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Biologically infallible? Men's views on male age-related fertility decline and sperm freezing

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Abstract Trends in people having children later in life and increasing evidence of male age-related fertility decline (ARFD) has led some to propose sperm freezing as a suitable response. However, little consideration has been given to how men might respond to such a proposal, and there has been a paucity of empirical data to inform such a consideration. This paper arises from in-depth, semi-structured interviews with men ($n = 25$) who do not have children but want or expect to have them in the future. Data on men's perceptions of male ARFD and sperm freezing are presented and discussed in accordance with theoretical and conceptual tools relating to reproductive masculinity, biomedicalisation, gendered risk perception and meanings of sperm and masculinity. It suggests that that men's overall lack of concern regarding male ARFD and resistance towards ideas of sperm freezing result not only from a lack of exposure to evidence regarding male ARFD but are also shaped by ideals of reproductive masculinity, and may indicate resistance towards the idea of reproductive control. It argues that these positions perpetuate a gender unequal politicisation of ARFD and perpetuate particular gendered subjectivities relating to culpability and responsibility for guarding against risks of ARFD.

Keywords: fertility ageing, sperm freezing, reproductive technologies, medicalisation, risk, masculinities

Introduction

Trends in people having children later in life have persisted over recent decades and show no signs of abating, alongside which evidence of male age-related fertility decline (ARFD) continues to grow, leading some to argue the benefits of sperm freezing in response to these phenomena (Phillips *et al.* 2019, Smith 2015). However, little consideration has been given to how men might respond to such an idea, and there has been a paucity of empirical data to inform such a consideration. This paper arises from a qualitative study of men and reproductive timings, utilising data from in-depth, semi-structured interviews with men ($n = 25$) who do not have children but want or expect to have them in the future. Data on men's perceptions of male ARFD and sperm freezing are presented, and discussed in accordance with theoretical and conceptual tools relating to reproductive masculinity, biomedicalisation, gendered risk perception and meanings of sperm and masculinity. The paper considers the ways in which particular gendered ideals, beliefs and understandings of reproduction shape men's meaning making,

and the implications of these for perpetuating particular gendered subjectivities relating to responsibility and culpability for ARFD. The paper interprets findings from a sociological perspective, using sociological theories and concepts, although the findings also have relevance for other disciplines.

Context

Later parenthood and male ARFD

People are having children later in life than was the case in previous decades. Within England and Wales the average age of fatherhood (i.e. the age of men at the birth of first and subsequent children) has increased from 31.1 years in 1993 to 33.3 years in 2016 (ONS 2014, 2017).¹ Similarly the average age of motherhood has increased from 26.4 years in 1975 to 30.5 years in 2017 (ONS 2018). Such trends, and the associated notion that people are waiting until later in life before trying for children, have been a cause for concern within academia, health services and the media, as increasing age (particularly increasing female age) is associated with a range of adverse reproductive outcomes including subfertility, pregnancy-related risks and risks to the health of offspring (de Kat and Broekmans 2018). Explorations of later parenthood and the underlying factors have largely focused on women and it is suggested that this overemphasises female responsibility and implicates women's behaviour in 'problems' of 'delayed' childbearing leaving men's behaviours relatively neglected (Jamieson *et al.* 2010, Lloyd 1996).

Over the past two decades increased scientific attention has been paid to male ARFD (Mitu 2016). Numerous recent reviews have found increasing male age to be associated with declines in several semen traits and in semen quality, and with DNA mutations; to have a negative impact on a range of reproductive and fertility outcomes; and to positively correlate with the incidence of health conditions in offspring particularly autism, schizophrenia, bipolar disorders and childhood leukaemia (Johnson *et al.* 2015, Mazur and Lipshultz 2018, Phillips *et al.* 2019, Sharma *et al.* 2015). Kong *et al.* (2012) also report that *de novo* mutations – i.e. new mutations (Smith 2015) – in the genomic sequence of offspring strongly depend on paternal age. They report that every additional year of paternal age results in approximately two additional mutations in offspring, with approximately 65 mutations transmitted from fathers aged 40 compared to 25 from fathers aged 20 (mothers always transmit approximately 15, regardless of age), illustrating the role of paternal age in risks of conditions such as autism and schizophrenia in offspring (Kondrashov 2012, Kong *et al.* 2012).

