

1 **Parent psychological adjustment, donor conception and disclosure: a follow-up**
2 **over ten years**

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9

10 **ABSTRACT**

11

12 **Study question:** What is the relationship between parent psychological adjustment,
13 type of gamete donation (donor insemination, egg donation), and parents' disclosure
14 of their use of donated gametes to their children.

15 **Summary answer:** Disclosure of donor origins to the child was not always associated
16 with optimal levels of psychological adjustment, especially for fathers in donor
17 insemination families.

18 **What is known already:** Cross-sectional analyses have found mothers and fathers
19 who conceived a child using donated sperm or eggs to be psychologically well
20 adjusted, with few differences emerging between parents in gamete donation
21 families and parents in families in which parents conceived naturally. The
22 relationship between mothers' and fathers' psychological well-being, type of gamete
23 donation (donor insemination, egg donation) and parents' disclosure decisions has
24 not yet been examined.

25 **Study design, size, duration:** In this follow-up study, data were obtained from
26 mothers and fathers in donor insemination and egg donation families at five-points,
27 when the children in the families were aged 1, 2, 3, 7 and 10. In the first phase of the
28 study, 50 donor insemination families and 51 egg donation families with a 1-year-old
29 child participated. By age 10, the study included 34 families with a child conceived by
30 donor insemination and 30 families with a child conceived by egg donation,
31 representing 68% and 58% of the original sample respectively.

32 **Participants/materials, setting, methods:** Families were recruited through nine
33 fertility clinics in the United Kingdom. Standardised questionnaires assessing

34 depression, stress and anxiety were administered to mothers and fathers in donor
35 insemination and egg donation families.

36 **Main results and the role of chance:** Mothers and fathers in both donor
37 insemination and egg donation families were found to be psychologically well-
38 adjusted: for the vast majority of parents levels of depression, anxiety and parenting
39 stress were found to be within the normal range at all five time points. Disclosure of
40 the child's donor origins to the child was not always associated with optimal levels of
41 parental psychological adjustment. For example, disclosure was associated with
42 lower levels of psychological well-being for certain groups in particular (such as
43 fathers in donor insemination families), at certain times (when children are in middle
44 childhood and have a more sophisticated understanding of their donor origins).

45 **Limitations, reasons for caution:** Due to small sample sizes, the value of this study
46 lies not in its generalisability, but in its potential to point future research in new
47 directions.

48 **Wider implications of the findings:** Donor insemination and egg donation families
49 are a heterogenous group, and future research should endeavour to obtain data
50 from fathers as well as mothers. Support and guidance in terms of disclosure and
51 family functioning might be most beneficial for parents (and especially fathers) in
52 donor insemination families, particularly as the child grows older. The more that is
53 known about the process of disclosure over time, from the perspective of the
54 different members of the family, the better supported parents and their children can
55 be.

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61 interest to declare.

62 **Key words:** donor insemination, egg donation, psychological well-being, disclosure,
63 gamete donation

64

65

INTRODUCTION

66

67 Parental psychological adjustment is an important aspect of family functioning. The
68 psychological adjustment of both mothers and fathers has been found to be
69 associated with children's psychological development. For example, children living
70 with a mother who is depressed are at increased risk for behavioural difficulties and
71 a variety of psychiatric problems, including depression (Lovejoy, Graczyk, O'Hare, &
72 Neuman, 2000). Likewise, anxiety disorders have been found to cluster within
73 families (Turner, 2003), with children of anxious parents being seven times more
74 likely to develop an anxiety disorder themselves than the children of non-anxious
75 parents (Turner, Beidel, & Epstein, 1991). Similarly, high levels of parenting stress
76 (i.e. stress that is caused by day-to-day parenting) has been shown to be an
77 important factor in the development of child psychopathology (Deater-Deckard,
78 1998) and, in particular, behavioural problems (Barry, Dunlap, Cotten, Lochman, &
79 Wells, 2005).

80

81 Mothers' and fathers' mental health problems influence their children's
82 development in a number of different ways (Goodman & Gotlib, 1999). Firstly,
83 children with a depressed or anxious parent may have a genetic predisposition to
84 psychopathology. Secondly, mothers with psychopathology may expose their
85 children to negative cognitions, behaviours, and affect, which then place the child at
86 an elevated risk for developing psychopathology themselves. For example,
87 depressed mothers have been found to be more disengaged, hostile, manipulative,
88 and inconsistent in their discipline than non-depressed mothers (Dix & Meunier,
89 2009). Likewise, anxious mothers have been found to be less warm and less positive
90 in their interactions with their children, granting less autonomy to, and being more
91 critical of, their child in general when compared to non-anxious mothers (Whaley,
92 Pinto, & Sigman, 1999). It is also important to consider that mental health problems
93 do not exist in isolation, but within a social and familial context (Cicchetti, Rogosch,
94 & Toth, 1998). Therefore, children growing up in households in which one or both
95 parents are experiencing mental health problems may experience increased levels of
96 marital discord and family conflict, factors that have been identified as having a
97 detrimental effect on children's psychological adjustment.

