Abstract

Objective: Technology offers new opportunities, and challenges of as yet undreamed. Ethical intuitions honed over millions of years of small-group, competitive obligate sexual reproduction may mislead us in relation to new technologies. Between 1999 and 2008 the number of ART treatment cycles increased by 265% in Ireland. Some of the implications of such technologies are profound—challenging existing reproductive understanding. Ireland offers unique opportunities for study as a small country, emerging from a traditional religious past, with almost unregulated access to Assistive Reproductive Technology (ART*)*

Method: Data from an Irish population of varied ages and both sexes (N = 606) were collected through an on-line survey which included demographics and attitudes and knowledge of ART.

Results: While interest in ART was high, accurate knowledge was patchy. Latent class analysis revealed a typology of five groups of responders to ART, distinguished by their attitudes and knowledge of this technology. These groups were tentatively labelled as 'Worried Yet Willing', 'Live and Let Live', 'Disengaged', 'Judgemental' and 'Conflicted'. This is a large, demographically representative sample from a country—Ireland--that is actively considering reproductive challenges in the twenty first century. This is therefore a valuable opportunity to access the processes underlining attitudes to these new opportunities and threats. However, even though the sample was reasonably large, women were—perhaps unsurprisingly--over represented. They outnumbered men by 4:1. Follow up research might specifically focus on males, and especially males in certain key demographic sectors.

Conclusion: Responses to the introduction of ART in Ireland fell into five distinct groups. These groups had some predicative value in highlighting attitudes to ART provision in prospective groups, though not always in expected ways. Attitudes were generally positive. Understanding the distinguishing features of these types of responders is important for health care professionals regarding service development and delivery. Implications for the direction of future related research is discussed.

Keywords: fertility, assisted reproductive technologies, infertility

Introduction

Humans have a fundamental desire to reproduce that is typically woven into their sense of personal identity (Rogers, 1989, Willmott, Ryan, Sherretts, Woodfield, & McDermott, 2018). The full extent of sexuality is not only inclusive of sexual interest, perception and activity, but also of the recombination of genes in one individual, originating from two different individuals (Purves, 1998), a process defined as reproduction. Humans might be seen to have added asexual reproduction to their strategic suite of options. However, this would be a misunderstanding. Humans do not yet regularly clone themselves, although they now can achieve fertilisation outside of bodies. Assisted Reproductive Technologies (ART) are innovations which can "arouse strong emotions and passions, ranging from outright horror through to unquestioning acceptance" (Earle & Letherby, 2003, p. 1). Fuelled by these strong emotions and passions are social, moral, and ethical questions, characterised by an abundance of individual differences.

Contraceptive decoupling of sex and reproduction has allowed women to retain both their sexuality, and their autonomy. Advances in reproductive medicine and technology offer pragmatic ways to bypass the limitation imposed by infertility (Haynes & Miller, 2003; & Inhorn & Van Balen, 2002). Since the birth of the first In-Vitro-Fertilization (IVF) baby in 1978 (Steptoe & Edwards, 1978), ART has broadened its scope considerably.

Although initially developed to address infertility, ART is now also available to those who wish to become parents in non-traditional ways. These can include surrogate mothering, gamete donation, social egg-freezing (see Magri, & Seymour, 2004 for a review). This expansion has an unparalleled impact on human reproduction. Sexual activity is stripped of its potential procreative function. Intercourse is no longer needed in order to achieve parenthood. Sensationalist media reports are in constant danger of misinforming the public, which in turn

may have repercussions for reproductive decision-making and attitudes towards ART. However, structured information on how this decoupling of human reproduction and sexuality impacts the general publics' view on sexuality and procreation is lacking (Plomin, 2018).

