Child development and family relationships in families following ART

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Abstract

This review article focusses on child development and family relationships in families formed through third-party assisted reproductive technologies (ART). First, we provide an overview of the existing developmental research on families formed through sperm donation, egg donation, embryo donation, and surrogacy, respectively. We then consider some of the cross-cutting themes and issues in families following different types of ART, such as the role of openness and disclosure, and making donor connections, that relate to family relationships and children's outcomes. Finally, we reflect on some of the conceptual and methodological limitations of the current research, including its dependence on relatively homogenous samples, and its relative inattention to culture. We conclude by outlining some of the new directions for research in this area.

Key words: Assisted reproduction, child development, family functioning, gamete donation, surrogacy

Introduction

It is estimated that globally, one in six people in their lifetime will experience infertility, defined as the inability to conceive after a period of 12 months or more of regular unprotected sex (World Health Organisation, 2024). While the legislation and provision of ART differs between countries, many of these individuals will go on to use fertility treatment, including treatment with donor gametes (e.g., sperm, eggs, or embryos), and/or surrogacy, in which a person gestates a pregnancy for another individual or couple. Fertility treatment with donor gametes and pregnancy through surrogacy are also increasingly being used in family formation by same-sex couples and single people, who today represent a significant proportion of users across the globe, despite prohibitive legislation in several contexts (Human Fertilisation and Embryology Authority, 2023; McDermott et al., 2022).

Concerns about child development and family relationships in families formed using third-party ART have been raised since the earliest debates on assisted reproduction (Richards, 2014). These have included concerns that the absence of a genetic and/or gestational connection between parents and children would negatively impact parent-child relationship quality, and that being donor conceived or born through surrogacy would negatively affect children's psychological adjustment. Other concerns relating to the number or gender of parents in families formed through third-party ART, and the implications of these for children's psychological and gender development, have also been raised. However, the developmental literature on this topic has generally shown these concerns to be lacking in empirical foundation. Indeed, the psychological research conducted since the turn of the century overall illustrates that family processes are far more important for family functioning

and child development than is family structure or genetic relatedness and/or gestational connection in families formed through ART (Golombok, 2020). Research on these families therefore reflects and extends the longstanding findings of research on so-called non-traditional families, which differ from the traditional model of two heterosexual parents with their genetically related children in other ways, such as those headed by single parents and stepparents following parental separation (Golombok & Tasker, 2015).

The developmental literature on family relationships and child development in families formed through ART partly reflects historical and cultural trends in uses of ART. It is for this reason that many, but by no means all, studies have until recently focussed on families formed through anonymous sperm donation, families headed by couples, and families in the global North. Indeed, only relatively recently have researchers been able to study families with identifiable at age 18 donors, owing to contemporary legislative moves away from anonymous donation in many (but by no means all) jurisdictions. Restrictions on access to ARTs based on relationship status, sexual orientation, country of residence, and socioeconomic status have similarly shaped research in the field. Much of the research has used comparative designs, allowing researchers to isolate the role, if any, that third-party ART plays in child development and family relationships. A strength of some of this research, which we focus on in this review, is that it is longitudinal, therefore allowing researchers to understand not only how family relationships develop over time, but also to examine the antecedents of children's outcomes in these families. The research that we review below has generally used multiple methods, including interviews with parents, questionnaires, and observations of parent-child interactions, to collect data on children's development and family relationships. Some studies have also included independent assessments of children's adjustment by child psychiatrists blind to family type. More recent research has also collected data from children themselves, offering a vital insight into how children in families formed through ART themselves think and feel about their families and how they perceive the relationships within them.

Families formed through sperm donation

Families formed through sperm donation may be headed by one parent (generally mothers) or by two or more parents of the same or different gender. Much of what is known about children's development and family relationships in families formed through sperm donation has been learned through studies of two parent families, where children do not share a genetic connection to one of their parents (their father, in heterosexual couple households, or one of their mothers, in same-sex female couple households). Most recently, studies of single mother families formed through ART have expanded what we know about child development and family relationships in these families in general.

