, DeChello LM, Fang Z. Rates of weight change for black and white Americans over a twenty year period. *International Journal of Obesity* 2003;27:498-504.

Silventoinen K, Sans S, Tolonen H, Monterde D, Kuulasmaa K, Kesteloot H et al. WHO MONICA Project. Trends in obesity and energy supply in the WHO MONICA project. *Int J Obes Relat Metab Disord* 2004;28:710-8.

Sjöberg A, Moraeus L, Yngve A, Poortvliet E, Al-Ansari U, Lissner L. Overweight and obesity in a representative sample of schoolchildren - exploring the urban-rural gradient in Sweden. *Obes Rev.* 2011 Feb 23. doi: 10.1111/j.1467-789X.2010.00838.x. [Epub ahead of print]

Skouby SO. Contraceptive use and behaviour in the 21st century: a comprehensive study across five European countries. *Eur J Contracept Reprod Health Care* 2004;9:57-68.

Spinelli A, Talamanca IF, Lauria L. Patterns of contraceptive use in five European countries. European Study Group on Infertility and Subfecundity. *Am J Public Health* 2000;90(9):1403-8.

Statistics Sweden 2001. Population statistics. Örebro, Sweden: <http://www.scb.se>

Statistic Sweden (SCB) 2009.

http://www.scb.se/Pages/PressRelease_290189.aspx

Stenqvist K, Höglund D, Löwhagen GB, Andersson-Ellström A, Milsom I. Klamydiainfektionerna ökar – hur vänder vi trenden? *Läkartidningen* 2002;99:4860-66.

Sundell G, Milsom I, Andersch B. Factors influencing the prevalence and severity of dysmenorrhea in young women. *Br J Obstet Gynaecol* 1990;97:588-594.

Swedish National Institute of Public Health 2009; sexuality and reproductive health <http://www.fhi.se/en/>

Swedish National Institute of Public Health 2010. Folkhälsoinstitutet (FHI).

<http://www.fhi.se/PageFiles/10796/A2010-13-Levnadsvanor-lagesrapport-2010.pdf>

Swinyard EA. Patient compliance instructions. In Goodman & Gillman eds. *The pharmacological basis of therapeutics*. MacMillan Publishing Co Inc, New York 1980 pp 1671-1674.

T

The Alan Guttmacher Institute Sexual and reproductive Health: Contraception. *Facts on contraceptive use in the United States* (june 2010).
http://www.guttmacher.org/pubs/fb_contr_use.html

The Alan Guttmacher Institute, 2009. Abortion worldwide: a decade of uneven progress.
<http://www.guttmacher.org/sections/abortion.php>

The Cairo conference 1994. <http://www.iisd.ca/vol06/0639000e.html>

The National Board of Health and Welfare 2009 (chapter 9: reproduction).
<http://www.socialstyrelsen.se/publikationer2009/2009-126-71>

The population register in Sweden.
<http://www.skatteverket.se/folkbokforing>

Trussell James. Contraceptive failure in the United States. *Contraception* 2010;70:89-96.

Trussell J. Contraceptive efficacy. In: Hatcher RA, Trussell J, Stewart F, et al., editors. *Contraceptive technology: eighteenth revised edition*. New York: Ardent Media, 2004. p. 773-845.

U

UK eligibility criteria for contraceptive use (UKMEC 2005/2006). Faculty of family planning and reproductive health care. The Royal College of Obstetrics & Gynaecology.
www.ffprhc.org.uk/.

United Nations, Department of Economic and Social Affairs, Population Division (2009). *World Contraceptive Use 2009* (POP/DB/CP/Rev2009).

United Nations Millenium Development Goals
www.un.org/millenniumgoals/maternal.shtml

Uygur D, Erkaya S. Reasons why women have induced abortions in a developing country. *European Journal of Obstetrics & Gynecology and Reproductive Biology* 2001;96:211-214.

V

van Lunsen RHW, van Dalen LP, Laan ETM. Contraception and sexuality. *In: Contraception and Family Planning*: Editor: Milsom I, *European Practice in Gynaecology and Obstetrics Series No. 8*, Elsevier, Edinburgh 2006.

Vg Regionen. Utvärdering av subventionerade avgifter år 2000.
<http://www.vgregion.se/upload/HSNkansli/Rapporter%20Analys/Prevmedelton%C3%A5ringar.pdf>

W

Wellings K. Trends in sexual behaviour. *In: Contraception and contraceptive use*. Editors: Glasier A, Wellings K, Critchley H. RCOG Press, London 2005, pp. 12-18.

Westhoff C. Trends in sexual behaviour. *In*: Contraception and contraceptive use. Editors: Glasier A, Wellings K, Critchley H. RCOG Press, London 2005, pp. 108-117.

WHO : Global Database on Body Mass Index, Geneva 2000. <http://apps.who.int/bmi/index.jsp>

Winkler UH, Ferguson H, Mulders JAPA. Cycle control, quality of life and acne with two low-dose oral contraceptives containing 20 µg ethinyl estradiol. *Contraception* 2004;69:469-476.

Wong CL, Farquhar C, Roberts H, Proctor M. Oral contraceptive pill for primary dysmenorrhoea. *Cochrane database of Systematic Reviews* 2009, Issue 4. Art. No.: CD002120. DOI: 10.1002/14651858. CD002120.pub3.

World Health Organization (WHO) 2003. Safe abortion: technical and policy guidance for health systems. <http://whqlibdoc.who.int/publications/2003/9241590343.pdf>

Wysocki S. A survey of American women regarding the use of oral contraceptives and weight gain. *Int J Gynecol Obstet* 2000;70 (Suppl 1); 114.