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Prescription contraception use: A cross-sectional population study of psychosocial determinants

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Complete List of Authors:	Molloy, Gerry; NUI Galway, School of Psychology Sweeney, Leigh-Ann; NUI Galway, School of Psychology Byrne, Molly; NUI Galway, School of Psychology Hughes, Carmel; Queens University Belfast, School of Pharmacy Ingham, Roger; University of Southampton, Centre for Sexual Health Research Morgan, Karen; Royal College of Surgeons in Ireland, Division of Population Health Sciences Murphy, Andrew; NUI Galway, Discipline of General Practice, School of Medicine
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5 **Prescription contraception use: A cross-sectional population study of psychosocial determinants**
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15 Corresponding author: Gerard J. Molloy

16
17 Address: 1037 Arts Millennium Building Extension (AMBE), School of Psychology, National University
18 of Ireland, Galway, Republic of Ireland.
19

20 E-mail: gerry.molloy@nuigalway.ie Phone: +353-91-495123 Fax: +353-91-521355
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22
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26

27 Leigh-Ann Sweeney and Molly Byrne, National University of Ireland, Galway, Republic of Ireland

28 Carmel M Hughes, Queen's University Belfast, Belfast, Northern Ireland, UK

29 Roger Ingham, University of Southampton, Southampton, UK

30 Karen Morgan, Royal College of Surgeons in Ireland, Dublin, Republic of Ireland

31 Andrew W Murphy, National University of Ireland, Galway, Republic of Ireland
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Objective

Many forms of contraception are available on prescription only e.g. the oral contraceptive pill (OCP) and long acting reversible contraceptives (LARCs). In this analysis we aim to identify key determinants of prescription contraceptive use.

Design

Cross-sectional population survey. Data on socio-demographic indices, concerns about the OCP and perceived barriers to access were collected.

Setting

Dataset constructed from a representative population based telephone survey of community dwelling adults in the Republic of Ireland (RoI)

Participants

1,515 women aged between 18 and 45 years

Main outcome measure

Self-reported user of the OCP or LARCs (intrauterine contraception, contraceptive injections or sub-dermal contraceptive implants) in the previous 12 months

Results

For at least some of the previous year, 35% had used the OCP and 14% had used LARCs, while 3% had used two or more of these methods. OCP users were significantly younger, more likely to be unmarried and had higher income than non-users. Overall, 68% agreed with the statement 'that taking a break from long term use of the contraceptive pill is a good idea' and 37% agreed with the statement that 'the OCP has dangerous side effects' and this was the strongest predictor variable of non-use of the OCP. Intrauterine contraception users were significantly older, more likely to be married and had lower income than non-users. Injections or sub-dermal contraceptive implant users were significantly younger, less likely to be married, had lower income and were less likely to agree that taking a break from long-term use of the pill is a good idea than non-users.

Conclusions: Prescription contraceptive use is socio-demographically patterned, with LARCs in particular being associated with lower incomes. Concerns about the safety of the OCP remain prevalent and are important and modifiable determinants of contraceptive-related behaviour.

Strengths and limitations of this study

- This is the first study to provide a detailed population level multivariable analysis of a range of psychosocial determinants of prescription contraceptive use, including concerns about the safety of the OCP, in a representative sample of over 1500 women.
- The study data were self-reported in a telephone interview and may be subject to recall and social desirability biases; however this is a widely used method to collect data on sexual health from large samples, and has established reliability and validity.
- The identification of both modifiable and non-modifiable determinants of prescription contraceptive use can inform targeted interventions to improve sexual and reproductive health.

INTRODUCTION

Many of the most effective and widely used methods of contraception usually require a prescription from a physician. [1] Data from the United Nations indicates that in more economically developed regions, the oral contraceptive pill (OCP), which is one such method, is second only to male condom use (18.4%) with an estimated international prevalence rate of 17.7% in women who are in a stable relationship. [1] OCP use has remained constant or has increased over the last 10 years in many countries, including Republic of Ireland (RoI) and the United Kingdom (UK). [2 3] The user-dependent nature of the OCP means that the failure rate of the OCP is substantially greater than long acting reversible contraception (LARCs) methods e.g. intrauterine contraception and subdermal contraceptive implants. [4] However, it is important to note that these methods are not suitable for all women. [5] There is also evidence that negative attitudes and misconceptions about specific types of LARC may be pervasive [6 7] including among health care providers [8 9]; therefore, use of these methods remains much lower than the OCP in many countries. [1]

Previous studies have shown that certain types of prescription contraception tend to be more widely used by certain demographic groups. However, these studies are somewhat dated, of variable methodological quality and from a limited range of socio-cultural contexts. [10] Additionally, these studies have not examined the independence of socio-demographic predictors in accounting for prescription contraception use. Some of these predictors become more closely related over time. For example, age and marital status have become more strongly associated with each other due to the increasing age at which people marry and the rapidly changing patterns of relationship stability in some countries. [11 12] It is also possible that there may be age-dependent beliefs about contraception, e.g. the OCP, which could determine its use. This may be due to the high profile reporting of health risks associated with earlier versions of the OCP to which older contraceptive users may have been exposed and the improved safety of more recent versions of the OCP. [5] In the context of RoI, there is also evidence that older contraceptive users may not have

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3 received information on contraception as part of their formal sex education. [2] Analyses examining
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5 how beliefs about the OCP vary by age are necessary in order to elucidate under what conditions a
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7 range of factors explain patterns of OCP use.
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10 Beliefs about the safety of medical treatments are of particular interest as these variables
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12 are potentially modifiable determinants of uptake and adherence to prescription contraception.
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14 There is a significant body of research focusing on the 'Necessity-Concerns framework' of treatment
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16 adherence over the last 15 years. [13 14] This approach emphasises the individual's judgement of
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18 personal need for medication or other forms of treatment (necessity beliefs) and concerns about the
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20 potential adverse consequences of taking it e.g. side-effects and long-term use. Although much of
21
22 this literature focuses on chronic illness, more recent work has identified similar associations
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24 between these treatment beliefs and adherence to the OCP, particularly concerns about the OCP.
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26 [15] This latter study was in a small sample of students (N=130) in the United Kingdom (UK),
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28 therefore the external validity of these findings is limited. In the present study, we examine whether
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30 a range of socio-demographic variables, including concerns about the OCP and barriers to access can
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32 account for prescription contraception use in a representative sample of women between the ages
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34 of 18-45 in the general population in RoI. Specifically, we examine OCP use and two types of LARC
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36 use, namely intrauterine contraception and contraceptive injections or sub-dermal contraceptive
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38 implants. Although some studies have combined these into one LARC user category [16], it is likely
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40 that the characteristics of users vary for these methods given the previous trends to avoid
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42 intrauterine contraception in nulliparous women. [17 18] Therefore, we assess intrauterine
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44 contraception use and contraceptive injections or sub-dermal contraceptive implants use separately
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46 in our analysis. Although these represent three distinct prescription contraception methods, the
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48 latter two methods are combined into one category in this study measure, due to the low frequency
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50 of use of contraceptive injections and sub-dermal contraceptive implants.
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METHOD

Study design

Data were drawn from women who participated in the Irish Contraception and Crisis Pregnancy Study 2010 (ICCP-2010). [2] This was a nationally representative cross-sectional survey of men and women between the ages of 18 and 45 who were living in ROI (N=3,002; women n = 1,515). The study was designed to describe attitudes, knowledge and behaviours relating to sexual health and, in particular, contraception and crisis pregnancy. Crisis pregnancy in this context was defined as “a pregnancy that represents a personal crisis or an emotional trauma in either of the following circumstances: (a) a pregnancy that began as a crisis, even if the crisis was subsequently resolved or (b) a pregnancy that develops into a crisis before the birth due to a change in circumstances.” [2]

Setting and sample

This population-based telephone survey was conducted in 2010. The random digit dialling of both landline and mobile phones and the quota sampling technique that was used to ensure a representative sample of the general population within this age band are described in detail in the main report and a separate publication. [2 19] The overall response rate to the survey was 69%.

Recruitment and consent

A standardised introduction to the study was used to describe who was carrying out the survey, its confidential nature and how the telephone numbers had been randomly selected. Following confirmation that the respondent was over 18 years of age and verbal agreement to participate, the telephone interview began.

Questionnaire survey

The telephone-administered questionnaire collected information on the participant’s socio-demographic data, living arrangements, children, sex education, knowledge and attitudes about

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3 contraception, contraceptive use over the last year, sources of contraception and contraceptive
4 services, sexually transmitted infections, most recent sexual partnership, experience of pregnancy
5 and knowledge of crisis pregnancy services, including abortion. The full questionnaire and dataset
6 are available on request from the Irish Social Science Data Archive. For the present study, we
7 highlight ten variables in our main analyses; these psychosocial variables were selected based on
8 previous literature and variables that capture aspects of an individual's motivation, capability and
9 opportunity to use prescription contraception, as defined by the behaviour change wheel approach
10 for identifying factors for behaviour change interventions. [20]

21 *Socio-demographic data*

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24 In addition to age in years, data were gathered on marital and relationship status (married,
25 separated, divorced, widowed and never married), education (primary or incomplete secondary
26 only, complete secondary and third level) and whether respondents were in receipt of general
27 medical services (GMS). Such entitlement is based on an assessment of individual's income and is
28 therefore a reliable indicator of socio-economic status; individuals with GMS have lower incomes. In
29 2010, approximately 40% of the population in RoI had GMS eligibility. At the time of this survey
30 patients with such eligibility receive all medications, including contraceptives, free of charge; non-
31 GMS patients pay for all prescriptions up to a monthly limit of approximately €90.

42 *Prescription contraception use in the last year*

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45 In order to assess prescription contraception use, respondents were asked 'Which of these methods
46 of contraception or precautions to avoid pregnancy have you and any partner (s) used together in
47 the last year?' The first contraceptive mentioned on this list was 'The contraceptive pill'. The fifth
48 contraceptive method mentioned on the list was 'Coil, intrauterine device or intrauterine system
49 (Mirena®)'. The eleventh method mentioned was 'Injections (Depo Provera®) or Implanted
50 contraceptive capsules' (Implanon®). If respondents used these in the last year, they were scored as
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3 1 and if not, they were scored as 0. It is important to note that this would not necessarily refer to
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5 continuous use of these methods. Participants were also asked which methods of contraception or
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7 precautions to avoid pregnancy had they ever heard of as part of this section.
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10 *Concerns about the OCP*

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13 Two items assessed concerns about the contraceptive pill. These were, 'The contraceptive pill has
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15 dangerous side-effects' and 'Taking a break from the long-term use of the contraceptive pill is a good
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17 idea'. These were scored on a 5 point scale from 1 Strongly Agree to 5 Strongly Disagree. Higher
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19 scores related to lower concerns. There was a small to moderate positive correlation between these
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21 two items ($r=0.15$, $p<0.01$), which indicates that they can be treated as distinct but related aspects
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23 of concerns about the OCP. A "Don't know" response that was not part of the 5 point scale was used
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25 by approximately 3% of the participants; therefore, the two concern variables were dichotomised
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27 into 'Agree' versus 'other' to preserve cases in the analyses.
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30 *Barriers to access*

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33 Various barriers to accessing contraception were assessed in ICCP-2010. These included the
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35 following items: Do not know where to get contraception/services, cannot access
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37 contraception/services in your locality, are embarrassed about accessing contraception/services,
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39 cannot afford contraception/services. The responses to these items were 'Yes' or 'No'. As fewer than
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41 1% of the overall sample responded 'Yes' to the item 'Do not know where to get
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43 contraception/services,' this variable was not included in the analyses. Participants were also asked
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45 'How difficult do you find it to get contraception?' Responses were provided on a 4 point scale from
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47 1 Very difficult to 4 Not at all difficult.
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51 **Data analyses**