A landmark, longitudinal UK study of parenting and child development in heterosexual couple families created using ART[1] – including families formed through sperm donation – began in the year 2000. Families were visited when children were 1, 2, 3, 7, 10, 14, and 20 years old. At preschool age, the children in families formed through sperm donation were found to be well adjusted, and their relationships to their parents (both their mothers and fathers, which were assessed separately) were more positive than were parent-child relationships in a comparison group of heterosexual couple families who had conceived

[1] This study also included families formed through egg donation and families formed through surrogacy, and the related findings are discussed in the relevant sections of the article.

without assistance (Golombok et al., 2004a, 2005, 2006a). Similarly, in middle childhood, no differences in children's adjustment were found across family types (Golombok et al., 2013). It was at this fourth phase that children's own reports about family relationships, which they described as affectionate and close, were also first elicited (Blake et al., 2014). However, at this phase, mother-child relationships were found to be less positive in families formed through ART, a finding that the researchers explained in relation to whether parents had disclosed their use of ART to their children (Golombok et al., 2013), which is discussed in greater detail below. Contrary to expectations, however, fathers in families formed through sperm donation reported lower levels of parental distress than did fathers who conceived unassisted or through egg donation (Casey et al., 2013).

In adolescence, there were no differences between children across family types in terms of psychological wellbeing and self-esteem, and adolescents conceived by sperm donation were found to be well adjusted and to have positive relationships with their parents, echoing the findings of previous phases (Golombok et al., 2017). The most recent phase of the study, once children reached young adulthood, found no differences between families formed through sperm donation and those who conceived unassisted in young adults' wellbeing or the quality of family relationships (Golombok et al., 2023). However, young adults conceived by sperm donation reported poorer family communication than those conceived by egg donation (Golombok et al., 2023).

A longitudinal, Dutch study of lesbian mother families[2] formed through sperm donation has drawn similar conclusions. When the children were aged between 4-8 years, no differences in the adjustment of children in lesbian mother families and children in heterosexual couple families were found, and few differences in parenting styles were found between the biological and non-biological mothers in the lesbian mother families (Bos et al., 2007). When children were aged between 8-12 years, their own reports about their relationships with their mothers and their social experiences were elicited. At this phase, children generally reported positive relationships with each of their mothers; no differences in parent-child relationship quality were found, either between parents, or when compared to population-level data (Bos & van Balen, 2008), echoing the findings of an earlier cross-sectional study that included the views of children aged between 4-8 years old (Brewaeys et al., 1997). Neither were there differences between the children of lesbian mothers or a normative sample in terms of psychological adjustment (Bos & van Balen, 2008). However, although the children of lesbian mothers generally reported low levels of stigmatisation, the study found that higher levels of stigmatisation were associated with lower levels of psychological wellbeing among children who had less contact with other children of LGBTQ+ parents (Bos & van Balen, 2008), suggesting that this is a protective factor. Finally, in terms of gender and sexual identity, at this phase, the children in lesbian mother families felt less pressure from their parents to conform to gender stereotypes and were more likely to question having heterosexual relationships in the future than children in heterosexual couple families (Bos & Sandfort, 2010).

Similar findings emerge from a US longitudinal study of lesbian mother families formed through sperm donation. At the outset, this study included both one-parent families (14 families) and same-sex female couple families (70 families), and families were visited when children were aged 2, 5, 10, 17, and 25 years old. When the children were age 2, those in two mother families had the same levels of mother-child bonding with each of their parents

[2] The terms used to describe the families that participated in the cited research are those used by the researchers.

(Gartrell et al., 1999). At age 5, most families were found to be high functioning, and most mothers had no concerns about their children's health or development (Gartrell et al., 2000). At age 10, no differences in the adjustment of children of lesbian mothers and children in the general population were identified, with the exception that female children of lesbian mothers had fewer externalising behaviour problems than the population norm (Gartrell et al., 2005). However, an association between children's experiences of homophobia and behavioural problems was found, with those experiencing homophobia showing increased behavioural problems at age 10 (Gartrell et al., 2005). It was at this phase that children's own reports about family relationships, which they described positively, were also first elicited (Gartrell et al., 2005).

At age 17, high-quality parent-child relationships were found to moderate the negative effect of homophobia on children's outcomes (Bos & Gartrell, 2010). At this age, the adjustment of adolescents in lesbian mother families overall differed positively to the population norm, with adolescents in lesbian mother families rated significantly higher in competence and lower in problems than adolescents in the general population (Gartrell & Bos, 2010). At age 25, no differences were found between the young adults in lesbian mother families and the population norm on measures of adaptive functioning, behavioural and emotional problems, and mental health (Gartrell et al., 2018). However, experiences of homophobia in adolescence were indirectly associated with both internalising and externalising problems in young adulthood (Bos et al., 2021).

