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# What do friends and the media tell us? How different information channels affect women's risk perceptions of age-related female infertility

Elina Lampi<sup>A</sup>

## Abstract

Based on a survey given to a random sample of Swedish 20-40 year old females, this paper investigates through which channels women receive information about the general risk levels of age-related female infertility and how the different channels affect women's perceptions of the risk. We find that the media reach women of all ages, while only about one woman in four has received information from the health care system. We also found that what peers say and do strongly affect women's risk perceptions: The respondents who had obtained information from friends and relatives were more likely to state too high risks, while a woman with close friends or relatives who became pregnant at age 35 or older was more likely to have a correct perception of the risks. Since women are most interested in receiving information from the health care system, we argue that health care workers should inform women earlier than what happens today.

**Keywords:** Information, Media, Health care, Infertility, General risk.

**JEL Classification:** D81, D83, I10, J13

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## **1. Introduction**

A woman's risk of not being able to become pregnant increases with age. Since no available medical test is able to reveal a woman's personal risk, it is important for a woman to have knowledge about the general risk levels and how they change with age. Interesting issues therefore include how women obtain information about this risk of age-related female infertility and how the different information channels affect their risk perceptions. Infertility is defined as a state where a healthy couple of childbearing age tries to but does not manage to become pregnant within a 12-month period without using any type of contraceptive. Thus, infertility does not indicate sterility but instead highlights a group of individuals having trouble becoming pregnant and who may need medical assistance (Infomedica, 2004). A biased risk perception is undesirable for a woman who wishes to become pregnant; overestimation creates an unnecessary worry and underestimation may result in serious disappointments if it becomes difficult to become pregnant. Moreover, to be able to plan the timing of births together with other important life decisions such as education etc., it is important for a woman to be aware of how the risk increases with age. Thus, it is not sufficient to know the general risk level for the own age group only. Another reason why it is important for women to have knowledge about the changes in risk due to increasing age is as shown in this paper: Women are themselves information spreaders when they talk with their peers about the risks.

The objectives of this paper are to investigate: (1) from what sources women receive information about the general risks of age-related female infertility, (2) how different information channels affect risk perception, and (3) who would like to have more information, and from what source(s)? To be able to address these objectives, 2,000 questionnaires were mailed out to a random sample of 20-40 year old women living in Sweden. The respondents were asked to identify from which sources they had obtained information and from where they would like to receive more information. They were also asked to estimate the general risks of female infertility for four different age groups (20-24, 25-29, 30-34, and 35-40 years).

According to Weaver and Wakshlag (1986), personal experiences have the strongest impact on a person's beliefs, followed by information from peers, and then all other information channels. A woman may have personal experience of pregnancy and/or of trying to become

pregnant, which gives her some kind of perception of the infertility risks, both on a personal and a general level. Women might also be affected by information they get through both formal and informal channels, e.g., from the health care system, different media sources, and/or discussions with friends and relatives. A woman's risk perception might also be influenced by the ages at which her close friends and relatives became pregnant. The degree to which information is adopted by people depends on how credible they think the source of the information is (Wiegman and Gutteling, 1995). According to Tonn et al. (1990), information based on the experiences of peers is considered to be especially credible.

How the media affects risk perception is a debated issue. Some studies have shown that the media makes people aware of risks (see for example Wiegman and Gutteling, 1995), and Kasperson et al., (2003) found that high media coverage alone does not increase perceived risks. Several previous studies have reported that experiences of peers affect people more than the mass media does (McAlister, 1987; Rogers, 1987; Tonn et al., 1990; Chang and Kinnucan, 1991; Wählberg and Sjöberg, 2000)<sup>1</sup>, and if the object of the risk is straight out feared, rumors within peer groups may be a significant element in forming people's perceptions (Kasperson et al., 1988). However, the information women receive might not be correct. Incorrect information has an opportunity cost since it may crowd out more correct information in a person's mind. It is therefore important to investigate how different information channels affect risk perceptions of age-related infertility.

Furthermore, infertility is a sensitive issue and we know that people react differently to information. Increasing the amount of information for individuals not wanting it increases their stress levels and causes anxiety, while extra information reduces the stress of individuals who are information seekers (Miller and Mangan, 1983). Some people may choose to totally ignore the information if it is seen as too negative (Bénabou and Tirole, 2002). We therefore ask: *who* wishes to be informed about the risks, and from which sources do they want information. We then compare these sources with the sources they actually receive information from.

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<sup>1</sup> According to McAlister (1987) and Rogers (1987), it is well-known that the mass media channels are effective in creating awareness but that peers are often the most influential in an individual's decision to adopt or reject new information and to change or not change her behavior. According to Tonn et al. (1990), personal experience and/or communications may be needed to make knowledge relevant for a person.

We also include a test of media information that investigates whether a peak in the media coverage of the general risks of age-related female infertility affects women's risk perceptions. This was possible for us to do since only two days before the survey had been planned to be mailed out, several major newspapers in Sweden published articles based on the public health study by Lampic et al., (2006). Newspapers reported the findings that female and male university students in Sweden have overly optimistic perceptions of women's chances of becoming pregnant, especially for women age 35 and older. Headlines such as "Swedish students at risk for childlessness – both men and women overestimate fertility after age 35" (Svenska Dagbladet, 2005) and "Swedish students know too little about fertility – both men and women overestimate the possibilities to have a child after 35 and researchers warn that the consequences might be involuntary childlessness" (Göteborgs Posten, 2005) were common. However, these articles did not say *anything* about the actual risk levels. To be able to see whether these kinds of articles affect women's risk perceptions, 200 of the 2,000 questionnaires were not sent out with the others but instead to another random sample of women two months later. This way of testing is in line with several previous studies about how media affects risk perceptions; see for example Soumerai et al., (1992) on how media can play a central role in decreasing the use of aspirin among children. Similarly, several studies have shown that negative health risk information from the media has significant effects on food demand (Chang and Kinnucan, 1991; Burton and Young, 1996; Verbeke and Ward, 2001)<sup>2</sup>.