98

99 The influence of fathers' psychological adjustment on family functioning and child
100 outcomes has received less attention by researchers than that of mothers (Phares &
101 Compas, 1992). A recent meta-analytic review of 28 studies concluded that paternal
102 depression has a significant, though small, effect on parenting, with depressed
103 fathers demonstrating fewer positive parenting behaviours and more negative
104 parenting behaviours (Wilson & Durbin, 2010). The effect size for the relationship

105 between paternal depression and parenting behaviours was found to be comparable
106 to those found for mothers, indicating that psychological adjustment affects fathers'
107 parenting behaviours to the same extent as it does for mothers.

108

109 Parents' psychological adjustment may differ between families created by gamete
110 donation and families in which parents conceived naturally for a number of reasons.
111 The parenting experience may be different for heterosexual couples who conceive
112 using donated sperm or eggs compared to those who conceived naturally, as one
113 parent lacks a genetic relationship with the child (the father in donor insemination
114 families, and the mother in egg donation families). Parents who conceive using
115 donated sperm or eggs have also experienced a different route to parenthood,
116 typically having experienced infertility and undergone fertility treatment, which may
117 have lasted for many years. These parents have had to accept that they are unable
118 to experience the pregnancy and birth of a child who is their shared genetic
119 offspring, which may have involved feelings of grief and loss (Hammer, Burns &
120 Covington, 2006). Although the stress of infertility has traditionally been thought of
121 as being more pronounced for women (Greil, 1997), research in the past decade
122 indicates that men likewise experience feelings of sadness and anxiety and may feel
123 unable to talk to their friends or family about this experience (Dooley, Nolan, &
124 Sarma, 2011; Fisher & Hammarberg, 2012). It has been questioned whether parents
125 who have experienced infertility and conceived using assisted reproductive
126 technologies will be able to parent effectively having endured a long period of
127 infertility (van Balen, 1998).

128

129 Another reason why parental psychological well-being may differ in families created
130 by gamete donation is the issue of disclosure. Parents who have conceived using
131 donated sperm or eggs have a choice as to whether to tell their child about their
132 donor origins and if so, how and when to do so. In the UK, parents are generally
133 encouraged to tell their child that they were conceived using the egg or sperm of a
134 donor at a young age, with the hope that there will never be a time when this
135 information is new or shocking (HFEA, 2004; Nuffield Council on Bioethics, 2013). An
136 increasing number of parents in both donor insemination and egg donation families
137 are choosing to tell their children about their donor origins, although most two-
138 parent heterosexual parent families in the UK appear not to do so (Readings *et al.*,
139 2011). Keeping a secret within the family may cause high levels of anxiety and has
140 been described as being psychologically “hard work” (Lane & Wegner, 1995), as
141 individuals or couples may become preoccupied with the secret, and feel anxious
142 and uncomfortable when topics related to the secret are raised in conversation
143 (Karpel, 1980). On the other hand, it has been recognised that the disclosure of
144 secrets may not always be an easy option (Vrij *et al.*, 2003) and may result in a
145 reaction that is psychologically damaging (Caughlin *et al.*, 2009).

146

147 Despite concerns about the experience of infertility and the issue of disclosure,
148 mothers and fathers who have conceived a child using donated sperm or eggs have
149 been found to be psychologically well adjusted, with few differences emerging
150 between parents in gamete donation families and comparison groups of parents
151 who conceived naturally (Golombok *et al.*, 1996; Golombok *et al.*, 2002; Murray *et*
152 *al.*, 2006). Of the small number of cross-sectional studies that have compared family

153 functioning in disclosing and non-disclosing gamete donation families, no differences
154 have been found in mothers' or fathers' psychological well-being (Golombok *et al.*,
155 2002; Lycett *et al.*, 2004; Nachtigall *et al.*, 1997).

156

157 The analysis presented in the paper aims to build upon what we know about parent
158 psychological well-being in donor conception families in relation to disclosure. Due
159 to the highly sensitive nature of research in this area, the recruitment of families is
160 challenging and sample sizes are typically small, therefore donor insemination and
161 egg donation families are often treated as homogenous group. In the exploratory
162 analysis presented in this paper, mothers' and fathers' psychological adjustment in
163 relation to disclosure is examined in donor insemination families and egg donation
164 families over a ten-year period. The more that is known about parent psychological
165 adjustment in donor insemination and egg donation families over time, in relation to
166 the disclosure of the child's donor origins, from the perspective of both mothers and
167 fathers, the better supported parents and their children can be.