Turning to single mother families, an early, cross-sectional US study of both single and coupled mothers (of whom 55 were in lesbian couples, and 25 were in heterosexual couples) found no differences in children's adjustment at age 7 across family types (Chan et al., 1998). Process variables such as parenting stress and interparental conflict were found to be associated with children's adjustment irrespective of family type (Chan et al., 1998). In the UK, Golombok and Murray's (2005a, 2005b) research found that single mothers showed lower levels of mother-child interaction and lower levels of sensitivity towards their children, who were aged between six months and one year, than did mothers in heterosexual couples who had also conceived via sperm donation (Murray & Golombok 2005a). However, when followed up when the children were age 2, single mothers reported greater pleasure in their children, and lower levels of anger towards them, and their children had fewer difficulties, than did mothers and children in the comparison group (Murray & Golombok 2005b).

A second longitudinal, comparative UK study of single mother families began in 2011. When children were between 4-9 years old, no differences between families in terms of mother-child relationship quality or children's adjustment were found, except for lower levels of parent-child conflict in single mother households (Golombok et al., 2016). For both family types, process variables such as the presence of financial difficulties and parenting stress were associated with children's outcomes. When children were aged between around 8-10 years, no differences in mother-child relationship quality or children's adjustment were found. However, higher levels of parenting stress and higher levels of children's prior adjustment difficulties were each associated with children's adjustment difficulties, irrespective of family type (Golombok et al., 2021). Unique to this study is that the researchers collected data from children since the study began, providing an insight into how very young children think and feel about their families formed through ART. In early childhood, most children reported that they would not change their family in any meaningful way, were they given the choice to do so (Zadeh et al., 2016). In middle childhood and into adolescence, the researchers investigated the relationship between parent-child relationship quality and thoughts and

feelings about the sperm donor (Zadeh et al., 2017). These findings are discussed in a later section of this article.

Overall, the findings of research on families formed through sperm donation show that at no point in childhood, adolescence or early adulthood are parent-child relationships or children's adjustment negatively affected by conception through sperm donation. In families where children do show difficulties, these appear to be related to family factors such as parents' financial challenges and parenting stress, and, in same-sex female couple families, to social factors such as stigmatisation. At the same time, more recent cross-sectional research on adults conceived through sperm donation found that donor conceived adults experienced significantly more stress, but not depression or anxiety, compared to those who were spontaneously conceived (Adams et al., 2022). Further research is needed to understand the disparity across study findings, which, at present, researchers understand to be a consequence of sampling (e.g., in the longitudinal research, via parents through fertility clinics and national registers, and in the cross-sectional research, via online support and networking groups for donor conceived people).

Although less is known about the children of single mothers as they grow older, the absence of problems in younger children in single mother families formed through ARTs has also been found in both Israeli (Weissenberg et al., 2007) and Spanish (Diez et al., 2021) contexts. More recent research has also investigated the whether the type of ART involved matters for parent-child relationship quality in the context of same-sex female couple families. Distinguishing between families formed through reciprocal IVF with donor sperm (where a woman gives birth to the genetic child of her female partner) and families formed through traditional IVF with donor sperm, this study found no differences between family types, and no differences between the mothers in families formed through reciprocal IVF, on measures of mother-child relationship quality (Golombok et al., 2023).

Families formed through egg donation

The developmental literature on families formed through egg donation has shown that much like families formed through sperm donation, families formed through egg donation are generally functioning well. In the UK longitudinal study, at preschool age, children in families formed through egg donation were found to be well adjusted, and their relationships to their parents (both their mothers and fathers) were more positive than were parent-child relationships in other family types (Golombok et al., 2004a, 2005, 2006a). At age 1, fathers through egg donation showed higher levels of emotional involvement than fathers through sperm donation, and fathers in both groups showed higher levels of involvement than did fathers in families who had conceived unassisted (Golombok et al., 2004a). At age 2, mothers through egg donation reported feeling more joy in the parent-child relationship than mothers who conceived unassisted or through sperm donation, and lower levels of overprotectiveness towards their child than did mothers through sperm donation (Golombok et al., 2005). At age 3, mothers through egg donation showed higher levels of mother-child interaction than mothers who conceived unassisted or through sperm donation (Golombok et al., 2006a), and, when compared to mothers who conceived unassisted, mothers who had used ART (whether egg or sperm donation) were found to express more warmth towards their child (Golombok et al., 2006a). In middle childhood, no differences in children's adjustment were found across family types (Golombok et al., 2013). However, as described above, at this phase the families formed through ART were characterised by less positive mother-child

relationships than were mother-child relationships in unassisted families, and mothers in families formed through egg donation showed less positive mother-child interactions than mothers in families formed through sperm donation (Golombok et al., 2013). No differences in father-child interactions were found across family types, and children born through egg donation described their family relationships as affectionate and close (Blake et al., 2014). Children's reports of high-quality parent-child relationships in ART families were also found at age 10 (Blake et al., 2014).