The remainder of this paper is organized as follows. Section 2 describes the survey, its design, and the actual risk levels used in this study. Section 3 reports the descriptive statistics and the empirical results from the analyses associated with the objectives of this paper. Finally, Section 4 discusses the results and concludes the paper.

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<sup>2</sup> According to Chang and Kinnucan (1991), information about the connection between blood cholesterol and dietary fats decreased the consumption of butter in Canada. They also found that an industry advertising campaign increased the demand for butter. According to Verbeke and Ward (2001), negative information about meat decreases the consumption of meat and affects what kind of meat people want to buy.

## 2. The survey and survey design

In order to investigate the objectives of this study, the respondents were asked to estimate the risks of female infertility<sup>3</sup> for four different age groups (20-24, 25-29, 30-34, and 35-40 years). The part of the survey containing the scenario and all four risk questions are included in the Appendix. As an example, we show the question about the general risk for the 20-24 age group<sup>4</sup>:

**Question 1.** I believe that the average risk for a 20-24 year old woman of *not* becoming pregnant during a time period of one year is.....%

Furthermore, the respondents were asked whether they had received information about the risks of age-related female infertility and whether they would like to get more information. They were also asked to identify from what sources they had obtained information and from where they would like to receive more information. The questionnaire also included questions about whether the respondent wished to become pregnant (and if so, when). Since the subject of infertility may be sensitive to many, the respondents were completely anonymous.

The survey was mailed out in two rounds to a random sample of 20-40 year old women living in Sweden.<sup>5</sup> The first 1,800 questionnaires were sent out in November 2005, and the remaining 200 in January 2006. The overall response rate was 47 percent. The reason for sending out some of the questionnaires in January was that only one day before the survey had been planned to be mailed out in November, several major newspapers in Sweden published articles based on the public health study by Lampic et al. (2006) about how male and female university students in Sweden underestimate the age-related decline in female fertility, especially among women aged 35 or older. We saw this as a good opportunity to test whether articles of this kind could affect women's risk perceptions. If there is such an effect, then those who answered the questionnaire directly after the large media coverage should have stated higher risks than those who received the questionnaire two months later.

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<sup>3</sup> Meaning *not* becoming pregnant despite regular unprotected intercourse during a one-year period.

<sup>4</sup> The respondents were also asked to state what they believe their personal risk to be. The stated personal risks are however not the objective of this paper. For a discussion on how the stated personal and general risk perceptions differ, see Lampi (2006).

<sup>5</sup> The first pilot survey consisted of 45 questionnaires sent out by e-mail in October 2004 to a non-random sample of 20-40 year old women. The resulting revised questionnaire was tested on a focus group, and then a second pilot study was carried out, where 200 questionnaires were sent out in October 2005 by regular mail to a

Postcards were sent out to all respondents as a single reminder 10 days after the questionnaires (in both November and January).

The "actual" risks of age-related infertility used in this paper are estimates based on age-specific pregnancy rates with unprotected intercourse for modern populations.<sup>6</sup> The infertility risk levels are collected through interviews performed by the National Survey of Family Growth (NSFG) in 2002 in the U.S.<sup>7</sup> According to the 2002 study (including over 7,600 women), the infertility risk is 7 % for 20-24 year old women, 11 % for 25-29 year old women, 17 % for 30-34 year old women and 23 % for 35-40 year old women (Chandra et al, 2005).<sup>8</sup> Infertility risks collected from retrospective surveys such as the NSFG are seen as the most trustworthy even if it may be difficult for a woman to remember exactly when she began trying to become pregnant (Högberg, 1998). The NSFG surveys have been conducted six times during the 1973-2002 period and the infertility levels are nearly the same in all of the NSFG surveys, indicating robustness.

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random sample of 20-40 year old women living in Sweden. The questionnaire was again revised based on the comments and results of the second pilot study.

<sup>6</sup> The two other ways to measure infertility risks are: age-specific pregnancy rates in natural populations (populations where contraception and abortion are not allowed or used) and age-specific pregnancy rates with artificial insemination in modern populations. The major disadvantage of studies done in natural populations is that the type of data is hard to compare with more modern data, while artificial insemination ends up boosting infertility rates and is therefore often criticized since the probability of becoming pregnant artificially is much smaller compared to using the natural method (see e.g., Bongaarts, 1982). A study of artificially inseminated women reports that 26-27 % of women 30 or younger, 39 % of women aged 31-35, and 46 % of women aged 36-40 did not become pregnant within a one-year period (Schwartz and Mayaux 1982). A study by Tietze (1957) reports the shares of a natural population (Hutterites) who were infertile in the first half of the 20<sup>th</sup> century: 3 % of women aged 20-24 were permanently infertile, while the corresponding shares of women aged 25-29, 30-34, and 35-39 years were 5.3 %, 9.0 %, and 22 %.

<sup>7</sup> The NSFG survey measures the infertility rates of women who had not become pregnant despite not using contraceptives, during the 12 months preceding or earlier the time of the interview; i.e. according to the official definition of infertility. Surgically sterilized couples are excluded from the survey.

<sup>8</sup> The risk levels for women aged 20-24 are taken from the NSFG survey from 1976. The reason for using values from the 1976 survey is that contrary to subsequent surveys, it does not include women younger than 20 (who we perceive as too young to answer our questions). Moreover, the youngest age group in the 2002 survey is 15-29 year old women, while the youngest age interval is divided into two age groups (20-24) and (25-29) in the 1976 survey. The risk levels for the NSFG 1976 survey are 7 % for 20-24 year old women, 11 % for 25-29 year old women, 16 % for 30-34 year old women and 23 % for 35-40 year old women, which are very similar to the 2002 results (National Center for Health Statistics, 1987).