However, others have found no clear correlation between paternal age and fertility outcomes (Dain *et al.* 2011) or have argued that although evidence does illustrate risks of male ARFD, absolute risks remain low (Wu *et al.* 2016). Some have highlighted the conflicting evidence within this body of work (Jennings *et al.* 2017, Mazur and Lipshultz 2018, Sharma *et al.* 2015), although the weight of the evidence does seem to suggest the impact of male ARFD is greater than was previously thought (Jennings *et al.* 2017).

However, despite growing (if not uncontested) evidence, a limited body of research suggests that such evidence has not infiltrated public consciousness to any great degree. Daniluk and Koert (2013) report low levels of awareness among men regarding the impact of male ARFD on sperm quality and infant health risks. Similarly, Hammarberg *et al.* (2013) report men underestimating the age at which male fertility starts to decline. However, beyond this small number of quantitative studies which test fertility knowledge, little is known about the meanings men apply to ARFD (and to sperm freezing in the context of ARFD – see below), and there is insufficient qualitative research to provide rich and nuanced insights into men's world views.

Alongside growing evidence of male ARFD, in recent years there has been increased media reporting of male ARFD (Hens 2017, Mitu 2016) with media outlets such as the Guardian (Press Association 2015) and the Independent (Petter 2019) publicising this phenomenon and proposals of sperm freezing to address this. It is towards these proposals that that this paper now turns.

Sperm freezing

Thus far, sperm freezing for one's own future use has predominantly been utilised in an attempt to preserve men's fertility prior to undergoing cancer treatment (Mitu 2016), in advance of anticipated fertility damage in cases of military service (Mitu 2016) and among some transwomen prior to transition (Mattawanon *et al.* 2018). However, growing concern about the impact of male ARFD has led some to argue for sperm freezing as a solution to this particular concern (Phillips *et al.* 2019, Smith 2015).

In particular, Smith (2015) proposes a UK system of 'state-supported universal sperm banking' for younger men (e.g. aged 18) (Smith 2015: 775). Smith is concerned not with the impact of male ARFD on broader fertility outcomes, but with the greater number of *de novo* germline mutations in older men's sperm (see above) and the associated increased likelihood of genetic disorders in offspring; and the impact of this at the population and evolutionary level with trends of later fatherhood 'gradually reducing human fitness in the long term' (2015: 775). Similarly, based on a review of evidence, Phillips *et al.* (2019) suggest that mid-life and older men who are considering fatherhood should be encouraged to freeze sperm before age 35 or at least 45. Despite some negative responses to such proposals within the media (Hens 2017), and some resistance within academia (Jennings *et al.* 2017), there also exists support for such proposals within academia (Kondrashov 2012), and such proposals continue to be re-articulated as evidence of male ARFD continues to grow (Phillips *et al.* 2019, Smith 2015).

Thus far, proposals for 'social' sperm freezing in the context of anticipated ARFD appear not to have infiltrated public consciousness and the commercialisation of this technology to any great degree, although there is some evidence of sperm freezing being advertised or used for this purpose within a small number of US clinics (Hudson 2015, Mitu 2016) and in China (Wahlberg 2018). Although these examples are exceptions rather than the norm, growing evidence of male ARFD and proposals to address this position such an initiative within the potential future landscape of reproductive technologies. However, these proposals have been largely theoretical with little consideration of how men might respond to such an idea, and there has been a lack of empirical data to inform such consideration.

This paper utilises several conceptual and theoretical ideas relating to men, masculinities and reproduction, as well as biomedicalisation and risk, to interpret the data and to enhance understanding of men's perceptions of male ARFD and sperm freezing. These are introduced in the following sections.

Men, masculinities and reproduction

Daniels (2006) conceptualises reproductive masculinity as a set of beliefs or assumptions about men's relationship to human reproduction, specifically that men are assumed to be: secondary in biological reproduction, less vulnerable to reproductive harm than women, virile, and relatively distant from the health problems of their offspring. This offers a potentially fruitful framework for interrogating the meanings men (and women) assign to various male reproductive phenomena. Daniels argues that such assumptions have shaped and skewed the science and politics of male reproduction (2006), yet little research has explored whether such assumptions have salience in men's own meaning making. Theorising on men's relationship with

sperm also offers avenues for enhanced understanding of men's meaning making. In her seminal work on the multiple cultural meanings of sperm, Moore (2007) argues that sperm is intimately linked with masculinity. She suggests that currently sperm have increased visibility and malleability, more so than ever before: sperm can be captured, counted, analysed and sold – they can be manipulated outside men's bodies; and that this manipulation can be experienced, by some, as a threat to masculinity.