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169

170

MATERIALS AND METHODS

171

Participants

173

174 Data were collected as part of larger study of heterosexual, two-parent families
175 created by assisted reproduction in the UK. This larger study aimed to examine
176 family functioning in families created by donor insemination, egg donation,

177 surrogacy and a control group of families in which children were naturally conceived.
178 Data have obtained from parents at five time-points, when the children were aged
179 one (Golombok *et al.*, 2004), two (Golombok *et al.*, 2005), three (Golombok *et al.*,
180 2006), seven (Golombok *et al.*, 2011; Readings *et al.*, 2011) and 10 years (Golombok
181 *et al.*, 2012).

182

183 The donor insemination and egg donation families were recruited through nine
184 fertility clinics in the United Kingdom. All two-parent heterosexual families with a
185 child aged between nine months and one year old were asked to take part in the
186 research. The exclusion criteria were severe congenital abnormalities and multiple
187 births (Golombok *et al.*, 2004). At this initial stage, 50% of donor insemination
188 families (n = 50) and 75% of egg donation families (n = 51) agreed to take part. No
189 information is available on those families that declined.

190

191 By age 10, the study included 34 families with a child conceived by donor
192 insemination and 30 families with a child conceived by egg donation, representing
193 68% and 58% of the original sample respectively (response rates for each phase of
194 the study are presented in Table I). Rather than having actively withdrawn, the
195 majority of those families from whom data was not obtained had moved home and
196 could not be traced. The response rate has been calculated per family rather than for
197 mothers and fathers separately. At some phases of the study, fathers completed
198 questionnaire booklets but were unavailable for interview (mostly due to work
199 commitments). The number of mothers and fathers in each family type from whom
200 we obtained questionnaire data are presented in Tables II and III.

201

202 Those families who participated when the children were aged 10 (responders) were
203 compared with those who did not (non-responders). There was no association
204 between whether families participated at age 10, and mothers' or fathers' intentions
205 regarding whether to tell their child about the nature of their conception reported at
206 age one. Likewise, there was no association between maternal or paternal
207 psychological well-being (levels of depression, anxiety and stress) at age one, and
208 whether families participated at age 10.

209

210 **Procedure**

211

212 Ethical approval for the earlier phases of the study (when children were aged one,
213 two or three) was obtained from the City University Ethics Committee, and ethical
214 approval for the latter phases (when children were aged seven and 10) was granted
215 by the Cambridge Psychology Research Ethics Committee.

216

217 When children were aged one, two, three, seven and 10, a research psychologist
218 trained in the study techniques visited the families at home. Standardised
219 questionnaires relating to parents' psychological adjustment were administered to
220 mothers and fathers individually. Standardised interviews were also conducted with
221 mothers and fathers, a section of which dealt with disclosure (for more information
222 see Blake *et al.*, 2010).

223

224 **Measures**

225

226 *Disclosure status (age one, two, three, seven and 10 years)*

227

228 Parents' disclosure status was rated using data obtained during interviews with
229 mothers. When children were aged one, two and three, parents' disclosure status
230 was categorised according to parents' intentions, given the young age of their
231 children and their children's inability to understand. At age one, 46% of donor
232 insemination (n=23) and 56% of egg donation parents (n = 29) reported that they
233 intended to disclose in the future.

234 When children were aged seven, 29% of mothers in donor insemination families (n =
235 10) and 47% of mothers in egg donation families (n = 14) reported that they had
236 started the process of disclosure. At the latter phases of the study, we defined
237 disclosure status according to actual behaviour (rather than intentions) as most
238 parents who disclose do so by the time their child is 7 year old (Blake *et al.*, 2010;
239 Mac Dougall *et al.*, 2007a).

240 To clarify, disclosure status was categorised as follows:

241 *Age one, two and three: "disclosing"* families refers to those in which mothers
242 planned to tell the child about their donor origins in the future or had already
243 started doing so; "non-disclosing" refers to those who did not plan to do so or were
244 uncertain as to how to proceed.

245 *Age seven and 10: "disclosing"* refers to those families in which mothers reported
246 that they had started the process of telling their children about their donor origins;
247 all other families were categorised as "non-disclosing".