### 3. Results

#### 3.1 Descriptive statistics

Table 1 shows the descriptive statistics of all the variables used in the analysis.<sup>9</sup>

**Table 1.** The descriptive statistics of risk variables, information variables, variables regarding having/wanting to have children, and socio-economic variables. Whole sample

Variable	Description of the independent variables	Mean	Std. dev.
Risk 25-29	=1 if the risk is stated for the age group 25-29.	0.25	0.43
Risk 30-34	=1 if the risk is stated for the age group 30-34.	0.25	0.43
Risk 35-40	=1 if the risk is stated for the age group 35-40.	0.25	0.43
Health care	=1 if the respondent has received information about age-related infertility from the health care system.	0.26	0.44
Info. from the media	=1 if the respondent has received information about age-related infertility from magazines, newspapers, TV/radio, or Internet.	0.73	0.44
Media over 35	=1 if the respondent has read in magazines specifically about women who became pregnant $\geq 35$ years old.	0.87	0.33
Info. from friends/relatives	=1 if the respondent has received information about age-related infertility from her friends or relatives.	0.32	0.47
Friends/relatives over 35	=1 if the respondent has close friends or relatives who became pregnant $\geq 35$ years old.	0.72	0.45
Knowledge	=1 if the respondent feels that she has enough information about the risk of age-related infertility.	0.33	0.47
January	=1 if the respondent got the questionnaire in January.	0.10	0.30
Underestimates all risks	=1 if the respondent underestimates all 4 general risks by at least with 25 %.	0.09	0.28
Overestimates all risks	=1 if the respondent underestimates all 4 general risks by more than 25 %.	0.44	0.50
Have children	=1 if the respondent has children.	0.53	0.50
Child; yes within 3 years	=1 if the respondent wants to have a child within 1-3 years.	0.28	0.45
Child; yes but do not know when	=1 if the respondent wants to have a child but does not know when.	0.27	0.45
Child; unsure	=1 if the respondent is unsure if she wants to have a child.	0.07	0.25
Age 25	=1 if the respondent is 25-29 years old.	0.22	0.42
Age 30	=1 if the respondent is 30-34 years old.	0.26	0.44
Age 35	=1 if the respondent is 35-40 years old.	0.33	0.47
Big city	=1 if the respondent lives in Stockholm, Gothenburg, or Malmö.	0.33	0.47
University	=1 if the respondent has a university education.	0.45	0.50
Student	=1 if the respondent is a student.	0.19	0.39
Partner	=1 if the respondent is married, co-habiting, or has a steady partner.	0.82	0.39
Income	= The monthly pre-tax income of the respondent, expressed in 1000 SEK. <sup>10</sup>	17.24	8.92
No. of women	859		

<sup>9</sup> Respondents who did not answer the risk questions (17 individuals) are excluded. The respondents who mixed the chance to and risk not to become pregnant (23 individuals) are also excluded from all analyses. Due to these reasons and the missing values of the independent variables, the sample size for the whole sample is 859 women.

<sup>10</sup> At the time of the survey, 7.50 SEK  $\approx$  1 USD.



Comparing the descriptive statistics of the respondents with the national statistics, we see that the relative sizes of the age groups correspond well with the national age distribution of women.<sup>11</sup> Similarly, the share of women who were mothers is the same as at the national level (Statistics Sweden 2002). However, the share of respondents with a university education is slightly, but significantly higher in this study than in Sweden as a whole (Statistics Sweden 2004).

### 3.2 From what sources do women receive information about the general risks of age-related female infertility?

Table 2 reports from what channels women at different ages (and as a whole sample) had received risk information.

**Table 2.** The information channels women had received information from, by age group and whole sample.

Variable	20-24 years	25-29 years	30-34 years	35-40 years	Whole sample
Health care	0.13	0.18	0.27	0.38	0.26
Info. from the media	0.74	0.75	0.72	0.72	0.73
Media over 35	0.83	0.90	0.89	0.87	0.87
Info. From friends/relatives	0.28	0.31	0.37	0.30	0.32
Friends/relatives over 35	0.56	0.67	0.79	0.81	0.72
Knowledge	0.15	0.26	0.41	0.43	0.33
No. of women	167	190	220	282	859

A large majority of the respondents had received information about infertility from various media sources. Similarly, nearly all respondents had read articles in weekly or monthly magazines about women who became pregnant at age 35 or older. So, the media is the most common information channel. On the other hand, only 26 percent said they had received information from the health care system. Furthermore, a large majority (73 %) of the respondents claimed to have close friends or relatives who became pregnant at age 35 or older, while 32 percent had discussed the risk with friends or relatives and only one-third claimed to already have enough knowledge about the issue. Dividing the respondents between mothers and childless respondents (not reported here), we find that only 16 percent of the childless women who wanted to have a child had received information from the health

<sup>11</sup> All these comparisons are made by bootstrapping the sample and by using percentile tests, and significance is calculated at the 5 % significance level. About 80 % of 35-40 year old women living in Sweden have children younger than 18 years. The corresponding share in this study is 80 %. Forty-one percent of women aged 20-44 in Sweden have university education (Statistics Sweden, 2004).

care system, while 34 percent of the mothers had, a difference which is significant at the one percent level according to a Chi-square test. A larger share of the mothers had friends who became pregnant at age 35 or older, while all other information channels reached about equal shares of mothers and women without children.<sup>12</sup>

We also find that the media reaches women of all ages. On the other hand, the share of women who had received information from the health care system increases substantially with age. The results also show that women in the 30-40 age group more often perceive that they have enough knowledge about the risks than women in the 20-29 age group.<sup>13</sup> We are therefore in the next section going to investigate whether the older women have more correct risk perceptions than the younger.

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<sup>12</sup> These results are available upon request.

<sup>13</sup> A difference that is significant according to a Chi-square test at the 1 % significance level.

