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Schumm, W. R. (2014) Challenges in predicting child outcomes from different family structures. *Comprehensive Psychology*, 3, 10.

Challenges in predicting child outcomes from different family structures¹

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Abstract

Many studies purport to reveal the effects of family structure upon child outcomes. Important limitations in such research are discussed. First, many studies rely on current family structure, which overlooks the past environment to which a child was exposed. Therefore, little can be said about the “dose” of family structure(s) received by the child or how such exposures might have occurred at important developmental turning points in the child’s life. Studies involving heterosexual and/or same-sex (LGBT) parent families often must deal with such limitations, and so are a good model for assessing how duration of exposure to different types of family structures and the child’s developmental situation(s) during such exposures might affect outcomes. Literature examples are discussed, and one study is assessed in detail to demonstrate that in some cases, more information about how long a child spent in different family structures can be found through careful statistical detective work.

The role that family structure may play in influencing children’s outcomes has been of interest to many social science scholars. Many family variables could be important, e.g., having two parents, a single parent, or step-parent, same-sex parents, or adoptive parents, siblings, or step-siblings, etc. In assessing the effect of family structure, correlating the *current* structure of a child’s family and outcomes is not adequate. There are at least two problems with this approach. First, family structures change over time, so that a child often does not remain in the same structure from birth to reaching maturity. Furthermore, the duration of exposure to any particular family structure may differ from one family to another. Second, exposures may occur at different developmental stages or situations of the child (and their parents). There might be key developmental times where family structure has a greater or lesser effect on a child. Therefore, “snapshot” renditions of family structure are incomplete, if not misleading, in terms of the child’s development.

Although not all studies with such limitations (e.g., Burston, Murray, Mooney-Somers, Stevens, & Golding, 2003) have been subjected to intense criticism (Redding, 2013), some have been (e.g., Amato, 2012; Barrett, 2012; Eggebeen, 2012; Gates, *et al.*, 2012; Goldberg, Kashy, & Smith, 2012; Massey, 2012; Osborne, 2012; Sherkat, 2012; Siegel, Perrin, Dobbins, Lavin, Mattson, Pascoe, *et al.*, 2012; Wright, 2012; Anderson, 2013; Becker & Todd, 2013; Moore & Stambolis-Ruhstorfer, 2013; Perrin, Cohen, & Caren, 2013; Reiss, 2014), although some have minimized the implications of such limitations (Destro, 2012; Johnson *et al.*, 2012; Marks, 2012; Monte, 2013).² For example, one of the chief criticisms of Regnerus’s (2012a, 2012b, 2012c) research was that those children who had been born into a mixed-orientation marriage (MOM) should not have been classified as children from gay or lesbian families even if the gay or lesbian parent had established a stable home thereafter.

A few illustrations of some of these problems, featuring several recent studies based on the National Longitudinal Study of Adolescent Health (known as the Add Health study), are reviewed below in chronological order of publication. The National Longitudinal Study of Adolescent Health began as a nationally representative sample of over 90,000 U.S. adolescents who were in Grades 7 to 12 during 1994–1995. There have been four longitudinal in-home interviews of the adolescents, for a sub-sample of approxi-

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²At the same-sex marriage trial in Michigan (February 25, 2014), Dr. David M. Brodzinsky served as an expert witness for the plaintiffs. He testified (p. 65) that because the participants in the Regnerus study had been born into heterosexual families that were later disrupted, the study did not allow for any conclusions to be drawn about the effect of being raised by same-sex parents. However, many other studies with same-sex families have incorporated similar types of families and have not been challenged with respect to their legitimacy (Schumm, 2012; Redding, 2013).

mately 15,000 adolescents, most recently in 2008. The Add Health survey has been used to investigate numerous aspects of well-being with ecological data on the social and community environment, as well as biological data at the individual level. Although not reviewed here, Tillman's (2007) study using ADD HEALTH data is one of the better recent such studies.

Studies of Heterosexual Parent Families

Add Health Studies

Cookston (1999) used Add Health data to compare child outcomes in terms of problem behaviors as a function of three family structures (single-mother, single-father, intact family), with parental supervision as a mediating variable. The adolescents in the study ranged in age from 11 to 19 yr. ($M=14.8$). Although the study's in-home interviews involved a large sample of 15,000 adolescents, only 684 adolescents were studied because others (>95%) were from families that could not be clearly coded into one of the three categories. Families were coded as single-parent only if the adolescent's biological parents had never married or had been married and later divorced. Of the 684 adolescents, 322 were from single-mother families, 106 from single-father families, and 256 from intact families. Cookston found that delinquency ($d=0.34$ in single-mother families; $d=0.60$ in single-father families), heavy drinking ($d=0.16$ in single-mother families; $d=0.47$ in single-father families), and illicit drug use ($d=0.17$ in single-mother families; $d=0.49$ in single-father families) were lower for adolescents from intact families or from families (more often intact ones) where parental supervision was high vs low ($d=0.25$ for delinquency; $d=0.27$ for heavy drinking; $d=0.22$ for illicit drug use). While the study's conclusions might seem strong, the results were based on less than 5% of the Add Health sample and neither the duration of time having lived in any of the types of families nor the developmental stages of the adolescent were used in the analyses of child outcomes.

Davis and Friel (2001) also used Add Health data from 6,261 adolescent girls and 6,106 adolescent boys, between the ages of 11 and 18 yr. In terms of family structure, they did not report n 's, but percentages, for intact two-parent family (65.4%, approximate $n=8,088$), stepfamily (33.3%, approximate $n=4,188$), single-parent family (1.3%, approximate $n=161$), cohabiting parents (11%, approximate $n=1,360$), and lesbian parents (2.1%, approximate $n=260$). They did not find family structure to be strongly related to either of their two outcome variables (age at initiation of sexual activity and number of sex partners); the only variables consistently related to those outcomes for both girls and boys were adolescent religiosity (measured in five levels) and the adolescent's GPA (measured in four levels). For each unit increase in religiosity girls initiated sexuality 0.11 yr. later, boys

0.09 yr. later. Likewise, for each unit increase in religiosity, girls had 0.16 fewer sexual partners, boys 0.21 fewer. For each unit of higher GPA, girls initiated sexuality 0.17 yr. later, boys 0.22 yr. later. For each unit of higher GPA, girls had 0.36 fewer sexual partners, boys 0.29 fewer. However, their analyses did not take into account parental relationship stability or duration, or the adolescent's age at which changes in family structure may have occurred, relative to the adolescent's development.