In adolescence, there were no differences between children across family types in terms of psychological wellbeing and self-esteem (Golombok et al., 2017). However, at this phase, both mothers and adolescents in families formed through egg donation reported poorer relationship quality than mothers and adolescents in families formed through sperm donation on questionnaire measures. However, unlike previous study phases, no differences were found in parent-child relationship quality when assessed by interviews or observations of mother-child interaction (Golombok et al., 2017). The latest phase of the study, when children were aged 20, found no differences between families formed through egg donation and those who conceived unassisted in young adults' wellbeing or the quality of family relationships. However, mothers in families formed through egg donation reported less positive family relationships than mothers in families conceived through sperm donation (Golombok et al., 2023).

A more recent, longitudinal UK study of families formed through egg donation, which compared, for the first time, heterosexual couple families formed through egg donation and heterosexual couple families formed through IVF, began in 2013. Families were visited at two time points, when children were in infancy, and at age 5. In infancy, families formed by egg donation were found to be functioning well overall (Imrie et al., 2019). No differences were found between family types in father-infant interaction quality. However, mother-infant interaction quality was found to be less optimal in families formed through egg donation compared to families formed through IVF, and mothers' confidence in parenting their children conceived through egg donation was found to be lower than mothers who had conceived through IVF. When the differential demographic characteristics of the two groups, namely more multiple births and higher maternal age in families formed through egg donation, were controlled for, the statistically significant differences between groups were not found (Imrie et al., 2019). This is a noteworthy finding given that advanced maternal age has overall been shown to be associated with lower rates of emotional and behavioural problems in children (Lysons & Jadva, 2023).

At age 5, although mean scores for both groups for both externalising and internalising problems indicated that children across family types were overall well adjusted, children born through egg donation showed higher levels of externalising problem behaviours than children born through IVF, as rated by their mothers, fathers, and teachers, and higher levels of internalising problem behaviours, as rated by their teachers only (Imrie et al., 2023). Children's own ratings of their psychological wellbeing showed no differences between family types (Imrie et al., 2022). Very few differences were found between family types in parent interview and observational measures of the quality of mother-child or father-child interactions (Imrie et al., 2023). However, children in families formed through egg donation rated their relationships with their mothers as higher in warmth and enjoyment than did children in families formed through IVF; no differences were found in children's ratings of the father-child relationship across family types (Imrie et al., 2022). Observational and interview measures found that mothers and fathers in families formed through egg donation showed

higher levels of parenting stress and represented themselves as less confident and competent as parents, than did mothers and fathers in families formed through IVF. Mothers through egg donation also reported lower levels of social support and couple relationship quality, greater anger toward their child, and perceived their child as more angry and less happy, compared to mothers through IVF. Fathers through egg donation showed greater criticism and anger toward their child, less joy in parenting, and were less satisfied with the support they received, than were fathers through IVF. However, mean scores indicated good overall parent-child relationship quality in both families formed through egg donation and families formed through IVF, suggesting that all families were doing well overall (Imrie et al., 2023).

In terms of associations with children's adjustment, the study by Imrie et al. (2023) showed that factors such as lower levels of social support among mothers when children were in infancy, fewer changes in maternal reflective functioning over time, and greater concurrent maternal criticism, were each associated with children's externalising problem behaviours. Internalising problem behaviours were associated with poor couple relationship quality when children were in infancy, and fewer changes in maternal reflective functioning over time (Imrie et al., 2023). However, these factors were functioning similarly in both family types. Steeper increases in parenting stress over time were associated with higher child externalising problems in families formed through egg donation, but not families formed through IVF.