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55 Descriptive statistics were calculated for the main study variables in order to characterise the
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57 sample. Independent t tests and Chi square tests for independence were used to compare groups on
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3 continuous and categorical data respectively. Logistic regression analyses were used to test
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5 multivariable models. The final complete multivariable model allowed the statistical independence
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7 of the predictive variables to be established. Logistic regression provides odds ratios and 95%
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9 confidence intervals for each predictor of prescription contraception use, which calculates estimates
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11 of effect sizes for the study predictors. As there were 536 OCP users (35%) and 152 intrauterine
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13 contraception users (10%) in this sample (n= 1,515), there were sufficient numbers of events per
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15 variable to use our multivariable logistic regression with 10 predictors. [21] As there were only 67
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17 women using injections or sub-dermal contraceptive implants (4%) this analysis could provide less
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19 reliable estimates with 10 predictors. Moderation analyses were carried out using the moderation
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21 script for SPSS developed by Hayes and Matthes. [22] Moderation analyses were used to assess
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23 whether there were age dependent associations between beliefs about the OCP and OCP use. This
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25 tested whether the strength of the association between beliefs about the OCP and OCP use varies
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27 for different age groups. All analyses were weighted to ensure that the results are representative of
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29 the population. Full details of the weighting parameters used are provided in the ICCP-2010 report.
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36 **Ethical approval**

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38 The original ICCP-2010 survey protocol received ethical approval from the Research Ethics
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40 Committee of the Royal College of Surgeons in Ireland (RCSI) and the programme of work that
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42 includes the present analysis received ethical approval from the NUI Galway Research Ethics
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44 Committee (Reference: 14/Jan/03).
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48 **RESULTS**

49 **Sample**

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51 An outline of the sample characteristics grouped by prescription contraception users and non-users
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53 of that method is provided in Table 1. Forty-four women (3%) had used 2 or more of the OCP,
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3 intrauterine contraception, contraceptive injections or sub-dermal contraceptive implants in the
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5 previous year, therefore the totals do not equal 1515 participants in Table 1. Full details of the study
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7 sample are provided elsewhere. [2] Eighty-three per cent had heard of the OCP, 76% had heard of
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9 intrauterine devices/systems and 72% had heard of injections or sub-dermal contraceptive implants.
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11 Only 5% of women had not used any method of contraception in the previous year. OCP users,
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13 compared with non-OCP users, were significantly younger, were less likely to be married, less likely
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15 to be in receipt of GMS, less likely to believe that the pill has dangerous side effects, less likely to
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17 believe that taking a break from the long-term use of the contraceptive pill is a good idea, more
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19 likely to report difficulty in getting contraception, more likely to report that they could not access
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21 contraception/services in their locality and more likely to say they could not afford
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23 contraception/services. Intrauterine contraception users were significantly older, more likely to be
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25 married, less likely to have third level education and more likely to be in receipt of GMS. Injections
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27 or sub-dermal contraceptive implants users were more likely to be significantly younger, more likely
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29 to be unmarried, more likely to be in receipt of GMS and less likely to believe that taking a break
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31 from the long-term use of the contraceptive pill is a good idea. In the total sample (n=1515), 37%
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33 agreed with the statement that the OCP had dangerous side effects and 68% agreed that taking a
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35 break from long-term use of the contraceptive pill was a good idea. The proportion of participants in
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37 all groups who reported barriers to access was relatively low i.e. $\leq 5\%$
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Table 1

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45 In the multivariable analysis presented in Table 2, all study variables were included regardless of
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47 univariate associations in order to assess the statistical independence of these determinants. In this
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49 table, lower odds are associated with non-use of the method e.g. being married and having general
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51 medical services were associated with non-use of the OCP as shown in Table 2. The multivariable
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53 model shows that younger age, being unmarried, not being in receipt of GMS and not believing that
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55 the OCP has dangerous side effects emerged as significant independent predictors of OCP use. The
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strongest predictor was not agreeing with the statement that 'The contraceptive pill has dangerous side-effects'. This overall pattern of findings did not change when the continuous measures of education and concerns about the OCP were included in place of the dichotomized variables. Older age, being married and being in receipt of GMS were significant predictors of intrauterine contraception use, while younger age, being in receipt of GMS and not agreeing that taking a break from the long-term use of the contraceptive pill is a good idea were significant predictors of injections or sub-dermal contraceptive implants use. Being in receipt of GMS was the strongest predictor of both LARCs methods. The multivariate models accounted for a moderate amount of variability in prescription contraception use as indicated by the Nagelkerke R^2 value.

Table 2

Respondents who agreed that 'The contraceptive pill has dangerous side effects' were significantly older ($M=32.26$, $SD=7.83$ years versus $M=31.42$, $SD=7.41$ years, $t=-2.06$, $p=0.04$), as were respondents who agreed that 'Taking a break from the long-term use of the contraceptive pill is a good idea' ($M=32.61$, $SD=7.44$ years versus $M=29.87$, $SD=7.53$, $t=-6.60$, $p<0.01$). In moderation analyses, there was no significant interaction between age and believing that the OCP had dangerous side-effects in predicting OCP use. However, there was a significant interaction between age and believing that taking a break from the long term use of the contraceptive pill was a good idea (Interaction term $Beta=-0.05$, $p<0.01$). These age-dependent associations are provided in Table 3 below. This table compares the strength of this association, i.e. Beta values, at 1 standard deviation above and below the mean value of the moderator variable i.e. age. In older women, i.e. those 1 standard deviation (SD) above the mean age of 31.85 years agreeing with this statement was strongly predictive of pill non-use, whereas this was not the case among younger women i.e. those 1SD below the mean age. This decomposition of the interaction into these three groups is recommended by statistical texts describing this analytical method. [22]

Table 3

Table 1 Sample characteristics of study participants (n= 1,515) by OCP or LARCs user status

Variable	OCP user n=536 (35%)	Non-user of OCP n=978 (65%)	Intrauterine contraception n =152 (10%)	Injections or sub-dermal contraceptive implant n=67 (4%)	Non-users of LARCs n=1302 (86%)
Age in years (SD)	29 (7)**	33 (8)	36 (6)**	28 (7)**	31 (8)
Married (%)	169 (32)**	502 (51)	110 (72)**	21 (31)*	542 (42)
Education (% Third level)	223 (42)	391 (40)	45 (30)**	20 (30)	551 (42)
General medical services (% yes)	120 (22)*	279 (29)	65 (43)**	31 (46)**	307 (24)
The OCP has dangerous side-effects (% Agree)	143 (27)**	404 (42)	59 (39)	18 (27)	472 (37)
Taking a break from the long-term use of the OCP is a good idea (% Agree)	339 (63)**	678 (71)	103 (68)	32 (48)**	886 (69)

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How difficult do you find it to get contraception (SD)	3.76 (0.59)*	3.83 (0.49)	3.86 (0.48)	3.85 (0.53)	3.79 (0.55)
Cannot access contraception/services in your locality (% yes)	27 (5)**	24 (2.5)	4 (3)	2 (3)	47 (4)
Are embarrassed about accessing contraception/services (% yes)	21 (4)	23 (2)	4 (3)	1 (2)	39 (3)
Cannot afford contraception/services (% yes)	21 (4)*	19 (2)	5 (3)	0 (0)	35 (3)

*<0.05; **<0.01: Comparisons are with the non-user group of the specified contraception; SD: Standard deviation

Table 2 Multivariable logistic regression predicting prescription contraception use (1 =Yes, 0 = No) among study participants (n= 1,515)

Predictor variable	OCP		Intrauterine contraception		Injections or sub- dermal contraceptive implant	
	Odds ratio	95% CI	Odds ratio	95% CI	Odds ratio	95% CI
Age in years (continuous)	0.92**	0.91,0.94	1.10**	1.06, 1.13	0.92**	0.88, 0.97
Unmarried (Reference)	1.00		1.00		1.00	
Married	0.67**	0.51,0.89	2.48**	1.62, 3.80	1.09	0.56, 2.13
Education at Third level No (Reference)	1.00		1.00		1.00	
Education at Third level Yes	0.83	0.65,1.07	0.74	0.49, 1.12	0.74	0.41, 1.32
General medical services- No (Reference)	1.00		1.00		1.00	
General medical services- Yes	0.62**	0.46,0.83	2.63**	1.76, 3.91	2.31**	1.33, 3.99

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The OCP has dangerous side-effects-Other (Reference)	1.00		1.00		1.00	
The OCP has dangerous side-effects-Agree	0.52**	0.43,0.68	1.19	0.81, 1.76	0.84	0.47, 1.49
Taking a break from the long-term use of the OCP is a good idea-Other (Ref)	1.00		1.00		1.00	
Taking a break from the long-term use of the OCP is a good idea-Agree	0.89	0.68,1.15	0.73	0.49, 1.11	0.48**	0.28, 0.81
How difficult do you find it to get contraception (continuous)	0.80	0.56, 1.15	1.32	0.66, 2.66	0.92	0.44, 1.91
Cannot access contraception/services in your locality-No (Reference)	1.00		1.00		1.00	
Cannot access contraception/services in your locality-Yes	1.20	0.55, 2.63	1.13	0.26, 4.97	0.71	0.11, 4.45
Are embarrassed about accessing contraception/services-No (Reference)	1.00		1.00		1.00	
Are embarrassed about accessing contraception/services-Yes	0.69	0.32, 1.52	1.48	0.39, 5.68	0.16	0.01, 2.13
Cannot afford contraception/services-No (Reference)	1.00		1.00		1.00	
Cannot afford contraception/services-Yes	0.88	0.40, 1.92	2.31	0.63, 8.44	0.99	0.00, 0.00
Nagelkerke R ² for full model		0.17		0.18		0.11

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**<0.01; 1= Yes, 0 = No; 1= Agree, 0 =Other; 1= reference category for binary predictor variables.

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Table 3 Association between agreeing that ‘taking a break from the oral contraceptive pill is a good idea’ and OCP non-use across younger, average and older age groups

Age in years	Beta	Standard error	95% CI Beta	P
24.23 (-1 SD)	0.09	0.15	-0.20, 0.39	0.53
31.85 (Mean)	-0.26	0.12	-0.50, -0.02	0.03
39.46 (+ 1SD)	-0.61	0.19	-0.98, -0.24	<0.01

DISCUSSION

The analysis provides a detailed description of the characteristics of prescription contraception users in RoI. Lower income, as indexed by having GMS, was the strongest predictor of both kinds of LARC use. These results highlight that concerns about the OCP are common and that these concerns are linked to prescription contraception use, with the strongest predictor of not using the OCP being the belief that 'the contraceptive pill has dangerous side-effects'. The analysis also shows that the association between concerns and OCP use varied according to age, with the association being particularly strong among older women. This might be partly explained by exposure to historical reporting of specific health risks associated with the OCP that have since been shown to be unsupported. [5] It is also likely that the increased duration of exposure to the OCP that older users will have may also partly account for this. In the ICCP-2010 report [2] there was evidence indicating that contraception was a topic in the sex education of 70% of those between the ages of 18-25 years of age in the survey, but only 34% of those between the ages of 36-45 years of age said that contraception was mentioned. This might also partly explain the greater concerns about OCP reported by older women, as it is likely that access to accurate information about contraception was harder to access.