Manning and Lamb (2003) also used Add Health data from 13,231 adolescents to assess child outcomes as a function of family structure in terms of single mothers ($n=3,593$), cohabiting unmarried parents ($n=559$), married stepparents ($n=1,352$), and married two-biological parents ($n=7,727$). They noted specifically, "... the Add Health data do not include details about family structure histories" (p. 881). They did control for the duration of the relationship for all the family types except single mothers as well as number of mother's marriages, parental supervision and closeness, family income, mother's age and education, child's age, importance of religion to child, number of children in the household, and other variables. In general, adolescents from two-parent married families fared better, although the importance of religion to the adolescent and closeness to mother were also significant predictors of the adolescent doing better. Compared to those with two biological married parents, adolescents from families with a cohabiting stepfather, married stepfather, or single mother reported a greater frequency of having been suspended or expelled from school ($p<.001$, all three comparisons), a higher rate of delinquency, a greater extent of school problems, and lower GPA. Scores on the Peabody Picture Vocabulary Test (PPVT) were only lower for adolescents from cohabiting stepfather ($B=2.36$) families and single mother ($B=0.85$) families compared to those from married biological parents. Differences on college expectations were not statistically significant for any of the comparisons. For example, in regression models with unstandardized coefficients, importance of religion was related to higher grade point average ($B=0.16$), lower rates of delinquency ($B=0.72$), fewer school problems ($B=0.25$), and higher expectations of going to college ($B=0.11$) while closeness to mother was related to higher grade point average ($B=0.22$), lower rates of delinquency ($B=1.18$), fewer school problems ($B=0.55$), higher scores on the Peabody Picture Vocabulary Test ($B=0.96$), and to higher expectations of going to college ($B=0.08$). They acknowledged that family structure (e.g., whether the parents married) might have been influenced or caused by child problems or related to selection effects. Specifically, they said that "... we may find that mothers with children who have greater behavior problems and poor school performance are more likely to cohabit than marry. Thus, there could be selection into family types based on the adolescent be-

TABLE 1
Variations in Numbers of Different Types of Families in Different Reports Based on Add Health Data

Family Type	Cookston (1999)	Davis and Friel (2001)	Manning and Lamb (2003)	Demuth and Brown (2004)	Hawkins, <i>et al.</i> (2006)
Married Biological Parents	256	8,088	7,727	9,505	10,275
Single Parent Family	428	161		4,317	3,741
Single Mothers	322		3,593	3,792	3,212
Single Fathers	106			525	529
Cohabiting Unmarried Parents		1,360	559		
Married Stepparents		4,188	1,352	2,482	
Mother-Stepfather Families				2,039	
Father-Stepmother Families				443	
Repartnered Resident Mother					1,955
Repartnered Resident Father					422
Two Nonresident Parents					937
Lesbian Parents		260			

haviors. In a similar vein, the causal nature of the covariates is not clearly specified in our models" (p. 891).

Demuth and Brown (2004) also used Add Health data to assess child outcomes as a function of single-parent or step-family family structure. In particular, they assessed outcomes for adolescents from "two-biological-parent, married-couple families ($n=9,505$), single-mother families ($n=3,792$), single-father families ($n=525$), mother-stepfather families ($n=2,039$), and father-stepmother families ($n=443$)" (p. 66). Family structure was based on the adolescent's current situation at the time of their interview. Demuth and Brown also controlled for the presence of any other adult in the home, as well as parent involvement, closeness, household size, parent education, and child's age. They found that family structure, in general, no longer significantly and directly predicted child outcomes after controlling for the other variables, although the family process variables may have mediated the relations between family structure and child outcomes. While the Demuth and Brown (2004) study improved over the Cookston (1999) study by using more of the adolescent participants and by including step-families, it still did not distinguish dose effects of family structure or child development effects.

Hawkins, Amato, and King (2006) used Add Health data to assess parental involvement as a function of family structure, including children with two married parents ($n=10,275$), an unpartnered resident mother and nonresident father ($n=3,212$), a repartnered (married or cohabiting) resident mother and nonresident father ($n=1,955$), a nonresident mother and unpartnered resident father ($n=529$), a nonresident mother and repartnered (married or cohabiting) resident father ($n=422$), and two nonresident parents ($n=937$). While they found greater parental involvement for mothers and resident parents, their data nonetheless did not include much in the way of longitudinal assessment of changes in family structure related to the developmental status of the adolescents.

Limitations of Heterosexual Family Studies

The Add Health dataset can be drawn from in various ways, depending on the definitions of family structure in each study. Definitions must vary substantially among different reports, as accounts of different types of families vary widely (Table 1). The criteria for such definitions tend not to be described in detail, possibly not enough to permit replication of or even a clear understanding of the results of such Add Health reports. For example, it is interesting to note that in most of the above studies diverse types of single-parent families would have met the inclusion criteria for the study. For example: (1) child lived with both biological parents until age 17 when the parents divorced and the child lived with her mother after the divorce, (2) the child's biological parents never married and the child is now 19 yr. old, (3) the child's parents divorced when the child was three yr. old and neither parent remarried, while the child is 11 yr. old now, (4) the child lived with both biological parents until they divorced when the child was 12 yr. old after which the father died when the child was 13 while the child continued to live with her mother for three yr. after the divorce. Lumping all of these situations together as if they would contribute to a child's development in the same way is clearly a serious limitation. The studies did not assess the number of transitions to which a child might have been exposed, the relationship stability of the child's parents, or the ages at which the child experienced various types of transitions. Some of the studies did not report effect sizes or enough information to calculate effect sizes.