### 3.3 Stated risks and how different information channels affect women’s risk perception.

#### *Stated mean and median risks*

“The main sample” are those who answered the first survey conducted immediately after the large media coverage (in November), while those who answered the second survey conducted two months later (in January) constitute “the media test sample.” When all respondents are analyzed together we simply call it “the whole sample.” Table 3 reports the stated general and the actual risk levels according to the NSFG 2002 survey. Since the distributions of the stated risks are skewed, both the mean and the median risks are commented on.

**Table 3.** The actual risks according to the NSFG 2002 survey and the stated mean and median general risks for the main sample and for the media test sample.

<b>Age group</b>	<b>Actual risk NSFG (2002)</b>	<b>Stated mean risk , main sample</b>	<b>Stated mean risk , media test sample</b>	<b>Stated median risk, main sample</b>	<b>Stated median risk, media test sample</b>
20-24 years	7 %	13 %	13 %	10 %	10 %
25-29 years	11 %	18 %	18 %	15 %	15 %
30-34 years	17 %	27 %	27 %	25 %	25 %
35-40 years	23 %	40 %	40 %	40 %	35 %
No. of women		770	89	770	89

As seen in Table 3, stated risk increases with age group in both samples, i.e., the respondents are aware of the relationship between age and the risk of infertility. Also, the stated mean risks are the same in both samples and significantly higher than the actual risk levels, while the stated median risks are quite close to the actual ones for women younger than 35 in both samples.<sup>14</sup> As mentioned before, actual risk levels differ a bit depending on the way they are measured. In addition, respondents usually round their answers to the nearest five percent (Manski, 2004). We therefore allow for some deviation in the risk perceptions before claiming that somebody over- or underestimated the risk levels. However, the median and mean stated risks for the oldest age group (35-40 years) are 35-40 percent (depending on the

<sup>14</sup> The null hypothesis that the mean stated risk in the sample is equal to the mean actual risk is tested with the bootstrapping method for both the main sample and the media test sample. One thousand samples were bootstrapped by randomly drawing observations with replacement as many times as there are observations in the original sample. The difference between the mean stated risks and the actual risks are calculated 1000 times for each age group. By using the percentile method and the 95 % confidence interval, it can be shown that the stated mean risks are significantly different than the mean actual risks at the 5 % significance level for all age groups. It should be noted that the advantage of the percentile method is that it makes no assumption about the underlying distribution (Efron and Tibshirani, 1998).

sample), which clearly is an overestimation.<sup>15</sup> Respondent age has no significant effect on the stated risk levels; they are about the same with and without the respondents younger than 30.

To find out whether the large media coverage immediately before our main survey was sent out had any effect on the stated risks, we compare the stated risks of the main and the media test samples and find the mean risks to be the same. However, the stated median risk for the oldest age group (35-40 years) is 5 percentage points lower in the media test sample. That the newspaper articles especially highlighted (sometimes already in the introduction) the age of 35 as a threshold after which a woman's fertility begins to take a sharper decline might have increased the stated median risk levels in the main sample for the oldest age group (35-40 years). However, although the difference is substantial it is not significant.<sup>16</sup>

#### *How the different information channels affect the perception of female infertility risks*

Table 4 reports the results of the multinomial logit model, which analyzes how the different channels of information affect whether the stated risks are estimated correctly or whether they are under- or overestimated. The stated risks for the four age groups are strongly correlated and it is likely that there is unobservable heterogeneity among the respondents. Therefore, the data is pooled and standard errors are corrected for clustering.<sup>17</sup> Each respondent stated risk levels of infertility for women in the four age groups. Since a same respondent may overestimate, underestimate, and/or give correct risk estimates when estimating these risks, all conceivable combinations are in principle possible. Therefore, it is better to investigate whether the stated *risk* is underestimated, correct, or overestimated, instead of whether *a respondent* stated correct or biased risks. Moreover, there is always some uncertainty about the correct risk levels, so we allow for a deviation of  $\pm 25$  percent in the "correct" risk estimation. To be able to examine how the information channels affect the probability of estimating the risks correctly, the dependent variable consists of risks divided into three

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<sup>15</sup> The median risks in both samples remain the same if we exclude the highest stated risks (top 10 % of both samples), indicating that the median risks are robust. We excluded risks that are larger than 40 % for the 20-24 age group, 50 % for the 25-30 age group, 60 % for the 30-34 age group, and 70 % for the 35-40 age group.

<sup>16</sup> The difference is tested both by a Wilcoxon rank sum test and a Chi-square test corrected for continuity (see Siegel and Castellan, 1988).

<sup>17</sup> The correlations between the risks stated for the four age groups are between 0.39 and 0.84. The highest correlations are between the risks stated for the two youngest age groups (0.82) and between the two oldest age groups (0.84). Furthermore, there is no strong correlation among the explanatory variables in the regression.

groups: risks that are underestimated by more than 25 %, risks that are about correct ( $\pm 25$  % of the actual risk level is allowed), and risks that are overestimated by more than 25 %.<sup>18</sup>

**Table 4.** Results of the multinomial logit model. The dependent variable is whether the stated risk is underestimated, stated correctly, or overestimated. Deviations by 25 % are allowed. Whole sample.