As with the research on families formed through sperm donation, the longitudinal studies of families through egg donation thus points to the role of family processes in family functioning. Overall, children conceived by egg donation are well adjusted, but more research is needed to understand the findings identified by Imrie et al. (2023). One possible explanation is that the UK longitudinal study compared child adjustment and family functioning in families formed through egg donation to families who conceived unassisted, while more recent research has involved comparison groups of families who conceived using IVF. Cross-sectional studies, comparing children's outcomes in families formed through egg donation to population norms, have also failed to replicate Imrie et al.'s (2023) findings (Widbom et al., 2022; Shelton et al., 2009), despite using the same measure of emotional and behavioural difficulties, and similar sampling approaches. This suggests that further, longitudinal research on these families is needed.

Families formed through embryo donation

Very little research has examined family functioning and child adjustment within families formed following embryo donation. Unlike with sperm or egg donation, in families formed through embryo donation, the child does not have a genetic link to either parent. Embryos are usually donated by single people or couples who have completed their own treatment and decide to donate their unused embryos to others. This means that the children born following embryo donation will likely have full genetic siblings being raised in different families. Only one study has examined family functioning and child adjustment in families formed following embryo donation systematically and longitudinally (MacCallum et al., 2007). In this UK study of families with a child aged between 2-5 years of age, families formed through embryo donation did not differ from families formed through IVF using parents' own gametes, or families with an adoptive child, on measures of couple relationship quality, parenting stress, anxiety, or depression. However, mothers and fathers in families formed through embryo donation were found to show higher levels of emotional over-involvement with their child compared to mothers with an adopted child. However, children's

psychological adjustment did not differ between groups (MacCallum et al., 2007). When the families were revisited when the children were aged 5-9 years, parents who had used embryo donation continued to show higher levels of emotional over-involvement compared to adoptive parents, along with greater reluctance to disclose the method of family formation. However, children's psychological adjustment did not differ between groups (MacCallum & Keeley, 2008). Whilst the findings from this study suggest the children born following embryo donation are well adjusted, the children in the study were still relatively young. More recent, cross-sectional research from the US, which included a small number of older children, found that children born following embryo donation scored within the normal range for emotional and behavioural problems based on mother's reports (Salari et al., 2024). In this study, most participants had either told or planned to tell their children about their donor conception. However, the response rate for the measures of children's adjustment was low, which the authors acknowledge as a limitation of their research. A larger cross-sectional study found no differences in children's adjustment across families formed through sperm donation, egg donation, and embryo donation (Shelton et al., 2009), suggesting that the absence of a genetic link to both parents does not in itself lead to adverse outcomes. With the increasing number of IVF procedures globally, and thereby larger numbers of patients choosing to donate their unused embryos to others, there is a need for further research on children's adjustment and family functioning in this growing family type. It is also important to understand how different types of embryo donation (e.g., anonymous, identifiable, or known), and different amounts of contact between donating and recipient families, impact family relationships and children's development.

Families formed through surrogacy

Despite surrogacy becoming a more common and familiar route to family building, it remains a controversial form of ART. Only one study has been following up families formed through surrogacy longitudinally. The UK longitudinal study of families formed through ART has been following families headed by heterosexual couples who underwent their surrogacy arrangement in the UK from when the target child was aged 1 to 20 years. At age 1, both mothers and fathers in families formed through surrogacy reported lower levels of stress related to parenting, and mothers showed lower levels of depression, compared to unassisted conception parents (Golombok et al., 2004b). However, parents through surrogacy were also found to display greater over-protectiveness towards their child, a finding that was no longer present by age 2 (Golombok et al., 2006b). By the time the children were aged 3, families through surrogacy showed greater similarities to families who conceived unassisted, and 44% of parents through surrogacy had started to tell their children about their birth through surrogacy (Golombok et al., 2006b). At age 7, all children scored within the normal range for psychological adjustment, although comparisons between the different family types revealed that children born following surrogacy showed slightly greater adjustment difficulties compared to children conceived using gamete donation. This difference disappeared by the time children were revisited at age 10 (Golombok et al., 2013). It is possible that greater problems at age 7 may have resulted from surrogacy born children being more likely to know about their birth compared to children born through gamete donation, meaning that they had faced the potential issues of identity and difference at an earlier age (Golombok et al, 2013). However, at age 14, children born through surrogacy were similar to children born through gamete donation and unassisted conception in terms of their psychological

adjustment (Golombok et al., 2017). In the study's latest phase, when children had reached young adulthood, there were again no differences found between the groups studied, suggesting that families formed through surrogacy continue to do well (Golombok et al., 2023).