Again, as noted, the sample sizes for each alleged type of family were very different in various studies (Table 1). Sample sizes for single-parent families, using the same national data set, ranged from 161 to 4,317. For stepfamilies, samples ranged from 1,352 to 4,188, and for two-parent, intact families the sample sizes ranged from 256 to 10,275. The sample size differences from the

same data set indicate that very different definitions of family structures were used in these studies. Given such differences, valid and useful comparisons across the studies are virtually impossible.

Studies of Same-Sex Parent Families

Selected Studies on Same-Sex Families

In the Add Health data set, most studies have not assessed different structures among same-sex parent families, especially with respect to male same-sex parent families. Those that have categorized family structure indicate the same problem of criteria: Davis and Friel (2001) identified 260 lesbian mother families in the data set, but later researchers only identified between 18 (Patterson, 2009) and 44 (Wainright & Patterson, 2006) lesbian couple families. Thus, in all likelihood, the vague definitions of family structure and lack of family history have affected studies of same-sex parent families as they have heterosexual parent families.

In contrast to the literature on heterosexual parent families, many studies in the literature involving lesbian mothers or gay fathers have reported some heterosexual relationship history in the parents' past (Schumm, 2012). As early as 1991, Tasker and Golombok observed that "A further limitation to these studies is that most of the children who participated spent the early part of their lives in a heterosexual family" (p. 186). Recent studies that confirm that observation include Goldberg and Kvalanka (2012), Goldberg and Allen (2013), Goldberg, *et al.* (2012), and Regnerus (2012a, 2012b, 2012c), reviewed below. A more detailed discussion of research on same-sex parent families by Golombok and her colleagues will follow (Golombok, Perry, Burston, Murray, Mooney-Somers, Stevens, *et al.*, 2003; Stevens, Perry, Burston, Golombok, & Golding, 2003; Perry, Burston, Stevens, Golding, Golombok, & Steele, 2004).

Family Stability

Goldberg and Kvalanka (2012) discussed how they obtained a sample of 49 children who had been born into 22 heterosexual relationships and 27 non-heterosexual relationships. Since the heterosexual relationships involved parents who came out later as gay or lesbian, it is probably safe to assume most of them divorced, although that percentage was not reported. But what of the 27 non-heterosexual relationships? Of the 27, 20 were born via donor insemination to lesbian couples, 2 were born to single lesbian mothers, one was adopted at birth by a lesbian couple, one was adopted as a toddler by a lesbian couple, while three more were born into or adopted by couples who were not romantically involved but were co-parents. Thus, there were 22 lesbian couples who gave birth to or adopted children (2 children had single mothers, 3 children had parents who were not romantically involved). Goldberg and Allen

(2013) reported that of those 22, 16 broke up and usually re-partnered into new stepfamily configurations (73%, 15 born into lesbian couples via donor insemination and one adopted as a toddler by a lesbian couple); of the 20 lesbian couples who became parents by donor insemination, 15 (75%) broke up. Furthermore, of the 16 children from same-sex couples who broke up, the average age for that breakup was cited by Goldberg and Allen (2013, p. 533) as 6.34 yr., with a median of 5.50 yr. and a range of 1 to 13 yr. However, of the three children born to or adopted by non-romantically involved couples or to single lesbian mothers ($n=5$), four (80%) had parents who later formed romantic partnerships that later dissolved (Fig. 1). Thus, of the 27 children born into or adopted by gay or lesbian parents (not originally born into a heterosexual relationship except for the one child adopted as a toddler by two lesbian mothers), 20 (74%) experienced a parental breakup. If all of the 22 children born into heterosexual relationships experienced a parental divorce or breakup, then as many as 42 (86%) of the 49 children overall experienced a parental breakup. This is far higher than would be expected in a population sample in the U.S. Amato (2000) indicated that about 40% of all children would "experience parental divorce before reaching adulthood" (p. 1269). Amato (2010) stated that data from the "National Survey of Family Growth indicate that 42% of non-Hispanic Whites and Hispanics divorced within the first 15 years of marriage" (p. 651), although that rate of divorce was lower for married couples with children. Lansford (2009) indicated that "between 43% and 50% of first marriages" (p. 140) would end in divorce, affecting 50% of American children.

Definitions of Family Structure

Regnerus (2012a, 2012b, 2012c) has been criticized extensively because his sample included adult children of same-sex parents where those children had spent part of their youth living with heterosexual parents before or after one or both of the parents came out as gay or lesbian. If similar criteria had been applied to previous studies of children from LGB families, many of the participating families would have had to be disqualified from participation. Even so, one of the limitations of the Regnerus (2012a, 2012b) studies was that respondents were classified as having been only from a LGB family even if they had never lived with the same-sex partner of their LGB parent. On the positive side, the NFSS data set does include data from birth to adulthood for each respondent on which caregivers the respondent had lived with on a year-by-year basis, providing the potential to overcome many of the limitations of previous heterosexual or same-sex parenting studies.

Family Structure "Dose"

While, as noted, many studies of lesbian, gay, bisexual, or transgender (LGBT) parenting have involved

parents from previous mixed orientation marriages (MOMs), sometimes those studies have not explained the extent to which the samples involved MOMs nor the ages of the children when the parents re-partnered into LGBT families. Golombok, *et al.* (2003), Stevens, *et al.* (2003), and Perry, *et al.* (2004) published results from a data set that included 28 lesbian mother families in which the children had been born into a heterosexual relationship, as well as 10 (Stevens, *et al.*, 2003, p. 347; Perry, *et al.*, 2004, p. 470) or 11 (Golombok, *et al.*, 2003, p. 22) other lesbian families where at least one child had been conceived by donor insemination. The researchers explained that the average age of the 28 children when their mother entered into a lesbian relationship was 4.1 yr. (approximately 49 mo.) with a range of 0 to 108 mo. (Golombok, *et al.*, 2003, p. 22; Stevens, *et al.*, 2003, p. 350; Perry, *et al.*, 2004, p. 470). Furthermore, the average age of the child at the time of the study was 92.5 mo. ($SD=15.5$) with a range of 62 to 116 mo. (Stevens, *et al.*, 2003, p. 350). The goal of the study had to be study families that had a 7-yr.-old child, but for the lesbian families the age restriction was relaxed to include children as young as five and as old as nearly nine years of age in order to recruit more lesbian families as participants in the study.