Traditionally, Ireland is predominantly a Catholic country with 78.3% of the population identifying as Roman Catholic (CSO, 2016). ART has been available since 1987 (Allison, 2016) and is currently is in the process of being legislated for (O'Sullivan, 2018). The official stance of the Roman Catholic Church is that all methods of artificial reproduction are morally illicit (Harris, 2015), going so far that in Poland – also a Roman Catholic country--there is a Church-led campaign to criminalise IVF (Radkowska-Walkowicz, 2012). For a review of the often trenchant attitudes to this in Poland, see Korolczuk (2016) for a review. The question immediately arises as to whether such extreme positions noted in Poland might obtain in another Catholic country, Ireland. Prohibition on abortion has lasted in Ireland up until May 2018. How one's sexuality and reproductive life as experienced, is, of course, influenced by the specific cultural and religious traditions, alongside the legislative framework of the country in which it is lived (Genuis, Chang, & Genuis, 1993; De La Fuente Fonnest, Sondergard, Fonnest, & Vedsted-Jacobsen, 2000; Wennberg, Rodriguez-Wallberg, Milsom, & Brannstorm 2016). Between 1999 and 2008 ART treatment cycles increased by 265% in Ireland, signifying the rapid growth of this sector and the demand for services (Naasan et al, 2012).

A large survey on the public's perceptions of infertility treatments conducted in six European countries, the USA, and Australia demonstrated that nearly 90% of participants were aware of the existence of IVF. However, there are gaps in public awareness regarding the definition and incidence of infertility, and the success rates of ART (Adashi et al., 2000). There has been significant increase in support for social acceptance of IVF over three decades in Australia for both traditional (e.g married couples) and non-traditional (e.g. single women/lesbians using donor sperm) service users (Kovacs, Morgan, Levine, & McCrann, 2012). General attitudes

towards ART amongst women became progressively more supportive as their exposure to ART increased (Fortin & Abele, 2014). Public attitudes towards ART is liberal in Sweden with the exception of surrogacy (Wennberg, et al, 2016). The general public is likely to support ART use among marginalized groups such as obese women (Shah et al, 2013), and cancer patients whilst they are less supportive for HIV patients (Mok-Lin, Missmer, Berry, Soleymani Lehmann, & Ginsburg, 2011). Infertile women are more liberal than their fertile counterpart with regards to ART access based on marital status and sexual orientation (Heikkilä, Länsimies, Hippeläinen, & Heinonen, 2004) and more frequently agreed that there should be no age limit for artificial insemination procedures (Blaževičienė, Jakušovaitė, & Vaškelytė, 2014).

To date, relatively little is known about how the general public view Assisted Reproductive Technology (ART) in the Republic of Ireland. Our previous study had categorised individual differences into a typology of five (tentative) categories of responders to an ARTs survey; 'Worried Yet Willing', 'Live and Let Live', 'Disengaged', 'Judgemental' and 'Conflicted' (Dempsey, King, & Nagy, 2018). We review the categorization process briefly here:

Creating and Validating a Typology

Key discriminating elements of the questionnaire were subjected to latent class analysis to reveal any underlying trends in the data. These elements were sex (categorical), educational level (treated as ordinal) and the pattern of answers to the attitudinal questions to assistive reproductive technologies as follows:

Participants were asked to assess the validity of potential objections to ART on a 6-point scale where (1) indicated totally invalid and 6 (totally valid). The questions pertained to

Naturalness; messiness; fate; expense; hubris; redirection of health care resources; time; pain, need to take drugs; invasiveness, and impersonality (full details of questionnaire available on request).

Table 1: Breakdown of Bayseian Information Criteria Scores per Proposed Latent Class Analysis:

Age was treated as a covariate in order to control for linear age-related factors.

	LL	BIC(LL)	Npar	L^2	df	p-value
1-Cluster	-11370.7635	23153.7476	64	18121.7364	563	2.9e-3392
2-Cluster	-10802.4908	22126.6982	81	16985.1909	546	5.4e-3166
3-Cluster	-10614.5060	21860.2248	98	16609.2214	529	1.1e-3099
4-Cluster	-10480.1634	21701.0356	115	16340.5361	512	6.4e-3056
5-Cluster	**-10385.0154**	**21620.2357**	**132**	**16150.2401**	**495**	**1.0e-3028**
6-Cluster	-10334.0571	21627.8152	149	16048.3235	478	3.6e-3020

A **five-cluster** model showed the lowest *BIC* and was thus preferred. The breakdown of the individual clusters was as follows:

Table 2

Descriptive statistics relating to the 5-cluster model.

Cluster	Cluster Name	Mean Age	n	%
1	Worried Yet Willing	28.7	192	31.4
2	Live and Let Live	19.2	130	21.3
3	Disengaged	22.8	63	10.3
4	Judgmental	19.1	155	25.4
5	Conflicted	31.1	71	11.6

A brief summary of each cluster is as follows:

1. 'Worried Yet Willing'; Members of this cluster were typically highly educated (75% undergraduate level or above). While they were worried about the expense of ART (*M* = 5.3) and how time consuming it might be (*M = 3.5)*, they would be willing to engage with ART if necessary, scoring in the mid-range.