Several studies focusing on same-sex male couples who have used surrogacy have also found that these families are functioning well, and the children in these families are well-adjusted. In an international study involving surrogacy families headed by gay fathers from the UK, the Netherlands and France, it was found that levels of parenting stress, depression, anxiety, and relationship satisfaction did not differ between fathers who had used surrogacy and comparison groups of lesbian couple families who had used sperm donation and heterosexual couple families who had conceived through IVF (van Rijn-van Gelderen et al., 2018). In a US study of gay fathers who had a 3–9-year-old child born through surrogacy, it was found that the children in gay father families showed lower levels of internalising problems compared to children in a comparison group of lesbian mother families (Golombok et al., 2018). All the children were well adjusted. This study also found that irrespective of family type, parents who perceived higher levels of stigma reported greater externalising problems in their children (Golombok et al., 2018).

Recent years have also seen an increase in the number of single men using surrogacy to have a child. An Italian study reported few differences in parenting, parent-child relationships or child adjustment between families headed by gay and heterosexual single men and families headed by gay couples or heterosexual couples. The only difference reported was in levels of parenting stress, which were higher among single fathers compared to fathers in the other family types (Carone et al., 2020). This finding is perhaps unsurprising given the additional parenting load that is experienced in families headed by a single parent. In a UK study comparing the psychological health of single fathers to single mothers, no differences were found in relation to parenting stress or on other measures of mental health, including depression and anxiety (Jones et al., 2022). A recent review of single father families formed through surrogacy concluded that children showed normal levels of psychosocial adjustment (Pareira, 2022). However, studies have shown that experiencing stigma may lead to more negative outcomes. In an observational study of parent-child play of single gay and single heterosexual fathers of 3–10-year-old children, an indirect relationship was found between frequency of microaggressions experienced by fathers (irrespective of their sexual orientation) and sensitivity towards their child (Carone et al., 2021a). Moreover, a recent study of coparenting (with grandparents, babysitters, or uncles/aunts) in single father families formed through surrogacy found that fathers' experiences of greater coparenting quality in their family of origin demonstrated lower levels of conflictual coparenting of their child, and an association was found between lower levels of conflictual coparenting and levels of paternal attachment security among children. However, supportive coparenting was not associated with either fathers' experiences of coparenting in their family of origin or children's attachment security to their fathers (Carone, 2022).

Thus, a growing number of studies have found that children born through surrogacy do not experience psychological difficulties and have good relationships with their parents. However, more research is needed on the perspectives of children born through surrogacy. The practice of surrogacy varies across countries and has also changed over time, such that prospective parents are increasingly likely to travel overseas for surrogacy, which may impact the relationships they have with the surrogate, the information they have about the donor, and their legal status as parents (Jadva et al., 2018, 2019). Surrogacy is therefore best

understood as an umbrella term (Jadva, 2020). The impact of whether and how different forms of surrogacy impact family functioning and child adjustment requires investigation.

Cross-cutting issues in families formed through ART

While it is useful to consider the findings of research on families formed through sperm donation, egg donation, embryo donation and surrogacy separately, there are several issues that cut across these families. The issue that has perhaps received the most attention in the literature is disclosure to children of their genetic origins, and the impact of disclosure or non-disclosure on family relationships. Likely because of the history of ART, which in contrast to other fields such as adoption has until recently involved a debate about whether children should be told about their donor conception or birth through surrogacy, several researchers have studied this issue directly. In the longitudinal study by Golombok and colleagues, it was found that mothers who had not told their children about their origins by age 7 had elevated levels of distress compared to those who had disclosed to their children. However, maternal distress was found to have a more negative impact on children who were aware of their origins, suggesting a complex relationship between disclosure, maternal distress, and children's adjustment (Golombok et al., 2013). At adolescence, no differences were found between disclosing and non-disclosing families in terms of parenting quality, parent-child relationship quality, family functioning, or children's adjustment (Ilioi et al., 2017). Similarly, a recent Swedish study of families formed through egg and sperm donation found no differences in parents' and children's outcomes in disclosing and non-disclosing families, respectively (Widbom et al., 2022). However, contrary to the study by Golombok and colleagues (2013), parents in the Swedish study who had not told their children – who were aged 7-8 years – showed similar levels of anxiety, depression, and parental stress to those who had (Widbom et al., 2022). The authors suggest these different findings may be explained by the intention to disclose among the non-disclosing parents in their study, in contrast to previous studies, which have included non-disclosing parents who do not intend to tell their children about their conception in the future. At the same time, Golombok and colleagues' research later showed that among disclosing families, adolescents who were told about their genetic origins before the age of 7 had more positive family relationships and higher levels of wellbeing than those who had been told at age 7 years or later (Ilioi et al., 2017), suggesting that the earlier that disclosure takes place, the more positive the outcomes in terms of family functioning and child adjustment.