248

249 *Edinburgh Depression Scale (age one, two, three, seven and 10 years)*

250 To assess parents' level of depression, the Edinburgh Depression Scale [EDS]
251 (Thorpe, 1993) was administered to both mothers and fathers. This 10-item measure
252 produces a total score ranging from 0 to 30, with higher scores indicating higher
253 levels of depression. Scores of 13 or above are indicative of the presence of a
254 depressive illness for women (Cox, Holden, & Sagovsky, 1987) and scores above 10
255 have been shown to be indicative of a depressive illness in men (Matthey, Barnett,
256 Kavanagh, & Howie, 2001). The questionnaire has been found to have satisfactory
257 validity, split-half reliability and to be sensitive to changes in depression over time
258 (Cox *et al.*, 1987). Although it was originally devised for use with women in the
259 postpartum period, the scale has been shown to be applicable to mothers outside of
260 the postpartum period and to fathers (Matthey *et al.*, 2001).

261

262 *Trait Anxiety Inventory (age one, two, three, seven and 10 years)*

263 The Trait-Anxiety Inventory (Spielberger, 1983), a 20-item questionnaire measuring
264 the individual's general level of anxiety, was also administered to mothers and
265 fathers. Scores on this questionnaire range from 20 to 80, with higher scores
266 indicating greater anxiety. This questionnaire is one of the most well-established
267 measures of anxiety, used in over 3000 studies (Spielberger, 1989). It has been
268 shown to have good reliability and to discriminate well between clinical and non-
269 clinical samples (Spielberger, 1983).

270

271 *Parenting Stress Index (age one, two, three and seven years only)*

272 The short form of the Parenting Stress Index [PSI] (Abidin, 1990) is a standardised
273 assessment of stress associated with parenting, was completed by mothers and
274 fathers. This 36-item questionnaire comprises three subscales (Parental Distress,
275 Parent-Child Dysfunctional Interaction, and Difficult Child) which are summed to
276 produce a total stress score, with higher scores representing greater levels of stress
277 experienced in the role of parent. A total stress score above 90 indicates clinically
278 significant levels of stress. Test-retest reliability for the total score was reported to
279 be 0.96 over a 1 to 3-month interval and .65 over a year. Concurrent and predictive
280 validity have been demonstrated for the full-length questionnaire, and the short
281 form has been reported to correlate very highly with the full-length version (Abidin,
282 1990). The PSI was not administered at age 10; the battery of tests given to parents
283 changed at each time-point and some questionnaires were eliminated so that
284 others, which were more pertinent to families in which children were aged 10, could
285 be included.

286 **Analytical approach**

287

288 A cross-sectional factorial ANOVA design was utilised, which allowed differences
289 between family type (donor insemination versus egg donation families), disclosure
290 (disclosing versus non-disclosing) and the interaction between family type and
291 disclosure status to be examined at each time-point. An ANOVA approach was taken
292 as opposed to the more complex MANOVA approach in order to avoid any further
293 loss of data and to aid the interpretation of findings. Due to relatively small sample
294 sizes at the latter time-points of the study (especially for data obtained from

295 fathers), a longitudinal analytical approach was not taken, as it would have involved
296 a considerable loss of data.

297

298 Demographic variables were compared between the different family types at each
299 phase of the study. Mothers in egg donation families were significantly older than
300 mothers in donor insemination families at age one, two, seven and 10. In addition,
301 there was a statistically significant difference in family size at age 1 and 3, with
302 children in egg donation families being more likely to be only children. There was no
303 difference between groups in socioeconomic status, as measured by the parent with
304 the highest ranking occupation according to a modified version of the Registrar
305 General's Classification (The Population and Census Statistics [OCPS] and
306 Employment Department Group, 1991). At each time-point, the relationship
307 between demographic variables that differed between groups and the outcome
308 variables were examined. No significant relationships were found.

309

310 The statistic eta-squared (η^2) was calculated and the square root of this value (the
311 effect size r) has been reported. Effect sizes are classified as small ($r = 0.1 - 0.23$),
312 medium ($r = 0.24 - 0.36$) and large ($r > 0.37$) (Cohen, 1992). Eta-squared has been
313 criticised for providing an overestimation of the effect size (Field, 2009), but was
314 considered appropriate due to the unequal sample sizes in each group.

315

316

RESULTS

317

318

Age one

319

320 Mothers' scores on questionnaires assessing depression, stress and anxiety were
321 entered into factorial ANOVAs (see Table II). The effect of family type (donor
322 insemination versus egg donation) was non-significant for all three measures of
323 psychological well-being. The interaction effect between family type and disclosure
324 was non-significant for all three measures of psychological well-being.

325

326 The effect of disclosure (disclosing versus non-disclosing) approached statistical
327 significance for mothers' levels of depression ($F(1) = 3.45, p = .07, r = .19$) and was
328 statistically significant for mothers' levels of parenting stress ($F(1) = 4.97, p = .03, r =$
329 $.23$). For mothers in both donor insemination and egg donation families, levels of
330 depression and stress were lowest for mothers who planned to tell their child about
331 their donor origins.