2. 'Live and Let Live'; 98% of this sample were of secondary educational level or lower. They scored in the low range for all objections (next to cluster 5) but especially low for the "unnatural" (*M*=1.5); "fate" (*M*=1.39) and "playing god" objections (*M* = 1.18).

3. 'Disengaged'; educational distribution was bimodal (60% had secondary level or below, and 26% had undergraduate level or above). They typically found all objections to ART to be "somewhat" or "totally" invalid. This was the smallest cluster and had more males than any other cluster though the female percentage was still in majority with 68.8%.

4. 'Judgmental'; this cluster had a lower educational level (97% with secondary level or below educational level). Unlike the 'Live and Let Live' cluster, the 'Judgmental'

group tended to score relatively high in agreement with thinking that ART may be "unnatural" (*M* = 3.2), "messy" (*M* = 2.4), "against fate" (*M* = 2.8), "playing god" (*M* = 2.4) or "taking resources from other medical care" (*M*= 2.6)

5. 'Conflicted'; comprised the highest average educational level of all clusters: 33% had a master's level of education or above. These participants scored the highest in accepting arguments against ART in all categories, yet, conversely expressed worry about their own fertility.

This typology was validated against eight self-description questions regarding attitudes to personal use of ART using multivariate analysis on the eight self-description questions, and overall there was a significant main effect (Roy's Largest Root = 0.2, partial eta squared = 0.166, $p < .001$ $F = 15.02$, observed power = 1.0). Validation - in answer to the "would you consider using ART (self or partner) this predicts membership of clusters 4 or 5 (n= 611, chi squared = 38.1, df = 4 p <.001). See Dempsey et a. (2018) for further details. The current research aims to ascertain how each cluster varied in their attitudes to the possible availability and advisability of ART to particular potential recipients across the range of age, sexual orientation and demographic variables.

Method

Ethical approval from a leading Irish third-level institution (details available on request) was gained before carrying out an extensive on-line survey. Data were collected on demographics, knowledge of fertility, knowledge of ART, as well as personal attitudes to fertility and attitudinal (vignette-based) opinions on the appropriateness of others receiving ART.

In terms of the vignettes, participants were told the following *'Only one fertility clinic in the country provides state-funded fertility treatments. There are limited places available and there is a long waiting list. It is the clinic's duty to assess couples before providing them with treatment and it is at their own discretion to decide to whom they offer state-funded IVF'*.

Following this were six specially constructed vignettes, where the characteristics of potential recipients of ART were described. For example: *'Susan is 36 and her husband Mark is also 36. They have been married for 3 years. After a year of trying for a baby, they started doing the basic tests through their GP. All their results were fine so they were referred to the fertility clinic where they were diagnosed with unexplained infertility'*.

The stories varied in terms of the sex and age of the participants (e.g. two same sex couples of typical reproductive age ("36"), one single female at the edge of normal reproductive age ("early 40s"), one with a female over normal reproductive age ("44"), and one with a similarly older male for control). Other aspects remained the same. Full details available on request.

Participants were then asked to what extent they agreed with whether or not it was right to provide fertility treatments to those described, with a low score indicating an objection to ART and a high score indicating acceptance. They were asked whether or not any children so produced would be different from peers, whether they were likely to have health issues, whether participants had long-term concerns, whether such ART might in some way endanger

society, or whether such treatment was unnatural and should not be available. For these responses, a low score indicates an agreement with ART and high scores indicate an objection to ART.

These data allowed for a generation of profiles of what aspects of ART provision to various types of people—defined by age and sexuality, were the most positively or negatively valenced by the target population. Given that previous research had produced a validated typology of this population based on their attitudes to ART in relation to themselves, this was re-used to predict outcomes across 36 measures based on the vignettes.

Prior to starting the survey, participants were given information on the study and it was noted that '*By completing the questionnaire you are agreeing to take part in this study. No personally identifying material will be collected and you can withdraw from the study at any point up to submission of your responses'*.