In none of these studies did the researchers disclose how much time the children actually spent in a heterosexual family rather than in a lesbian family. Thus, we are left with a sense that a large percentage of the families had begun as MOMs (at least 72%, 28/39), but it is not clear how many of the children had spent more time in a heterosexual family environment than in an LGBT family environment. Other scholars have noted this issue. While discussing Golombok, *et al.*'s (2003) study, Goldberg, *et al.* (2012) reported that of the children of the 39 lesbian-mother families, 28 "had been born into a heterosexual-parent family, and were 4.1 yr. old, on average, when their mothers entered into a lesbian relationship. Thus, the children of lesbian mothers often spent time in other family structures during their early years" (p. 506). Schumm (2012) noted that, with respect to the Golombok, *et al.* (2003) research, "children who had spent most of their life in heterosexual families were, in fact, included within the operational definition of children from lesbian families" (p. 1360). In the Appendix, more detailed analyses are presented to reaffirm the observations of Goldberg, *et al.* (2012) and Schumm (2012) with respect to the Golombok, *et al.*, studies, a situation partly necessitated because Golombok, *et al.* have not released detailed information on how long each of their participants spent in various family structures.

It is possible that the "dose" of LGBT or heterosexual parenting might have affected the child outcomes measured, possibly depending on the developmental status of the child when the changes in family structure had occurred. It is vital to establish the relevance or ef-

fect of "family structure dose" before grouping LGBT or heterosexual parent families, because sampling without regard to stability may lead to conclusions that can not be generalized to all families of either type. This principle has been recognized by others; e.g., Rosenfeld (2010, 2013) did not combine recently established and more stable LGBT families in his U.S. Census data analyses, implying that he did not think it wise to assume that all LGBT families were alike, regardless of how long they had been established or stable. Similarly, Allen (2013) also had to deal with similar issues in his analyses of Canadian census data.

Conclusion

Family structure does not appear to be static in either heterosexual or LGBT families. Recategorizing families because they have experienced changes over time would eliminate many from eligibility for research participation. Taking a "snapshot" approach also ignores the timing of changes which might tie in with the developmental status of the child and future child outcomes. Even so, it appears that researchers have often disagreed substantially on how to classify family structure, even when using the same data sets. If a child's entire family structure history is known, questions remain about how to classify that structural exposure overall.

Family structural histories can be complex and this is becoming more common as time goes on. Although it would be ideal to know year-by-year how a child's family structure changed over time, it might be helpful to know the type of family structure to which the child had the most exposure. If researchers do not release their data for independent analysis, careful statistical detective work can still indicate how many children in a data set spent more time in one family structure than in another (see Appendix). Such work is valuable in developing study designs to examine various difficult-to-study issues related to family structure, including, e.g., parenting styles, juvenile delinquency, drug use, sexual activity, academic and social success, etc. Longitudinal studies are so expensive and time-consuming that such statistical work on less-than-complete extant reports is well worth the effort. It is vital that peer-reviewed reports include far more information about samples and definitions of family structure.

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TABLE 2
Life Histories of Children Ages 5 to 9 Years in New Family Structures Study Who Lived With a Lesbian Mother ($N=12$)

Case Number for Each Child	Age of Child, by Each Year of Age, While Living in a Lesbian Family	Total Numbers of Years Child Lived with both Biological Mother and Biological Father	Total Number of Years Child Lived with Biological Mother Who Was a Single Parent in Each Year
1	1, 2, 3, 4, 5	0	0
2	3, 4, 5, 6, 9	1	3
3	7	1	5
4	7	1	5
5	7, 8	2	4
6	7, 8, 9	3	3
7	7, 8, 9	5	0
8	8	1	6
9	9	0	8
10	9	0	0
11	9	8	0
12	9	5	3

Note Numbers may not add up to oldest age of child while in a lesbian parent family due to the child having been in family constellations other than a single parent or two-parent heterosexual household. Cases are arranged in order by earliest age that a child spent time in a two-parent lesbian family. A child was counted, in the Regnerus (2012a) study, as living at a given age with a caregiver if the child spent at least 4 mo. out of that year with that caregiver. For example, if a child had lived for 6 mo. or 9 mo. at age 6 with a lesbian mother, then the child would be credited with a “dose” of 1 yr. in that particular family structure at age 6.

Appendix

Statistical Detective Work: Family Structure “Dose”

This appendix is an important set of techniques to use when drawing hypotheses for further study from extant literature. Examples are drawn from well-cited studies in the literature.

Ages of Children

Golombok, *et al.*'s (2003) study can be examined more closely for hints about the “dose” of lesbian parenting received by the children in the samples. Golombok and colleagues have not published a table listing the years each child spent in each type of family, but there may be several avenues by which to learn more about the family history of the children, even without complete data.