Bio/medicalisation and risk

Considering health theorisation more broadly, medicalisation (Busfield 2017) offers a lens through which to explore issues of male reproduction and potential interventions, enabling a consideration of issues of control, responsabilisation and resistance. While varying definitions have been employed (see Busfield 2017), Conrad usefully defines medicalisation as the process of 'defining behaviour as a medical problem or illness and mandating or licensing the medical profession to provide some type of treatment for it' (1975: 12). It is argued that changes in the organisation and practice of biomedicine in recent decades, as per new technoscientific developments, have resulted in an extended and intensified form of medicalisation in the form of biomedicalisation (Clarke *et al.* 2010). Biomedicalisation involves the transformation of bodies through new socio-technical arrangements (Baldwin 2019, Clarke *et al.* 2010), comprising the process of medicalisation '*from the inside out*' (Clarke *et al.* 2010: 47–8), and creates a new emphasis on health, risk and surveillance (Clarke 2014).

Medicalisation is not a gender-neutral process, and scholars have drawn attention to the ways women's bodies and lives have been subject to increased medicalisation in comparison to men's, particularly with regard to fertility, reproduction and reproductive technologies (see Baldwin 2019, Martin 2010 for overviews). This paper seeks to further attend to such gendered patterning within processes of medicalisation, by considering not women's but men's bodies as potential sites of reproduction-related medicalisation.

Theorisation on risk perception and the sociocultural construction of risk (Hannah-Moffat and O'Malley 2007, Zinn 2008) also offers a valuable lens for analysing data on fertility ageing risks and associated interventions. Such a perspective is not concerned with the validity or truth of risk, but in risk conceptualisation: the ways risks are constructed, perceived, mobilised and resisted and how this is influenced by socio-cultural values and power relations (Zinn 2008). It also draws attention to the ways potential risks are interpreted in gendered ways based on gendered assumptions, knowledge, norms and hierarchies (Hannah-Moffat and O'Malley 2007).

Following an overview of study methods below, this paper presents findings from men regarding their perceptions of male ARFD and sperm freezing. These findings are then discussed in relation to reproductive masculinity, biomedicalisation, gendered risk perception and meanings of sperm and masculinity. The paper is not concerned with assessing the 'accuracy' of men's perceptions or their validity or alignment with a specific 'truth'; but instead with the ways in which particular gendered ideals, beliefs and understandings of reproduction shape men's meaning making, and the implications of these. The paper argues that men's overall lack of concern regarding male ARFD and resistance towards ideas of sperm freezing are shaped by ideals of reproductive masculinity, and may indicate resistance towards the idea of reproductive control. It is suggested that men in the study perceived or mobilised certain risks relating to sperm freezing, while rejecting other risks relating to male ARFD, which coalesced to undermine both the need for and practice of universal sperm freezing (USF). It is argued that these positions perpetuate a gender unequal politicisation of ARFD and perpetuate particular gendered subjectivities relating to culpability and responsibility for guarding against risks of ARFD.

Methods

This paper utilises findings from a qualitative study of men and reproductive timings. The aim was to investigate men's perceptions and intentions regarding reproductive timings. Heterosexual men of any age (18 years and older) who do not have children but want or expect to have children in the future, of any relationship status (i.e. both partnered and unpartnered men), were invited to participate in semi-structured, in-depth, one-to-one interviews. Exclusion criteria were gay men, men living with children in a parental role (e.g. stepchildren) or men with fertility problems. Men provided written informed consent prior to being interviewed. Ethical approval was granted by De Montfort University Faculty of Health and Life Sciences Research Ethics Committee (reference number 1729).

Multiple recruitment routes were utilised including recruiting personal contacts, recruitment via family, friends and colleagues, snowball sampling and advertising to various mailing lists, community groups and social media (see Law 2019). Maximum variation sampling was employed to strive for diversity within the sample in terms of age, relationship status, ethnicity and socioeconomic status (see Law 2019) in order to be inclusive of groups often marginalised in research (Culley *et al.* 2004) and of a range of perspectives.

Twenty-five men participated in the study, ranging in age from 22 to 47 years, with a mean age of 31.72 years. Thirteen men were unpartnered and twelve were in a relationship. Fifteen men were White British, six were Asian/Asian British Indian, three were Black/Black British African and one was Black/Black British Caribbean. Overall, the sample was highly educated with 20 men stating their highest qualification was an undergraduate degree or higher qualification. Eighteen were working full time, six were students and one was working part time.