The independent links between prescription contraception use and age, marital status and having GMS i.e. having lower income, are consistent with observations seen in other countries. [10] The prevalence and predictive power of the two variables assessing concerns about the OCP suggests that concerns may continue to have an important role in contraceptive choice, as has been observed in earlier studies in other contexts. [23] The low numbers of respondents reporting barriers to access ($\leq 5\%$) and the weak predictive power of 'perceived difficulty' of finding contraception measure suggest that access to contraception is no longer reported as a major problem among adults in RoI and probably not an important determinant of OCP use. However, it is important to acknowledge that there may be barriers to access in those under 18. [24] The findings

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3 relating to sex education in ICCP-2010 mentioned in the last paragraph [2] do indicate that
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5 contraception is more likely to be part of the sex education of younger cohorts. However, it is not
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7 universally covered according to the data and there is a relatively recent history of avoiding the topic
8
9 in sex education [2], which may create and reflect implicit social disapproval of contraception.
10

11
12 The predictive power of 'concerns about the OCP' and the potentially modifiable nature of
13
14 these beliefs suggest that reproductive health promotion needs to place particular emphasis on
15
16 shaping accurate beliefs about the OCP and indeed LARCs' methods to optimise individual
17
18 contraceptive choices. In addition to this, it is clear that there are socio-economic determinants of
19
20 OCP use in that the current results show that OCP use was more common among those who did not
21
22 have GMS i.e. those with higher income, and LARCs use was more common among those who did
23
24 have GMS i.e. those with lower incomes. Therefore, although few people indicated that they could
25
26 not afford contraceptive services (<5%), it is likely that there are socio-economic barriers to
27
28 contraception use. Recent intervention studies, including natural experiments, suggest that
29
30 removing financial and other access barriers can have a substantial impact on uptake of
31
32 contraceptives, particularly LARCs. [25 26]
33
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36

37 The OCP is currently a significantly less expensive option in the short term for those who do
38
39 not have GMS costing less than €20 per month. Therefore it is possible that LARCs methods, which
40
41 may cost up to €300 initially, are not financially feasible for those with incomes just above the
42
43 threshold that would entitle them to GMS. As a result, LARC use may predominate in those with
44
45 lowest incomes who do qualify for GMS and those with higher incomes in RoI, where the initial
46
47 higher cost is not a barrier. It is also worth noting that this socio-economic difference seen within RoI
48
49 reflects socio-economic differences between other countries in respect of LARC use. For example,
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51 intrauterine contraception is more commonly used and often freely available in less economically
52
53 developed parts of the world, e.g. in Asia, there is a 27% prevalence among women using
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1
2
3 contraception, whereas it is a relatively expensive option in many more wealthier regions e.g. 6%
4
5 prevalence in North America. [18]
6
7

8 Contraception has been a controversial socio-political topic in the RoI. Prescribing and
9
10 having contraception of any description was illegal in the RoI until 1980 [27] and emergency
11
12 contraception was not available without prescription until 2011. [28] This can be largely explained by
13
14 the particular religious ethos that historically pervaded healthcare and politics in RoI. [29] Given this
15
16 cultural backdrop, policy measures such as providing free contraceptive services to all may be likely
17
18 to receive resistance in RoI, even if evidence from health economic analysis in other contexts
19
20 indicates that this investment may lead to health gain for the population. [28]
21
22

23 **Limitations and strengths**

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25
26
27 There are a number of aspects of the methodology where alternative approaches would
28
29 have been desirable. First, the data were entirely self-reported in the format of a telephone
30
31 interview. This is subject to the usual problems of recall and social desirability biases in
32
33 measurement. However this is a widely used approach with established reliability and validity that
34
35 may be superior to face-to-face interviews for sensitive topics. [30] Second, the cross-sectional study
36
37 design does not allow any causal inferences to be made from the data. Third, it would have been
38
39 preferable to have psychometrically validated measures of concerns about the pill [15] and other
40
41 related psychological constructs related to medication beliefs [14] and LARCs rather than the single
42
43 item measures used in this study that only addressed the OCP. Nevertheless, there are several
44
45 strengths to the present study which help to mitigate these limitations, including: the representative
46
47 sample of the general population within the specified age band who provided anonymized data; the
48
49 reporting of multivariable and moderation analyses to provide a more detailed and nuanced
50
51 assessment of the relationship between a broad range of predictors and prescription contraceptive
52
53 use; the separate analysis for two different classes of LARCs which are sometimes considered
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55 together; [16] and the use of relatively recently collected data on this topic. This is particularly
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1
2
3 important due the changing nature of contraceptive use over the last 10-15 years in this [2] and
4
5 other international contexts. [1]
6
7

8 **Conclusion**

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10
11 Prescription contraceptive use is socio-demographically patterned with LARCs' methods in
12 particular being associated with lower incomes in RoI. Despite the established safety of the OCP,
13 concerns remain prevalent in RoI, which may reflect the socio-cultural context surrounding
14
15 contraception. These concerns are important and modifiable determinants of contraceptive-related
16
17 behaviour that may have more resonance in older users of contraception. The evidence from this
18
19 study suggests that further efforts are required to clarify the health risks associated with the OCP
20
21 and LARCs. Future work will also need to establish who (e.g. GP or nurse), where (e.g. primary care
22
23 or educational settings) and how (e.g. during consultations or sex education classes), this can be
24
25 optimally delivered.
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2
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8 the Health Service Executive Crisis Pregnancy Programme.
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15
16
17 **Competing interests** None.
18

19
20 **Participant consent** Obtained.
21

22
23 **Ethics approval** The original ICCP-2010 survey protocol received ethical approval from the Research
24 Ethics Committee of the Royal College of Surgeons in Ireland (RCSI) and the programme of work that
25 includes the present analysis received ethical approval from the NUI Galway Research Ethics
26 Committee (Reference: 14/Jan/03).
27
28
29
30

31
32 **Contributors** GM, KM, MB and AM conceived the research. GM carried out the research, data
33 analysis and drafted the paper. All authors approved the final manuscript.
34
35

36
37 **Data sharing statement:** There ICCP-2010 dataset is available from the Irish Social Science Data
38 Archive: <http://www.ucd.ie/issda/>
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STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract (b) Provide in the abstract an informative and balanced summary of what was done and what was found
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported
Objectives	3	State specific objectives, including any prespecified hypotheses
Methods		
Study design	4	Present key elements of study design early in the paper
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants (b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group
Bias	9	Describe any efforts to address potential sources of bias
Study size	10	Explain how the study size was arrived at
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding (b) Describe any methods used to examine subgroups and interactions (c) Explain how missing data were addressed (d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed <i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed <i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy (e) Describe any sensitivity analyses

Continued on next page

Results

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed (b) Give reasons for non-participation at each stage (c) Consider use of a flow diagram
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders (b) Indicate number of participants with missing data for each variable of interest (c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)
Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time <i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure <i>Cross-sectional study</i> —Report numbers of outcome events or summary measures
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included (b) Report category boundaries when continuous variables were categorized (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses

Discussion

Key results	18	Summarise key results with reference to study objectives
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence
Generalisability	21	Discuss the generalisability (external validity) of the study results

Other information

Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based
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*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Prescription contraception use: A cross-sectional population study of psychosocial determinants

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6 **Prescription contraception use: A cross-sectional population study of psychosocial determinants**
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16 Corresponding author: Gerard J. Molloy

17
18 Address: 1037 Arts Millennium Building Extension (AMBE), School of Psychology, National University
19 of Ireland, Galway, Republic of Ireland.

20
21 E-mail: gerry.molloy@nuigalway.ie Phone: +353-91-495123 Fax: +353-91-521355
22
23

24
25
26
27
28 Leigh-Ann Sweeney and Molly Byrne, National University of Ireland, Galway, Republic of Ireland

29
30 Carmel M Hughes, Queen's University Belfast, Belfast, Northern Ireland, UK

31
32 Roger Ingham, University of Southampton, Southampton, UK

33
34 Karen Morgan, Royal College of Surgeons in Ireland, Dublin, Republic of Ireland

35
36 Andrew W Murphy, National University of Ireland, Galway, Republic of Ireland
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40 Key words: contraception; contraception behaviour; contraceptive methods; contraception, female

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42 Word count: 4,596
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Objective

Many forms of contraception are available on prescription only e.g. the oral contraceptive pill (OCP) and long acting reversible contraceptives (LARCs). In this analysis we aim to identify key determinants of prescription contraceptive use.

Design

Cross-sectional population survey. Data on socio-demographic indices, concerns about the OCP and perceived barriers to access were collected.

Setting

Dataset constructed from a representative population based telephone survey of community dwelling adults in the Republic of Ireland (RoI)

Participants

1,515 women aged between 18 and 45 years

Main outcome measure

Self-reported user of the OCP or LARCs (intrauterine contraception, contraceptive injections or sub-dermal contraceptive implants) in the previous 12 months

Results

For at least some of the previous year, 35% had used the OCP and 14% had used LARCs, while 3% had used two or more of these methods. OCP users were significantly younger, more likely to be unmarried and had higher income than non-users. Overall, 68% agreed with the statement 'that taking a break from long term use of the contraceptive pill is a good idea' and 37% agreed with the statement that 'the OCP has dangerous side effects' and this was the strongest predictor variable of non-use of the OCP. Intrauterine contraception users were significantly older, more likely to be married and had lower income than non-users. Injections or sub-dermal contraceptive implant users were significantly younger, less likely to be married, had lower income and were less likely to agree that taking a break from long-term use of the pill is a good idea than non-users.

Conclusions: Prescription contraceptive use is socio-demographically patterned, with LARCs in particular being associated with lower incomes. Concerns about the safety of the OCP remain prevalent and are important and modifiable determinants of contraceptive-related behaviour.

Strengths and limitations of this study

- This is the first study to provide a detailed population level multivariable analysis of a range of psychosocial determinants of prescription contraceptive use, including concerns about the safety of the OCP, in a representative sample of over 1500 women.
- The study data were self-reported in a telephone interview and may be subject to recall and social desirability biases; however this is a widely used method to collect data on sexual health from large samples, and has established reliability and validity.
- The identification of both modifiable and non-modifiable determinants of prescription contraceptive use can inform targeted interventions to improve sexual and reproductive health.