332

333 Fathers' scores from the Edinburgh Depression Scale, Parenting Stress Index and
334 Trait Anxiety Inventory were entered into factorial ANOVAs (as shown in Table III).
335 For all three measures of psychological well-being, the effects of family type,
336 disclosure status, and interaction effects were not statistically significant.

337

338

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Age two

342

343 *Mothers*

344

345 At age 2, mothers' scores for depression, parenting stress and anxiety were entered
346 into a factorial ANOVA. For all three measures of psychological well-being, the
347 effects of family type, disclosure status, and interaction effects were not statistically
348 significant.

349

350 Likewise, when fathers' scores on the Edinburgh Depression Scale and Parenting
351 Stress Index were entered into an ANOVA, the main effects of family type, disclosure
352 status and interaction effects were not statistically significant.

353

354 However, for fathers' scores on the Trait Anxiety Inventory the effect of disclosure
355 was statistically significant ($F(1) = 6.31, p = .02, r = .31$). For fathers in both donor
356 insemination and egg donation families, levels of anxiety were lowest in non-
357 disclosing families.

358

359

Age three

360

361 At age 3, the effects of family type, disclosure status, and interaction effects were
362 not statistically significant on any of the measures of psychological well-being for
363 mothers or for fathers.

364

365

Age seven

366

367 When children were aged seven, mothers' scores from the Edinburgh Depression
368 Scale, Parenting Stress Index and Trait Anxiety Inventory were entered into factorial
369 ANOVAs. The effect of family type was non-significant for all three measures of
370 psychological well-being. The interaction effect between family type and disclosure
371 was non-significant for all three measures of psychological well-being.

372

373 The effect of disclosure was statistically significant for mothers' levels of depression
374 ($F(1) = 7.45, p = .01, r = .34$). For mothers in both donor insemination and egg
375 donation families, levels of depression were lowest for mothers in families in which
376 parents had started the process of disclosure.

377

378 For fathers' scores on the Edinburgh Depression Scale, Trait State Anxiety
379 questionnaire and Parenting Stress Index, the effect of family type was non-
380 significant for all three measures of psychological well-being.

381

382 The main effect of disclosure was statistically significant for fathers' levels of anxiety
383 ($F = 5.38, p = .03, r = .33$). Levels of anxiety were lowest for fathers in families in
384 which parents had not disclosed. The main effect of disclosure was non-significant
385 for fathers' levels of depression and parenting stress.

386

387 The interaction effect between family type and disclosure for fathers' levels of
388 anxiety approached statistical significance ($F(1) = 2.90, p = .1, r = .25$), as shown in
389 Table III. For fathers in donor insemination families, levels of anxiety were lowest for

390 fathers in non-disclosing families. For fathers in egg donation families, levels of
391 anxiety were more similar between disclosing and non-disclosing families.

392

393 There was also a significant interaction effect for fathers' levels of parenting stress (F
394 = 5.47, $p < .02$, $r = .34$) as shown in Table III. For fathers in donor insemination
395 families, levels of stress were lowest for fathers who had not disclosed, whereas for
396 fathers in egg donation families, levels of parenting stress were lowest for fathers in
397 families who had started the process of disclosure.

398

399

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401

402

Age 10

403

404 Mothers' scores on the Edinburgh Depression Scale and Trait Anxiety Inventory at
405 age 10 were entered into factorial ANOVAs (see Table II). The effect of family type
406 and disclosure status were non-significant for both measures of psychological well-
407 being.

408

409 The interaction effect between family type and disclosure was statistically significant
410 for mothers' anxiety scores ($F(1) = 6.77$, $p < .01$, $r = .33$) as shown in Table II. For
411 mothers in donor insemination families, anxiety levels were lowest for those
412 mothers who had not disclosed. Conversely, for mothers in egg donation families,

413 levels of anxiety were lowest for those mothers who had started the process of
414 disclosure.

415

416 Fathers' scores on the Edinburgh Depression Scale and Trait Anxiety Inventory at age
417 10 were entered into factorial ANOVAs. The effect of family type was non-significant
418 for both measures of psychological adjustment.

419

420 The effect of disclosure was marginally significant for anxiety ($F(1) = 2.90, p = .1, r =$
421 $.28$), with levels of anxiety being lowest for fathers in non-disclosing families.

422

423 The interaction effect for fathers' levels of depression was statistically significant (F
424 $(1) = 4.23, p = .05, r = .33$) as shown in Table III. For fathers in donor insemination
425 families, levels of depression were lowest for those fathers who had not told.