Men were asked about their reasons for participating in the study; their past and current circumstances in relationships, education and work; their views about what is the 'right time' and what is 'too late' for men and women in general and for themselves to have children and what factors they deemed significant in determining timings; their ideals and expectations for their own future reproductive timings; their conversations with partners and others on this topic; their views on sperm freezing, assisted reproductive technologies and shared parental leave; and, finally, their reflections on the interview process. Interviews ranged from 39 to 122 minutes in length, with the mean length as 88 minutes. Interviews were audio recorded, transcribed verbatim and anonymised. (NVivo 11), QSR International, was used to aid analysis: main themes and subthemes were identified, a coding framework was compiled and entered into NVivo and data were analysed thematically (Braun and Clarke 2006).

Questioning men about their views on what was the 'right time' and what was 'too late' for having children resulted in discussions of men's and women's ARFD. A pre-amble was used to begin discussions about the possibility of sperm freezing for ARFD: 'In summer 2015 there was an article in the news about a bioethicist in Abertay University, Dundee, who was arguing that all 18 year old men should have their sperm frozen on the NHS for them to use later in life because of the declines to sperm quality as men age' (Smith 2015). Men were then asked to discuss their views on this.

Findings

This paper reports on data from two themes which were purposively extracted and analysed for this paper: men's perceptions of ARFD and their views on the proposal of USF.

Men's perceptions of ARFD

Interviews included discussions about men's perceptions of male ARFD, female ARFD and comparisons between the two. Frequently men stated that their understanding of ARFD was limited and vague, and often comprised more tentative guesses than conclusive facts.

Male ARFD Approximately two-thirds of participants discussed male ARFD. Of these, approximately half did not perceive ageing to affect male fertility in any significant way. These men spoke of how men could still have children late on in their lives, and believed that sperm quantity or quality did not significantly decline with age and that men were relatively invulnerable to reproductive harm associated with ageing (Daniels 2006).

'For a man he can always produce his offspring so there is no restriction in terms of him providing, in terms of fertility'. (Asian/Asian British Indian male, age 38)

'That doesn't occur . . . declining sperm fertility . . . You can quite happily produce sperm because they are produced daily, hourly, on every minute, they are always producing more, and as far as I am aware, and I have heard no evidence or scientific evidence to actually argue that it declines with age'. (White British male, age 29)

However, the other half of these men perceived that men may be subject to ARFD. These men spoke of how sperm quality is affected (including mutations or genetic problems in sperm) and how fertility declines with age – although some included the caveat that conception was still possible. Men also described the potential risks to offspring including risks of learning difficulties, Down's syndrome, disabilities or defects, or 'other issues' or 'health issues'.

'The older you [men] are then the more likely it is that your child could have learning difficulties or other issues'. (White British male, age 36)

'After a certain point of time your sperm is not working so great. The older you get you have more complications in terms of your genetics, DNA, the quality of your sperm cells'. (Asian/Asian British Indian male, age 30)

However, these men only constituted one-third of the overall sample, with the other two-thirds either not speaking about male fertility ageing or refuting the idea of this. Overall, men's fertility was framed as relatively ageless in contrast to women's finite fertility lifespan.

'Men can father a child I don't know up to the age of, the last one I heard was up to the age of 80 or something but women can't'. (Asian/Asian British Indian male, age 30)

A small number of men discussed male ARFD in relation to their own lives, and speculated as to whether they might themselves be subject to such risks – although these possibilities were represented in a fairly carefree manner (which may or may not have masked a more serious level of concern undisclosed in interviews) or were accompanied by statements which counteracted concern.

Participant: 'Things stop working when you get older. Things you need to produce to have children dwindle away . . .'.
Interviewer: 'As in the effect on sperm do you mean when you get older?'

Participant: 'Older, you know, I hope mine are working (laughter)'. (Asian/Asian British Indian, age 39)

'I've got a friend who's a GP . . . one concern was around . . . will my sperm quality have degraded with age. And she's like 'well, no, it tends not to actually', which is interesting. I didn't know that and she's a doctor so I presume she knows'. (White British male, age 39)

Despite these examples, overall male ARFD was not something men related to their own lives to any great degree or perceived as posing any particular risk. Almost all of these men (with the exception of one) had not yet started trying to conceive with partners, and they appeared to feel they had no reason to be concerned about ARFD: there was a general presumption of fertility across the sample.²

Female ARFD In contrast to their lack of consideration of male ARFD, more of the men raised the issue of female ARFD and spoke at greater length about this. Overall, the vast majority of men perceived that women were subject to considerable ARFD. Men spoke about both a gradual reduction in fertility, as well as a definitive end of one's fertility life span, with several men relating this to menopause. The phrase 'biological clock' was utilised frequently, as were variations on this such as 'time bomb'.