INTRODUCTION

Many of the most effective and widely used methods of contraception usually require a prescription from a physician. [1] Data from the United Nations indicates that in more economically developed regions, the oral contraceptive pill (OCP), which is one such method, is second only to male condom use (18.4%) with an estimated international prevalence rate of 17.7% in women who are in a stable relationship. [1] OCP use has remained constant or has increased over the last 10 years in many countries, including Republic of Ireland (RoI) and the United Kingdom (UK). [2 3] The user-dependent nature of the OCP means that the failure rate of the OCP is substantially greater than long acting reversible contraception (LARCs) methods e.g. intrauterine contraception and subdermal contraceptive implants. [4] However, It is important to note that these methods are not suitable for all women. [5] There is also evidence that negative attitudes and misconceptions about specific types of LARC may be pervasive [6 7] including among health care providers [8 9]; therefore, use of these methods remains much lower than the OCP in many countries. [1]

Previous studies have shown that certain types of prescription contraception tend to be more widely used by certain demographic groups. However, these studies are somewhat dated, of variable methodological quality and from a limited range of socio-cultural contexts. [10] Additionally, these studies have not examined the independence of socio-demographic predictors in accounting for prescription contraception use. Some of these predictors become more closely related over time. For example, age and marital status have become more strongly associated with each other due to the increasing age at which people marry and the rapidly changing patterns of relationship stability in some countries. [11 12] It is also possible that there may be age-dependent beliefs about contraception, e.g. the OCP, which could determine its use. This may be due to the high profile reporting of health risks associated with earlier versions of the OCP to which older contraceptive users may have been exposed and the improved safety of more recent versions of the OCP. [5] In the context of RoI, there is also evidence that older contraceptive users may not have

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4 received information on contraception as part of their formal sex education. [2] Analyses examining
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6 how beliefs about the OCP vary by age are necessary in order to elucidate under what conditions a
7
8 range of factors explain patterns of OCP use.
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11 Beliefs about the safety of medical treatments are of particular interest as these variables
12
13 are potentially modifiable determinants of uptake and adherence to prescription contraception.
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15 There is a significant body of research focusing on the 'Necessity-Concerns framework' of treatment
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17 adherence over the last 15 years. [13 14] This approach emphasises the individual's judgement of
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19 personal need for medication or other forms of treatment (necessity beliefs) and concerns about the
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21 potential adverse consequences of taking it e.g. side-effects and long-term use. Although much of
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23 this literature focuses on chronic illness, more recent work has identified similar associations
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25 between these treatment beliefs and adherence to the OCP, particularly concerns about the OCP.
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27 [15] This latter study was in a small sample of students (N=130) in the United Kingdom (UK),
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29 therefore the external validity of these findings is limited. In the present study, we examine whether
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31 a range of socio-demographic variables, including concerns about the OCP and barriers to access can
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33 account for prescription contraception use in a representative sample of women between the ages
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35 of 18-45 in the general population in RoI. Specifically, we examine OCP use and two types of LARC
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37 use, namely intrauterine contraception and contraceptive injections or sub-dermal contraceptive
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39 implants. Although some studies have combined these into one LARC user category [16], it is likely
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41 that the characteristics of users vary for these methods given the previous trends to avoid
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43 intrauterine contraception in nulliparous women. [17 18] Therefore, we assess intrauterine
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45 contraception use and contraceptive injections or sub-dermal contraceptive implants use separately
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47 in our analysis. Although these represent three distinct prescription contraception methods, the
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49 latter two methods are combined into one category in this study measure, due to the low frequency
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51 of use of contraceptive injections and sub-dermal contraceptive implants.
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METHOD

Study design

Data were drawn from women who participated in the Irish Contraception and Crisis Pregnancy Study 2010 (ICCP-2010). [2] This was a nationally representative cross-sectional survey of men and women between the ages of 18 and 45 who were living in ROI (N=3,002; women n = 1,515). The study was designed to describe attitudes, knowledge and behaviours relating to sexual health and, in particular, contraception and crisis pregnancy. Crisis pregnancy in this context was defined as “a pregnancy that represents a personal crisis or an emotional trauma in either of the following circumstances: (a) a pregnancy that began as a crisis, even if the crisis was subsequently resolved or (b) a pregnancy that develops into a crisis before the birth due to a change in circumstances.” [2]

Setting and sample

This population-based telephone survey was conducted in 2010. The random digit dialling of both landline and mobile phones and the quota sampling technique that was used to ensure a representative sample of the general population within this age band are described in detail in the main report and a separate publication. [2 19] The overall response rate to the survey was 69%.

Recruitment and consent

A standardised introduction to the study was used to describe who was carrying out the survey, its confidential nature and how the telephone numbers had been randomly selected. Following confirmation that the respondent was over 18 years of age and verbal agreement to participate, the telephone interview began.

Questionnaire survey

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4 The telephone-administered questionnaire collected information on the participant's socio-
5 demographic data, living arrangements, children, sex education, knowledge and attitudes about
6 contraception, contraceptive use over the last year, sources of contraception and contraceptive
7 services, sexually transmitted infections, most recent sexual partnership, experience of pregnancy
8 and knowledge of crisis pregnancy services, including abortion. The full questionnaire and dataset
9 are available on request from the Irish Social Science Data Archive. For the present study, we
10 highlight ten variables in our main analyses; these psychosocial variables were selected based on
11 previous literature and variables that capture aspects of an individual's motivation, capability and
12 opportunity to use prescription contraception, as defined by the behaviour change wheel approach
13 for identifying factors for behaviour change interventions. [20]
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25 26 *Socio-demographic data* 27

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29 In addition to age in years, data were gathered on marital and relationship status (married,
30 separated, divorced, widowed and never married), education (primary or incomplete secondary
31 only, complete secondary and third level) and whether respondents were in receipt of general
32 medical services (GMS). Such entitlement is based on an assessment of individual's income and is
33 therefore a reliable indicator of socio-economic status; individuals with GMS have lower incomes. In
34 2010, approximately 40% of the population in ROI had GMS eligibility. At the time of this survey
35 patients with such eligibility receive all medications, including contraceptives, free of charge; non-
36 GMS patients pay for all prescriptions up to a monthly limit of approximately €90.
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47 48 *Prescription contraception use in the last year* 49

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51 In order to assess prescription contraception use, respondents were asked 'Which of these methods
52 of contraception or precautions to avoid pregnancy have you and any partner (s) used together in
53 the last year?' The first contraceptive mentioned on this list was 'The contraceptive pill'. The fifth
54 contraceptive method mentioned on the list was 'Coil, intrauterine device or intrauterine system
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4 (Mirena®). The eleventh method mentioned was 'Injections (Depo Provera®) or Implanted
5
6 contraceptive capsules' (Implanon®). If respondents used these in the last year, they were scored as
7
8 1 and if not, they were scored as 0. It is important to note that this would not necessarily refer to
9
10 continuous use of these methods. Participants were also asked which methods of contraception or
11
12 precautions to avoid pregnancy had they ever heard of as part of this section.
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14 15 16 *Concerns about the OCP*

17
18 Two items assessed concerns about the contraceptive pill. These were, 'The contraceptive pill has
19
20 dangerous side-effects' and 'Taking a break from the long-term use of the contraceptive pill is a good
21
22 idea'. These were scored on a 5 point scale from 1 Strongly Agree to 5 Strongly Disagree. Higher
23
24 scores related to lower concerns. There was a small to moderate positive correlation between these
25
26 two items ($r=0.15$, $p<0.01$), which indicates that they can be treated as distinct but related aspects
27
28 of concerns about the OCP. A "Don't know" response that was not part of the 5 point scale was used
29
30 by approximately 3% of the participants; therefore, the two concern variables were dichotomised
31
32 into 'Agree' versus 'Other' to preserve cases in the analyses. Those scoring Strongly Agree and Agree
33
34 were classified as 'Agree' and all other responses were classified as 'Other'.
35
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38 39 *Barriers to access*

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41 Various barriers to accessing contraception were assessed in ICCP-2010. These included the
42
43 following items: Do not know where to get contraception/services, cannot access
44
45 contraception/services in your locality, are embarrassed about accessing contraception/services,
46
47 cannot afford contraception/services. The responses to these items were 'Yes' or 'No'. As less than
48
49 1% of the overall sample responded 'Yes' to the item 'Do not know where to get
50
51 contraception/services,' this variable was not included in the analyses. Therefore, these four
52
53 variables are binary variables where participants were classified as Yes or No. Participants were also
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4 asked 'How difficult do you find it to get contraception?' Responses were provided on a 4 point scale
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6 from 1 Very difficult to 4 Not at all difficult.
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9 10 **Data analyses**

11
12 Descriptive statistics were calculated for the main study variables in order to characterise the
13
14 sample. Independent t tests and Chi square tests for independence were used to compare groups on
15
16 continuous and categorical data respectively. Logistic regression analyses were used to test
17
18 multivariable models. The final complete multivariable model allowed the statistical independence
19
20 of the predictive variables to be established. Logistic regression provides odds ratios and 95%
21
22 confidence intervals for each predictor of prescription contraception use, which calculates estimates
23
24 of effect sizes for the study predictors. As there were 536 OCP users (35%) and 152 intrauterine
25
26 contraception users (10%) in this sample (n= 1,515), there were sufficient numbers of events per
27
28 variable to use our multivariable logistic regression with 10 predictors. [21] As there were only 67
29
30 women using injections or sub-dermal contraceptive implants (4%) this analysis could provide less
31
32 reliable estimates with 10 predictors. Moderation analyses were carried out using the moderation
33
34 script for SPSS developed by Hayes and Matthes. [22] Moderation analyses were used to assess
35
36 whether there were age dependent associations between beliefs about the OCP and OCP use. This
37
38 tested whether the strength of the association between beliefs about the OCP and OCP use varies
39
40 for different age groups. All analyses were weighted to ensure that the results are representative of
41
42 the population. Full details of the weighting parameters used are provided in the ICCP-2010 report.
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46 [2]

47 48 49 **Ethical approval**

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52 The original ICCP-2010 survey protocol received ethical approval from the Research Ethics
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54 Committee of the Royal College of Surgeons in Ireland (RCSI) and the programme of work that
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4 includes the present analysis received ethical approval from the NUI Galway Research Ethics
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6 Committee (Reference: 14/Jan/03).
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9 RESULTS

10 Sample

11
12 An outline of the sample characteristics grouped by prescription contraception users and non-users
13
14 of that method is provided in Table 1. Forty-four women (3%) had used 2 or more of the OCP,
15
16 intrauterine contraception, contraceptive injections or sub-dermal contraceptive implants in the
17
18 previous year, therefore the totals do not equal 1515 participants in Table 1. The three most widely
19
20 used methods of contraception were condoms (39%), the OCP (35%) and the intrauterine
21
22 contraception (10%). The 'non-users of LARCs' column in Table 1 refers to participants who neither
23
24 used intrauterine contraception use nor sub-dermal contraceptive implants as a method of
25
26 contraception in the previous year. Full details of the study sample are provided elsewhere. [2]
27
28 Eighty-three per cent had heard of the OCP, 76% had heard of intrauterine devices/systems and 72%
29
30 had heard of injections or sub-dermal contraceptive implants. Only 5% of women had not used any
31
32 method of contraception in the previous year. OCP users, compared with non-OCP users, were
33
34 significantly younger, were less likely to be married, less likely to be in receipt of GMS, less likely to
35
36 believe that the pill has dangerous side effects, less likely to believe that taking a break from the
37
38 long-term use of the contraceptive pill is a good idea, more likely to report difficulty in getting
39
40 contraception, more likely to report that they could not access contraception/services in their
41
42 locality and more likely to say they could not afford contraception/services. Intrauterine
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44 contraception users were significantly older, more likely to be married, less likely to have third level
45
46 education and more likely to be in receipt of GMS. Injections or sub-dermal contraceptive implants
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48 users were more likely to be significantly younger, more likely to be unmarried, more likely to be in
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50 receipt of GMS and less likely to believe that taking a break from the long-term use of the
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4 contraceptive pill is a good idea. In the total sample (n=1515), 37% agreed with the statement that
5
6 the OCP had dangerous side effects and 68% agreed that taking a break from long-term use of the
7
8 contraceptive pill was a good idea. The proportion of participants in all groups who reported
9
10 barriers to access was relatively low i.e. $\leq 5\%$
11