426 Conversely, for fathers in the egg donation group, levels of depression were lowest
427 for fathers in families who had disclosed.

428

429

DISCUSSION

430

431 This study examined the relationship between mothers' and fathers' psychological
432 adjustment, type of donation (donor insemination, egg donation), and disclosure of
433 donor origins to the child at ages 1, 2, 3, 7 and 10. Two main findings emerged.

434 Firstly, mothers and fathers in both donor insemination and egg donation families
435 were found to be psychologically well-adjusted: for the vast majority of parents
436 levels of depression, anxiety and parenting stress were found to be within the

437 normal range at all five time points. Secondly, disclosure of the child's donor origins
438 to the child was not always associated with optimal levels of parental psychological
439 adjustment. For example, for fathers in donor insemination families, it was non-
440 disclosure that was associated with higher levels of psychological functioning at age
441 two, seven and 10.

442

443 The majority of mothers and fathers in both donor insemination and egg donation
444 families were found to be psychologically well-adjusted at all five time-points. These
445 findings add to the body of literature that has found high levels of parent
446 psychological well-being in families created using assisted reproductive technologies
447 (e.g. Golombok, MacCallum, Goodman, & Rutter, 2002; Golombok *et al.*, 1996;
448 Golombok, Brewaeys, *et al.*, 2002; Murray, MacCallum, & Golombok, 2006). Low
449 levels of parental psychological disorder have been found to be beneficial to
450 children's psychological development. In this respect, gamete donation families
451 therefore appear to provide children with a positive family environment in which to
452 grow.

453

454 However, in terms of the relationship between disclosure of donor origins to
455 children and psychological adjustment, different patterns were found for mothers
456 and fathers. For example, greater levels of psychological adjustment were found for
457 mothers who planned to tell their child about the nature of their origins from age
458 one compared to those who did not. Whereas fathers in non-disclosing families at
459 age two had greater levels of psychological well-being than fathers in disclosing
460 families. Similarly, at age 7, higher levels of psychological well-being were found for

461 those mothers who had started the process of disclosure, whereas for fathers,
462 higher levels of psychological well-being were found in non-disclosing families. Also
463 of note is that interaction effects (examining the relationship between family type
464 and disclosure) were more prominent for fathers than they were for mothers. For
465 those families in which parents had disclosed more positive findings emerged for egg
466 donation families (where fathers have a genetic link with the child) compared to
467 donor insemination families (where fathers do not).

468

469 Due to its design and analytical approach, this study cannot speak to causation.
470 Fathers have been found to have little involvement in the process of disclosure,
471 particularly in egg donation families (Blake *et al.*, 2010). It is possible that disclosure
472 is less challenging in egg donation families because both parents have a biological
473 relationship to the child (mothers have a gestational link and fathers have a genetic
474 link), or it may be the case that infertility holds less stigma for women than for men,
475 and that disclosure is therefore a less threatening and difficult task (Appleby *et al.*,
476 2012; Raoul-Duval *et al.*, 1992). Research of an in-depth qualitative nature may be
477 better suited to unpacking the differences and similarities between men and women
478 in the disclosure process in both donor insemination and egg donation families.

479

480 It is also important to note that the dichotomy between disclosure and non-
481 disclosure is not always simple, with some parents engaging in “layers” of disclosure,
482 telling their family members and children about some aspects of their origins, but
483 not others (Daniels, 1995; Readings *et al.*, 2011). It is also important to note that
484 although families in this analysis were categorised as “disclosing”, the children in

485 these families may not have an understanding of what it means to be donor
486 conceived, and families may have only discussed this topic once or twice (*Blake et*
487 *al.*, 2010).

488

489 The analyses presented in this paper are limited by small sample sizes (as indicated
490 in Tables II and III), particularly in terms of data obtained from fathers in the latter
491 phases of the study. Sample sizes smaller than 30 are often considered to be
492 acceptable in psychology, yet Rosnow *et al.*, (2000) emphasise that it would be
493 difficult for significant small or medium effects to be found at the .05 level when the
494 smaller of the two samples is less than 30. Underpowered analyses have a
495 substantial risk of missing significant results. As emphasised throughout the paper,
496 the analyses in this study are exploratory and any generalisations from this dataset
497 made from this analysis should be made with great caution. However, the data
498 presented in this analysis are valuable, as they have been obtained from donor
499 insemination and (lesser-studied) egg donation families over a ten-year span.
500 Therefore, the value of the findings of this analysis lies in its potential to point
501 researchers in new directions. Fathers are often neglected in research on families
502 created by assisted reproductive technologies, and in family research at large,
503 therefore we echo the call for the greater inclusion of fathers in research in this field
504 (e.g. Culley *et al.*, 2013), as assuming that the experiences and perceptions of
505 mothers and fathers are equivalent may be misleading. The findings of this study
506 also suggest that the process of disclosure may be different in donor insemination
507 and egg donation families and that they should not be treated as a homogenous
508 group. Although we are beginning to understand more about the early phases of

509 disclosure when children are young (*e.g. Blake et al., 2010; Mac Dougall et al., 2007*),
510 it is now crucial to understand what happens next in the disclosure process, in
511 adolescence and beyond.