Participants

606[1] Irish participants were recruited through third level education institutions and a variety of social media platforms. The age range was from 18 to 71. The mean age was 24.04 (*SD*= 8.50). The modal age was 18. Overall, 21.7% identified as male, 77.9% as female, and fewer than 1% either identified as transgendered or preferred not to answer. Exclusion criteria: The target population comprised Irish people. There was a question on country of origin, and 12 non Irish participants completed the survey. However, they were excluded from this level of analysis as the focus was Irish attitudes to ART.

[1] The typology was constructed with N = 611. However, five people did not complete all of the vignettes and so were dropped the current analysis.

Results

A detailed breakdown of the dozens of individual and grouped patterns of responses is available on request, only a summary can be offered here due to space constraints.

Art and Other

The typical pattern across clusters was for the responses from Cluster 2 (those we had tentatively labelled "Live and Let Live") and Cluster 4 (labelled "Judgmental") to not differ significantly from one another demographically—e.g. in terms of age, sex and educational breakdown, but to differ significantly in their approval of ART provision to all those described in the vignettes. A single example illustrates this typical pattern:

With the baseline couple vignette (a heterosexual pair in their thirties) MANOVA revealed a significant variation across attitudes (Pillai's trace = .978, F = 3047.1, df = 6; p< .001, partial eta squared = .978) Those who scored the highest (M = 2.96; SD = 0.64) on "This couple should be offered ART" were Cluster 5 ("Conflicted"); but this group also scored the lowest on question 2, "These children will be different from traditional children" (M = 1.2; SD = 0.40). With this couple, it was cluster 4 ("Judgmental") who expressed the most concern about long-term consequences (M = 2.34; SD = 0.91) the potential danger to society (M = 1.95; SD = 0.77); and possible unnaturalness of the procedure and its possible sequelae (M = 1.58, SD = 0.64).

It should be noted that overall the objections to this couple being offered ART from *all* clusters was comparatively low. The (corrected) largest degree of objection was (M =1.2, SD =0.70) for Cluster 4 ("Judgmental") to the "older male partner" version of the vignettes. This level still equates to a typical answer of the border of "agree" and "agree strongly" to the "ART should be offered" question. The lowest objection was from Cluster 5 ("Conflicted") to the "older mother" variant (M = 0.263, SD = 0.34), and this is just a bit closer to the "agree strongly

boundary". The clusters did show discriminate validity when compared to one another in more detail. To see this, we performed a large number of planned follow-up pairwise comparisons between clusters, with Bonferoni correction, showed a number of statistically significant scores in response to all individual questions. Once again, space precludes a full breakdown (available on request) but the first vignette to illustrates the general pattern:

Question 1; *ART should be given to this couple*; Showed statistically significant variation predicted by between Clusters 2 ("Live and let live") and 5 ("Judgmental") (p = .029).

Question 2; ; Between Clusters 1 ("Worried but willing") and 2 ("Live and let live") (p < .001).

Question 3; Children born this way will likely have health issues; Between Clusters 1 and 3 (p = .031).

Question 4; I have concerns about the long term consequences; Between 1 and 2 (p < .001) 1 and 4 (p < .001) 2 and 3 (p< .001) and 3 and 5 (p < .001) and 4 and 3 (p< .001) and 4 and 5 (p <.001).

Question 5; Society is endangered by this ART provision; Between 1 and 2 (p= .007); 1 and 4 (p= .006) 2 and 5 (p= .004) and 4 and 5 (p = .002).

Question 6; This ART provision is unnatural; Between 1 and 2 (p <.001) 1 and 4 (p = .001) 2 and 3 (p < .001)2 and 5 (p< .001) 3 and 4 (p < .001) and 4 and 5 (p < .001).

Thus, the individual questions seemed to show a fair degree of discriminate validity in terms of the original typology, even when considering a relatively unproblematic case of ART provision. In light of this, our original naming of the clusters appeared to need revision (Dempsey, King & Nagy, 2018). What links Clusters 2 and 4 most obviously is age (M = 19.1 and 19.2 respectively) and educational level (secondary or below in each case). This appears to us to be a new finding.