12
13
14 Table 1
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16
17 In the multivariable analysis presented in Table 2, all study variables were included regardless of
18
19 univariate associations in order to assess the statistical independence of these determinants. In this
20
21 table, odds ratios less than 1 are associated with non-use of the method; for example, being married
22
23 and having general medical services were associated with non-use of the OCP as shown in Table 2.
24
25 The multivariable model shows that younger age, being unmarried, not being in receipt of GMS and
26
27 not believing that the OCP has dangerous side effects emerged as significant independent predictors
28
29 of OCP use. The strongest predictor was not agreeing with the statement that 'The contraceptive pill
30
31 has dangerous side-effects'. This overall pattern of findings did not change when the continuous
32
33 measures of education and concerns about the OCP were included in place of the dichotomised
34
35 variables. In Table 2 intrauterine contraception use and sub-dermal contraceptive implants use are
36
37 compared with non-use of these methods. Older age, being married and being in receipt of GMS
38
39 were significant predictors of intrauterine contraception use, while younger age, being in receipt of
40
41 GMS and not agreeing that taking a break from the long-term use of the contraceptive pill is a good
42
43 idea were significant predictors of injections or sub-dermal contraceptive implants use. Being in
44
45 receipt of GMS was the strongest predictor of both LARCs methods. The multivariate models
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47 accounted for a moderate amount of variability in prescription contraception use as indicated by the
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49 Nagelkerke R^2 value.
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54 Table 2
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4 Respondents who agreed that 'The contraceptive pill has dangerous side effects' were significantly
5
6 older (M=32.26, SD =7.83 years versus M= 31.42, SD=7.41 years, $t = -2.06$, $p=0.04$), as were
7
8 respondents who agreed that 'Taking a break from the long-term use of the contraceptive pill is a
9
10 good idea ' (M=32.61, SD=7.44 years versus M=29.87, SD=7.53, $t = -6.60$, $p<0.01$). In moderation
11
12 analyses, there was no significant interaction between age and believing that the OCP had
13
14 dangerous side-effects in predicting OCP use. However, there was a significant interaction between
15
16 age and believing that taking a break from the long term use of the contraceptive pill was a good
17
18 idea (Interaction term Beta= -0.05, $p <0.01$). These age-dependent associations are provided in Table
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20 3 below. This table compares the strength of this association, i.e. Beta values, at 1 standard
21
22 deviation above and below the mean value of the moderator variable i.e. age. In older women, i.e.
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24 those 1 standard deviation (SD) above the mean age of 31.85 years agreeing with this statement was
25
26 strongly predictive of pill non-use, whereas this was not the case among younger women i.e. those
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28 1SD below the mean age. This decomposition of the interaction into these three groups is
29
30 recommended by statistical texts describing this analytical method. [22]
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Table 3

Table 1 Sample characteristics of study participants (n= 1,515) by OCP or LARCs user status

Variable	OCP user n=536 (35%)	Non-user of OCP n=978 (65%)	Intrauterine contraception n =152 (10%)	Injections or sub-dermal contraceptive implant n=67 (4%)	Non-users of LARCs n=1302 (86%)
Age in years (SD)	29 (7)**	33 (8)	36 (6)**	28 (7)**	31 (8)
Married (%)	169 (32)**	502 (51)	110 (72)**	21 (31)*	542 (42)
Education (% Third level)	223 (42)	391 (40)	45 (30)**	20 (30)	551 (42)
General medical services (% yes)	120 (22)*	279 (29)	65 (43)**	31 (46)**	307 (24)
The OCP has dangerous side-effects (% Agree)	143 (27)**	404 (42)	59 (39)	18 (27)	472 (37)
Taking a break from the long-term use of the OCP is a good idea (% Agree)	339 (63)**	678 (71)	103 (68)	32 (48)**	886 (69)

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How difficult do you find it to get contraception (SD)	3.76 (0.59)*	3.83 (0.49)	3.86 (0.48)	3.85 (0.53)	3.79 (0.55)
Cannot access contraception/services in your locality (% yes)	27 (5)**	24 (2.5)	4 (3)	2 (3)	47 (4)
Are embarrassed about accessing contraception/services (% yes)	21 (4)	23 (2)	4 (3)	1 (2)	39 (3)
Cannot afford contraception/services (% yes)	21 (4)*	19 (2)	5 (3)	0 (0)	35 (3)

* <0.05 ; ** <0.01 : Comparisons are with the non-user group of the specified contraception; SD: Standard deviation

Table 2 Multivariable logistic regression predicting prescription contraception use (1 =Yes, 0 = No) among study participants (n= 1,515^a)

Predictor variable	OCP		Intrauterine contraception		Injections or sub- dermal contraceptive implant	
	Odds ratio	95% CI	Odds ratio	95% CI	Odds ratio	95% CI
Age in years (continuous)	0.92**	0.91,0.94	1.10**	1.06, 1.13	0.92**	0.88, 0.97
Unmarried (Reference)	1.00		1.00		1.00	
Married	0.67**	0.51,0.89	2.48**	1.62, 3.80	1.09	0.56, 2.13
Education at Third level No (Reference)	1.00		1.00		1.00	
Education at Third level Yes	0.83	0.65,1.07	0.74	0.49, 1.12	0.74	0.41, 1.32
General medical services- No (Reference)	1.00		1.00		1.00	

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General medical services- Yes	0.62**	0.46,0.83	2.63**	1.76, 3.91	2.31**	1.33, 3.99
The OCP has dangerous side-effects-Other (Reference)	1.00		1.00		1.00	
The OCP has dangerous side-effects-Agree	0.52**	0.43,0.68	1.19	0.81, 1.76	0.84	0.47, 1.49
Taking a break from the long-term use of the OCP is a good idea-Other (Ref)	1.00		1.00		1.00	
Taking a break from the long-term use of the OCP is a good idea-Agree	0.89	0.68,1.15	0.73	0.49, 1.11	0.48**	0.28, 0.81
How difficult do you find it to get contraception (continuous)	0.80	0.56, 1.15	1.32	0.66, 2.66	0.92	0.44, 1.91
Cannot access contraception/services in your locality-No (Reference)	1.00		1.00		1.00	
Cannot access contraception/services in your locality-Yes	1.20	0.55, 2.63	1.13	0.26, 4.97	0.71	0.11, 4.45
Are embarrassed about accessing contraception/services-No (Reference)	1.00		1.00		1.00	
Are embarrassed about accessing contraception/services-Yes	0.69	0.32, 1.52	1.48	0.39, 5.68	0.16	0.01, 2.13
Cannot afford contraception/services-No (Reference)	1.00		1.00		1.00	

Cannot afford contraception/services-Yes	0.88	0.40, 1.92	2.31	0.63, 8.44	0.99	0.00, 0.00
Nagelkerke R ² for full model		0.17		0.18		0.11

**<0.01; 1= Yes, 0 = No; 1= Agree, 0 =Other; 1= reference category for binary predictor variables, ^a numbers vary due to missing values on one or more variables in analyses

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Table 3 Association between agreeing that ‘taking a break from the oral contraceptive pill is a good idea’ and OCP non-use across younger, average and older age groups

Age in years	Beta	Standard error	95% CI Beta	P
24.23 (-1 SD)	0.09	0.15	-0.20, 0.39	0.53
31.85 (Mean)	-0.26	0.12	-0.50, -0.02	0.03
39.46 (+ 1SD)	-0.61	0.19	-0.98, -0.24	<0.01

DISCUSSION

The analysis provides a detailed description of the characteristics of prescription contraception users in RoI. Lower income, as indexed by having GMS, was the strongest predictor of both kinds of LARC use. These results highlight that concerns about the OCP are common and that these concerns are linked to prescription contraception use, with the strongest predictor of not using the OCP being the belief that 'the contraceptive pill has dangerous side-effects'. The analysis also shows that the association between concerns and OCP use varied according to age, with the association being particularly strong among older women. This might be partly explained by exposure to historical reporting of specific health risks associated with the OCP that have since been shown to be unsupported. [5] It is also likely that the increased duration of exposure to the OCP that older users will have may also partly account for this. In the ICCP-2010 report [2] there was evidence indicating that contraception was a topic in the sex education of 70% of those between the ages of 18-25 years of age in the survey, but only 34% of those between the ages of 36-45 years of age said that contraception was mentioned. This might also partly explain the greater concerns about OCP reported by older women, as it is likely that access to accurate information about contraception was harder to access.

The independent links between prescription contraception use and age, marital status and having GMS i.e. having lower income, are consistent with observations seen in other countries. [10] The prevalence and predictive power of the two variables assessing concerns about the OCP suggests that concerns may continue to have an important role in contraceptive choice, as has been observed in earlier studies in other contexts. [23] The low numbers of respondents reporting barriers to access ($\leq 5\%$) and the weak predictive power of 'perceived difficulty' of finding contraception measure suggest that access to contraception is no longer reported as a major problem among adults in RoI and probably not an important determinant of OCP use. However, it is important to acknowledge that there may be barriers to access in those under 18. [24] The findings

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4 relating to sex education in ICCP-2010 [2] do indicate that contraception is more likely to be part of
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6 the sex education of younger cohorts. However, it is not universally covered according to the data
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8 and there is a relatively recent history of avoiding the topic in sex education [2], which may create
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10 and reflect implicit social disapproval of contraception.
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14 The predictive power of 'concerns about the OCP' and the potentially modifiable nature of
15
16 these beliefs suggest that reproductive health promotion needs to place particular emphasis on
17
18 shaping accurate beliefs about the OCP and indeed LARCs' methods to optimise individual
19
20 contraceptive choices. In addition to this, it is clear that there are socio-economic determinants of
21
22 OCP use in that the current results show that OCP use was more common among those who did not
23
24 have GMS i.e. those with higher income, and LARCs use was more common among those who did
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26 have GMS i.e. those with lower incomes. Therefore, although few people indicated that they could
27
28 not afford contraceptive services (<5%), it is likely that there are socio-economic barriers to
29
30 contraception use. Recent intervention studies, including natural experiments, suggest that
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32 removing financial and other access barriers can have a substantial impact on uptake of
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34 contraceptives, particularly LARCs. [25 26]
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39 The OCP is currently a significantly less expensive option in the short term for those who do
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41 not have GMS costing less than €20 per month. Therefore it is possible that LARCs methods, which
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43 may cost up to €300 initially, are not financially feasible for those with incomes just above the
44
45 threshold that would entitle them to GMS. As a result, LARC use may predominate in those with
46
47 lowest incomes who do qualify for GMS and those with higher incomes in RoI, where the initial
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49 higher cost is not a barrier. It is also worth noting that this socio-economic difference seen within RoI
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51 reflects socio-economic differences between other countries in respect of LARC use. For example,
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53 intrauterine contraception is more commonly used and often freely available in less economically
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55 developed parts of the world, e.g. in Asia, there is a 27% prevalence among women using
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57 contraception, whereas it is a relatively expensive option in many more wealthier regions e.g. 6%
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4 prevalence in North America. [18] The socio-economic distribution of LARCs use in RoI is likely to
5
6 reflect the non-universal coverage of prescription contraceptive costs for both the recipients and
7
8 providers of contraceptive services.
9

10
11 Contraception has been a controversial socio-political topic in the RoI. Prescribing and
12
13 having contraception of any description was illegal in the RoI until 1980 [27] and emergency
14
15 contraception was not available without prescription until 2011. [28] This can be largely explained by
16
17 the particular religious ethos that historically pervaded healthcare and politics in RoI. [29] This might
18
19 also partly explain the greater concerns about OCP reported by older women in the present study.
20
21 Given this cultural backdrop, policy measures such as providing free contraceptive services to all may
22
23 be likely to receive resistance in RoI from religious lobby groups, even if evidence from health
24
25 economic analysis in other contexts indicates that this investment may lead to health gain for the
26
27 population. [30]
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30 31 **Limitations and strengths** 32