As mentioned before, the age range of the 28 children was from 62 to 116 mo., while the age at which they entered into a lesbian family was from birth to 108 mo. (Stevens, *et al.*, 2003, p. 350). Because the study was done after the child had entered into a lesbian family, the age of entry into a lesbian family must be less than the age of

the child at the time of the study. Thus, from the range of age at entry into a lesbian family, there was at least one family that began as a lesbian family when the child was 108 mo. old. The child had to be older than 108 mo. (9 yr.), but the oldest child in the study was 116 mo. old. Therefore, at least one child lived in a family with a different structure for at least 107 mo., but could not have been in a lesbian family for more than 9 mo., so spending less than 9% of her/his life in a lesbian parent family at the time of the study. Clearly, at least one child was born into a heterosexual family and spent far more time in that family or some other non-lesbian family form than was spent in the lesbian parent family. More detailed analysis indicates that at least three of the 28 children spent more time outside of a lesbian parent family than in it.³

From the NFSS data, each of the more than 200 “same-sex parent families” was examined, by recording

it, then age-at-interview (Y) would be twice the age-at-entry (X) such that $Y=2X$. If all of the remaining 27 children spent more time inside a lesbian family than outside of it, then Y_{avg} must be greater than $2X_{avg}$. If not, if $Y_{avg} < 2X_{avg}$, then at least one child among the 27 children had to spend more time outside a lesbian family than inside one. For the remaining 27 children, twice the average age-at-entry of 46.81 mo. = 93.62 mo. ($2X_{avg}$). However, $91.63 < Y_{avg} < 91.93$, which is somewhat less than $2X_{avg}$ of 93.62 mo., which means that at least one child, and possibly more than one, of the remaining 27 children had to spend more time outside of a lesbian family than inside one. Furthermore, one child did enter into a lesbian parent family at birth (0 mo.) and was between 62 and 116 mo. old at the time of the study. Removing that case from the 27, leaving 26 cases, yields $2X_{avg} = 97.22$, which remains greater than the four possible extreme values of Y_{avg} (90.69, 91.00, 92.77, 93.08), using combinations of 62 and 116 mo. against the previous Y_{avg} values of 91.63 and 91.93.

³If the one case with age-at-entry 108 mo. is removed from the average of 49 mo., for 28 children, we obtain an average of 46.8 mo. for the remaining 27 children. The child who entered a lesbian family at 108 mo. had to be at least 108 mo., old and no more than 116 mo. old, so that the average age-at-interview for the other 27 children had to be between 91.6 mo. (removing 116 mo.) and 91.9 mo. (removing 108 mo.). If a child spent as much time in a lesbian family as outside

the caretakers that each adult child reported that they had lived with each year from birth to age 18 (caretakers including biological mother, biological father, stepmother, stepfather, mother's boyfriend/partner, father's girlfriend/partner, adoptive mother, adoptive father, mother's girlfriend/partner, father's boyfriend/partner, grandmother, grandfather, other relatives, foster parents, institution, other, and on their own). Using that information (Table 2), there were 12 cases in which a child had lived with a lesbian mother and her girlfriend (defined as a same-sex romantic partner) between the ages of 5 and 9, the same age range in the Golombok, *et al.* (2003) study. In 25% of the cases, the child had lived for more years with both mother and father than the child had lived within a two-parent lesbian household. In one-third of the cases, the child had lived longer in a lesbian two-parent family than in a heterosexual two-parent family. In five cases, the child had spent the same number of years in both types of families, usually having spent most of the time with a mother as a single parent, usually after leaving her male partner but before finding a female partner. If one extrapolates these results for $N=28$, that would suggest that 7 (25%) of Golombok, *et al.*'s (2003) children would have spent more time in a heterosexual parent family than in a lesbian parent family. It is possible that if some mothers were "heterosexual" single parents, more children could have been counted as having spent more time in a two-parent heterosexual family than in a two-parent lesbian family, but Table 2 represents a conservative estimate of the years spent by each child in a two-parent heterosexual family. A further complication of such data is that it may not be clear how long any periods of single motherhood were while the mother identified as heterosexual or while she identified as lesbian or bisexual.

Javaid (1993) also provided limited data on the age of the children of lesbian mothers and the age at which the mothers had divorced the fathers involved. The 26 children ranged in age from 6 to 25 yr. (2, 6–8 yr.; 11, 9–12 yr.; 10, 13–18 yr.; 3, 19–25 yr.). The ages at separation/divorce ranged from before birth to 19 yr. (2, before birth; 2, birth to 2 yr.; 5, 3–5 yr.; 11, 6–12 yr.; 6, 13–19 yr.). Those children whose parents separated prior to age 3 were all at least six yr. old, guaranteeing that they spent more time in their new lesbian family than in the former heterosexual family ($N=4$). Those children

⁴In particular, if the separation occurred at age 13 yr., the children could not now be only 12 yr. old or younger and in a lesbian family. Ambiguity is more evident for those children for whom the separation occurred between the ages of 2 and 12 yr. but whose ages ranged between 6 and 25 yr. For cases in which separation/divorce occurred between the ages of 3 and 5 yr. but whose study ages were between 6 and 25 yr. most likely these children spent more time in their new lesbian families than in the previous heterosexual families ($N=5$). Those children ages of 6 and 12 yr. whose parents divorced/separated probably spent more time in their new lesbian family if they were now 13 to 25 yr. old ($N=6$, estimated), while they probably spent more time in their heterosexual family if they were now 6 to 12 yr. old ($N=5$, estimated).

whose parents separated after age 12 but whose ages were less than 26 yr. had spent more time in their former heterosexual family than in the new lesbian family ($N=6$).⁴ It is reasonable to project that about 11/26 (42%) spent more time in a heterosexual family than in a lesbian family. Extrapolation suggests that of Golombok *et al.*'s 28 children (2003), 12 may have spent more time in a heterosexual family; clearly this is a potential confound of family structure research. It is strongly recommended that researchers use and report well-documented criteria for sample selection.

Theory of Chance

Given that there is certainty that at least three of the families spent more time in a heterosexual family than in a lesbian family, what is the probability that none of the other 25 families spent more time in a heterosexual family than in a lesbian family? If $N=25$ and p = only .11 (3/28, $q=0.89$) in a binomial distribution (www.vassarstats.net/binomialX.html), then there is less than a 6% chance that *none* of the 25 cases will not involve more time in a heterosexual family than in a lesbian family. If the probability of any given case being in a heterosexual family longer is only slightly larger than 11%, at 15%, then the chances of none of them being so become small ($p < .02$, two-tailed). From a theory of chance perspective, for none of the other 25 families' children to have spent more time in a heterosexual or non-lesbian parent family than in a lesbian parent family, the chances of any one of them doing so was eleven percent or less on average. The odds of there not being at least four children in the Golombok, *et al.* (2003) research who spent more time in a heterosexual family than in a lesbian family are slim.