Variable	Underestimated by more than 25 %		Correct risks $\pm 25$ %		Overestimated by more than 25 %	
	Marg. eff.	P-value	Marg. eff.	P-value	Marg. eff.	P-value
Intercept	-0.071	0.077	-0.421	0.000	0.492	0.000
Risk 25-29	-0.126	0.000	0.295	0.000	-0.169	0.000
Risk 30-34	-0.138	0.000	0.304	0.000	-0.166	0.000
Risk 35-40	-0.241	0.000	0.231	0.000	0.010	0.702
Health care	-0.041	0.026	-0.017	0.215	0.058	0.005
Info. from the media	-0.059	0.000	0.031	0.019	0.028	0.138
Media over 35	-0.036	0.076	-0.012	0.469	0.049	0.048
Info. from friends/relatives	-0.022	0.156	-0.028	0.023	0.050	0.005
Friends/relatives over 35	0.025	0.127	0.034	0.009	-0.060	0.002
Knowledge	-0.002	0.913	-0.001	0.941	0.003	0.885
January	0.043	0.051	-0.015	0.422	-0.028	0.284
Have children	0.059	0.003	-0.006	0.693	-0.053	0.018
Child; yes within 3 years	0.027	0.195	-0.014	0.376	-0.013	0.587
Child; yes but do not know when	0.058	0.015	-0.026	0.165	-0.032	0.247
Child; unsure	0.105	0.000	0.030	0.182	-0.135	0.000
Age 25	0.044	0.065	-0.009	0.626	-0.035	0.208
Age 30	0.001	0.974	-0.021	0.332	0.020	0.534
Age 35	0.016	0.575	-0.019	0.388	0.003	0.934
Big city	0.013	0.415	-0.009	0.451	-0.003	0.846
University	0.042	0.005	0.020	0.091	-0.062	0.000
Student	0.046	0.033	0.031	0.064	-0.077	0.002
Partner	0.019	0.346	0.021	0.187	-0.041	0.085
Income	-0.000	0.756	0.002	0.008	-0.002	0.147
No. of responses (share)	715 (21 %)		591 (17 %)		2128 (62 %)	

As seen in Table 4, if a respondent received information from the health care system, the probability of underestimating decreases by 4 percentage points. However, women who received information from the health care system were also more likely to overestimate the risk; the probability of overestimation increases by nearly 6 percentage points. One possible explanation is that the respondents who overestimated the risks may have had some kind of gynecological problems.

<sup>18</sup> Because there is no clear ordering of the dependent variable (whether the stated risks are underestimated, correct, or overestimated), it is more appropriate to use the multinomial logit than an ordered model.

Keeping in mind that the media is the most common information channel, it is important to study how they affect risk perceptions. We find that women who had received information from the media were more likely to state a correct risk, but that respondents who had read articles in the magazines about women who became pregnant at age 35 or older were more likely to overestimate the risks. In addition, the results of our media test are in line with our expectations that respondents in the test sample were more likely to state lower risks than those in the main sample (who received the questionnaire immediately after the large media coverage).

What peers say and do affect risk perceptions. The respondents who had obtained information from friends and relatives were more likely to state too high risks. However, a woman with close friends or relatives who became pregnant at age 35 or older was more likely to have a correct perception of the risks. Comparing the effects of the media and friends/relatives, we see that the magnitudes of the effects are nearly the same in the case when the risks are almost correctly estimated, but the signs are the opposite. Information from the media is thus better for the risk perception than information from friends and relatives. Another interesting result is that mothers and respondents who wanted (possibly again) to become pregnant later in life, but did not know when, were more likely to underestimate the risks.

As a sensitivity analysis we estimated the same multinomial logit model again, but this time allowing a 50 percent deviation from the actual risk levels when classifying the responses.<sup>19</sup> The results show that articles in magazines about women who became pregnant in their late 30s no longer affect the probabilities of overestimating the risks significantly. Moreover, information from the health care system no longer decreases the probability of underestimation significantly. The results of how women are affected by their peers are more robust: There are no changes in significance or in signs of the marginal effects that capture that women had received information from friends/relatives or that a woman had close friends/relatives who became pregnant at age 35 or older. However, the effects of peers are even larger when we allow for a 50 percent deviation from the actual risk levels; the sizes of the marginal effects are doubled. Finally, our media test gives the same result: Women who completed the questionnaire two months later were more likely to underestimate the risks

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<sup>19</sup> The results are available upon request.

than those who completed the questionnaire immediately after several newspapers reported that students underestimate the risks.

Our results are in line with the findings by McAlister, (1987), Rogers, (1987), Tonn et al., (1990), Chang and Kinnucan, (1991), and Wåhlberg and Sjöberg, (2000), who all found that experiences of peers affect people more than the mass media does. As shown in Table 2, a much larger share of the older women than of the younger claimed to already have enough knowledge about the risks. However, the results in Table 4 show that age has no significant effect on the probabilities to state correct risks. Moreover, those in the sample who claimed to already have enough knowledge about the risks do not significantly differ from other women in terms of their probabilities of stating correct risks.

### **3.4 Who wants to have more information, and from what source?**

Table 5 shows the shares of respondents, by age groups, who wanted/did not want to obtain more information, and the share who were unsure. It also reports whether the women who under- or overestimated all the risks (by more than 25 %) wanted to receive more information. The table also shows through what channels the respondents wanted to receive the information, given that they wanted more information.<sup>20</sup> The second to the last row in the table shows the shares of women who had never received any information about the risk from any information source.

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<sup>20</sup> We allowed the respondents to state several channels of information that they would like to receive information through. The respondents were also allowed to state other sources of information than those reported in Table 5. This explains why the percentages do not sum up to 100 %.

**Table 5.** The shares of respondents who did / did not want or were unsure of wanting to receive information. Channels through which respondents wished to obtain information, given that they wanted information. Whole sample, respondents by age group, and women who under- or overestimated all risks.

<b>Variable</b>	<b>Whole sample</b>	<b>20-24 years</b>	<b>25-29 years</b>	<b>30-34 years</b>	<b>35-40 years</b>	<b>Underestimates all risks</b>	<b>Overestimates all risks</b>
<i>Attitude towards information</i>							
Yes, more information	42 %	57 %	55 %	36 %	26 %	38 %	41 %
No more information	39 %	17%	25 %	44 %	59 %	42 %	40 %
Unsure if more information	19 %	26 %	20 %	20 %	15 %	20 %	19 %
<i>Channels women wanted to receive information from</i>							
Info. from health care	64 %	69 %	72 %	64 %	56 %	51 %	65 %
Info. from friends/relatives	6 %	10 %	7 %	5 %	5 %	5 %	7 %
Info. from media	27 %	40 %	35 %	23 %	17 %	27 %	29 %
<i>Never received information about the risks</i>							
Never received information from any channel	15 %	18 %	15 %	16 %	12 %	27 %	12 %
No. of women	859	167	190	220	282	74	380

As seen in Table 5, a clear majority of women under 30 years wished to have more information, while smaller share of the older women were interested in receiving more information. This is in line with the fact that the older women claimed to already have enough knowledge about the risks. Another explanation is of course that as many as 55 percent of the women 30 or older were mothers who did not want/were very unsure whether they wanted to have more children. However, we saw in Table 4 that older women were not more likely than younger to state risks more correctly. In addition, one-third of the women older than 30 were sure that they wanted to become pregnant, indicating that they also should be informed about the risks. Looking at the descriptive statistics of the women younger than 30, we see that as many as 86 of all women in this age group wanted to have a child, and that a large majority (72 %) were childless at the time.