33
34 There are a number of aspects of the methodology where alternative approaches would
35
36 have been desirable. First, the data were entirely self-reported in the format of a telephone
37
38 interview. This is subject to the usual problems of recall and social desirability biases in
39
40 measurement. However this is a widely used approach with established reliability and validity that
41
42 may be superior to face-to-face interviews for sensitive topics. [31] Second, the cross-sectional study
43
44 design does not allow any causal inferences to be made from the data, as temporality in the
45
46 relationships between variables cannot be established. Third, it would have been preferable to have
47
48 psychometrically validated measures of concerns about the pill [15] and other related psychological
49
50 constructs related to medication beliefs [14] and LARCs rather than the single item measures used in
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52 this study that only addressed the OCP. Fourth, there are a number of additional measures that were
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54 not included that would have provided useful information on contraceptive choice; for example,
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4 whether the combined oral contraceptive or the progesterone only pill was used and/or whether the
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6 participant's reason for using contraception was for contraception only or for other medical reasons.
7
8 Finally, this is a unique health care context where funding models for contraceptive services differ
9
10 from many other health care systems.
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14 Nevertheless, there are several strengths to the present study which help to mitigate these
15
16 limitations, including the representative sample of the general population within the specified age
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18 band who provided anonymised data, the reporting of multivariable and moderation analyses to
19
20 provide a more detailed and nuanced assessment of the relationship between a broad range of
21
22 predictors and prescription contraceptive use, the separate analyses for two different classes of
23
24 LARCs which are sometimes considered together, [16] and the use of relatively recently collected
25
26 data on this topic. This is particularly important due to the changing nature of contraceptive use over
27
28 the last 10-15 years in this [2] and other international contexts. [1]
29

30 31 32 **Conclusion**

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34
35 Prescription contraceptive use is socio-demographically patterned with LARCs' methods in
36
37 particular being associated with lower incomes in RoI. Despite the established safety of the OCP,
38
39 concerns remain prevalent in RoI, which may reflect the socio-cultural context surrounding
40
41 contraception. These concerns are important and modifiable determinants of contraceptive-related
42
43 behaviour that appear to more resonance in older users of contraception. The evidence from this
44
45 study suggests that further efforts are required to clarify the health risks associated with the OCP
46
47 and LARCs. Future work will also need to establish who (e.g. GP or nurse), where (e.g. primary care
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49 or educational settings) and how (e.g. during consultations or sex education classes), this can be
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51 optimally delivered.
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3
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5
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11
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13
14 the Health Service Executive Crisis Pregnancy Programme.
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17
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21 **Participant consent** Obtained.
22

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24 **Ethics approval** The original ICCP-2010 survey protocol received ethical approval from the Research
25
26 Ethics Committee of the Royal College of Surgeons in Ireland (RCSI) and the programme of work that
27
28 includes the present analysis received ethical approval from the NUI Galway Research Ethics
29
30 Committee (Reference: 14/Jan/03).
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33
34 **Contributors** GM, KM, MB and AM conceived the research. GM carried out the research, data
35
36 analysis and drafted the paper. All authors commented on and approved the final manuscript.
37

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39 **Data sharing statement:** There ICCP-2010 dataset is available from the Irish Social Science Data
40
41 Archive: <http://www.ucd.ie/issda/> The survey questionnaire is available at:
42
43 http://www.ucd.ie/t4cms/ICCP_2010_-_main_questionnaire.pdf
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STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract (b) Provide in the abstract an informative and balanced summary of what was done and what was found
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported
Objectives	3	State specific objectives, including any prespecified hypotheses
Methods		
Study design	4	Present key elements of study design early in the paper
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants (b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group
Bias	9	Describe any efforts to address potential sources of bias
Study size	10	Explain how the study size was arrived at
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding (b) Describe any methods used to examine subgroups and interactions (c) Explain how missing data were addressed (d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed <i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed <i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy (e) Describe any sensitivity analyses

Continued on next page

Results

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed (b) Give reasons for non-participation at each stage (c) Consider use of a flow diagram
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders (b) Indicate number of participants with missing data for each variable of interest (c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)
Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time <i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure <i>Cross-sectional study</i> —Report numbers of outcome events or summary measures
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included (b) Report category boundaries when continuous variables were categorized (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses

Discussion

Key results	18	Summarise key results with reference to study objectives
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence
Generalisability	21	Discuss the generalisability (external validity) of the study results

Other information

Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based
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*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Prescription contraception use: A cross-sectional population study of psychosocial determinants

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6 **Prescription contraception use: A cross-sectional population study of psychosocial determinants**
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16 Corresponding author: Gerard J. Molloy

17
18 Address: 1037 Arts Millennium Building Extension (AMBE), School of Psychology, National University
19 of Ireland, Galway, Republic of Ireland.

20
21 E-mail: gerry.molloy@nuigalway.ie Phone: +353-91-495123 Fax: +353-91-521355
22
23

24
25
26
27
28 Leigh-Ann Sweeney and Molly Byrne, National University of Ireland, Galway, Republic of Ireland

29
30 Carmel M Hughes, Queen's University Belfast, Belfast, Northern Ireland, UK

31
32 Roger Ingham, University of Southampton, Southampton, UK

33
34 Karen Morgan, Royal College of Surgeons in Ireland, Dublin, Republic of Ireland

35
36 Andrew W Murphy, National University of Ireland, Galway, Republic of Ireland
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Objective

Many forms of contraception are available on prescription only e.g. the oral contraceptive pill (OCP) and long acting reversible contraceptives (LARCs). In this analysis we aim to identify key determinants of prescription contraceptive use.

Design

Cross-sectional population survey. Data on socio-demographic indices, concerns about the OCP and perceived barriers to access were collected.

Setting

Dataset constructed from a representative population based telephone survey of community dwelling adults in the Republic of Ireland (RoI)

Participants

1,515 women aged between 18 and 45 years

Main outcome measure

Self-reported user of the OCP or LARCs (intrauterine contraception, contraceptive injections or sub-dermal contraceptive implants) in the previous 12 months

Results

For at least some of the previous year, 35% had used the OCP and 14% had used LARCs, while 3% had used two or more of these methods. OCP users were significantly younger, more likely to be unmarried and had higher income than non-users. Overall, 68% agreed with the statement 'that taking a break from long term use of the contraceptive pill is a good idea' and 37% agreed with the statement that 'the OCP has dangerous side effects' and this was the strongest predictor variable of non-use of the OCP. Intrauterine contraception users were significantly older, more likely to be married and had lower income than non-users. Injections or sub-dermal contraceptive implant users were significantly younger, less likely to be married, had lower income and were less likely to agree that taking a break from long-term use of the pill is a good idea than non-users.

Conclusions: Prescription contraceptive use is socio-demographically patterned, with LARCs in particular being associated with lower incomes in the RoI. Concerns about the safety of the OCP remain prevalent and are important and modifiable determinants of contraceptive-related behaviour.

Strengths and limitations of this study

- This is the first study to provide a detailed population level multivariable analysis of a range of psychosocial determinants of prescription contraceptive use, including concerns about the safety of the OCP, in a representative sample of over 1500 women in the Republic of Ireland.
- The study data were self-reported in a telephone interview and may be subject to recall and social desirability biases; however this is a widely used method to collect data on sexual health from large samples, and has established reliability and validity.
- The identification of both modifiable and non-modifiable determinants of prescription contraceptive use can inform targeted interventions to improve sexual and reproductive health.

INTRODUCTION

Many of the most effective and widely used methods of contraception usually require a prescription from a physician. [1] Data from the United Nations indicates that in more economically developed regions, the oral contraceptive pill (OCP), which is one such method, is second only to male condom use (18.4%) with an estimated international prevalence rate of 17.7% in women who are in a stable relationship. [1] OCP use has remained constant or has increased over the last 10 years in many countries, including Republic of Ireland (RoI) and the United Kingdom (UK). [2 3] The user-dependent nature of the OCP means that the failure rate of the OCP is substantially greater than long acting reversible contraception (LARCs) methods e.g. intrauterine contraception and subdermal contraceptive implants. [4] However, it is important to note that these methods are not suitable for all women. [5] There is also evidence that negative attitudes and misconceptions about specific types of LARC may be pervasive [6 7] including among health care providers [8 9]; therefore, use of these methods remains much lower than the OCP in many countries. [1]

Previous studies have shown that certain types of prescription contraception tend to be more widely used by certain demographic groups. However, these studies are somewhat dated, of variable methodological quality and from a limited range of socio-cultural contexts. [10] Additionally, these studies have not examined the independence of socio-demographic predictors in accounting for prescription contraception use. Some of these predictors become more closely related over time. For example, age and marital status have become more strongly associated with each other due to the increasing age at which people marry and the rapidly changing patterns of relationship stability in some countries. [11 12] It is also possible that there may be age-dependent beliefs about contraception, e.g. the OCP, which could determine its use. This may be due to the high profile reporting of health risks associated with earlier versions of the OCP to which older contraceptive users may have been exposed and the improved safety of more recent versions of the OCP. [5] In the context of RoI, there is also evidence that older contraceptive users may not have

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4 received information on contraception as part of their formal sex education. [2] Analyses examining
5
6 how beliefs about the OCP vary by age are necessary in order to elucidate under what conditions a
7
8 range of factors explain patterns of OCP use.
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11 Beliefs about the safety of medical treatments are of particular interest as these variables
12
13 are potentially modifiable determinants of uptake and adherence to prescription contraception.
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15 There is a significant body of research focusing on the 'Necessity-Concerns framework' of treatment
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17 adherence over the last 15 years. [13 14] This approach emphasises the individual's judgement of
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19 personal need for medication or other forms of treatment (necessity beliefs) and concerns about the
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21 potential adverse consequences of taking it e.g. side-effects and long-term use. Although much of
22
23 this literature focuses on chronic illness, more recent work has identified similar associations
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25 between these treatment beliefs and adherence to the OCP, particularly concerns about the OCP.
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27 [15] This latter study was in a small sample of students (N=130) in the United Kingdom (UK),
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29 therefore the external validity of these findings is limited. In the present study, we examine whether
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31 a range of socio-demographic variables, including concerns about the OCP and barriers to access can
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33 account for prescription contraception use in a representative sample of women between the ages
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35 of 18-45 in the general population in RoI. Specifically, we examine OCP use and two types of LARC
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37 use, namely intrauterine contraception and contraceptive injections or sub-dermal contraceptive
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39 implants. Although some studies have combined these into one LARC user category [16], it is likely
40
41 that the characteristics of users vary for these methods given the previous trends to avoid
42
43 intrauterine contraception in nulliparous women. [17 18] Therefore, we assess intrauterine
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45 contraception use and contraceptive injections or sub-dermal contraceptive implants use separately
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47 in our analysis. Although these represent three distinct prescription contraception methods, the
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49 latter two methods are combined into one category in this study measure, due to the low frequency
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51 of use of contraceptive injections and sub-dermal contraceptive implants.
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METHOD

Study design

Data were drawn from women who participated in the Irish Contraception and Crisis Pregnancy Study 2010 (ICCP-2010). [2] This was a nationally representative cross-sectional survey of men and women between the ages of 18 and 45 who were living in ROI (N=3,002; women n = 1,515). The study was designed to describe attitudes, knowledge and behaviours relating to sexual health and, in particular, contraception and crisis pregnancy. Crisis pregnancy in this context was defined as “a pregnancy that represents a personal crisis or an emotional trauma in either of the following circumstances: (a) a pregnancy that began as a crisis, even if the crisis was subsequently resolved or (b) a pregnancy that develops into a crisis before the birth due to a change in circumstances.” [2]

Setting and sample

This population-based telephone survey was conducted in 2010. The random digit dialling of both landline and mobile phones and the quota sampling technique that was used to ensure a representative sample of the general population within this age band are described in detail in the main report and a separate publication. [2 19] The overall response rate to the survey was 69%.

Recruitment and consent

A standardised introduction to the study was used to describe who was carrying out the survey, its confidential nature and how the telephone numbers had been randomly selected. Following confirmation that the respondent was over 18 years of age and verbal agreement to participate, the telephone interview began.