512

513 Although early disclosure is generally recommended and encouraged (Nuffield
514 Council on Bioethics, 2013), the difficulty of carrying out this task has been
515 recognised by many (Blyth *et al.*, 2010; Golombok, 1997; Grace & Daniels, 2007;
516 Salter-Ling *et al.*, 2001). The findings of this exploratory analysis suggest that
517 disclosure might be difficult for certain groups in particular (such as fathers in donor
518 insemination families), at certain times (when children are in middle childhood). The
519 reasons for these patterns are unclear, and the cross-sectional analyses presented in
520 this paper do not allow us to infer causation. Research that begins to explore *which*
521 aspects of disclosure are particularly challenging and *why*, and what kind of
522 information or support parents and offspring in these families would find helpful,
523 would be of great value. Factors that would be worthy of further investigation might
524 be how parents' disclosure decisions change over time and why, and how this is
525 dealt with by mothers and fathers. Ultimately, the more that is known about the
526 process of disclosure over time, from the perspective of the different members of
527 the family, the better supported parents and their children can be.

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530 **Authors' roles**

531 All authors contributed to the acquisition and interpretation of data for this study.

532 L.B drafted this manuscript and all authors have contributed to its revision and

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541 **Conflict of interest**

542 None declared.

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695 **Table I: Response Rates for all Family Types at each Phase of the Study**

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Child's age (y)	Donor insemination	Egg donation
1	50	51
2	46	48
% original sample	92%	94%
3	41	41
% original sample	82%	80%
7	36	32
% original sample	72%	67%
10	34	30
% original sample	68%	59%

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698 *N.B. Sample sizes need not always decrease over time, as in some cases families*699 *were unable to participate during one phase of the study (e.g. a family event, moving*700 *house) but were then able to participate at a later phase.*

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Table II: Mothers' Psychological Wellbeing

Family	Disclosure	N	Mean	SD	Statistically significant effects*
Age 1					
Parenting Stress					Disclosure $F=4.97, p=.03$
DI	Non-disclosing	26	62.88	15.16	
	Disclosing	21	58.38	11.83	
ED	Non-disclosing	19	65.84	11.68	
	Disclosing	26	57.23	15.73	
Depression					Disclosure $F=3.45, p=.07$
DI	Non-disclosing	26	6.42	3.35	

	Disclosing	21	4.67	4.47	
ED	Non-disclosing	19	6.58	4.71	
	Disclosing	27	5.11	4.15	
Anxiety					None
DI	Non-disclosing	26	35.50	8.42	
	Disclosing	21	36.52	9.88	
ED	Non-disclosing	19	37.68	8.59	
	Disclosing	27	37.22	10.11	
Age 2					
Parenting Stress					None
DI	Non-disclosing	21	65.81	20.48	
	Disclosing	21	65.43	15.50	
ED	Non-disclosing	15	71.07	11.96	
	Disclosing	21	66.05	19.33	
Depression					None
DI	Non-disclosing	21	6.14	3.72	
	Disclosing	21	4.19	3.47	
ED	Non-disclosing	15	6.07	3.20	
	Disclosing	21	5.62	4.73	
Anxiety					None
DI	Non-disclosing	21	37.38	8.63	
	Disclosing	21	34.76	8.13	
ED	Non-disclosing	15	36.80	8.36	
	Disclosing	21	36.05	9.51	
Age 3					
Parenting Stress					None
DI	Non-disclosing	20	64.05	16.24	
	Disclosing	18	63.83	17.25	
ED	Non-disclosing	8	61.75	9.45	
	Disclosing	25	64.96	17.95	
Depression					None
DI	Non-disclosing	20	6.25	4.04	
	Disclosing	18	4.83	4.85	