Men perceived the risks associated with female ARFD to relate to: chances of achieving conception, risks of pregnancy complications, risk of miscarriage, risks to the health of offspring, risks to the health of the gestating and birthing woman, and risks of additional strain on women's bodies and longer recovery from gestation and labour.

'I think there are associated risks as well with [women] having children later, the risk of having children with Down Syndrome or spina bifida or all sorts of other diseases'. (White British male, age 29)

Men considered that finding the 'right time' to have children was far more complex for women than for men because women's ARFD gave them a much narrower timeframe to achieve desirable social circumstances in which to have children. This *difference* between men and women, both biologically in terms of vulnerability to ARFD and consequently socially in terms of timings for family building, was discussed and emphasised by men within interviews, and was a strong thread running through the data.

'There is a biological factor involved with women which makes it [finding the right time] a lot harder than for men'. (White British male, age 24)

Overall, comparing the data on men's perceptions of male and female ARFD, as well as the direct comparisons the men themselves drew between these (see above), illustrates how men viewed ARFD not as a problem for men in general or for themselves to be concerned with, but as a problem for women.

Men's perceptions of USF

The vast majority of men had not heard of the USF proposal at the time it was publicised (i.e. in 2015). They used the interview to talk through and weigh up the various pros and cons. While approximately four men felt this was a sensible initiative, approximately ten perceived that it was not, with the remaining men providing mixed or unclear responses. Such a scheme may be considered a form of biomedicalisation of male ARFD (see discussion below) and men's responses are of interest in assessing their endorsement or resistance to such medicalisation.

Positive aspects of the scheme: enhancing flexibility and choice Those who endorsed the proposal felt that it may give individuals and couples greater flexibility regarding the timing of

having children, and thereby reduce pressure and provide an option to use the best quality sperm when trying to conceive.

‘I think it’s a good idea . . . It gives couples or individuals . . . the flexibility of when they wish to have a child. So should they wish to leave it to the mid-thirties or late thirties or something like that it gives the child the best chance in terms of healthy sperm and healthy eggs’. (White British male, age 29)

Resistance to the scheme More common were men’s doubts, concerns or criticisms about the scheme. These related to cost and waste, a lack of necessity for the scheme, unease with the extraction of sperm and a range of potential risks associated with this technology; these are discussed in turn below.

Cost and waste.—A key criticism related to the scheme being funded via the NHS, perceived as being under great financial strain. Many appeared to consider this a non-essential, optional treatment and believed that the NHS should be reserved for urgent, priority, essential treatment which was seen to be more deserving. Linked to this, many men believed that there would be vast quantities of unused, i.e. wasted, sperm as men would either not seek to have children, or would do so without the use of frozen sperm.

‘A financial burden it would put on the NHS, I think it would be quite a financial strain. And at the same time there would be a lot of samples that may never be used because people would then have their sperm frozen and then go off and had children naturally . . . there are more issues that require more urgent funding’. (Black/Black British African male, age 24)

Lack of necessity: resistance to ideas of male ARFD. Men’s opposition was also based on a perception that such a scheme was unnecessary because, as described above, few perceived men were subject to significant ARFD.

‘I suppose it would depend on what I perceived to be the rate of fertility how it declines in males, but as far as I am aware it doesn’t decline that rapidly until much later in life. So . . . I would see it as not particularly necessary’. (White British male, age 27)

In addition to looking at this in terms of men’s ARFD *in general*, men positioned it as unnecessary in relation to *individual* men as one cannot predict if or how one’s own sperm quality or quantity may decline with age. They also suggested that if they did in the future encounter fertility problems, they would not be able to know whether these were age related or not, i.e. whether pre-emptive sperm freezing would have prevented infertility. This suggests that these men perceived that men in general would not experience male ARFD universally or in a uniform fashion, i.e. on the same timescale and to the same extent across the board, unlike women who they perceived to be subject to a much more fixed, predetermined and universal experience of female ARFD. Men viewed potential male ARFD as more variable and individualised than female ARFD.