In studies where children's views about their conception and the donors or surrogates involved in their conception or birth have been sought, findings have generally shown that they are not distressed by the information as children (Brewaeys et al., 1997; Blake et al., 2014; Malmquist et al., 2014; van Parys et al., 2015), adolescents (Zadeh et al., 2018) or young adults (Jadva et al., 2023). Findings from recent studies based on relatively small samples suggest that children's thoughts and feelings about their conception and the sperm donors involved may be related to the quality of the relationships they have with their mothers. A Belgian study found that children who wanted to know more about the donor and those who did not did not differ in terms of their adjustment or the quality of interactions with their parents (Vanfraussen et al., 2003). However, in a US study by Slutsky et al. (2016), it was found that adolescents with secure-autonomous attachment patterns, as measured by the Friends and Family Interview, were more curious about their donor conception than were those with

insecure-dismissing attachment patterns. The minority of adolescents with insecure-disorganised attachment patterns were most likely to feel negative about the donor involved in their conception (Slutsky et al., 2016), a finding that was replicated in a UK study with younger children that used the same measures (Zadeh et al., 2017). However, in the UK study, no significant correlations between children's attachment patterns and curiosity about the donor were found, suggesting that more research is needed to understand the influence of parent-child relationship quality on children's interest in the donor. Research looking at this issue among children conceived by egg and embryo donation, and in relation to children's thoughts and feelings about their surrogates is also needed.

An increasingly relevant cross-cutting issue for families formed through ART is the legal status of the donor/s or surrogate. However, very few studies to date have sought to examine how family functioning and child adjustment may differ in families that use anonymous donors and those that use identifiable donors, the latter of which across jurisdictions usually refers to donor conceived children being able to request the donor's name, date of birth, and last known address, when they reach the age of 18. In the US longitudinal study of lesbian mother families, no associations were found between children's adjustment and donor type (whether identifiable or anonymous) in childhood, adolescence, or early adulthood (Carone et al., 2021b). However, findings related to whether young adults had contacted the donor were not included in analyses.

To date, there have been no systematic studies of the relationship between identifying the donor and/or contact with the donor, family functioning, and children's adjustment. This is likely because it is only relatively recently that prospective donor identifiability became legally enforced in many jurisdictions, meaning that individuals with the right to request information have not yet, or have only recently, come of age. Donor identifiability is nevertheless an important issue that cuts across families formed through different types of ART. The studies that have begun to examine whether donor conceived young adults with the right to request identifying information about the donor do indeed exercise it have shown that most eligible individuals have not yet done so (Lampic et al., 2022), such that whether it will be possible to examine these developmental questions in the future remains to be seen. For families formed through surrogacy, children's information about, and contact with, the surrogate appears to depend upon several factors, among them whether surrogacy is domestic or international, whether the arrangement is private or managed by a third party, and parents' and surrogates' wishes (Imrie & Jadva, 2014; Jadva et al., 2019). Similarly, for families formed through embryo donation, children's contact with the donating family – in which there are children who are 'fully' genetically related, and parents who may or may not be genetically related, to them – appears to depend upon several factors, including the nature of the donation (e.g., anonymous, identifiable, or known), and donating and recipient parents' wishes (Blyth et al., 2019; Collard & Kashmeri, 2011). It is worth highlighting that for children in embryo donation families, legal rights to information likely relate to information about donating parents, rather than a right to information about the individuals to whom they are genetically related.

The greater ease of searching for donors, genetic surrogates and those conceived using the same donor (hereafter donor siblings) through other means such as commercial DNA testing presents an alternative opportunity to research the relationship between identifying the donor/s, surrogate and/or donor siblings, family functioning, and children's adjustment. However, while many studies have investigated thoughts, feelings, and experiences among those who identify the donor and/or donor siblings, the evidence base

about these relationships and how they relate to patterns of family functioning and psychological adjustment, including over time, is currently lacking. This is particularly noteworthy given that some of the existing research has found that identifying multiple donor siblings (Indekeu et al., 2022) and contact across multiple families (Hertz & Nelson, 2020) can be challenging experiences. Similarly, although many researchers have recently begun to focus on the role of commercial DNA testing in the lives of donor conceived people, no studies have examined the implications of test taking and/or results on psychological or familial outcomes. Given that some studies have shown that commercial DNA testing may be how some donor conceived individuals learn about their conception for the first time (Zadeh, 2024), it is noteworthy that one study found that those who had discovered unanticipated genetic information through DNA testing (including but not limited to information about donor conception) showed higher levels of depression, anxiety, and panic symptoms than the population norm (Avni et al., 2023).