Distribution Overlap

The age range of the children was from 62 mo. to 116 mo. The range for age-at-entry into a lesbian parent family was 0 to 108 mo. Suppose hypothetically there was an age distribution from 208 to 250 mo., such that the age distribution did not overlap at all with the age-at-entry distribution of 0 to 108 mo. The shortest possible time that any child could have spent in a lesbian parent family would have been 100 mo. (208–108). But even the *shortest possible* time spent in a lesbian parent family would have been 40% (100/250) of the oldest age of any child. Under such circumstances, it might well have been true that most, if not all, of the children would have spent more time in a lesbian parent family than in other family structures. But rather than having no distributional overlap, which would be conducive to such an outcome, here there was substantial overlap, from 62 to 108 mo. Given that even a non-overlapping pattern of age from 208 to 250 mo. would not rule out the possibility of one or two children having spent more time in a heterosexual family than in a lesbian parent family (e.g.,

age 208 mo., entered a lesbian parent family at 108 mo., 100 mo. in a lesbian parent family, 108 mo. in a heterosexual parent family), having extensive overlap allows for a much greater chance of having at least a few predominately heterosexual parent situations.

Critical Values for Age-at-Entry into a Lesbian Parent Family

Another more specific way to consider distribution overlap is to recognize 31 mo. and 58 mo. as critical points. A child who is 31 mo., at time of entry into a lesbian parent family could have spent half of its life in that family structure if its age was 62 mo. at the time of the study. Any children who entered into a lesbian parent family at a younger age than 31 mo. could have spent more time in a lesbian than in a heterosexual parent family (not that they did, it's just that it's possible). A child older than 58 mo. at time of entry into a lesbian parent family could not have spent more time in a lesbian parent family than in other situations because the oldest child in the study was 116 mo. Thus, the situation is this: in terms of age at entry into a lesbian parent family, from birth to 31 mo., there is a possibility (not a certainty) that the child spent more time in a lesbian parent family; from 32 mo. to 58 mo., the possibilities could go either way; from 58 mo. to 108 mo., the child could not have spent more of its time in a lesbian parent family.

Since the age at entry into a lesbian parent family had a range of zero to 108 mo., it is apparent that 46% of the range for age-at-entry (i.e., the last 50 mo. of 108 mo.) falls into a category that does not easily allow for children to have spent more time in a lesbian parent family than in a heterosexual parent family (this depends on the unknown duration of single motherhood, if any, between membership in a heterosexual or lesbian parent family). For there to be no such children, age-at-entry must retain its range of 108 mo., yet no more than one case can be allowed to occur in the upper 46% of that range. That would seem to be a very improbable situation.

For example, suppose one child entered a lesbian parent family at birth, which did occur because of the range being from zero to 108 mo. It would take at least five children who entered a lesbian parent family at 57 mo. or so to offset the effect on the average age-at-entry to keep that average at 49 mo. With three such children who entered a lesbian parent family at birth, it would take 15 children who entered at 57 mo., or later; with four such children, there would be almost no children left to keep the average at 49 mo. If the assumptions are relaxed and allow for children entering a lesbian parent family at an age older than 58 mo., you can retain the average at 49 mo., but then there are more children are in a situation (older than 58 mo.) where they cannot have spent more time in a lesbian parent family than they have in

other family structures. The bottom line is that with the large overlap of the age-at-entry and age-at-study distributions, the odds are slim that there are no children who spent more time in a heterosexual parent family (or a non-lesbian parent family) than in a lesbian parent family.

Interpreting Means and Standard Deviations

Although not all students of statistics may understand the importance of variance, it has many meanings and is very useful (Schumm, Bosch, & Doolittle, 2009). A standard deviation for a distribution suggests, if the distribution is normally distributed, that 4.5% of the cases fall outside \pm two standard deviations (*SDs*) of the mean and that 68% of the cases fall within \pm one standard deviation of the mean, while 13.6% of the cases fall between one and two standard deviations on each side of the mean. If data are not approximately in line with those expectations, authors should let readers know, lest they incorrectly interpret the meaning of the mean scores and standard deviations that are reported. None of Golombok and colleagues' studies mentioned any non-normality in their age distributions. In the following text, as an example of how the examination of normality is helpful in interpretation, first the age distributions will be assumed to approximate the normal distribution; then, the assumption of normality is rejected to examine the influence of non-normality on possible outcomes.

Distribution of age of child.—For the 28 focal children in the 28 lesbian families with non-donor-inseminated children, the average age was 92.5 mo. ($SD=15.5$). But what if that *SD* has not been reported – could it have been estimated? How? There are two extreme cases to consider. One extreme case is if most of the children's ages were packed into the far left or far right of the age distribution. One situation that will generate an average of 92.5 mo., but has most cases at the extremes, with 12 children being 62 mo., old, 15 being 116 mo., old, and one being 106 mo., old. This situation will generate the largest possible standard deviation while keeping the mean score correct, with $SD=27.0$. The other extreme situation would minimize the standard deviation by packing most cases near the mean score but keeping the known outliers of 62 mo. and 116 mo. Here we have one child of age 62 mo., one child of age 116 mo., 6 children of age 92 mo., and 20 children of age 93 mo., with $SD=7.43$. These two standard deviations average to $SD_{avg}=17.21$. To be conservative and cut that average *SD* by 10% gives 15.49, which is very close to the actual known standard deviation of 15.52 mo. Another approach, recommended by Brase and Brase (2009, p. 270), is to divide the range of age by four, to estimate the standard deviation, yielding 13.5, which yields an underestimate of the actual standard deviation in this case.