‘But even though it might be proven that when you get to 30 or 50 your sperm might decline but you never know. You could have sperm until you are 50 or 60’. (Black/Black British African male, age 23)

Separating 'sacred' sperm from the body. A small number of men discussed the scheme in relation to the meanings sperm held for them (Moore 2007), with one man describing how such a procedure would be an unnatural interference with a 'sacred' substance, juxtaposing nature and science, and another describing feeling protective of his sperm and concern at the prospect of it being outside of his control.

'I would disagree because it doesn't sound right, it doesn't sound natural, it just sounds too scientific, like freezing sperm, that's something that is sacred'. (Black/Black British African male, age 23)

Interviewer: 'And how about if now at 30 you now had frozen sperm in a clinic how would that feel now?'

Participant: 'I don't know, I would feel very protective of it and I would feel very unsafe and think well who is using that, what is that being used for. Not that I would expect it would be used inappropriately I guess, but it would be not only part of my body but part of my biological make up of my genetic heritage I guess that wasn't in my control, or it wouldn't feel completely in my control. It would be stored somewhere, it would be outside of me and I don't know I find the idea a bit unnerving'. (White British male, age 30)

Perceived risks Men also considered the risks such a scheme might pose, including risks relating to storage, security, access and the potential for posthumous use without consent. Other risks considered were that frozen sperm might have adverse effects on offspring conceived. Some men drew on films or literature to warn of the dangers or consequences of 'science going too far'. Others felt the scheme might be abused by people using it to have children later in their lives than they perceived was acceptable, i.e. in their 50s or 60s.

'There would then be a large bank of specimens. And how well maintained that would be and how secure that would be and who would have access to that would be issues for me'. (White British male, age 30)

'What are the side effects as well of you keeping that sperm? . . . it's the risk of something going wrong . . . Because I always think back to Frankenstein when he created something but it didn't come out to what he wanted it just came out as this horrible monster . . . when you are creating life in an unnatural way you never know what the outcome will be'. (Black/Black British African male, age 23)

Freezing gametes: a female phenomenon

Interestingly, a small number of men, when informed of the scheme, responded with the question 'why men and not women?' Men appeared to think that egg freezing was a more logical endeavour to address contemporary problems resulting from trends towards later parenthood and ARFD.

'I think instead of freezing sperm we should be more looking at ovaries frozen because women are the ones that have, who go through menopause . . . doesn't it make sense to have women to freeze their eggs than men to freeze their sperm? Because we will produce sperm into our seventies, although not as healthy as when we are young. But at some point women don't produce eggs anymore'. (Black/Black British African male, age 24)

‘Why the men, why aren’t we talking about eggs and women here?’ (White British male, age 39)

Discussion

The data reported here suggest that, in contrast to their views of female ARFD, overall men did not consider male ARFD to be significant; it appeared to be of little concern to men in relation to their own lives, and there was a general presumption of fertility. Although men voiced both positive and negative responses to the notion of USF, overall there was resistance to this initiative for a variety of reasons. This discussion adopts the view that meanings individuals apply to phenomena are socially constructed and highly influenced by people’s social contexts, relations and interests (Wynne 1995). It is suggested that the meanings men applied to ARFD and to sperm freezing are underpinned by particular gendered beliefs and ideals, and demonstrate a particular understanding of gendered aspects of reproduction in a specific social and historical context.

That male ARFD was not seen by the men in this paper as significant at the general population level, and in particular was of little concern as something they themselves as individuals may be subject to, resonate with Daniels’ (2006) conceptualisation of reproductive masculinity. Thus far, the impacts of reproductive masculinity have been little considered empirically at the level of men’s lived experiences, with initial conceptualisation being positioned at the macro-level of science and politics (Daniels 2006), and other usages exploring healthcare practice (Almeling and Waggoner 2013). Data from this paper suggest that such ideals and beliefs, particularly that men are less vulnerable to reproductive harm than women and are distant from health problems of their children, appear to have some salience in men’s own meaning making. Using the conceptualisation of reproductive masculinity helps to explain how men’s lack of belief in and concern regarding male ARFD may not only be influenced by a limited exposure to evidence of male ARFD but also informed by gendered cultural ideals about men’s positions in relation to reproduction. Furthermore, ideals of reproductive masculinity may help to explain men’s resistance to sperm freezing, as such an initiative may appear to be in conflict with deep-rooted assumptions of men as ageless (in relation to fertility), virile and invulnerable.