Discussion

Things have changed in Ireland in the last two decades. The current survey reveals that typical attitudes towards ART in Ireland are broadly positive. The underlying reason might be that it is viewed primarily as the solution for alleviating infertility, but the reasons for this—in terms of moral and political viewpoints, can be fractionated somewhat. The majority of respondents were women, who are perhaps more than likely to respond empathically to the position of those with the challenges of reproduction (e.g. biological or social infertility). Motherhood is still emphasized as women's primary social role and biological motherhood is viewed by many as the most valued path toward parenthood (Parry, 2005). Regardless of the causes of infertility, most of the fertility treatments are aimed at the female partner. The men in this process are marginalized and their role is often reduced to providing a semen sample on time (Mikkelsen, Madsen, & Humaidan, 2012). Ireland is often described as a pro-natalist society (Allison, 2016), and there can be a stigma associated with remaining childless.

However, positive Irish attitudes across the board were not (seemingly) driven by underlying latent moral stances taken towards "unnaturalness" (indexed as homosexuality) or "karma" (indexed as age of recipients). Instead, they seem to be predicted mainly by age and education, which covary. This was not highlighted by previous literature, e.g. Genuis et al., (1993). Factors such as age, experience, and gender all appear to play a part in determining responses. At a general level, there do not seem to be any overarching arguments against the use of ART. However, when we look closer at the typology, we uncover nuances within each cluster, indicating an array of individual differences. When taken at a macro level, we risk losing the nuances within each cluster. Contradicting tendencies were discovered, which certainly warrant further exploration. For example, as females get closer to the decline of their fertility,

as in Cluster 5 ("Conflicted"), decisions potentially involving ART become more real than abstract, and become more complex. The number of those availing of ART treatments is rising perhaps because of women's interests in delaying pregnancy and their increased awareness about ART.

These findings may be further explained by a widespread shift in favor of acknowledging parental choice in reproductive matters. A majority of survey participants support the use of ART in marginalised groups, e.g. same-sex relationships. This would fit with what had been found internationally (Kovacs, et al, 2012). This support may indicate the increasing emphasis on individuals' autonomy, their right to mental and physical well-being, and non-discrimination in medical care. In Western societies, ART is presented within a liberal, capitalistic framework. These technologies have altered, and will continue to alter, the traditional reproductive trajectory by offering a wide array of available ART modes to achieve parenthood. The wide scope of reproductive choices aggravated by assisted conception, and prenatal diagnosis have been highlighted as key concerns in sociological and anthropological studies of human reproduction (Konrad, 2003; Rapp, 2011; Teman, Ivry, & Goren, 2016). Using technological assistance in achieving embodied parenthood; conception and pregnancy are becoming increasingly complicated by the ensuing knowledge and/or moral dilemmas e.g. the need to contemplate the fate of excess embryos, consequences of gamete donation, or - by using prenatal diagnosis --the prospect of deciding the futures of anomalous fetuses. On the other hand, in the context of ART, intercourse is no longer a two-person generative event of the body. Transitioning from sex without reproduction, to reproduction without sex seemingly allows us to render obsolete some of the prejudices around non-traditional sexuality.

Another significant aspect of attitudes towards new reproductive technologies is their accessibility, which is largely dependent on the price of ART treatments and the affluence of those who wish to avail of those treatments. There is no consensus regarding the limits of

treatment provision. Despite consumption rates of assisted reproductive technologies in Ireland and elsewhere are steadily rising, there is no state funded ART treatment available in Ireland

Data regarding public attitudes to ART is scarce in Ireland. Studies conducted elsewhere focused mainly on populations such as healthcare providers. Findings from these studies contrast with those highlighted here. Healthcare professionals demonstrating a reluctance to provide ART for single men or gay couples (Gurmankin, Caplan, & Braverman, 2005), and artificial reproduction to single women and lesbians (De La Fuente Fonnest, et al, 2000). The current research has identified somewhat more permissive attitudes among potential consumers of ART, at least in Ireland.

ART challenges traditional family patterns. The findings of this study however, warrants further exploration; moving beyond the general issue of acceptance, and into consideration of particular ART techniques. Helping couples to conceive through ART is becoming a normalized part of reproductive medicine. However, using donor sperm and a surrogate mother to achieve parenthood without appropriate legislative framework could engender social and legal confusion. Considering that only 29% of IVF cycles result in pregnancy (Kupka, et al, 2016), potential consumers need to be educated about the processes, success rates and implications of ART. Humans may be fast approaching a stage where they can give the lie to our title (which alludes to Ecclesiastes 7:13), and start to answer the question as to who can straighten what he has made crooked.

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