It is especially interesting to investigate those with biased risk perceptions. The Chi square test reveals that women who had never received information about the risk make up a larger share of those (at the 1% significance level) who underestimated all four risks than of all other women. Hence, lack of information may explain biased risk perceptions.<sup>21</sup> For women who overestimated all four risk levels, we find the opposite result: A higher share of these

<sup>21</sup> Nearly 60 % of the women who underestimated all the risks were 30 years or older.



women had been in contact with information compared to other women, and the difference is statistically significant. However, when it comes to wanting more information, the shares of women who under- or overestimated the risks do not significantly differ from other women. In summary, we have shown that women, regardless of their age, should be informed. The question is from what source they want to receive information.

As seen in Table 5, given that women wanted more information, a majority wanted to receive it from the health care system. Since the media, and to some extent friends/relatives, are the most common channels of information, we see that the source women tend to want information from is not the source they actually get it from. If we assume that most people want to obtain information from the sources they feel are the most credible, the statistics of this study are contrary to the findings by Tonn et al., (1990). According to them, information based on peer experiences is felt to be more credible than media information. In our study, women were most likely to want information from the health care system. The media is the second most desirable source of information, while very few of the respondents wanted to receive information from friends or relatives. It could also be the case that women were less keen on wanting more information from the media since almost all of them had already received information from there.

We also asked 21 gynecologists working in Sweden about who they give information regarding the risk of age-related infertility to.<sup>22</sup> The ten doctors who answered said that they mainly give information either to all women around age 30 or older or only to women who request information.<sup>23</sup> According to these physicians, the health care system tends to inform older women who we find are less interested, while the younger women who we find would want more information are not informed.

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<sup>22</sup> The 21 gynecologists were contacted by phone, e-mail, fax, or mail in November 2006.

<sup>23</sup> Other categories of women who receive information from doctors are those with a steady partner and women with some kind of gynecological problem.

*The health care system as an information channel*

Because the health care system is the most desirable source of information, we investigate further what affects the probability of wanting information from this source and who wants the information. The results of the binary probit model, where the dependent variable is one if a respondent wished to obtain information from the health care system, are shown in Table 6. In addition to the variables used in the previous regression, we include two variables to especially investigate the women with biased risk perceptions. The first variable indicates whether a woman underestimate the general risk levels by more than 25 % for *all four age groups*, and the second whether a woman overestimated the risk levels by more than 25 % for *all four age groups*.

**Table 6.** Results of the binary probit model. The dependent variable is one if a woman wished to receive information about the risk from the health care system.

<b>Variable</b>	<b>Marginal effect</b>	<b>P-value</b>
Intercept	0.060	0.534
Health care	0.086	0.031
Info. from the media	-0.050	0.201
Media over 35	-0.045	0.375
January	-0.002	0.974
Info. from friends/relatives	0.045	0.222
Friends/relatives over 35	0.026	0.503
Knowledge	-0.104	0.009
Underestimates all 4 risks	-0.156	0.017
Overestimates all 4 risks	-0.004	0.904
Have children	0.034	0.461
Child; yes within 3 years	0.155	0.000
Child; yes but do not know when	0.179	0.000
Child; unsure	-0.014	0.841
Age 25	0.071	0.200
Age 30	0.035	0.590
Age 35	-0.008	0.907
Big city	0.041	0.272
University	-0.061	0.094
Student	0.076	0.130
Partner	0.033	0.513
Income	-0.001	0.749
No. of women	859	

The results in Table 6 show that women who had already received information from the health care system were more likely to want to obtain even more information from this source. On the other hand, the probability of wanting information decreases by 10 percentage points if a respondent felt that she already had enough knowledge about the risks. This is an interesting finding because, as shown in Table 4, those who felt they had enough knowledge were not more likely to state more correct risks than other women. The other information

variables have no significant effect on the probabilities of wanting information from the health care system.

Women who underestimated the risk levels for all age groups by more than 25 percent were less likely to want to receive more information from the health care system. The effect is large; the probability of wanting information decreases by 16 percentage points. The stated mean risk levels of these respondents are also substantially lower than those of the whole sample,<sup>24</sup> showing that the risk perceptions of these women are clearly biased. As mentioned before, the shares of women who underestimated all risks do not significantly differ from the shares of other women when we look at who wants to receive more information. However, they are obviously less likely to receive information from the health care system. One explanation might be that it is more sensitive to receive information from a personal source, such as physicians. However, underestimation of the risks might be undesirable, especially since a majority (56 %) of the women who clearly underestimated all risks were sure that they would like to have a child. Women who overestimated the risks for all age groups do not significantly differ from those who had just about correct risk perceptions when we look at who wanted more information from the health care system.

Women who wanted to become pregnant were more likely to want to receive information from the health care system. The probabilities increase by 16-18 percentage points. However, women of different ages do not significantly differ from each other when it comes to wanting to have information from the health care system.

#### **4. Conclusions and discussion**

This paper is based on a survey of a random and representative sample of Swedish females aged 20 to 40, and investigates: (1) from what sources women receive information about the general risks of age-related female infertility, (2) how different information channels affect women's perceptions of the risks, and (3) who would like to have more information, and from what source(s)?

