



## Original research article

Cost of unintended pregnancy in Sweden – a possibility to lower costs by increasing LARC usage<sup>☆,☆☆</sup>Sara Engstrand<sup>a,\*</sup>, Helena Kopp Kallner<sup>b,c</sup><sup>a</sup> Bayer A/S, Arne Jacobsens Allé 13, 6, 2300, København, Denmark<sup>b</sup> Department of Women's and Children's Health, Karolinska Institutet and Karolinska University Hospital, 171 76 Stockholm, Sweden<sup>c</sup> Department of Clinical Sciences at Danderyd Hospital, Karolinska Institutet, 171 77 Stockholm, Sweden

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## ABSTRACT

**Objectives:** The objective of this study was to determine the cost of unintended pregnancy (UP) in Sweden and savings generated by a switch of 5% of women from short-acting reversible contraception (SARC) and other methods to long-acting reversible contraceptives (LARCs).

**Study design:** We constructed an economic model to estimate the number and costs of UPs and contraceptive use over a 1-year period. The population consisted of all women aged 15–44 years requiring reversible contraception and at risk of UP. UPs could result in birth, spontaneous abortion, induced abortion, and ectopic pregnancy. The model included costs incurred by the healthcare payer or out-of-pocket expenses by women, and indirect costs, i.e., foregone wages from time away from work.

**Results:** We estimated 73,989 unintended pregnancies yearly, amounting to costs of almost €158 million. A 5% switch from non-LARCs to LARCs would generate more than 3500 fewer UPs yearly with savings of nearly €7.7 million. The majority of these savings would arise from reduced costs for UPs.

**Conclusions:** UPs are costly for society and women. A small change in the proportion of women using the most effective methods generates substantial cost savings due to fewer UPs and thus fewer abortions. A switch in 5% of women using non-LARCs could prevent more than 3500 UPs yearly, generating savings of more than SEK 70 million (€7.7 million) or of 2.4% of costs for UPs.

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## 1. Introduction

Sweden has a high rate of unintended pregnancy (UP) and the highest teen abortion and repeat abortion rate in Europe [1]. World-wide, UP is a health issue associated with costs for women, couples and societies. In the United States, 51% of all pregnancies in 2008 were estimated to be UPs [2], and 41% of UPs have been estimated to occur due to inconsistent use of contraception, whereas only 5% occur in women who use contraception consistently [3]. The remainders of UPs are due to nonuse of contraception. Approximately 40% of UPs in the

United States [2] end in abortion, and the same rates have been reported in Sweden [4].

In spite of easy access to contraceptives, a recent study could show that Sweden has an unmet need for contraception, i.e., the proportion of women needing, but not using contraception. In addition, the study showed that Sweden has a high number of women using traditional methods, such as calendar method and coitus interruptus or no method [4].

The most effective reversible contraceptive methods are long-acting reversible contraception (LARC), consisting of implants and intrauterine contraception [5]. As LARCs facilitate compliance, they have been shown to reduce the rates of abortion and repeat abortion in numerous studies [6–9]. However, in spite of contraceptive pills having higher failure rates with typical use than LARCs [7], pills are the most commonly prescribed contraceptive method for young women in Sweden [4] as well as in several other European Countries [10] and the US [11].

Health care budgets are limited worldwide, and together with aspects such as efficacy, safety and accessibility, determining the cost effectiveness of a change in prescription pattern is important in order to influence policy and clinical practice. Numerous studies have been published on the cost of UP and the impact of a 5%–10% switch to LARCs [12–14]. However, data on use of contraceptives in these studies

**Abbreviations:** DRG, Diagnosis Related Groups; LARC, long-acting contraception; US, United States of America; SARC, short-acting reversible contraception; UP, unintended pregnancy.

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\* Corresponding author.

E-mail address: [sara.engstrand@bayer.com](mailto:sara.engstrand@bayer.com) (S. Engstrand).

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were determined by analysis of the prescription registers and data from nationwide surveys performed before 2010. This study aimed at estimating the cost of UP in Sweden and the possible cost reduction for society if 5% of women would switch from short-acting reversible contraception (SARC) to LARCs using newer and real-life data.

## 2. Methods

We constructed an economic model in conjuncture with previously reported methodology to estimate the number and costs of UP and contraceptive use over a 1-year period [12,15]. The CoUP model consisted of two submodels. A diagrammatic representation of the two models, demonstrating how they are linked, is shown in Fig. 1. The first submodel estimated the number and cost of UP, as well as the proportion of UP costs that can be attributed to imperfect adherence. The second submodel estimated the utilization and cost of contraceptive methods and the proportion of UPs attributable to imperfect adherence and projected cost savings from a 5% switch in contraceptive usage from non-LARC to LARC. Injections are included in SARCs due to the need of repeated visits to a provider; thus, they are user dependent. Finally, we calculated the change in UPs and costs when 5% of women using non-LARC moved to LARC [15]. Due to particularly high abortion rates in the 20–29 age group, we performed a subanalysis on this group. The analysis was conducted from a societal perspective, which included both direct and indirect costs incurred by both the health care payer and the women using contraception.