Particularly striking within the data was that even among men who did perceive that men are subject to male ARFD, this was not something they related to their own lives to any great degree. Overall, men perceived that female ARFD affected all women in a uniform, fixed and predetermined way; but that male ARFD was much more variable, individualised and unpredictable. Reflecting on these findings in conjunction with the data regarding men’s rejection of the notion of sperm freezing is of particular interest in terms of considering men’s sense of confidence in their reproductive capacity. While for female social egg freezers ‘anticipated infertility’ (Martin 2010) is used as a rationale for freezing eggs (Baldwin *et al.* 2018), the men in this paper, in contrast, demonstrated ‘presumed fertility’. They utilised uncertainty as a reason to *reject* sperm freezing, i.e. their uncertainty as to whether ageing will affect sperm led them to err on the side of optimism.

As a phenomenon which expands medical involvement to include aspects of social life previously outside the jurisdiction of medicine (Busfield 2017, Zola 1972), and in which behaviour is defined as a medical problem mandating medical treatment or intervention (Conrad 1975), USF may be considered a form of biomedicalisation of male ARFD. Furthermore, given its concern with the transformation of the body through new technologies, it may be

considered a form of biomedicalisation (Baldwin 2019, Clarke *et al.* 2009, Clarke *et al.* 2010). Findings from this paper demonstrate overall resistance among men to such biomedicalisation. While instances of resistance to medicalisation have previously been identified in relation to various phenomena once medicalisation has been, at least partially, realised (Conrad 2007, Scott 2006), the ways in which medicalisation is resisted in principle, or in the very *early* stages of medicalisation in which a phenomenon is initially defined as within the jurisdiction of medicine and requiring intervention, are relatively neglected. However, an examination of this is essential to enable understanding of how some phenomena come to be medicalised while others do not, and of the role of the lay populace within this (Ballard and Elston 2005, Conrad 2007, Scott 2006). Hens has argued that media hostility to Smith's proposal of USF is indicative of 'a resistance among men to being controlled with regard to reproductive options and choices' (2017: 112). As medicalisation brings new opportunities for social control (Zola 1972) – and indeed it has long been argued that the medicalisation of women's (reproductive) bodies has manifested as a form of control (see Earle and Letherby 2007) – it may be suggested that the reluctance of the men in this paper to embrace the proposal of USF may relate to both a lack of consideration of the validity of male reproductive ageing and a degree of resistance to the idea of engaging in a process which may be perceived as a loss of control over their reproductive bodies.

Furthermore, the data presented here relate not only to the meanings men apply to male ARFD and to sperm freezing but also to sperm itself. Men's hesitancy regarding sperm freezing may be indicative of an unease with the potential loss of reproductive control, arising from the separation of sperm from body. As Moore (2007) argues, with the advent of new forms of technology, increasingly sperm can be manipulated outside men's bodies, and for some this is experienced as a considerable threat to masculinity. USF represents an extreme and nationwide exercise in such manipulation, and the perceived threat to masculinity which this manipulation may constitute may in part contribute to men's resistance to USF.

Interpreting the findings from a risk perspective, within the theoretical framework of the sociocultural construction of risk, further advances understanding and interpretation of these data (Hannah-Moffat and O'Malley 2007, Zinn 2008). The data from this paper illustrate how men perceived or mobilised certain risks, while rejecting other risks, which coalesced to form their resistance towards ideas of male ARFD and the notion of sperm freezing. They rejected risks of male ARFD (i.e. they rejected the idea that ageing poses a risk to male fertility), while perceiving and mobilising risks *associated with* USF (including risks to storage, security, access, the quality of gametes and well-being of offspring, etc.) – with the combined effect of undermining both the need for and practice of USF. This rejection of certain risks, and mobilisation of other risks, may be informed by assumptions relating to men's invulnerability, virility and (fertility) agelessness (Daniels 2006).

Furthermore, gender-critical perspectives on risk suggest that risk and gender are mutually constitutive – that gender is affected by risk and risk by gender – and that 'particular gendered understandings of risk produce new responsibilities and patterns of action' (Hannah-Moffat and O'Malley 2007: 2). Both men's perceptions of female ARFD as risky and of male ageing as not risky (in terms of fertility), as well as responses to the proposal of USF of 'why men and not women?', illustrate the centrality of women and female ARFD within men's meaning making regarding reproduction. It may also indicate that within men's perceptions women bear more responsibility in matters of reproduction. The specific risk perception and rejection men displayed, as outlined above, perpetuates particular gendered subjectivities whereby women retain responsibility for pre-empting problems of ARFD and guarding against them. Theorising on social egg freezing as a form of biomedicalisation draws attention to ways this technology creates specific fertility risk management responsibilities for (still-fertile) women, compelling