Distribution of age-at-entry into a lesbian parent family.—The authors of the Golombok *et al.* (2003) studies did not report the *SD* for age-at-entry into a lesbian parent family. However, using the same approach used to estimate the *SD* for age of child at the time of the study, the our *SD* estimate would be maximized by using 15 children at birth, 12 children at 108 mo., and one child at 76 mo., yielding $SD=53.93$ while keeping the average age at 49 mo. The standard deviation estimate can be minimized by assuming one child at 0 mo., one child at 108 mo., 16 children at 49 mo., and 10 children at 48 mo., yielding $SD=14.77$ while retaining the average of 49 mo. If those two estimates are averaged and reduced by ten percent, $SD=30.92$ or approximately 31. Thus the extreme high estimate of the standard deviation is 54 mo., the extreme low estimate is 15 mo., and a conservative middle estimate is 31 mo. Because an $SD=54$ mo. would subsume most of the families within just one standard deviation of the mean score, a situation which usually would only occur within two standard deviations of the mean score, it seems very likely that the actual standard deviation is lower than 54 mo. Dividing the range by four yields an estimate of 27 mo., a bit less than the estimate of 31 mo.

Comparing the estimated distributions for child's age.—An ordinary *z* distribution can be used to assess the area under a normal curve, the area representing the percentage of cases to the right of the *z* value. Here the total number of cases is 28. The *z* value can be determined by subtracting the mean score from the critical value for this situation and dividing by the standard deviation. For example, if the critical value for age at entry into a lesbian family was an age of 70 mo., then we would have $z=(69-49)/SD$. If the *SD* were 10, then $z=20/10=2.0$, with only 2.28% of the cases to the right of the *z* score, which might be one case ($2.28\% \times 28=0.64$).

As mentioned before, the critical values were 31 and 58 mo. Using the three estimates of standard deviations for age at entry into a lesbian parent family: if $SD=54$, $z=(58-49)/54=0.167$; if $SD=31$, $z=(58-49)/31=0.290$; if $SD=15$, $z=(58-49)/15=0.600$. Using a table for areas of a standard normal distribution, one would expect to find, respectively, about 43% ($SD=54$), 38% ($SD=31$), or 27% ($SD=15$) of the children at or above an age of 58 mo., which for 28 cases would represent an estimate of 12, 10, or 7 participants, rounding all of the estimated downward to be conservative. Thus, using the most conservative approach, one would expect that one-quarter of the participants would have spent more time outside of a lesbian parent family than inside it. The estimates here are conservative because it is still possible for some children younger than 58 mo. at time-of-entry into a lesbian parent family to have spent more time outside of that family structure than within it.

Non-normal age distribution.—It is possible that the age distribution for entry into a lesbian parent family is not normal. There are seven major possibilities for non-

normal distribution characteristics: uniform, skewed toward younger ages, skewed toward older ages, a uniform distribution, and platykurtic, leptokurtic, or bimodal (with two peaks) distributions.

First, the distribution may be uniform. If the ages-at-entry were distributed evenly across the range of ages, from zero to 108, then there would be one child approximately every 4 mo. That pattern would yield approximately 11 or 12 children above the critical value of 58 mo. and well over one-third of the children would have spent less time in a lesbian parent family than some other family structure(s).

Second, the distribution may be skewed. If the distribution is skewed toward younger ages, there would be more children to the left of the mean than expected with a longer tail than expected to the right of the mean. This pattern would indicate that more children were entering into lesbian parent families at a younger age. However, to keep the mean score at 49 mo., there would have to be a smaller number of children who entered into lesbian parent families very late. Those later-age-at-entry children would have higher ratios of time spent outside of a lesbian parent family compared to time spent in a lesbian parent family, which would still support the argument that at least a few of the children spent more time outside of that family structure. If the distribution is skewed toward older ages, there would be more children to the right of the mean than expected with a longer tail to the left of the mean. This pattern would indicate that more children had entered into lesbian parent families at a later age. Since 58 mo. of age-at-entry into a lesbian parent family is a critical value, this type of distribution would tend to have more children past that critical value than if the distribution was skewed in the opposite direction. For this pattern to occur with the same mean, there would have to be more children who entered into a lesbian parent family at birth or very early than in more normal distributions. Nevertheless, this distribution would tend to favor the argument that more children spent more time outside of a lesbian parent family than within one.

If the ages had a *platykurtic distribution*, which is flatter than normal, and closer to a uniform distribution, then the number of children above the critical value of 58 mo. would be between that for a uniform distribution and the normal distribution, because the tail of the distribution toward the higher ages would be larger than for the normal distribution but smaller than for the uniform distribution. Accordingly, one would expect between 7 and 11 children to have ages above the critical value of 58 mo.

If the ages of children had a *leptokurtic distribution*, the distribution would be more peaked than normal. In the most extreme case, the pattern might include one case at 0 mo., one case at 108 mo., and 26 cases at about 50 mo. It might appear that with this distribu-

tion there would be only one case above the critical value of 58 mo. However, at this point, examining the distribution of children's ages at the time of the study, 62 to 116 mo. ($M=92.5$, $SD=15.5$), gives a clearer perspective. With a hypothetical leptokurtic distribution, the ages of the children would have to be restricted to 50 mo. or older because the child could not be younger at the time of the survey than the time they had entered into a lesbian parent family (they would have never been – yet – in a lesbian family and therefore would not have qualified for the study, as a child in a lesbian parent family). Of course, the data show that no child was younger than 62 mo., so the restriction is actually true to the data as reported. At the same time, if the children were 100 mo. or older, then they would have spent more time in a lesbian parent family than in a different family structure because at 100 mo. of age, most of the children ($26/28=93\%$) would have spent 50 mo. in a lesbian parent family and 50 mo. elsewhere. Therefore, the situation would be this: one child of age 116 mo. who had entered into a lesbian parent family at age 108 mo., one child of unknown age who had entered into a lesbian parent family at birth and remained there (but clearly spent more time in that family structure than not), and 26 children who entered into a lesbian parent family at 50 mo., but were between 62 mo. and 116 mo. of age at the time of the study. To simplify the assessment, assume the average age of the child at the time of the study remains 92.5 mo. ($SD=15.52$) with a normal distribution. If so, there would be approximately four children (16% of 26) over the age of 108 mo., nine children (34% of 26) between 92.5 and 108 mo., nine children (34% of 26) between 78 and 92.5 mo., and four children between the ages of 62 and 78 mo. The four children under the age of 78 mo. would have spent 28 or fewer months in a lesbian parent family but almost 50 mo. in a different family structure. The nine children under the age of 92.5 mo. would have spent no more than 43 mo. in a lesbian parent family but nearly 50 mo. in a different family structure. Thus, with an extreme leptokurtic distribution, approximately 13 (46%) of the children would have spent more time outside of a lesbian parent family than in one.