### 2.1. Population

We defined the eligible population as all women aged 15–44 years requiring reversible contraception and at risk of UP. We excluded women without need for contraception (due to infertility, previous sterilization, same sex relationship, etc.) as they do not affect the result of the study. Our key target group for increased LARC use was women aged 20–29 years as this group incurs the highest number of abortions [16]. We used Swedish population data to define the female population

in the relevant age ranges [17]. US [11], Norwegian [18] and Swedish data [4] were used to define the proportion of women to be excluded as not needing contraceptives.

### 2.2. Unintended pregnancy

The model treated UP as any pregnancy resulting from contraceptive method failure and assumed that pregnancy could result in one of four outcomes: birth, spontaneous abortion, induced abortion and ectopic pregnancy, with the probability of outcome differentiated by age. Data on the number of births and induced abortions by age group were available from national registries, the latest available year (2011) being used [16,19]. The number of spontaneous abortions, however, was not directly identifiable from literature but could be calculated using data on the incidence of spontaneous abortions as a function of induced abortions within each age group [20]. Furthermore, the number of ectopic pregnancies was merely available for the entire female population [21]. As age-group-specific figures were not available, the total number of ectopic pregnancies was distributed across ages assuming the same relative distribution as for births.

We determined the proportion of each pregnancy outcome that was unintended in order to estimate the number of UP outcomes. In the absence of Swedish published data, we calculated rates of “unintendedness” for births per age group from US-data [22,23]. Likewise, we took the rate of unintended pregnancies leading to induced abortions from the literature and assumed it to be 92% for all ages [23]. For spontaneous abortions and ectopic pregnancies, we assumed them to be equally distributed for intended and unintended pregnancies [12]. The proportions of each pregnancy outcome assumed to be due to UP were applied to the raw numbers of each pregnancy outcome to estimate UP events for each age group (Table 1).

### 2.3. Contraceptive use

The contraceptive methods included in the model were limited to reversible contraceptive methods categorized as either LARCs (implant,

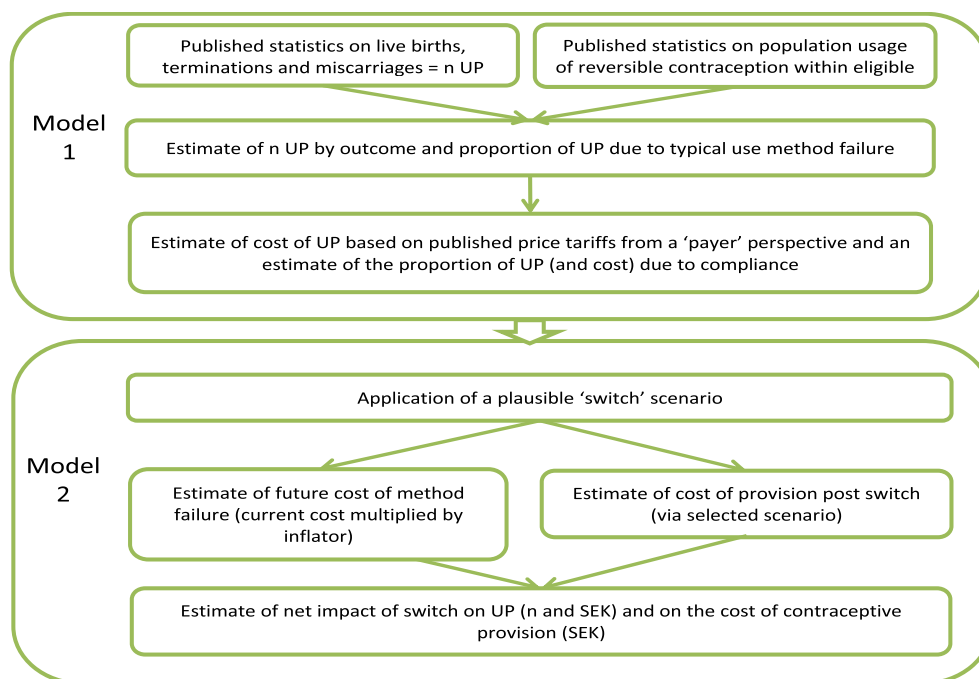


Fig. 1. Schematic representation of the cost of UP model, presented by the two submodels.

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