them to act as responsible reproductive citizens by taking action (via these technologies) to mitigate against ARFD risks (Baldwin 2019, Martin 2010). Were sperm freezing to become more readily accepted and available, such a move may make more visible men's role in reproduction and subfertility; and may go some way to redressing the imbalance whereby women are held responsible for age-related subfertility and 'problems' of 'delayed' childbearing (Jamieson *et al.* 2010, Lloyd 1996). Conversely, arguably men's resistance to sperm freezing represents resistance to such risk management responsibilities, and to accountability for matters of ARFD and reproductive timings; and perpetuates a gender unequal politicisation of ARFD and particular gendered subjectivities relating to culpability and responsibility for guarding against risks of ARFD. This is not to suggest such resistance is conscious nor deliberate; it reflects the different sociocultural understandings of male and female ARFD (and responsibility for guarding against this) circulating within the lay populace, and therefore the different contexts with in which these technologies – social egg freezing and sperm freezing – exist.

The findings also have relevance at the level of social and healthcare policy. Sperm freezing continues to be suggested as a solution to address male ARFD in light of trends of later parenthood, but the success of any such scheme depends on several interrelated factors including the receptiveness of men; as such a deeper understanding of men's resistance to the hypothetical issue of USF may be of benefit in the development of related policies. Furthermore, men's perceptions of male ARFD and their responses towards fertility preservation are of relevance for the development of policies regarding male reproductive health and preconception healthcare more generally (Mitu 2016).

Limitations

The study sample was relatively small and there is a need for further large-scale research to further explore men's perceptions, as well as additional qualitative studies to provide rich, detailed data. USF was not something men had considered prior to interviews and as such their responses were initial impressions; had they considered the proposal over a longer time scale, different data may have emerged.

That the interviewer was female will likely have affected the interview dynamic and shaped the data (Pini and Pease 2013). Although difficult to precisely identify the effects of this, one can speculate that this interview arrangement may have made men more defensive of their virility and as such enhanced their apparent commitment to ideals of reproductive masculinity. Discussing a traditionally female topic with a woman may have enhanced their sense of men as secondary in matters of reproduction. The idea of USF may have been interpreted as particularly intrusive when proposed by a woman. As such men's apparent lack of concern regarding male ARFD and resistance to ideas of sperm freezing may have been heightened by the gendered interview encounter.

The sample construction will have influenced the data collected. Despite efforts to reach a diverse socioeconomic population, the sample was predominantly middle class. The sample was ethnically diverse, although no differences were observed between ethnic groups with regard to the two themes presented here. However, literature suggests that male fertility and virility may be valorised in South Asian and African cultures (Culley *et al.* 2004, Dyer *et al.* 2004); as such ideals of reproductive masculinity may be more apparent in this ethnically diverse sample. However, the majority of the sample was White and further research is needed to examine how meanings of ARFD and sperm freezing may vary among ethnic groups. Similarly had the sample included only partnered men, men actively trying with their partners to conceive or men facing infertility, different data may have emerged as men's perspectives would likely be shaped by living those particular realities.

Conclusion

This paper has reported highly novel and as yet unpublished data offering insights into men's perceptions of male ARFD and of sperm freezing as response to this. It suggests that men's overall lack of concern regarding male ARFD and resistance towards ideas of sperm freezing result not only from a lack of exposure to evidence regarding male ARFD but are also shaped by ideals of reproductive masculinity, and may indicate resistance towards the idea of reproductive control. It argues that these positions perpetuate a gender unequal politicisation of ARFD and perpetuate particular gendered subjectivities relating to culpability and responsibility for guarding against risks of ARFD. The study contributes to theories of gender and medicalisation, adds to the body of work on how risk perception is gendered, and demonstrates the salience of ideals of reproductive masculinity empirically within men's sense making, beyond science, politics and the clinic. Finally, it provides valuable insights for male reproductive health policy development.

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Author contributions

Caroline Law: Conceptualization (lead); data curation (lead); formal analysis (lead); investigation (lead); methodology (lead); project administration (lead); writing-original draft (lead); writing-review & editing (lead).

Notes

- 1 Data on the average age of first-time fatherhood are not known as data on men's previous births are not collected at birth registration within England and Wales.
- 2 Two men reported they had conceived with previous partners who had then had abortions, and another had donated sperm which had resulted in a live birth. These factors may have enhanced confidence in their own fertility among these three men.

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