Questionnaire survey

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4 The telephone-administered questionnaire collected information on the participant's socio-
5 demographic data, living arrangements, children, sex education, knowledge and attitudes about
6 contraception, contraceptive use over the last year, sources of contraception and contraceptive
7 services, sexually transmitted infections, most recent sexual partnership, experience of pregnancy
8 and knowledge of crisis pregnancy services, including abortion. The full questionnaire and dataset
9 are available on request from the Irish Social Science Data Archive. For the present study, we
10 highlight ten variables in our main analyses; these psychosocial variables were selected based on
11 previous literature and variables that capture aspects of an individual's motivation, capability and
12 opportunity to use prescription contraception, as defined by the behaviour change wheel approach
13 for identifying factors for behaviour change interventions. [20]
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25 26 *Socio-demographic data* 27

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29 In addition to age in years, data were gathered on marital and relationship status (married,
30 separated, divorced, widowed and never married), education (primary or incomplete secondary
31 only, complete secondary and third level) and whether respondents were in receipt of general
32 medical services (GMS). Such entitlement is based on an assessment of individual's income and is
33 therefore a reliable indicator of socio-economic status; individuals with GMS have lower incomes. In
34 2010, approximately 40% of the population in ROI had GMS eligibility. At the time of this survey
35 patients with such eligibility receive all medications, including contraceptives, free of charge; non-
36 GMS patients pay for all prescriptions up to a monthly limit of approximately €90.
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47 *Prescription contraception use in the last year* 48

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50 In order to assess prescription contraception use, respondents were asked 'Which of these methods
51 of contraception or precautions to avoid pregnancy have you and any partner (s) used together in
52 the last year?' The first contraceptive mentioned on this list was 'The contraceptive pill'. The fifth
53 contraceptive method mentioned on the list was 'Coil, intrauterine device or intrauterine system
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4 (Mirena®). The eleventh method mentioned was 'Injections (Depo Provera®) or Implanted
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6 contraceptive capsules' (Implanon®). If respondents used these in the last year, they were scored as
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8 1 and if not, they were scored as 0. It is important to note that this would not necessarily refer to
9
10 continuous use of these methods. Participants were also asked which methods of contraception or
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12 precautions to avoid pregnancy had they ever heard of as part of this section.
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14 15 16 *Concerns about the OCP*

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18 Two items assessed concerns about the contraceptive pill. These were, 'The contraceptive pill has
19
20 dangerous side-effects' and 'Taking a break from the long-term use of the contraceptive pill is a good
21
22 idea'. These were scored on a 5 point scale from 1 Strongly Agree to 5 Strongly Disagree. Higher
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24 scores related to lower concerns. There was a small to moderate positive correlation between these
25
26 two items ($r=0.15$, $p<0.01$), which indicates that they can be treated as distinct but related aspects
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28 of concerns about the OCP. A "Don't know" response that was not part of the 5 point scale was used
29
30 by approximately 3% of the participants; therefore, the two concern variables were dichotomised
31
32 into 'Agree' versus 'Other' to preserve cases in the analyses. Those scoring Strongly Agree and Agree
33
34 were classified as 'Agree' and all other responses were classified as 'Other'.
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38 39 *Barriers to access*

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41 Various barriers to accessing contraception were assessed in ICCP-2010. These included the
42
43 following items: Do not know where to get contraception/services, cannot access
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45 contraception/services in your locality, are embarrassed about accessing contraception/services,
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47 cannot afford contraception/services. The responses to these items were 'Yes' or 'No'. As less than
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49 1% of the overall sample responded 'Yes' to the item 'Do not know where to get
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51 contraception/services,' this variable was not included in the analyses. Therefore, these four
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53 variables are binary variables where participants were classified as Yes or No. Participants were also
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4 asked 'How difficult do you find it to get contraception?' Responses were provided on a 4 point scale
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6 from 1 Very difficult to 4 Not at all difficult.
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9 **Data analyses**

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11 Descriptive statistics were calculated for the main study variables in order to characterise the
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13 sample. Independent t tests and Chi square tests for independence were used to compare groups on
14
15 continuous and categorical data respectively. Logistic regression analyses were used to test
16
17 multivariable models. The final complete multivariable model allowed the statistical independence
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19 of the predictive variables to be established. Logistic regression provides odds ratios and 95%
20
21 confidence intervals for each predictor of prescription contraception use, which calculates estimates
22
23 of effect sizes for the study predictors. As there were 536 OCP users (35%) and 152 intrauterine
24
25 contraception users (10%) in this sample (n= 1,515), there were sufficient numbers of events per
26
27 variable to use our multivariable logistic regression with 10 predictors. [21] As there were only 67
28
29 women using injections or sub-dermal contraceptive implants (4%) this analysis could provide less
30
31 reliable estimates with 10 predictors. Moderation analyses were carried out using the moderation
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33 script for SPSS developed by Hayes and Matthes. [22] Moderation analyses were used to assess
34
35 whether there were age dependent associations between beliefs about the OCP and OCP use. This
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37 tested whether the strength of the association between beliefs about the OCP and OCP use varies
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39 for different age groups. All analyses were weighted to ensure that the results are representative of
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41 the population. Full details of the weighting parameters used are provided in the ICCP-2010 report.
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47 48 49 **Ethical approval**

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52 The original ICCP-2010 survey protocol received ethical approval from the Research Ethics
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54 Committee of the Royal College of Surgeons in Ireland (RCSI) and the programme of work that
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4 includes the present analysis received ethical approval from the NUI Galway Research Ethics
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6 Committee (Reference: 14/Jan/03).
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9 RESULTS

10 Sample

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12 An outline of the sample characteristics grouped by prescription contraception users and non-users
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14 of that method is provided in Table 1. Forty-four women (3%) had used 2 or more of the OCP,
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16 intrauterine contraception, contraceptive injections or sub-dermal contraceptive implants in the
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18 previous year, therefore the totals do not equal 1515 participants in Table 1. The three most widely
19
20 used methods of contraception were condoms (39%), the OCP (35%) and the intrauterine
21
22 contraception (10%). The 'non-users of LARCs' column in Table 1 refers to participants who neither
23
24 used intrauterine contraception use nor sub-dermal contraceptive implants as a method of
25
26 contraception in the previous year. Full details of the study sample are provided elsewhere. [2]
27
28 Eighty-three per cent had heard of the OCP, 76% had heard of intrauterine devices/systems and 72%
29
30 had heard of injections or sub-dermal contraceptive implants. Only 5% of women had not used any
31
32 method of contraception in the previous year. OCP users, compared with non-OCP users, were
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34 significantly younger, were less likely to be married, less likely to be in receipt of GMS, less likely to
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36 believe that the pill has dangerous side effects, less likely to believe that taking a break from the
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38 long-term use of the contraceptive pill is a good idea, more likely to report difficulty in getting
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40 contraception, more likely to report that they could not access contraception/services in their
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42 locality and more likely to say they could not afford contraception/services. Intrauterine
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44 contraception users were significantly older, more likely to be married, less likely to have third level
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46 education and more likely to be in receipt of GMS. Injections or sub-dermal contraceptive implants
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48 users were more likely to be significantly younger, more likely to be unmarried, more likely to be in
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50 receipt of GMS and less likely to believe that taking a break from the long-term use of the
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4 contraceptive pill is a good idea. In the total sample (n=1515), 37% agreed with the statement that
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6 the OCP had dangerous side effects and 68% agreed that taking a break from long-term use of the
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8 contraceptive pill was a good idea. The proportion of participants in all groups who reported
9
10 barriers to access was relatively low i.e. $\leq 5\%$
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14 Table 1
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17 In the multivariable analysis presented in Table 2, all study variables were included regardless of
18
19 univariate associations in order to assess the statistical independence of these determinants. In this
20
21 table, odds ratios less than 1 are associated with non-use of the method; for example, being married
22
23 and having general medical services were associated with non-use of the OCP as shown in Table 2.
24
25 The multivariable model shows that younger age, being unmarried, not being in receipt of GMS and
26
27 not believing that the OCP has dangerous side effects emerged as significant independent predictors
28
29 of OCP use. The strongest predictor was not agreeing with the statement that 'The contraceptive pill
30
31 has dangerous side-effects'. This overall pattern of findings did not change when the continuous
32
33 measures of education and concerns about the OCP were included in place of the dichotomised
34
35 variables. In Table 2 intrauterine contraception use and sub-dermal contraceptive implants use are
36
37 compared with non-use of these methods. Older age, being married and being in receipt of GMS
38
39 were significant predictors of intrauterine contraception use, while younger age, being in receipt of
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41 GMS and not agreeing that taking a break from the long-term use of the contraceptive pill is a good
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43 idea were significant predictors of injections or sub-dermal contraceptive implants use. Being in
44
45 receipt of GMS was the strongest predictor of both LARCs methods. The multivariate models
46
47 accounted for a moderate amount of variability in prescription contraception use as indicated by the
48
49 Nagelkerke R^2 value.
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54 Table 2
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4 Respondents who agreed that 'The contraceptive pill has dangerous side effects' were significantly
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6 older (M=32.26, SD =7.83 years versus M= 31.42, SD=7.41 years, $t = -2.06$, $p=0.04$), as were
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8 respondents who agreed that 'Taking a break from the long-term use of the contraceptive pill is a
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10 good idea ' (M=32.61, SD=7.44 years versus M=29.87, SD=7.53, $t = -6.60$, $p<0.01$). In moderation
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12 analyses, there was no significant interaction between age and believing that the OCP had
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14 dangerous side-effects in predicting OCP use. However, there was a significant interaction between
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16 age and believing that taking a break from the long term use of the contraceptive pill was a good
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18 idea (Interaction term Beta= -0.05, $p <0.01$). These age-dependent associations are provided in Table
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20 3 below. This table compares the strength of this association, i.e. Beta values, at 1 standard
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22 deviation above and below the mean value of the moderator variable i.e. age. In older women, i.e.
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24 those 1 standard deviation (SD) above the mean age of 31.85 years agreeing with this statement was
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26 strongly predictive of pill non-use, whereas this was not the case among younger women i.e. those
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28 1SD below the mean age. This decomposition of the interaction into these three groups is
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30 recommended by statistical texts describing this analytical method. [22]
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Table 3

Table 1 Sample characteristics of study participants (n= 1,515) by OCP or LARCs user status

Variable	OCP user n=536 (35%)	Non-user of OCP n=978 (65%)	Intrauterine contraception n =152 (10%)	Injections or sub-dermal contraceptive implant n=67 (4%)	Non-users of LARCs n=1302 (86%)
Age in years (SD)	29 (7)**	33 (8)	36 (6)**	28 (7)**	31 (8)
Married (%)	169 (32)**	502 (51)	110 (72)**	21 (31)*	542 (42)
Education (% Third level)	223 (42)	391 (40)	45 (30)**	20 (30)	551 (42)
General medical services (% yes)	120 (22)*	279 (29)	65 (43)**	31 (46)**	307 (24)
The OCP has dangerous side-effects (% Agree)	143 (27)**	404 (42)	59 (39)	18 (27)	472 (37)
Taking a break from the long-term use of the OCP is a good idea (% Agree)	339 (63)**	678 (71)	103 (68)	32 (48)**	886 (69)

How difficult do you find it to get contraception (SD)	3.76 (0.59)*	3.83 (0.49)	3.86 (0.48)	3.85 (0.53)	3.79 (0.55)
Cannot access contraception/services in your locality (% yes)	27 (5)**	24 (2.5)	4 (3)	2 (3)	47 (4)
Are embarrassed about accessing contraception/services (% yes)	21 (4)	23 (2)	4 (3)	1 (2)	39 (3)
Cannot afford contraception/services (% yes)	21 (4)*	19 (2)	5 (3)	0 (0)	35 (3)

* <0.05 ; ** <0.01 : Comparisons are with the non-user group of the specified contraception; SD: Standard deviation

Table 2 Multivariable logistic regression predicting prescription contraception use (1 =Yes, 0 = No) among study participants (n= 1,515^a)