ED	Non-disclosing	8	5.63	4.78	None
	Disclosing	25	5.44	4.38	
Anxiety					
DI	Non-disclosing	19	34.58	7.86	
	Disclosing	18	34.11	10.47	
ED	Non-disclosing	7	34.86	8.19	
	Disclosing	25	35.60	9.76	
Age 7					
Parenting Stress					None
DI	Non-disclosing	23	57.83	12.40	
	Disclosing	10	60.20	13.03	
ED	Non-disclosing	19	61.95	12.70	
	Disclosing	12	61.58	15.64	
Depression					Disclosure $F=7.45, p=.01$
DI	Not disclosed	25	4.88	3.03	
	Disclosed	9	3.78	3.19	
ED	Not disclosed	17	7.18	4.33	
	Disclosed	11	3.27	2.15	
Anxiety					None
DI	Not disclosed	23	28.13	9.24	
	Disclosed	9	24.78	10.90	
ED	Not disclosed	19	26.47	12.59	
	Disclosed	11	29.27	18.47	
Age 10					
Depression					None
DI	Not disclosed	24	5.08	3.92	
	Disclosed	9	5.67	4.18	
ED	Not disclosed	16	7.25	4.04	
	Disclosed	13	4.92	3.64	
Anxiety					Interaction $F=6.77, p=.01$
DI	Not disclosed	23	33.57	7.51	
	Disclosed	9	35.67	9.63	
ED	Not	16	39.81	7.31	

	disclosed				
	Disclosed	13	31.08	6.95	

707 *Factorial ANOVA for differences between family type, disclosure status and

708 interaction between them.

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Table III: Fathers' Psychological Wellbeing

Family	Disclosure	N	Mean	SD	Family	Disclosure	Interaction
Age 1							
<i>Parenting Stress</i>							
DI	Non-disclosing	23	57.35	10.53			
	Disclosing	18	61.89	17.68			
ED	Non-disclosing	17	61.88	11.67			
	Disclosing	23	63.00	14.06			
<i>Depression</i>							
DI	Non-disclosing	24	3.25	3.23			
	Disclosing	18	5.22	4.60			
ED	Non-disclosing	17	3.53	2.65			
	Disclosing	23	4.09	3.26			
<i>Anxiety</i>							
DI	Non-disclosing	24	32.79	7.74			
	Disclosing	17	33.41	9.84			
ED	Non-disclosing	17	32.18	6.47			
	Disclosing	23	37.22	7.19			
Age 2							
<i>Parenting Stress</i>							
DI	Non-disclosing	20	59.25	12.09			
	Disclosing	14	67.93	19.49			
ED	Non-disclosing	13	64.85	13.23			
	Disclosing	16	62.25	11.10			
<i>Depression</i>							
DI	Non-disclosing	20	3.40	2.96			
	Disclosing	14	5.21	5.51			

ED	Non-disclosing	13	4.46	3.78			
	Disclosing	16	6.13	4.11			
Anxiety						$F=6.31, p = .02$	
DI	Non-disclosing	20	30.45	7.40			
	Disclosing	14	36.14	9.83			
ED	Non-disclosing	13	32.77	7.41			
	Disclosing	16	37.25	7.10			
Age 3							
Parenting Stress							
DI	Non-disclosing	15	65.93	18.17			
	Disclosing	14	63.14	14.41			
ED	Non-disclosing	6	67.83	17.22			
	Disclosing	20	68.35	12.53			
Depression							
DI	Non-disclosing	17	4.94	4.78			
	Disclosing	13	5.08	4.82			
ED	Non-disclosing	6	4.67	4.63			
	Disclosing	20	4.15	2.85			
Anxiety							
DI	Non-disclosing	17	44.82	5.56			
	Disclosing	13	43.46	3.18			
ED	Non-disclosing	6	45.17	4.26			
	Disclosing	20	42.70	2.89			
Age 7							
Parenting Stress							$F=5.47, p=.02$
DI	Non-disclosing	15	50.53	11.24			
	Disclosing	7	63.71	8.98			
ED	Non-disclosing	14	65.14	17.25			
	Disclosing	9	59.67	8.20			
Depression							
DI	Not disclosed	17	3.71	2.73			
	Disclosed	5	4.40	2.07			
ED	Not disclosed	14	3.64	3.23			
	Disclosed	8	2.00	1.31			
Anxiety						$F=5.38, p=.03$	$F=2.90, p=.1$
DI	Not disclosed	17	30.12	6.37			
	Disclosed	7	38.43	9.03			
ED	Not disclosed	14	34.50	6.35			
	Disclosed	9	35.78	5.59			
Age 10							
Depression							$F=4.23, p=.05$
DI	Not disclosed	14	3.57	2.62			
	Disclosed	7	5.86	2.97			
ED	Not disclosed	9	4.67	2.78			
	Disclosed	9	3.33	2.35			
Anxiety						$F=2.90, p=.1$	

DI	Not disclosed	14	29.50	6.78			
	Disclosed	7	36.57	7.72			
ED	Not disclosed	9	32.33	5.52			
	Disclosed	8	32.63	5.48			

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