Conclusions and future directions

Despite significant advances in the literature on families formed through ART in the field of developmental psychology, there is evidently much that remains to be understood about family functioning and child development in these families. The existing psychological literature, which we have reviewed in this article, overall illustrates that family processes are more important for family functioning and child development than is family structure or genetic relatedness and/or gestational connection in families formed through ART (Golombok, 2020). This conclusion is not only valuable to academic researchers who want to understand more about how family formation relates to developmental outcomes, but also to policy makers and practitioners who may have assumptions about families formed in this way. Indeed, much of the literature we have discussed in this chapter has been instrumental in changing laws and practices across the globe with regards to the accessibility, and social acceptability, of ARTs and the families formed through them.

The overall conclusions from this research now present exciting opportunities for researchers to shift their focus to new questions. Several of the cross-cutting issues we have identified, including disclosure, donor identifiability, and making donor/surrogate connections, present future directions for researchers in the field. For example, while studies have shown that telling children about their donor conception or birth through surrogacy is not distressing for them, little is known about how the *nature* of disclosure through ARTs relates to family functioning and children's adjustment. This includes whether disclosure is experienced as a one-time or ongoing conversation within families (Best et al., 2023). While there have been noteworthy individual contributions to this topic area (Paul & Berger, 2007), more substantial evidence that also engages with the contemporary realities of ART – such as how children may feel about having a donor or surrogate who lives in a different country, or who donated within the context of the transnational fertility industry (Smietana et al., 2018) – is now needed. Similarly, how families actually discuss donor conception (including whether, for example, they discuss the donor's legal status), and how this relates to children's outcomes over time, has not been studied. This is particularly important to consider given research that has shown that parents may experience confusion about the legal status of the donor involved in conception (Zadeh, 2016; Lysons et al., 2023).

As we explained in this article's Introduction, the developmental literature partly reflects historical and cultural trends in uses of ART. As a result, the research to date, mostly

conducted in the global North, has depended on relatively homogenous samples of majority White, well-educated participants. Understanding the experiences of families from different cultural background is imperative, particularly as genetics and gestation may hold different meaning in different cultures (Gurtin & Vayena, 2012). Moreover, despite valuable research on the impact of experiences of homophobic stigmatisation on the children of lesbian parents (Bos et al., 2021), the impact of the social context on child development and family relationships in families following ART is not known, despite efforts to examine parents' social experiences cross-culturally (Indekeu & Lampic, 2021).

It is also noteworthy that the recruitment of participants for research on families formed through ART often proceeds through fertility clinics and/or surrogacy agencies, where prospective parents must be able to finance their treatment. Little is known about child development or parent-child relationships in families formed through ART without the involvement of clinicians or agencies, but this is also likely to be an important area of future research, particularly given increased accessibility to informal sperm donation networks through the internet and social media platforms. Families formed through informal donation notably fall outside of existing provision, such as central donor registers, which may be consequential for outcomes. Informal donation may also be more readily used by minoritised groups, such as people of colour, or those who are gender non-binary, who are generally underserved by existing clinics and services (Davis, 2020; Bower-Brown & Zadeh, 2021). Little is known about how experiences of minority stress among families formed through ART influence family functioning or child adjustment. Given some of the findings of research on sexual minority families formed through ART that we have discussed in this chapter, this will be another important area of study going forward.

Finally, given that the existing evidence points towards a process-oriented explanation of family functioning and child development in families formed through ART, researchers should now turn their attention to some of the process variables, such as family breakdown, that are known to relate to these outcomes in other families (Coleman & Glenn, 2009). Some of this work has begun in the US study of lesbian mother families (Gartrell et al., 2011). In this, the study of processes unique to families formed through ART should not be overlooked. Researchers of families formed through ART can learn a great deal from the conceptual shift in the study of LGBTQ+ families more generally, which has begun to address questions relating to the unique strengths of LGBTQ+ parenting that positively impact children's adjustment (Farr et al., 2022).

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