In a *bimodal distribution of age data*, if there was one age-at-entry into a lesbian parent family at 0 mo. and another at 108 mo., there could be 13 cases at age 34 mo., 12 cases at age 64 mo., and one case at age 55 mo., to maintain an average age of 49 mo. ($SD=20.7$). The case at 55 mo. could have spent more time inside a lesbian parent family than outside, but none of the 12 cases at 64 mo. could have done so, having spent 63 mo. elsewhere and no more than 52 mo. in a lesbian parent family (116–64). Thus, even with a bimodal distribution it is very likely that at least several children would have spent more time in a non-lesbian parent family.

Simulating data with three different correlations between age of child and age-at-entry.—There are many plausible distributions of *correlated age data*. Because there are only 28 cases, many distributions could retain the mean (92.5 mo.) and standard deviation (15.6) for age of child at the time of the study and also retain the mean age-at-entry into a lesbian parent family (49.0 or 49.1 mo.), and retain the extreme range scores. In a first scenario, both age variables increased in parallel with each other and were strongly correlated, $r=0.94$ ($p<.001$). The SD for age-at-entry was 34.6 mo. In this case, 14 of the simulated children spent more time in a heterosexual family than in a lesbian family. In the second scenario, the age-at-entry was reversed as much as possible so that as age of child at study increased, age-at-entry into a lesbian parent family decreased, so that $r=-0.65$ ($p<.001$) with $SD=23.0$ for age-at-entry into a lesbian parent family. In this scenario, 15 children spent more time in a heterosexual than in a lesbian parent family. In the final scenario, age-at-entry was randomized vs age of the child, so that $r=0.25$ (ns) with $SD=28.9$ for age-at-entry into a lesbian parent family. In this case, 12 children spent more time in a heterosexual than in a lesbian parent family. Thus, with three very different approaches to creating positively correlated age data, negatively correlated age data, and uncorrelated age data while retaining the known means and standard deviations, there were never fewer than 12 (43%) children who had spent more time in a heterosexual family than in a lesbian family.

Conclusion

As an example of how to assess complex aspects of change in family structure over time and relative doses of different types of family structure, I have tried to arrive at dependable evidence about the relative “dose” of family structure in Golombok *et al.*'s (2003) research through several different processes, using available information and basic mathematical or statistical calculations. If the mothers always identified as either heterosexual or non-heterosexual after the birth of the child, the basic demographic data virtually guarantee that children in three of the families spent more time in a heterosexual parent family than in a lesbian parent family. Using theory of chance, it would appear very unlikely that at least four children would not meet the criteria. If the NFSS data (Regnerus, 2012a, 2012b) or Javaid's (1993) data are in any way similar to the Golombok *et al.* (2003) data, then one would expect between 7 and 12 children to have been in a heterosexual parent family than in a lesbian parent family. If the age-at-entry distribution into a lesbian parent family was normal, again 7 to 12 children would be estimated as having been in other family structures longer than in a lesbian parent family. If the age-at-entry distribution was not normal, estimates—where they are possible to calculate—range between 7 and 13 children who spent

more time in a heterosexual than a lesbian parent family. Three different approaches to data re-engineering suggest that at least 12 children would have spent more time in a heterosexual than in a lesbian parent family. These estimates are all based on the most conservative assumptions possible. Golombok and several of her colleagues placed children into a lesbian parent family group, even though at least one of the children who was at least 108 mo. old could not have been in a lesbian parent family for more than 8 mo. (7.4% of its lifetime). Not only were such families defined as "lesbian parent" but the outcomes for the children were assessed with respect to the parents' lesbian sexual orientation, even when the mother might have identified herself as heterosexual for more of the child's life than the mother had defined herself as a lesbian.

Despite the serious issues of inconsistent criteria for family structure and typically incomplete report of family histories of children whose outcomes are of interest, it was possible for statistical detective work to improve understanding of the "dose" of heterosexual vs lesbian family environment experienced by the children in the Golombok, *et al.* (2003) research. This is an example of what can be done to tease out the possible effects of family structure variables to guide further research. In this selected study, information was limited to knowing that

28 children had spent some time in a heterosexual parent family before an age of between 62 and 116 mo. (Goldberg *et al.*, 2012). After the statistical detective work, it is known that at least three of the children spent as much or more time in a heterosexual parent family than they did in a lesbian parent family (and only a slim probability that no more than three did so). The chances appear good that between four and nine *more* children (seven to twelve children of the 28) also had spent more time in a heterosexual than a lesbian parent family by the age they had participated in the research. Of course, if all of the lesbian parent family were to remain stable for the remainder of the child's life, then by the time the child turned 18 yr. old, the children would have spent a much larger proportion of their life in a lesbian parent family, usually longer than they had in a heterosexual parent family. The challenge for understanding research about LGBT parent families is that any interpretation of "LGBT" must remain somewhat cautious if such families have been self-identified as heterosexual for longer than they have self-identified as non-heterosexual. To ascribe child outcomes to parental sexual orientation as a function of a strict binary typology (heterosexual vs gay or lesbian) based on the family's most current status would seem to overlook any sense of the relative duration of different types of family environments to which children had been exposed.