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<sup>24</sup> The stated mean levels of the risks are 3, 4, 6, and 10 % for the four age groups. The corresponding median risks are 3, 5, 6, and 10 %.

The results show that the media reaches women of all ages, while the share of women who have already received information from the health care system differs among the age groups. The older the woman, the more likely it is that she has received information from the health care system. This is in line with what the gynecologists we asked said: the health care system usually informs women around 30 and older, which is in sharp contrast to the fact that a large majority of the younger women (under 30) want more information from the health care system.

Women who have received information from the media are more likely to state correct risks. On the other hand, reading articles in magazines about women who became pregnant in their late 30s increases the probability of overestimation. One possible explanation is that several studies report that female age-related infertility increases only a little before age 30 but more rapidly after age 35 (Leridon, 2004; Infomedica, 2004). Therefore, it is possible that magazines spread information highlighting the ages 30 and 35 as "critical," making women believe that the risks are higher than they actually are. If overestimation creates unnecessary worry, women should also have other information sources.

Only about one-third of the respondents had discussed this risk with their friends or relatives, but as the results clearly show, friends and relatives are an important source of information that does affect women's risk perceptions. However, the information from friends and relatives seems to generally be incorrect, making female recipients more likely to overestimate the risks. One possible explanation is that people tend to mainly discuss problems and difficult pregnancies, leading to overestimations of the risks. On the other hand, the probability of stating correct risks increases if a woman has close friends or relatives who became pregnant at 35 or older. These findings are also in line with previous research; experiences of peers affect people more than the mass media (McAlister, 1987; Rogers, 1987; Tonn et al., 1990; Chang and Kinnucan, 1991; Wählberg and Sjöberg, 2000).

Moreover, we found that the stated median risk level for women aged 35-40 was clearly higher in the survey mailed out immediately after the media coverage than in the one carried out two months later, but the difference was not significant. Those who answered our second survey were more likely to underestimate the risks than those who answered the first survey, a result that is in line with our expectations. Thus, we find effects of the large media coverage on people's risk perceptions, although the effects are not always significant. It is also possible

that the effect of the increased media coverage lasted longer than two months, which could explain why the median and mean risks for the 35-40 age group were overestimated by both samples. Furthermore, we do not know whether the respondents actually read the articles in the Swedish newspapers in November 2005.

Our study points to three dilemmas that the Swedish health care system should want to direct attention to: (1) Only 26 percent of our respondents had obtained information from the health care system, while a majority wished they had. (2) Although large majority of the women who are younger than 30 want information from the health care system, the health care system tends to rather inform older women. Although we must remember that the issue of infertility might be sensitive for many women (which makes informing more difficult), we argue that it is important to reach women earlier since a majority of the younger women want to have a child later on but do not know when. (3) A larger share of women who underestimated the risk levels for all four age groups had not been in contact with any kind of information compared to other women. These women were however less likely to wish to receive information from the health care system, although a majority of them would like to have a child. In addition, if the health care system succeeds in informing women, it will affect women themselves as information channels; women can then give more correct information about the risks to their friends and relatives. Since the media is found to be the most common source of information, it should be an efficient channel for the health care system to use when informing women about the risks.

Although the empirical evidence in this paper comes from Sweden, the risks of age-related infertility concern all women, and our results are therefore of more general interest. It is very likely that the media reaches women in most countries, while the roles and practices of the health care systems might differ among countries. However, the results of this study can be useful for health care systems in other countries to reflect on who they give information to and whether they reach those with biased risk perceptions. Moreover, the health care systems should be aware that women receive biased information, especially from their friends and relatives, and that this can cause unnecessary worry or serious disappointments if it becomes difficult for a woman to become pregnant.

## References

- Bénabou R. and J. Tirole (2002), "Self-confidence and personal motivation", *The Quarterly Journal of Economics*, 117 (3), 871-915.
- Bongaarts J. (1982), "Infertility after age 30: A false alarm", *Family Planning Perspectives*, 14 (2), 75-78.
- Burton M. and T. Young (1996), "The impact of BSE on the demand for beef and other meats in Great Britain", *Applied Economics*, 28, 687-693.
- Chang H-S, and H. W. Kinnucan (1991), "Advertising, information, and product quality: The case of butter", *American Journal of Agricultural Economics*, 73, 1195-1203.
- Chandra A., GM Martinez, WD Mosher, JC Abma, and J. Jones (2005), Fertility, family planning, and reproductive health of U.S. women: Data from the 2002 National Survey of Family Growth, U.S. Department of Health and Human Services 23 (25), National Center for Health Statistics.
- Efron B. and R. J. Tibshirani (1998), *An introduction to the Bootstrap*, Chapman & Hall/CRC, U.S.A, 1998, p. 55.
- Göteborgs Posten (2005), Studenter riskerar bli barnlösa, 2005-11-16, Attached 2008-03-26
- Högber U. (1998), "Epidemiologiska synpunkter på fekunditet och infertilitet" In: *Ofrivillig barnlöshet*, N-O. Sjöberg (ed.), Rapport nr: 37, Arbets- och Rferensgruppen för Ofrivillig Barnlöshet 1998.
- Infomedica (2004), homepage: [www.infomedica.se/artikel.asp?CategoryID=11729](http://www.infomedica.se/artikel.asp?CategoryID=11729)
- Kasperson R. E, O. Renn, P. Slovic, H. S. Brown, J. Emel, R. Goble, J. X. Kasperson and S. Ratick, (1988), "The social amplification of risk: A conceptual framework", *Risk Analysis*, 8 (2), 177-187.
- Kasperson J. X., R. E. Kasperson, N. Pidgeon, and P. Slovic (2003), "The social amplification of risk: assessing fifteen years of research and theory" In: *The Social Amplification of Risk*, Pidgeon N., R. E. Kasperson and P. Slovic (eds.), Cambridge University Press, UK.
- Lampi (2006), Age-related risk of female infertility: A comparison between stated general and personal risks, Working Paper, Revised version April 2008, University of Gothenburg.
- Lampic C., A. Skoog Svanberg, P. Karlström and T. Tyden (2006), "Fertility awareness, intentions concerning childbearing, and attitudes toward parenthood among female and male academics", *Human Reproduction*, 21 (2), 558-564.
- Leridon H. (2004), Can assisted reproduction technology compensate for the natural decline in fertility with age? A model assessment, *Human Reproduction*, 19 (7), 1548-1553.
- Manski C. F. (2004), Measuring expectations, *Econometrica*, 72 (5), 1329-1376.
- McAlister A., (1987), "Social learning theory and preventive behaviour" In: Weinstein (Ed.) *Taking Care: Understanding and encouraging self-protective behaviour*, Cambridge University Press, USA, 1987.
- Miller S. and C. Mangan (1983), "Interacting effects of information and coping style in adapting to gynecologic stress: Should the doctor tell all?", *Journal of Personality and Social Psychology*, 45 (1), 223-236.
- National Center for Health Statistics, W. D. Mosher and W. F. Pratt (1987), Fecundity, infertility, and reproductive health in the United States, 1982, Vital and Health Statistics Series 23 (14). DHHS Pub No (PHS) 87-1990 U.S., Public Health Service Washington U.S., Government Printing Office, May 1987.
- Rogers E. M. (1987), "The diffusion of innovations perspective", In: Weinstein (Ed.) *Taking Care: Understanding and encouraging self-protective behaviour*, Cambridge University Press, USA, 1987.