Predictor variable	OCP		Intrauterine contraception		Injections or sub- dermal contraceptive implant	
	Odds ratio	95% CI	Odds ratio	95% CI	Odds ratio	95% CI
Age in years (continuous)	0.92**	0.91,0.94	1.10**	1.06, 1.13	0.92**	0.88, 0.97
Unmarried (Reference)	1.00		1.00		1.00	
Married	0.67**	0.51,0.89	2.48**	1.62, 3.80	1.09	0.56, 2.13
Education at Third level No (Reference)	1.00		1.00		1.00	
Education at Third level Yes	0.83	0.65,1.07	0.74	0.49, 1.12	0.74	0.41, 1.32
General medical services- No (Reference)	1.00		1.00		1.00	

General medical services- Yes	0.62**	0.46,0.83	2.63**	1.76, 3.91	2.31**	1.33, 3.99
The OCP has dangerous side-effects-Other (Reference)	1.00		1.00		1.00	
The OCP has dangerous side-effects-Agree	0.52**	0.43,0.68	1.19	0.81, 1.76	0.84	0.47, 1.49
Taking a break from the long-term use of the OCP is a good idea-Other (Ref)	1.00		1.00		1.00	
Taking a break from the long-term use of the OCP is a good idea-Agree	0.89	0.68,1.15	0.73	0.49, 1.11	0.48**	0.28, 0.81
How difficult do you find it to get contraception (continuous)	0.80	0.56, 1.15	1.32	0.66, 2.66	0.92	0.44, 1.91
Cannot access contraception/services in your locality-No (Reference)	1.00		1.00		1.00	
Cannot access contraception/services in your locality-Yes	1.20	0.55, 2.63	1.13	0.26, 4.97	0.71	0.11, 4.45
Are embarrassed about accessing contraception/services-No (Reference)	1.00		1.00		1.00	
Are embarrassed about accessing contraception/services-Yes	0.69	0.32, 1.52	1.48	0.39, 5.68	0.16	0.01, 2.13
Cannot afford contraception/services-No (Reference)	1.00		1.00		1.00	

Cannot afford contraception/services-Yes	0.88	0.40, 1.92	2.31	0.63, 8.44	0.99	0.00, 0.00
Nagelkerke R ² for full model		0.17		0.18		0.11

**<0.01; 1= Yes, 0 = No; 1= Agree, 0 =Other; 1= reference category for binary predictor variables, ^a numbers vary due to missing values on one or more variables in analyses

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Table 3 Association between agreeing that 'taking a break from the oral contraceptive pill is a good idea' and OCP non-use across younger, average and older age groups

Age in years	Beta	Standard error	95% CI Beta	P
24.23 (-1 SD)	0.09	0.15	-0.20, 0.39	0.53
31.85 (Mean)	-0.26	0.12	-0.50, -0.02	0.03
39.46 (+ 1SD)	-0.61	0.19	-0.98, -0.24	<0.01

DISCUSSION

The analysis provides a detailed description of the characteristics of prescription contraception users in RoI. Lower income, as indexed by having GMS, was the strongest predictor of both kinds of LARC use. These results highlight that concerns about the OCP are common and that these concerns are linked to prescription contraception use, with the strongest predictor of not using the OCP being the belief that 'the contraceptive pill has dangerous side-effects'. The analysis also shows that the association between concerns and OCP use varied according to age, with the association being particularly strong among older women. This might be partly explained by exposure to historical reporting of specific health risks associated with the OCP that have since been shown to be unsupported. [5] It is also likely that the increased duration of exposure to the OCP that older users will have may also partly account for this. In the ICCP-2010 report [2] there was evidence indicating that contraception was a topic in the sex education of 70% of those between the ages of 18-25 years of age in the survey, but only 34% of those between the ages of 36-45 years of age said that contraception was mentioned. This might also partly explain the greater concerns about OCP reported by older women, as it is likely that access to accurate information about contraception was harder to access.

The independent links between prescription contraception use and age, marital status and having GMS i.e. having lower income, are consistent with observations seen in other countries. [10] The prevalence and predictive power of the two variables assessing concerns about the OCP suggests that concerns may continue to have an important role in contraceptive choice, as has been observed in earlier studies in other contexts. [23] The low numbers of respondents reporting barriers to access ($\leq 5\%$) and the weak predictive power of 'perceived difficulty' of finding contraception measure suggest that access to contraception is no longer reported as a major problem among adults in RoI and probably not an important determinant of OCP use. However, it is important to acknowledge that there may be barriers to access in those under 18. [24] The findings

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4 relating to sex education in ICCP-2010 [2] do indicate that contraception is more likely to be part of
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6 the sex education of younger cohorts. However, it is not universally covered according to the data
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8 and there is a relatively recent history of avoiding the topic in sex education [2], which may create
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10 and reflect implicit social disapproval of contraception.
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14 The predictive power of 'concerns about the OCP' and the potentially modifiable nature of
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16 these beliefs suggest that reproductive health promotion needs to place particular emphasis on
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18 shaping accurate beliefs about the OCP and indeed LARCs' methods to optimise individual
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20 contraceptive choices. In addition to this, it is clear that there are socio-economic determinants of
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22 OCP use in that the current results show that OCP use was more common among those who did not
23
24 have GMS i.e. those with higher income, and LARCs use was more common among those who did
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26 have GMS i.e. those with lower incomes. Therefore, although few people indicated that they could
27
28 not afford contraceptive services (<5%), it is likely that there are socio-economic barriers to
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30 contraception use. Recent intervention studies, including natural experiments, suggest that
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32 removing financial and other access barriers can have a substantial impact on uptake of
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34 contraceptives, particularly LARCs. [25 26]
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39 The OCP is currently a significantly less expensive option in the short term for those who do
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41 not have GMS costing less than €20 per month. Therefore it is possible that LARCs methods, which
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43 may cost up to €300 initially, are not financially feasible for those with incomes just above the
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45 threshold that would entitle them to GMS. As a result, LARC use may predominate in those with
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47 lowest incomes who do qualify for GMS and those with higher incomes in RoI, where the initial
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49 higher cost is not a barrier. It is also worth noting that this socio-economic difference seen within RoI
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51 reflects socio-economic differences between other countries in respect of LARC use. For example,
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53 intrauterine contraception is more commonly used and often freely available in less economically
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55 developed parts of the world, e.g. in Asia, there is a 27% prevalence among women using
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57 contraception, whereas it is a relatively expensive option in many more wealthier regions e.g. 6%
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4 prevalence in North America. [18] The socio-economic distribution of LARCs use in RoI is likely to
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6 reflect the non-universal coverage of prescription contraceptive costs for both the recipients and
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8 providers of contraceptive services.
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11 Contraception has been a controversial socio-political topic in the RoI. Prescribing and
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13 having contraception of any description was illegal in the RoI until 1980 [27] and emergency
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15 contraception was not available without prescription until 2011. [28] This can be largely explained by
16
17 the particular religious ethos that historically pervaded healthcare and politics in RoI. [29] This might
18
19 also partly explain the greater concerns about OCP reported by older women in the present study.
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21 Given this cultural backdrop, policy measures such as providing free contraceptive services to all may
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23 be likely to receive resistance in RoI from religious lobby groups, even if evidence from health
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25 economic analysis in other contexts indicates that this investment may lead to health gain for the
26
27 population. [30]
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30 31 32 **Limitations and strengths** 33

34
35 There are a number of aspects of the methodology where alternative approaches would
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37 have been desirable. First, the data were entirely self-reported in the format of a telephone
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39 interview. This is subject to the usual problems of recall and social desirability biases in
40
41 measurement. However this is a widely used approach with established reliability and validity that
42
43 may be superior to face-to-face interviews for sensitive topics. [31] Second, the cross-sectional study
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45 design does not allow any causal inferences to be made from the data, as temporality in the
46
47 relationships between variables cannot be established. Third, it would have been preferable to have
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49 psychometrically validated measures of concerns about the pill [15] and other related psychological
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51 constructs related to medication beliefs [14] and LARCs rather than the single item measures used in
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53 this study that only addressed the OCP. Fourth, there are a number of additional measures that were
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55 not included that would have provided useful information on contraceptive choice; for example,
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4 whether the combined oral contraceptive or the progesterone only pill was used and/or whether the
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6 participant's reason for using contraception was for contraception only or for other medical reasons.
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8 Finally, this is a unique health care context where funding models for contraceptive services differ
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10 from many other health care systems.
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14 Nevertheless, there are several strengths to the present study which help to mitigate these
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16 limitations, including the representative sample of the general population within the specified age
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18 band who provided anonymised data, the reporting of multivariable and moderation analyses to
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20 provide a more detailed and nuanced assessment of the relationship between a broad range of
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22 predictors and prescription contraceptive use, the separate analyses for two different classes of
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24 LARCs which are sometimes considered together, [16] and the use of relatively recently collected
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26 data on this topic. This is particularly important due to the changing nature of contraceptive use over
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28 the last 10-15 years in this [2] and other international contexts. [1]
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30 31 32 **Conclusion**

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35 Prescription contraceptive use is socio-demographically patterned with LARCs' methods in
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37 particular being associated with lower incomes in RoI. Despite the established safety of the OCP,
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39 concerns remain prevalent in RoI, which may reflect the socio-cultural context surrounding
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41 contraception. These concerns are important and modifiable determinants of contraceptive-related
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43 behaviour that appear to more resonance in older users of contraception. The evidence from this
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45 study suggests that further efforts are required to clarify the health risks associated with the OCP
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47 and LARCs. Future work will also need to establish who (e.g. GP or nurse), where (e.g. primary care
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49 or educational settings) and how (e.g. during consultations or sex education classes), this can be
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51 optimally delivered.
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5
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7
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9
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11
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13
14 the Health Service Executive Crisis Pregnancy Programme.
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16

17
18 **Competing interests** None.
19

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21 **Participant consent** Obtained.
22

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24 **Ethics approval** The original ICCP-2010 survey protocol received ethical approval from the Research
25
26 Ethics Committee of the Royal College of Surgeons in Ireland (RCSI) and the programme of work that
27
28 includes the present analysis received ethical approval from the NUI Galway Research Ethics
29
30 Committee (Reference: 14/Jan/03).
31
32

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34 **Contributors** GM, KM, MB and AM conceived the research. GM carried out the research, data
35
36 analysis and drafted the paper. All authors commented on and approved the final manuscript.
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39 **Data sharing statement:** There ICCP-2010 dataset is available from the Irish Social Science Data
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41 Archive: <http://www.ucd.ie/issda/> The survey questionnaire is available at:
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43 http://www.ucd.ie/t4cms/ICCP_2010_-_main_questionnaire.pdf
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STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract (b) Provide in the abstract an informative and balanced summary of what was done and what was found
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported
Objectives	3	State specific objectives, including any prespecified hypotheses
Methods		
Study design	4	Present key elements of study design early in the paper
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants (b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group
Bias	9	Describe any efforts to address potential sources of bias
Study size	10	Explain how the study size was arrived at
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding (b) Describe any methods used to examine subgroups and interactions (c) Explain how missing data were addressed (d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed <i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed <i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy (e) Describe any sensitivity analyses

Continued on next page

Results

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed (b) Give reasons for non-participation at each stage (c) Consider use of a flow diagram
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders (b) Indicate number of participants with missing data for each variable of interest (c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)
Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time <i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure <i>Cross-sectional study</i> —Report numbers of outcome events or summary measures
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included (b) Report category boundaries when continuous variables were categorized (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses

Discussion

Key results	18	Summarise key results with reference to study objectives
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence
Generalisability	21	Discuss the generalisability (external validity) of the study results

Other information

Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based
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*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.