- Schwartz D. and MJ. Mayaux (1982), "Female fecundity as a function of age: results of artificial insemination in 2193 nulliparous women with azoospermic husbands. Federation CECOS.", *New England Journal of Medicine*, 306 (7), 404-406.
- Siegel S. and J. Castellan (1988), *Nonparametric statistics for the behavioural sciences*, McGraw-Hill Book Company, Singapore, 1988.
- Soumerai S.B., D. Ross-Degnan and J. S. Kahn (1992), "Effects of professional and media warnings about the association between aspirin use in children and Reye's syndrome", *The Milbank Quarterly*, 70 (1), 155-182.
- Statistics of Sweden (2002), "Pappa och barn", *VälfärdsBulletinen*, No. 4, homepage: [http://www.scb.se/Grupp/allmant/\\_dokument/A05ST0204\\_08.pdf](http://www.scb.se/Grupp/allmant/_dokument/A05ST0204_08.pdf).
- Statistics Sweden (2004), Statistics Sweden (2004), "Population aged 16-74 by level of education, sex and age 2004", homepage: [http://www.scb.se/templates/Product\\_9577.asp](http://www.scb.se/templates/Product_9577.asp).
- Svenska Dagbladet (2005), Studenter överskattar fertilitet-riskerar barnlöshet, 17th November 2005, [www.svd.se/nyheter/inrikes/artikel\\_478537.svd](http://www.svd.se/nyheter/inrikes/artikel_478537.svd), Attached Mars 2008.
- Tietze C. (1957) "Reproductive span and rate of reproduction among Hutterite women", *Fertility and Sterility*, 8 (1), 89-97.
- Tonn B. E., C. B. Travis, R. T. Goeltz and R. H. Phillippi, (1990), "Knowledge-based representations of risk beliefs", *Risk Analysis*, 10 (1), 169-184.
- Weaver J. and J. Wakshlag (1986), "Perceived vulnerability to crime, criminal victimization experience, and television viewing", *Journal of Broadcasting and Electronic Media*, 30 (2), 141-158.
- Verbeke W. and R. W. Ward (2001), "A fresh meat almost ideal demand system incorporating negative TV press and advertising impact", *Agricultural Economics*, 25, 359-374.
- Wiegman O. and J. M. Gutteling (1995), "Risk appraisal and risk communication: Some empirical data from the Netherlands reviewed", *Basic and Applied Social Psychology*, 16 (1&2), 227-249.
- Wählberg A. AF. and L. Sjöberg, (2000), "Risk perception and the media", *Journal of Risk Research*, 3 (1), 31-50.

## Appendix A

### Part 2 – Questions about the age-related risk of female infertility

Nowadays we establish families later in life than previous generations did. The average age of Swedish first-time mothers is 29 years, which is up five years from 30 years ago. Age affects the fertility of a woman, even if fertility is a very individual issue. *Infertility* is defined as when a woman regularly tries to but does *not* become pregnant without medical assistance during a period of one year. However, it is possible that she becomes pregnant after for example three years, with or without medical assistance. While infertility can be due to several reasons, this study investigates only how age affects female infertility.

Questions 1-4 below are about women of different ages. Imagine that these women try to become pregnant and that their partners are perfectly fertile. I want to know what you *believe* the risk of age-related infertility is for a woman in every age group. Question 5 is about what you believe your own risk to be.

The number you state as a percentage rate in questions 1-4 indicates the number of women out of 100 in that age group who will *not* become pregnant in a one year period without medical assistance, despite trying regularly. Answer the questions even if you feel unsure about the percentage rates. For this study, it is important to find out what you *believe* the risks to be. You can always go back and change your answers if you like.

**Question 1.** I *believe* that the average risk for a 20-24 year old woman of *not* becoming pregnant during a time period of one year is.....%

**Question 2.** I *believe* that the average risk for a 25-29 year old woman of *not* becoming pregnant during a time period of one year is.....%

**Question 3.** I *believe* that the average risk for a 30-34 year old woman of *not* becoming pregnant during a time period of one year is.....%

**Question 4.** I *believe* that the average risk for a 35-40 year old woman of *not* becoming pregnant during a time period of one year is.....%

Note: Question 5 below is about you personally.

**Question 5.** Imagine that you want to try to become pregnant. How great, do you *believe*, is your *personal* risk of *not* becoming pregnant during a time period of one year?.....%

Space for your own comments.....  
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